

**CITY OF NEWTON
LAND DEVELOPMENT DESIGN STANDARDS**

Adopted by City Council :
October 18,2011



CITY OF NEWTON, NC

Article I. DISCLAIMER NOTICE

This document is intended to establish minimum design and construction requirements for the preparation and submittal of plans for subdivision and other land development projects within the City of Newton and its Extraterritorial Jurisdiction (ETJ). The City of Newton will use these standards, as well as sound engineering principles, to review the detailed engineering drawings. All engineers are encouraged to use these standards in the preliminary layout of any development to minimize revisions. The designing engineer on any project should use judgment and experience to determine any additional information that may be necessary for review. The ultimate responsibility for a given design is that of the engineer of record.

Manual Revisions

This manual will be reviewed periodically for updating, and more frequent updates/revisions will be made as significant changes or additions are made to the material covered. Revisions will be available on the City of Newton website.

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Introduction

The City of Newton Departments of Planning, Public Works & Utilities, and Fire must review and approve all future residential and commercial development plans to verify conformity to City codes and other applicable standards. This document is a guide for the preparation and submittal of plans for approval by the City for land development projects within the City and its extraterritorial planning jurisdiction (ETJ). The minimum requirements for plan approval are detailed herein, and the design Engineer should use judgment and experience to determine what additional requirements are necessary. The City will use these general guidelines as well as sound Engineering principles to review all plan drawings for land development projects. Contacting appropriate City staff early on in the design phase of the project is encouraged and may lead to an expedient approval of your permit(s)..

Permits and Approvals

The City shall review and approve all plans prior to submittal to any other reviewing agency (State, Federal or Utility).

All approvals by all regulating authorities shall be obtained before any construction is started. Copies of these approvals, including all permits, maps, and plans, shall be received by the City before construction begins.

Approvals must be obtained from (but not limited to): the North Carolina Department of Transportation (Right-of-Way Encroachment); the North Carolina Department of Human Resources, Division of Health Services (Water); the North Carolina Department of Natural Resources and Community Development, Division of Environmental Management (Sewer); Railroads and Utilities (Right-of-Way Encroachment); and private property owners (easements). These shall all be obtained in the name of the owner/developer and transferred to the City or in the City's name initially (as applicable). The City shall incur no expense for permitting.

Special emphasis shall be placed on storm drainage designs, particularly as it relates to discharge of storm water onto adjacent property owners or into existing storm drains. The City shall review the measures that the developer has proposed to protect adjacent property owners and existing storm drainage systems, and require additional measures, if appropriate.

Approval Procedure

Approval by the City shall be obtained by the following procedure:

1. Submit three (3) sets of plans and one (1) reproducible set of plans with a letter requesting approval of the plans.

2. The City shall review the plans for conformance with the City's ordinances and standards. The City shall make appropriate comments and return the plans. The City shall return an approved set of plans with a letter of approval when no comments are warranted.
3. Obtain all other approvals, easements and rights-of-way, and submit copies to the City.
4. A Zoning Clearance Permit will be issued once all requirements have been met and additional documentation (permits, easements, etc.) has been received by the City.

Construction Records and Inspection

As-built drawings shall be prepared to reflect all changes made during construction. A field survey to locate all new structures and roads and to determine the inverts of new lines shall be conducted by the owner/developer. As-built drawings shall show locations of all drainage easements. Drainage discharges shall be referenced to fixed points so as to be easily located in the event that the markers are destroyed.

Guarantee of the Work

The work shall be guaranteed by the owner/developer for a period of one year. Guarantees shall be made in an acceptable form, as described in the Rules and Procedures of the Subdivision Review Board.

Acceptance of Facilities by the CITY OF NEWTON

The City may accept new facilities upon completion of the following:

1. All construction is complete and all tests satisfactory.
2. Plan originals with all as-built revisions are received.
3. All permanent easements, rights-of-way, and permits have been filed in the appropriate office(s).
4. All sediment and erosion control structures are removed and site is clear of debris and equipment.
5. Any releases required by the City.

Clearing

Where the lines are to be constructed in wooded areas, permanent easements shall be fully cleared. Cleared materials shall be disposed of off of the construction site. Disposal shall be made in accordance with all local and state laws. Trees cut down on the construction site will be hauled away from the site for proper disposal. Stumps of all trees cut down outside of the excavation area shall be removed. Ground surfaces shall be graded so as to promote drainage and allow mowing by vehicular equipment.

Site Grading

All rough grading shall be completed prior to the installation of the sewers and appurtenances.

Earthwork

Explosives and Blasting

Explosives for blasting shall be stored, handled, and used in accordance with the North Carolina Department of Transportation Standard Specifications-latest revision, all local regulations, and practices outlined in the "Blaster's Handbook" published by E.I. Dupont de Nemours and Company, Inc. Blasting shall be conducted so as not to endanger persons or property, and shall be covered or otherwise satisfactorily confined. The blaster shall be responsible for, and shall make good, any damage of whatever nature caused by blasting or accidental explosions.

Removal of Water

The bottom of all excavations shall be free from water when pipe is laid in the excavation, when concrete is placed and until work is carried above the groundwater level and is safe from flotation.

If any of the subgrade or underlying materials is disturbed by movement of groundwater, surface water, or any other reason, it shall be replaced with crushed stone or gravel.

Clean-Up of Site

At the completion of the work, all debris and excess construction materials shall be removed and the right-of-way shall be left clean and presentable.

Materials

Select Backfill

Select backfill material shall contain no man-made or organic material or clay pockets and shall be free of rocks, clods, or other materials larger than 2 inches in nominal diameter. Materials from on-site excavations may be used for select backfill provided they meet the specified requirements and contain optimum moisture content for proper compaction. Water saturated material shall not be used as select material. If sufficient on-site select backfill material is not available, acceptable material from an off-site borrow area shall be secured.

Backfill

Backfill shall be free of all organic materials and shall not contain any rocks larger than 4 inches in diameter, or be in a water saturated condition.

Crushed Stone or Screened Gravel

Crushed stone or screened gravel shall meet the requirements of the North Carolina Department of Transportation Standard Specifications-latest revision.

Crushed stone or screened gravel shall conform to standard size No. 5. Any rock excavated on site which meets this gradation may be used. Specifically the stone shall me the following gradation:

<u>Sieve Size</u>	<u>Percentage Dry Weight Passing Designated Sieve Size</u>
1-1/2 inch	100
1 inch	90-100
3/4 inch	20-55
1/2 inch	0-10
3/8 inch	0-5
No. 200	0-0.6

Pipe Bedding

All material used for pipe bedding shall conform to North Carolina Department of Transportation Standard Specification latest revision for standard size #57 material. Any rock, run-of-bank sand, or gravel excavated on site which meets the following gradation may be used.

<u>Sieve Size</u>	<u>Percentage Dry Weight Passing Designated Sieve Size</u>
1-1/2 inch	100
1 inch	90-100
3/4 inch	20-55
1/2 inch	0-10
3/8 inch	0-5
No. 200	0-0.6

Riprap

The stone for riprap shall consist of field stone or rough unhewn quarry stone. The stone shall be sound, tough, dense, and resistant to the action of air and water. The riprap shall be Class I as specified in the NCDOT Standard Specifications. The stone shall vary in weight from 5 to 200 pounds. At least 30 percent of the total weight of the riprap shall be in individual pieces weighing a minimum of 60 pounds each. Not more than 10 percent of the total weight of the riprap may be in individual pieces weighing less than 15 pounds each.

During placing, the stone shall be graded so that the smaller stones are uniformly distributed through the mass. The stone may be placed by mechanical methods, augmented by hand placing where necessary. The placed riprap shall form, a properly grade, dense, neat layer of stone. The placed riprap shall have a minimum depth of 12 inches.

Excavation

General

All excavation shall be made in such a manner, and to such widths, as will give ample room for properly constructing and inspecting the structures they are to contain, and for such sheeting, timbering, pumping, and drainage as may be required within the limits shown in Standard Detail W-9.0 and S-31.0.

Except where otherwise specified, excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade, or damage to adjacent areas. Intercept and collect surface runoff both at the top and bottom of cut slopes.

All excess excavated material and all excavated material which is unsuitable shall be removed from the site and replaced with suitable material.

Sheeting and Bracing

Place and maintain such sheeting and bracing as may be required to support the sides of the excavation, or to protect pipes and structures from possible damage, and to provide safe working conditions. The Contractor shall be responsible for the adequacy of all sheeting and bracing used, and for all damage resulting from sheeting and bracing failure or from placing, maintaining, and removing it. All sheeting and bracing shall be removed upon completion of the work. The City may permit sheeting to be left in place at the request and expense of others for the purpose of preventing injury to structures or property. Any sheeting or bracing left in place shall be cut off at least 2-feet below the finished ground surface.

Rock Excavation

All rock encountered within the limits of excavation shall be excavated. Rock shall be excavated so that generally there will be a clear space of at least 12-inches from the outside barrel of the pipe to the side of the trench. Isolated points of rock shall not come nearer than 6-inches to the pipe. At the trench bottom, the rock shall not come nearer than 6-inches to the pipe. In addition, sufficient rock shall be removed at joints to facilitate proper installation. Rock shall be fully removed at least 15-feet in advance of the laying of pipe.

Protection of Subgrade for all Excavations

To minimize the disturbance of the bearing materials and provide a firm foundation:

- (1) Excavation shall be carried out below subgrade in limited areas, should disturbed soil or material with natural low bearing capacity be encountered. Stabilizing of these areas shall be done with select backfill or coarse aggregate as required. Soils disturbed through the operations shall be excavated and replaced with select backfill or coarse aggregate, as required.
- (2) Provide positive protection against penetration of frost into materials below the bearing level during work in winter months.

Backfilling

Backfill shall be placed in maximum 6-inch lifts and compacted with tampers to 95 percent of Standard Proctor AASHTO-T99 density, excepting backfill under structures, which shall be compacted to 98 percent of Standard Proctor Density. Backfill in the roadways shall be tamped to NCDOT requirements.

Pipe trenches shall be backfilled as soon as possible after pipe installations. Where sheeting is used, use all reasonable measures to prevent the loss of support of the pipe or backfill when the sheeting is removed. If significant volumes of soil cannot be prevented from clinging to the extracted sheets, the voids shall be continuously backfilled as rapidly as possible. Thereafter limit the depth below subgrade that sheeting will be driven in similar soil conditions or employ other appropriate means to prevent a loss of pipe support. Sheeting embedded in granular fill or backfill materials shall be left in place.

Pipe Laying

Pipe laying shall in all instances be accomplished in a workmanlike manner laid true to line and grade with bell ends facing (up-grade) in the direction of laying. The various pipes shall be handled, belled-up and laid in accordance with the manufacturer's requirements and good engineering practices.

Pipe Bedding

Pipe bedding shall be NCDOT No. 57 washed stone, unless site conditions warrant otherwise, from a minimum of 4" below the pipe to Full Encasement of pipe as shown in the Standard Details. Bedding stone below pipe will be excavated to allow room for pipe bells. The bedding should support only the pipe barrel.

Portland Cement Concrete

Acceptance of Concrete: The Director of Utilities shall require all and as many tests as he deems necessary to insure the concrete acceptability. The cost of the test shall be at the suppliers or contractors expense.

Depositing: Concrete will not be used if it cannot be placed within ninety (90) minutes of the dispatch time. Concrete shall be deposited in such a manner so as to prevent contamination by foreign material and segregation due to rehandling or flowing. Segregated concrete and/or concrete consisting of foreign material will not be used. Depositing will not be done when temperature has not exceeded 35 degrees Fahrenheit and rising by 10:00 A.M. Concreting shall cease when the descending air temperature in the shade falls below 40 degrees Fahrenheit. It shall not resume until the ascending

air temperature rises to 35 degrees Fahrenheit. All concrete shall be kept from freezing. Frozen concrete shall be replaced. Free fall shall not exceed 3 feet in any case.

Forms: Forms may be made of wood, plywood, metal, or any other suitable material. Forms shall be mortar tight, of material strong enough to resist noticeable deflection or bulging between supports and the interior dimensions of the forms shall be such that the finished concrete shall be of the proper form and dimensions. The design of the forms shall take into account the effect of vibration of concrete as it is placed and also the rate of speed at which the forms will be filled.

Mechanical vibrators, of an approved type, and continuous spading and/or rodding of concrete shall be used to produce proper contact of concrete with forms and reinforcing steel in piers and with forms and pipe in monolithic inverts insuring a compact, dense and impervious artificial stone of uniform texture.

Curing: All concrete shall be cured by one of the following methods:

- (1) Forms left in place for a period of seven (7) days. Exposed concrete shall be moist cured.
- (2) Moist curing performed when forms are removed before seven (7) days. All construction joints shall be moist cured.
- (3) Curing compound used immediately after forms are removed and all surface water has disappeared.

Finishing: The structure shall have a uniform and textured surface. All form marks exposed to view shall be rubbed off with a stone.

Testing

Testing is required on all lines and shall be done in the presence of the Director of Utilities or his representative. A minimum of 48 hours notice shall be given to the Director of Utilities before testing begins unless other schedules can be arranged. All testing and disinfection shall be completed prior to connection to any existing line.

Sewer Line Testing

All new sewer lines shall be tested for water tightness. Leakage into the sewer lines shall not exceed 100 gallons per inch diameter per mile of pipe per 24 hours for any section of the line between adjoining manholes and 100 gallons per inch diameter per mile of pipe per 24 hours for any line, or system of lines, extending through two or more manholes. When determination of infiltration is not practicable because of dry trench conditions, exfiltration tests shall be made if, as

INSTALLATION SPECIFICATIONS

and where directed. The tests shall be made by filling the sewer between successive manholes with water to the top of the outlets of the upper manhole. The amount of water required to maintain the pipe full for the required test period shall be measured and the rate of leakage determined. When the leakage exceeds the specified amount, satisfactory correction shall be made. Both the test and the correction shall be made by the Contractor.

In lieu of hydrostatic testing, sewer line 24-inch diameter or smaller may be air tested in accordance with ASTM C-828, ASTM C924 and the following. Such tests shall consist of securely plugging the sewer line between manholes, pumping the section full of air to 4.0 psi and holding this pressure for five (5) minutes. Then the pressure should be reduced to 3.5 psi and the time recorded for the pressure to 1.0 psi to the new pressure of 2.5 psi. The time shall exceed the minimum test time given in the table below for test times per 100 feet for the appropriate nominal pipe diameter. (NCDOT Sewer Installation Section 1520-4B)

Pipe Size (Inches)	Test Time (Mins./100 ft)
8	1.2
10	1.5
12	1.8
18	2.4
21	3.0
24	3.6

The air test shall, as a minimum, conform to the test procedure described in ASTM C924 for concrete pipe, and other materials, test procedures approved by the Division of Environmental Management.

All sewer lines larger than 24-inch shall be visually inspected from the inside. Any leakage or rolled gaskets or defects shall be corrected.

Water Line Testing

Hydrostatic and Leakage Tests: On completion of the line or sections of the lines, connections and appurtenances, the line shall be filled and hydrostatically tested. The water for this purpose can be taken from existing lines under the supervision of the Utility Department; the pressure shall be increased to 200 PSI at the lowest point in the section being tested as specified by the Director of Utilities. Testing shall be for a minimum of 4 hours to a maximum of 24 hours. The water added during the testing shall be introduced through a Backflow Prevention device (per Water Detail W-17.0) that is installed prior to any testing operations. All water will be metered. All leaks and any defective material shall be repaired or replaced to the satisfaction of the Director of Utilities and the tests repeated until the requirements of this specification are met.

Leakage will be allowed on the basis of the formula set forth in AWWA Specification C-600.

$$L = \frac{SD(P)^{1/2}}{133,200}$$

- L = allowable leakage (gallons/hour)
- S = length of pipe in test (feet)
- D = nominal pipe diameter (inches)
- P = average test pressure (psig)

Field Testing Valves: In addition to manufacturer testing and certification, field tests of all valves as directed by AWWA Specifications C-500 and C-504 as applicable.

- (1) During the last stages of the test and without any reduction in pressure, first the hydrant valves will be closed, then progressing in an orderly manner from the end opposite from the test pump each main line valve will be closed and pressure released to determine if it is holding pressure (minimum 30 minutes).
- (2) Unless otherwise directed by the Director of Utilities, all Butterfly Valves will be tested to 150 PSI for a minimum of 30 minutes (Each) after the pipeline has been successfully tested.

Disinfection of Mains

All water mains shall be thoroughly flushed and disinfected before being placed in service. This work shall be done under the direct supervision of the Director of Utilities. After a thorough flushing and cleaning out, sufficient chlorine compounds shall be introduced in the lines to produce a chlorine concentration of at least 50 PPM. The chlorine solution shall be retained in the lines for at least twenty four (24) hours. At the end of this period, the chlorine residual shall be at least 10 PPM. The lines will then be flushed sufficiently to clear them of chlorine exceeding one part per million. Samples of water from the mains will then be taken and be analyzed for bacteriological purity. If the mains fail to meet the bacteriological standard for purity, then disinfecting and flushing will be repeated until such standards have been met. All analyses for chlorine and bacteriological purity will be by the City Personnel.

Drainage of Mains

Mains shall be drained through hydrants or blow-offs to natural drains. Drainage of mains will be accomplished in such a manner as to minimize erosion and siltation to adjoining properties. Water velocity from drainage and/or blow-off will also be dissipated in an acceptable manner to protect the environment.

Hydrants or blow-offs shall not be connected to any sewer, submerged in any streams, or installed in any other manner that will permit back siphonage into the distribution system.

Water Use

All water used for testing, flushing, disinfection, etc., shall be purchased from the City at prevailing rates. The use of water (time and quantity) shall be coordinated with the Director of Utilities. This coordination shall be accomplished by submittal of a proposed schedule of water use for approval by the Director of Utilities. The proposed schedule should be submitted ten (10) working days prior to any water use.

Final Grading and Landscaping

General

Fertilizing, seeding, and mulching of any and all areas disturbed during construction will follow within ten (10) working days of the installation of each run of pipe (being from manhole to manhole or 300 feet of water line). All plantings shall be maintained by the installer for a period of one (1) year after the completion of the work.

Materials

Lawn Fertilizer

Commercial fertilizer shall be a complete fertilizer with components derived from organic sources.

Commercial fertilizer shall contain the following percentages by weight:

Type 10-10-10

- 10% Nitrogen (Ureaform)
- 10% Phosphoric Acid
- 10% Potash

One-quarter of the Nitrogen shall be in the form of nitrates, one-quarter in the form of ammonia salts, and one-half in the form of natural organic Nitrogen. Available Phosphoric Acid to be free from superphosphate, bone, or tankage. Potash shall be Sulphate or Potash.

Elements shall conform to the standards of the Association of Official Agricultural Chemists.

The storage of commercial fertilizer shall be contained in waterproof storage areas and in such a manner that effectiveness will not be impaired.

Ground Limestone

Limestone with at least (50%) fifty percent shall pass a No. 200 U.S.S. mesh sieve.

At least (90%) ninety percent shall pass a No. 100 U.S.S. mesh sieve.

One hundred percent (100%) shall pass a No. 10 U.S.S. mesh sieve.

Total carbonates shall not be less than eighty percent (80%) of 44.8% Calcium Oxide equivalent; for purpose of calculation, total carbonates shall be considered as Calcium Carbonate.

Grass Seed

Seed shall be “New Crop” mechanically mixed seeds in the following seed mixture proportions:

<u>% Mixture</u>	<u>Seed Variety</u>	<u>% Purity</u>	<u>% Germination</u>
80	Kentucky 31	98	97
20	Kentucky Bluegrass	98	85

Seed Bed Preparation

The seed bed shall be prepared by pulverizing the soil to a depth of three (3) inches. Good surface drainage must be provided, allowances for settlement made and ground elevations adjusted accordingly. Visible ponding will not be allowed. All stones, roots, sticks, rubbish, and other objectionable material shall be removed.

Soil Improvements

Soil additives shall be applied incorporated in an approved manner into the topsoil at the following rates:

- (1) Fertilizer - 30 pounds per 1000 square feet of 10-10-10 fertilizer.
- (2) Lime - 100 pounds per 1000 square feet.
- (3) Superphosphate (0.20.0) - 12 pounds per 1000 square feet.

Seeding

The seed bed must be in a good, friable condition and has not become muddy or hard at the time seeding is to be performed.

Seed shall be applied at the rate of 8.0 lbs/1000 sq. ft. and raked or tilled into the topsoil with the resulting furroughs running across the natural slope of the ground.

Mulching

Dried straw shall be uniformly spread (approximately 1/4 of the ground should remain visible to avoid smothering seedling) over the area at the rate of 90 pounds per 1000 sq. ft. The straw shall be sprayed with liquid asphalt to bond it together and anchor it in place.

Liquid asphalt (thinned with kerosene) used during freezing weather shall be either rapid or medium curing, applied at a rate of 150 gallons per ton of straw (approximately 7 gallon per 1000 sq. ft.)

Maintenance

Maintenance shall consist of watering, weed and pest control (within established lawns), fertilization, erosion repair, reseeding and all else necessary to establish a vigorous health and uniform stand of grass. All areas and spots which do not show a uniform stand of grass, for any reason, shall be treated repeatedly until a uniform stand is attained.

Erosion and Sedimentation Control Measures

All work shall be done in accordance with and subject to the limitations of the N.C. Rules and Regulations for Erosion and Sediment Control.

It shall be the responsibility of the installer of the system to obtain approval of a sedimentation and erosion control plan from the NC Department of Natural Resources and Community Development prior to land disturbing activities.

All erosion control measures shall be maintained until no longer required for sediment control, at which time they shall be dismantled and removed from site.

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Materials Technical Specifications

All materials, equipment, and labor for construction shall be furnished in accordance with these specifications and in accordance with the Plans prepared by a Registered Professional Engineer licensed to practice in the state of North Carolina. Where a list of approved manufacturers is given, their order does not indicate an associated level of preference by the City of Newton. In general, Material shall conform to the NCDOT Standard Specifications for Roads and Structures, latest edition. Where a materials specification herein conflicts with NCDOT, the more stringent shall apply.

Domestic Steel and Iron Products Policy

All iron and steel products covered by this Materials Specification shall be purchased from domestic suppliers in conformance with Article 106-1 Paragraph B, "Domestic Steel", of the NCDOT Standard Specifications for Roads and Structures. This specification is in conformance with the "Buy American Act" of Congress. All gray iron castings for heavy duty applications shall be manufactured and tested according to ASTM A48, Class 35B of AASHTO M306. Foundry certifications and test results, with matching dates and production numbers shall be furnished upon request. Castings shall be of uniform quality, free from sand holes, gas holes, shrinkage cracks, and other surface defects. For traffic surface castings, bearing surfaces between manhole covers and rings or grates and frames shall be cast or machined with such precision to prevent rocking. Manufacturer's published casting weights shall vary +/- 5%.

General Materials Specification

Brick

Brick shall conform to the requirements of NCDOT Standard Specifications for Roads and Structures Section 1040 "Masonry." Note that such brick is pink in color.

Casing Spiders (Spacers)

Casing spiders shall be made of Type 304 stainless steel (including risers and hardware). Each shell shall be PVC lined and shall have bolted flanges. Casing spacer runners shall be constructed of ultra high molecular weight polymer (minimum 1 ½" wide) with a friction coefficient of not more than 0.12. Risers shall be 10 gauge. Risers and runners for top and bottom shells shall be of equal height. With approval of the City, unequal height risers and runners may be used to obtain proper grade for sanitary sewer mains. Casing spacers must be designed to ensure that only the runners of the spacer are in contact with the steel encasement pipe. The bell of the carrier pipe will not be allowed to be in contact with the encasement. Casing spacers shall be manufactured by one of the following:

1. Advance Products and Systems, Inc.
2. BWM Company
3. Cascade Waterworks Manufacturing Company

Concrete

All concrete will be made of Portland cement, water and aggregate and shall have a minimum 28-day compressive strength of 3,600 psi unless stated otherwise. Aggregate shall conform to ASTM C33. Ready-mix concrete shall conform to ASTM C94. Any concrete poured that has a slump over 4 inches as per ASTM C143, or has a batched time of more than 90 minutes, will be considered unacceptable. Concrete shall be air entrained with 5-7% air. Retarders and accelerators shall be used only as directed by the Director of Utilities.

A design of the mix made by an independent laboratory for each class of concrete will be submitted to the City for approval before concreting is started. No waterproofing material or admixture will be used in the concrete without the City's approval.

During the progress of work, standard compressive strength test specimens will be made, cured in accordance with ASTM C31 and tested by an independent testing laboratory in accordance with ASTM C39. At least four cylinders will be made for each test (one 7-day, two 28-days, and one reserve). Tests will be submitted for each 50 cubic yards or fraction thereof for each class of concrete used for the first 200 cubic yards of each class placed. For the next 300 cubic yards used, one test will be furnished for each 100 cubic yards and for all over 500 cubic yards, one test for each

500 cubic yards. The Director of Utilities determines testing rates and testing dates as necessary. Sampling concrete for test cylinders may be required at any time.

The Director of Utilities may request that high early strength concrete be used in certain situations. High Early Strength Concrete shall conform to Article 1000-7, "High Early Strength Portland Cement Concrete", of the NCDOT Standard Specifications for Roads and Structures.

Fencing

All fence materials and posts shall conform to the requirements of NCDOT Standard Specifications for Roads and Structures Section 1050, "Fence Materials." Permanent fencing shall consist of 48 inch high galvanized woven cattle fence, one strand of barbed wire 6 inches above fencing and 3 inches below the top of 4 inch by 7 ft. 6 in. tall treated post. Red Brand® fence 948-9-11 or equal (48 inch high, 11 gauge filler wire, 9 gauge top and bottom) is acceptable.

Fence Gates

Fence gates 50 inches high by 14 foot long will be furnished and installed in farm fences at locations as directed by the City (e.g., outfalls) or as indicated on the City's drawings. Gates will be five panel type cattle gate, fabricated using 19 gauge galvanized, tubular steel. Gates will be mounted on 8" diameter, 8 foot long, pressure treated posts. Hinges will utilize 5/8" pins screwed into posts, turned up at the bottom and turned down at the top. Female receivers mounted on gate frames will rotate on pins. All hinges, pins, etc. shall be hot-dip galvanized. Minimum retention for treated posts shall be .4 lbs. of chromate copper arsenate per cubic foot of wood.

For locking purposes, a 5/16" link chain 28" long, will be furnished and attached to the latch posts.

Gates will be installed as per the City of Newton Detail S-30.

Mortar

Mortar shall conform to the requirements of NCDOT Standard Specifications for Roads and Structures Section 1040 "Masonry."

Sand

All sand used in mortar or as fine aggregate in concrete will be clean, sharp, practically free from loam, clay or vegetable matter, and so graded as to insure workability and water-tightness when mixed with other ingredients. Sand will conform to ASTM C33, and when made into mortar will have a compressive strength at 7 and 28 days of not less than 100 percent of mortar made with standard sand. Independent laboratory tests will be submitted for approval of the City. Mortar sand shall meet the requirements of Article 1040-6, "Mortar Sand," of the NCDOT Standard Specifications for Roads and

Structures. Sand for use in concrete shall meet the requirements of Section 1014, "Aggregate For Portland Cement Concrete," of the NCDOT Standard Specifications for Roads and Structures.

Screenings

Screenings shall be placed on all paved roadways prior to beginning any trenching activities. Screenings shall be placed on the affected pavement area as directed by the City Inspector. All screenings shall be removed once backfilling has been completed. Screenings shall be Class II, Type 1, Select Material meeting the requirements of Section 1016, "Select Material," of the NCDOT Standard Specifications for Roads and Structures.

Steel Encasement Pipe

Steel encasement pipe shall be smooth wall pipe with welded joints. The pipe shall have minimum yield strength of 35,000 psi in accordance with ASTM A139 and A283. The encasement pipe must be capable of withstanding highway loadings and must have an inside diameter which will allow the carrier pipe to be removed subsequently without disturbing the encasement pipe. Encasement pipe and joints shall be of leak proof construction. The inside diameter of the encasement pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and larger in diameter. In general, to determine the casing size you should double the size of the carrier pipe, i.e., a 8" carrier pipe requires a 16" casing pipe. The Engineer of Record shall verify the clearance is sufficient to allow the carrier pipe to be removed without disturbing the casing pipe.

Minimum wall thickness for steel encasement pipe is as follows:

ENCASEMENT PIPE SIZE	WALL THICKNESS (NCDOT)	WALL THICKNESS (Railroad)
14"	.216"	.250"
16"	.250"	.281"
18"	.250"	.312"
20"	.250"	.344"
24"	.250"	.406"
30"	.312"	.469"
36"	.375"	.562"
48"	.500"	.750"

Encasement pipe installed on railway rights-of-way shall be subject to specifications by the American Railway Engineering Association. Encasement pipe installed on NCDOT rights-of-way shall be subject to specifications by the NCDOT.

Steel for Reinforcement

All reinforcement steel bars will conform to ASTM A615 (Grade 60) and all reinforcement welded steel wire fabric will conform to ASTM A185. All steel will be free from rust or other coatings which would destroy the bond between the steel and the concrete. Bars shall be tied together and supported to prevent damage by construction loads or pouring of concrete.

Stone (Miscellaneous)

Miscellaneous stone shall be ABC stone per NCDOT Standard Specifications for Road and Structures, Section 1005. This stone shall be used for driveways, streets, parking lots, etc.

Stone (Stabilization/Bedding)

Stabilization stone is No. 57 washed stone per NCDOT Standard Specifications for Roads and Structures, Section 1005, unless otherwise indicated by Engineer of Record. This stone shall be used in unstable soil, under or around pipe, under manholes, etc.

Sewer Materials Specifications

Couplings for Gravity Sewer Pipe (Repair Bands)

The use of rubber transition couplings shall only be used to adapt VCP (Vitrified Clay Pipe) to PVC or DIP. Couplings must have a wide solid stainless steel center band .012" thick, with 4 stainless steel screw clamps. All repair points shall be bedded (6") inches below bottom of pipe with a full encasement around the pipe using washed stone. Approved couplings are:

- Mission Flex-Seal® ARC Coupling
- Fernco® Strong Back Repair Coupling

All PVC to DIP transition connections shall be made using fabricated PVC transition line couplings, designed specifically for their intended use. PVC pipe repair couplings to replace defective PVC pipe are to be fabricated PVC repair couplings without pipe stops.

DIP repair couplings to replace defective pipe shall be mechanical joint sleeves.

Ductile Iron Pipe (Sewer)

Ductile iron sewer pipe shall be designed in accordance with AWWA C-150 and shall be manufactured in accordance with all applicable requirements of AWWA C-151 and ASTM A746. The interior of pipe for sanitary sewer will be lined with 40 mils of Protecto 401™ Ceramic Epoxy or equal. All bells and spigots for sanitary sewer pipe must be lined with a minimum of 8 mils of Protecto 401™ Joint Compound or approved equal. Pipe for sanitary sewer shall be thickness Class 50 minimum. Any deviations in class shall be otherwise specified or otherwise shown on the Engineer of Record's drawings. All ductile iron pipes shall be furnished with push-on joints in accordance with AWWA C-111, unless stated otherwise. Ductile iron sewer pipe must be easily recognized by the brownish red bells and spigots, as well as exterior stenciling of the words "For Sewer Only." Pipe design laying condition shall be as shown in City of Newton Standard Detail S-12.0.

❖ Restrained Joints

All restrained joint pipe shall have flexible push-on joints designed to deflect a minimum of 3° per joint. Field welding will not be allowed. Factory supplied field cut kits shall be used as directed by the pipe manufacturer. Approved restrained retainer glands shall be used to connect pipe to mechanical joint fittings. Restrained joint pipe is subject to approval by the Director of Utilities, whose acceptance or rejection shall be final. The Director of Utilities reserves the right to specify the type of restrained pipe to be used on specific projects and specific field applications. Approved restrained joint pipe are as follows:

- Field Lok 350® Gaskets
- TR Flex by U.S. Pipe
- Snap-Lok by Griffin
- Super-Lock by Clow.
- Flex-Ring by American

❖ **Rigid Restrained Joints**

Rigid restrained joint pipe, when required, shall be Mech-Lok™ by Griffin Pipe. Details of pipe joints and structural support of aerial crossings shall be submitted to the Director of Utilities for review and approval prior to construction.

❖ **Flange Joints and Accessories**

Flange joint pipe is approved for use only in pump stations. The Director of Utilities must approve flange joint pipe prior to design or use. Flange joints shall be in accordance with ANSI A21.10 of either Class 125 or Class 250, as required. Flanges, flange bolts and nuts, and gaskets shall conform to the dimensional requirements of ANSI B16.1 for Class 125 or ANSI B16.2 for Class 250. Flange pipe accessories shall be in accordance to ANSI/AWWA C115/A21.15. Bolts shall have standard Hexagonal heads and shall be provided with standard hexagonal cold pressed nuts unless otherwise specified. Bolts and nuts shall be made of the best quality refined iron or mill steel and shall have sound, well fitting threads.

Ductile Iron Pipe Fittings (Sewer)

Ductile iron fittings shall meet all requirements of ANSI A21.10 (AWWA C110) and will be of the mechanical joint type unless otherwise specified. All glands shall be ductile iron, not gray iron. The interior of fittings for sanitary sewer will be lined with 40 mils of Protecto 401™ Ceramic Epoxy or approved equal. All bells and spigots for sanitary sewer fittings must be lined with a minimum of 8 mils of Protecto™ 401 Joint Compound or approved equal. The exterior of all fittings shall be coated with a bituminous coating. Fittings coated on the interior and exterior with 8 mils of fusion bonded epoxy in accordance with ANSI/AWWA C116 and ANSI/AWWA C550 are acceptable. Fittings will have a minimum pressure rating of 250 psi and minimum iron strength of 25,000 psi unless otherwise specified by the City. The fittings shall be tested and the manufacturer shall provide certified test results when requested by the Director of Utilities. This testing shall include hydrostatic proof testing of fittings. Acceptable types of fittings include Push-On Joint and Mechanical Joint. Joints for aerial crossings shall be restrained joints meeting the requirements above. Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). Ductile iron compact fittings conforming to ANSI A21.53 (AWWA C153) are acceptable. "DI" or "Ductile" shall be cast on each fitting.

All Fittings are subject to approval by the Director of Utilities, whose acceptance or rejection shall be final. Details of pipe joints and structural support of aerial crossings shall be submitted to the Director of Utilities for approval prior to construction.

Manholes

Manholes shall be constructed of precast reinforced concrete designed for H-20 loads per ASTM C478. Construction will conform to City of Newton Standard Detail S-1. Manhole shelves and channels must be of the precast type, by the manufacturer. Channels shall be built to a depth and width to conform to the outside diameter of the influent and effluent pipes. The channel shall be constructed from the invert of the influent pipe to the invert of the effluent pipe with a minimum slope of 2 percent through the manhole. The channel shall be smooth in order to avoid any turbulence in the manhole. Manhole shelves shall slope from the manhole wall to the channel at a minimum slope of 0.5" per foot. Manhole shall have precast inverts for all lateral connections directing flow to the manhole outlet.

Polypropylene coated steel steps shall be installed 16 inches on center.

Inlet and outlet pipes shall be joined to the manhole with gasketed flexible watertight connections (rubber boots). Mortar shall be placed around all pipe connections. A maximum of two inches (2") shall be allowed for the protrusion of the influent and effluent pipes beyond the inside wall of the manhole.

All manhole joints shall be sealed on the outside of the manhole with butyl adhesive tape (minimum 6" wide). Manhole joints shall be assembled using Type B-Butyl Rubber conforming to AASHTO M-198. The tape shall be EZ-Wrap by Press-Seal Gasket Corp., or approved equal.

Precast reinforced concrete manholes used on right-of-way maintained by the North Carolina Department of Transportation must be approved by the North Carolina Department of Transportation before being installed.

Manholes used in the City of Newton are subject to the approval of the Director of Utilities, whose acceptance or rejection shall be final. See the City of Newton Standard Details for further information.

Manhole Rings and Covers

❖ Standard Ring and Cover

Standard manhole rings and covers will be made of cast iron and will conform to ASTM A48, Class 35B. In addition, all manhole rings and covers shall be designed to support an H-20 wheel load. All castings will conform to the shape and dimensions shown on the City of Newton detail drawing (Detail S-2) and will be free from holes, cracks or any other defects. Rings and covers will have machined seats so that the cover will not rattle. Rings will weigh a minimum of 190 pounds and covers a minimum of 120 pounds. The name of the foundry and the part number shall be cast permanently on the ring and the cover. Castings that do not meet specifications shall be rejected. Rings and covers furnished under these specifications shall be manufactured by one of the following:

- East Jordan Iron Works, Inc. (Ring - Part No. V-1304-1; Cover - Part No. V-1304)
- U.S. Foundry & Manufacturing Corp. (Ring - Part No. 669; Cover - Part No. KL)

❖ **Secured Ring and Cover**

Secured rings and covers shall meet all specifications for Standard rings and covers and shall conform to the City of Newton detail drawing for Secured Rings and Covers (Detail S-5.0) including two (2) – 1 ½" x 1 ¾" Type 316 stainless steel hexagonal head stainless steel bolts. Rings and covers shall be manufactured by one of the following:

- East Jordan Iron Works, Inc. (Ring - Part No. V-2384-3; Cover - Part No. V-I385)
- U.S. Foundry & Manufacturing Corp. (Ring - Part No. 669-2; Cover - Part No. KL-2)

❖ **Sealed Ring and Cover**

Sealed rings and covers shall meet all specifications for Secured Rings and Covers and shall conform to the City of Newton detail drawing for Sealed Rings and Covers (Detail S-4.0) including two (2) – 1 ½" x 1 ¾" Type 316 stainless steel hexagonal head stainless steel bolts. Rings and covers shall be manufactured by one of the following:

- East Jordan Iron Works, Inc. (Ring - Part No. V-2384; Cover - Part No. V-I385)
- U.S. Foundry & Manufacturing Corp. (Part No. 669-KL-BWTL)

❖ **Flat Top Manhole Sealed and Secured Ring and Cover**

Flat Top Manhole Sealed and Secured Rings and Covers shall meet all specifications for Standard rings and covers, except that rings will weigh a minimum of 136 pounds and covers a minimum of 120 pounds. All rings and covers shall conform to the City of Newton detail drawing (Detail S-7.0) including four (4) – 1 ½" x 1 ¾" Type 316 stainless steel hexagonal head stainless steel bolts. Flat-top manholes shall have Flat Top Sealed and Secured Rings and Covers cast into the top. Rings and covers shall be manufactured by one of the following:

- East Jordan Iron Works, Inc. (Ring - Part No. V-2484; Cover - Part No. V-2384)
- U.S. Foundry & Manufacturing Corp. (Ring - Part No. 571; Cover - Part No. KK)

Manhole Steps

Steps are required in all structures greater than 36-inches deep. All manhole steps shall conform to current OSHA standards and ASTM C478. All steps must be approved by the Director of Utilities prior to being installed.

Polyethylene Encasement

Materials and installation shall conform to ANSI A21.5 (AWWA C105). The polyethylene shall have a minimum thickness of 8 mil, shall be tubing type and shall be manufactured of virgin material. Installation of the polyethylene tubing shall conform to Method "B" outlined in Section 4.3.2.2 of ANSI A21.5 (AWWA C 105). The tape used

for installation of polyethylene tubing shall be plastic-backed adhesive with a thickness of 12 mils and a minimum width of 1 ½". The tape shall be capable of bonding to metal, bituminous coating and polyethylene at a temperature range of 32 to 120 degrees F.

Polyvinyl Chloride (PVC) Pipe (Sewer)

❖ PVC for Sewer Service Lateral Applications

Unless indicated otherwise, pipe for gravity sewer service lateral applications including the cleanout stack shall be PVC Schedule 40, ASTM D1785, "Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120," solvent cement joints (type SC).

❖ PVC for Gravity Applications

Sewer pipe 4-inches through 15-inches in diameter may be Poly Vinyl Chloride (PVC) sewer pipe with a minimum Standard Dimension Ratio (SDR) of 21 and shall meet all requirements of ASTM Specification D3034. Sewer pipe 18-inches through 27-inches in diameter may be Polyvinyl Chloride Pipe (PVC) large diameter sewer pipe with a minimum pipe stiffness of 46 PSI in accordance with ASTM Specification F679. Pipe joining shall be push on elastomeric joints only and joints shall be manufactured in accordance with ASTM Specification D3212. The pipe shall be furnished with integral bells and with gaskets that are permanently installed at the factory. The pipe shall be furnished in nominal lengths of 13 feet.

AWWA C900 PVC pipe (normally for water applications) with a DR of 18 or less is also acceptable for gravity sewer applications.

PVC pipe shall contain the markings required by ASTM D-3034, ASTM F-679, or AWWA C900 as applicable. The manufacturer shall submit certification that the pipe has been tested in accordance with ASTM D-3034, ASTM F-679, or AWWA C900 as applicable and has been found to meet all requirements. Test samples shall be as selected by the manufacturer or testing laboratory unless otherwise stipulated in the Special Provision Section of these specifications.

Fittings shall be in accordance with ASTM D-3034, F-679, AWWA C900 and/or D-3212 as applicable, with stiffness and wall thickness equal to or greater than the pipe. Adapters shall be provided to join different materials.

Retainer Glands

All retainer glands for restrained joints shall be wedge action glands with torque limiting twist off nuts. Approved glands are the following:

1. RomaGrip by Romac Industries, Inc.
2. Megalug Series 1200 by EBBA Iron Sales, Inc.
3. MJ Field Lok™ Gaskets by U.S. Pipe
4. Uni-Flange Series 1400 by Ford Meter Box Company, Inc.

Service Saddles (Sewer)

Service saddles for 4" sewer connections may be used in lieu of wyes. Saddles shall be style "CB" sewer saddle by Romac Industries, Inc., or an approved equal.

Valves (Air Release)

All air release valves shall conform to ANSI/AWWA C512 (refer to Detail S-33.0A). The air release valve shall be a pressure air valve (operating pressure 0-200 psi) manufactured by GA Industries or an approved equal. All interior iron surfaces of the air valve shall be coated with a minimum of 8 mils of fusion bonded epoxy or liquid epoxy in accordance with ANSI/AWWA C550. All internal working parts shall be stainless steel. All air release valves for force mains shall have long bodies and be furnished with back flushing attachments. The bronze ball valve curb stops shall have a minimum working pressure of 300 psi.

Water Materials Specifications

Approved Backflow Prevention Assemblies

All assemblies approved for use in the City of Newton system must have prior approval by Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California.

Backflow Prevention Assemblies two (2) and smaller shall have one quarter (1/4) turn, full port resilient seated, bronze ball valve shut-off. Assemblies two and one half (2 1/2) inches and larger shall have resilient wedge shut-off valves; the backflow preventer and resilient wedge shut-off must be fuse bonded epoxy coated. All reduced pressure zone assembly must be installed above ground. (No vault or pit installation)

DOUBLE CHECK VALVE ASSEMBLIES

AMES COMPANY, Inc.

Model 200B	1/2" - 2"
Model C200, C200N	2 1/2" - 10"
Model C200A, C200Na	2 1/2" - 6"
Model M200, M200N	2 1/2" - 10"
Model M200A, M200a	2 1/2" - 4"
Model 2000B	1/2" - 2"
Model 2000SS	2 1/2" - 12"

DANFOSS FLOMATIC

Model DCV	2 1/2" - 10"
Model DCVE	3/4" - 2"

WATTS

Model 007	1/2" - 3"
Model SS007	1/2" - 1"
Model 719	1/2" - 2"
Model 709	2 1/2" - 10"
Model 757, 757N	2 1/2" - 10"
Model 757a, 757Na	2 1/2" - 6"
Model 774	2 1/2" - 12"

APOLLO / CONBRACO

Model DC - 4S (4S - 100)	1/2"
Model DC - 40 (40-100)	3/4" - 10"
Model DC - 4SC (4SG-100)	2 1/2" - 8"
Model DC - 4S (4S-100)	10"

FEBCO

Model 850U	1/2" - 2"
Model 850 (Small)	1/2" - 2"
Model 850 (Large)	2 1/2" - 10"
Model 805YD	2 1/2" - 10"
Model 875	2 1/2" - 3"
Model 870	2 1/2" - 10"

WILKINS

Model 950XLCU	3/4" - 2"
Model 950XLT	3/4" - 2"
Model 950XLU	3/4" - 2"
Model 950XL	3/4" - 2"
Model 350	3/4" - 2"
Model 350A	2 1/2" - 10"
Model 450	2 1/2" - 10"

REDUCED PRESSURE ZONE ASSEMBLIES

AMES COMPANY, INC

Model 4000B	1/2" – 2"
Model 400B	3/4" – 2"
Model M400	2 1/2" – 10"
Model M400N	2 1/2" – 10"
Model M400Z	2 1/2" – 10"
Model C400	2 1/2" – 10"
Model C400N	2 1/2" – 10"
Model C400Z	2 1/2" – 10"
Model 4000CIV	2 1/2" – 10"
Model 4000SS	2 1/2" – 10"

FEBCO

Model 860 (Small)	1/2" – 2"
Model 860U	1/2" – 2"
Model 825Y	3/4" – 2"
Model 825YA	3/4" – 2"
Model 867	2 1/2" – 3"
Model 860 (Large)	2 1/2" – 10"
Model 825YD	2 1/2" – 10"
Model 880V	2 1/2" – 10"

WILKINS

Model 975XL	1/4" – 2"
Model 975XLSE	3/4" – 2"
Model 375	3/4" – 2"
Model 375A	2 1/2" – 10"
Model 475, 475V	2 1/2" – 10"

APOLLO / CONBRACO

Model RP-40 (40-200-T)	1/4"-2"
Model RP-40S(20-200-T2S)	1/4"-1"
Model RP-40 (40-200)	2 1/2"-10"

DANFOSS FLOMATIC

Model RPZE	3/4"-2"
Model RPZEII	1/2"-1 1/2"
Model RPZESA	3/4"-2"
Model RPZ	2 1/2"-10"

WATTS

Model 009	1/4"- 3"
Model SS009	1/2"- 1"
Model U009	1/2" – 2"
Model 909 (Bronze)	3/4" – 2"
Model 919	3/4"- 2"
Model 909 (Cast Iron)	2 1/2"-10"
Model 957	2 1/2"-10"
Model 957N, 957Z	2 1/2"-10"
Model 994	2 1/2"-10"

CONNECTION FOR FIRE SYSTEMS

All connection for fire systems connected with the public water system shall be protected with an approved backflow assembly. For no health hazard a double check detector check valve assembly. And for health hazard a reduced pressure detector principle assembly. All reduced pressure zone assembly must be installed above ground. (No vault or pit installation.)

NO HEALTH HAZARD (DCDA)

AMES

Model M300	2 ½" – 10"
Model M300N	2 ½" – 10"
Model M300a	2 ½" – 4"
Model M300Na	2 ½" – 4"
Model C300	2 ½" - 10"
Model C300N	2 ½" – 10"
Model C300a	2 ½" – 6"
Model C300Na	2 ½" – 6"
Model 3000SS	2 ½" – 12"
Model 3000B	2"
Model 3000SE	2 ½"

APOLLO / CONBRACO

Model DCDA-4S (4S-600)	10" Only
Model DCDA-4SG (4SG-600)	2 ½" – 8"

FEBCO

Model 806YD	3" – 10"
Model 856	2 ½" – 10"
Model 858	2 ½" – 10"
Model 876V	2 ½" – 10"

WATTS

Model 007DCDA	2" – 3"
Model 709DCDA	3" – 10"
Model 757DCDA	2 ½" – 10"
Model 757NDCDA	2 ½" – 10"
Model 774DCDA	2 ½" – 12"

WILKINS

Model 950XLTDABF	2"
Model 350ADA	2 ½" – 10"
Model 450DA	4" – 10"

HEALTH HAZARD (RPDA)

AMES

Model C500	2 ½" – 10"
Model C500N	2 ½" – 10"
Model C500Z	2 ½" – 10"
Model M500	2 ½" – 10"
Model M500N	2 ½" – 10"
Model M500Z	2 ½" – 10"
Model 5000CIV	2 ½" – 10"
Model 5000SS	2 ½" – 10"

APOLLO / CONBRACO

Model RPDA-40(40-700)	3"-10"
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FEBCO

Model 826YD	2 ½" – 10"
Model 870DC	2 ½"- 10"
Model 870VDC	2 ½"- 10"

WATTS

Model 909RPDA	2 ½"- 10"
Model 957RPDA	2 ½"- 10"
Model 957NRPDA	2 ½"- 10"
Model 957ZRPDA	2 ½"- 10"
Model 994RPDA	2 ½"- 6"

WILKINS

Model 375ADA	2 ½" – 10"
Model 475DA	4" – 10"
Model 475DAV	4" – 10"

PRESSURE VACUUM BREAKERS

APOLLO / CONBRACO

Model PVB-4 (4V-500)	½” – 2”
Model SVB-4W (4W-500)	¼” – ½”

FEBCO

Model 765	½” – 2”
Model 767FR	¾” – 1”

WATTS

Model 800MQT	½” – 2”
Model 800M4FR	½” – 2”

WILKINS

Model 420	¾” – 1”
Model 460	3/8” – 1”
Model 420A	½” – 2”

Backflow Prevention Enclosures (for Above-ground Installations)

City of Newton requires that all above-ground backflow prevention assemblies be protected from freezing by installing a protective enclosure over the backflow prevention assembly. All backflow prevention assemblies must meet the following performance requirements:

- 1) Freeze Protection – enclosures must provide at least 6.5R factor insulation.
- 2) Accessibility/Clearances – access for full replacement and minimum side, end and top clearances required for below-ground vault installations.
 - A) Adequate access to all parts of the backflow assembly (including the shut-off valves) is readily provided - what is Adequate ~ shall be determined by the City of Newton Cross Connection Coordinator.
 - b) Access provided allows testing and maintenance activity to be completed without having to enter the enclosure.
 - c) The enclosure is lightweight (i.e. each section requires no more than 3 or 4 men to remove) and is fully removable intact or in panels.
- 3) Drainage – adequate drainage for reduced pressure principle shall be provided via drain ports along the bottom of on of the side walls of the enclosure.

Copper Pipe (Water)

All copper pipes will conform to ASTM B88. All copper pipes shall be Type K, soft copper and all joints (connections) shall be compression. Fittings for copper tubing shall be red brass containing 85% copper, 5% lead, 5% tin, and 5% zinc in conformance with ASTM B-62 and with AWWA C-800. Compression fittings shall utilize a compression nut and/or split clamp with tightening screw. Stab type fittings are not approved.

Corporation Cocks

All corporation cocks shall be made of red brass in accordance with ASTM B62 and AWWA C800. Red brass shall consist of 85% copper, 5% lead, 5% zinc, and 5% tin. All

corporation cocks shall be of the ball valve type with AWWA inlet threads. Refer to the Table under section "Water Service Connection (3/4-inch and 1-inch)" for approved Model numbers.

Ductile Iron Pipe (DIP) (Water)

Ductile iron water pipe shall be designed in accordance with ANSI/AWWA C150/A21.50 and shall be manufactured in accordance with ANSI/AWWA C151/A21.51 and be cement mortar lined in accordance with ANSI/AWWA C104/A21.4. Four-inch (4") and larger diameter pipe shall be minimum Pressure Class 350, unless installation conditions require a higher pressure class. Any deviations in class shall be otherwise specified or otherwise shown on the Engineer of Record's drawings. Minimum ductile iron pipe diameter for water applications shall be 6 inches.

Pipe joints will be single rubber gasket push-on type or mechanical joint type unless otherwise specified or otherwise shown on the Engineer of Record's drawings. Pipe design laying condition shall be as shown in City of Newton Standard Detail W-10.0. All ductile iron pipes shall be furnished with push on joints and mechanical joint accessories in accordance with ANSI/AWWA C111/A21.11.

❖ **Mechanical Joint Accessories**

Bolts and gaskets for mechanical joint pipe and fittings shall be furnished by the pipe/fitting manufacturer and shall conform to ANSI/AWWA C111/A21.11.

❖ **Push-On Joint Material**

Gaskets for push-on pipe shall be furnished by the pipe manufacturer. Gaskets and gasket lubricant shall meet the requirements of ANSI/AWWA C111/A21.11.

❖ **Flange Joints and Accessories**

Flange joint pipe is approved for use only in pump stations, meter vaults, and backflow prevention enclosures. The Director of Utilities must approve flange joint pipe prior to design or use. Flange joints shall be in accordance with ANSI A21.10 of either Class 125 or Class 250, as required. Flanges, flange bolts and nuts, and gaskets shall conform to the dimensional requirements of ANSI B16.1 for Class 125 or ANSI B16.2 for Class 250. Flange pipe accessories shall be in accordance to ANSI/AWWA C115/A21.15. Bolts shall have standard Hexagonal heads and shall be provided with standard hexagonal cold pressed nuts unless otherwise specified. Bolts and nuts shall be made of the best quality refined iron or mill steel and shall have sound, well fitting threads.

❖ **Restrained Joint Pipe**

All restrained joint pipe shall have flexible push-on joints designed to deflect a minimum of 3° per joint. At locations where field cutting of restrained joint pipe is required, a special field cut kit shall be used by the Contractor. Field welding will not be allowed. Field cut kits shall provide restraint equivalent to factory manufactured restrained joint

pipe. Field kits shall be provided by the pipe manufacturer. Restrained joint pipe with a gripping gasket will not be allowed. Fittings shall have same restrained joint system as pipe. Restrained joint pipe shall be:

- Flex-Ring by American
- Super-Lock by Clow.
- Snap-Lok by Griffin
- TR Flex by U.S. Pipe

Ductile Iron Pipe Fittings (Water)

Ductile iron fittings shall be compact fittings conforming to ANSI/AWWA C153/A21.53, and will be of the mechanical joint type in accordance to ANSI/AWWA C111/A21.11. All glands shall be ductile iron, not gray iron. The interior of fittings will be cement-mortar lining of standard thickness in accordance with ANSI/AWWA C104/A21.4. The exterior of all fittings shall be coated with bituminous coating. Fittings coated on the interior and exterior with 8 mils of fusion-bonded epoxy in accordance with ANSI/AWWA C116/A21.16 are acceptable.

Polyvinyl Chloride (PVC) Pipe (Water)

All PVC pipe shall be manufactured in conformance with AWWA Standard C900 for DR 14 and ASTM D2241 for SDR 13.5, depending on system pressure, as provided by the City. The exterior of all PVC shall bear a continuous stamp indicating the AWWA or ASTM certification, DR or SDR ratio, size and manufacturer. All PVC shall have a bell with integral rubber gasket and be slip joint manufactured in accordance with AWWA C 151.

Bells of pipe shall be contoured to receive a bulb shaped circular rubber gasket and spigot end shall have sufficient taper to facilitate installation.

In areas where it is required to lay the pipe along a curve, the use of deflection couplings will be used to form the arc. The pipe shall not be bent to form the arc, nor shall the pipe be deflected within integral bells or ductile-iron fittings.

Deflection couplings shall be limited to use only on 150mm through 300mm (6"-12"), AWWA C900 PVC pipe. Unless otherwise approved by the Director of Utilities, PVC pipe shall be installed using 5 degree deflection couplings (2½ degrees at each bell) to form arcs with radii no less than the minimums noted below:

Pipe Length Used	Minimum Radius
6.10m (20')	69.80m (229')
3.05m (10')	35.05m (115')
Combination (refer to Section 3)	23.16m (76')

Fire Hydrants

All fire hydrants private and public connected to the City's water supply shall be dry-barrel fire hydrants, which comply with ANSI/AWWA C502. All hydrants will have a dry top with O-ring seals, which permanently seal off the stem operating threads from water and keep the lubricant in. All hydrants shall be opened by turning counter clockwise, and the direction of opening shall be indicated by means of an arrow and appropriate wording on the top of the hydrant. The main valve opening shall be 5-1/4" and be a compression type valve. Hydrants shall have a bronze main valve seat ring that thread into a bronze drain ring. Each hydrant shall have at least two bronze drain outlets. All hydrants shall have a thrust or anti-friction washer in the operating area of the hydrant bonnet. A weather cap around the operating nut on top of the hydrant is required. All hydrants will have a 6-inch mechanical joint base connection. Hydrants shall be designed for a minimum working pressure of 200 psi. Each hydrant shall be assembled at the factory with one 4.5-inch steamer nozzle with two 2-1/2-inch nozzles on either side.

All hydrants will be furnished with the breakable traffic feature that will break upon impact. The feature shall consist of a breakaway safety flange on the barrel and a breakable safety coupling in the main valve stem. The bottom of the breakaway flange shall be 1 to 4 inches above finished grade.

All exterior surfaces of hydrants placed in the public right-of-way and to be maintained by the City shall be painted two coats of (Safety Yellow #4308-9400) for the "Body", (Safety Red #4308-9000) for the (2) two "Nozzle Caps", and (Safety Blue #4308-0400) for the "Bonnet" with Reflective sprinkles, or to the City's satisfaction with Rust-Oleum Industrial Enamel Paint 944402 or approved equal. Note: Paint numbers are from Devco High Performance coatings Devguard - 4308 or equal.

Black plastic "Out of Use" disks (no bags) must be placed on hydrants immediately upon fire hydrant installation.

Hydrant will normally be three and one-half feet from the ground to the bottom of the hydrant (42" bury depth). However, when plans indicate deeper bury is required, such hydrants will be furnished conforming to the depth of bury as shown on the plans. Hydrant extensions will be installed only if necessary.

Summary Public and Private fire hydrants:

- (Public) Yellow Paint for the "Body" of the hydrant
- (Public) Red Paint for the "Nozzle Caps" of the hydrant
- (Public) Blue Paint for the "Bonnet" of the hydrant
- (Private) All hydrant red
- Hydrant connections shall be National Standard Thread
- Black "Out of Use" disk (no bag) installed immediately upon fire hydrant installation
- 1 to 4 inches from bottom of breakaway flange to final grade

Hydrants accepted by the City of Newton are as follows:

- Super Centurion 250, A-423 5-1/4" manufactured by Mueller Company
- 5-1/4" American Darling B-84-B, manufactured by American Flow Control
- K-81D 5-1/4"Guardian, manufactured by Kennedy Valve Company
- Medallion Hydrant 5-1/4", manufactured by Clow Valve Company

Meter Boxes (Water)

Meter boxes for water services shall be constructed of polyurethane or cast iron and fitted with a reader lid. Meter box and associated installations shall be in accordance with City of Newton Standard Details W-3.0 and W-4.0.

Meter Size	Length (in.)	Width (in.)	Height (in.)
3/4"	20	12	12
1"- 2"	30	16	18

Meter Vaults (Water)

All meters 2-inch and larger shall be installed in precast concrete vaults conforming to the City of Newton Standard Details. Vaults shall be approved for use within North Carolina Department of Transportation right-of-way and shall be designed for H-20 loading. Vaults may be adjusted as shown on the City of Newton Standard Details using standard size clay or concrete brick. Vaults shall have double leaf aluminum covers conforming to the City of Newton Standard Details.

Polyethylene Encasement

Materials and installation shall conform to ANSI A21.5 (AWWA C105). The polyethylene shall have a minimum thickness of 8 mil, shall be tubing type and shall be manufactured of virgin material. Installation of the polyethylene tubing shall conform to Method "B" outlined in Section 4.3.2.2 of ANSI A21.5 (AWWA C 105). The tape used for installation of polyethylene tubing shall be plastic-backed adhesive with a thickness of 12 mils and a minimum width of 1 1/2". The tape shall be capable of bonding to metal, bituminous coating and polyethylene at a temperature range of 32 to 120 degrees F.

Retainer Glands

All retainer glands for thrust restraint shall be wedge action glands with torque limiting twist off nuts. Approved glands are the following:

- RomaGrip by Romac Industries, Inc.
- Megalug Series 1200 by EBBA Iron Sales, Inc.
- MJ Field Lok™ Gaskets by U.S. Pipe

- Uni-Flange Series 1400 by Ford Meter Box Company, Inc.

Service Saddles (Water)

Service saddles shall be used as follows: Direct taps ¾" and 1" can be made to 6" or larger ductile iron pipe, pressure class 350. Service saddles shall be used for all other applications.

The saddle body shall be ductile iron with corrosion resistant paint. For corporation stop ball valves saddle bodies shall have CC thread outlet connections. The saddle gasket shall be of an "O-ring" design, not flat. Attached to the body shall be double U-bolt straps. Straps, washers and nuts shall be high-strength, low-alloy steel in accordance with ANSI A21.11 (AWWA C111). Saddles shall be Model 202NU by Romac Industries, Model 313 by Smith-Blair, or an approved equal.

T-Head Bolts and Hexagonal Nuts

All T-head bolts and nuts used for mechanical joint pipe, valves, hydrants or fittings shall be high-strength, low-alloy steel in accordance with ANSI A21.11 (AWWA C111). Cast iron bolts will not be accepted.

Tapping Sleeves

Tapping sleeves and valves shall be used for "wet" taps into existing water mains. Tapping sleeves shall be classified as either stainless steel or mechanical joint. The mechanical joint sleeve shall be a split sleeve with mechanical joint end connections and a flanged outlet. Stainless steel sleeves shall be split sleeves with drop in bolts and a mechanical joint outlet. Sleeves shall be designed for a minimum working pressure of 200 psi. Twelve-inch (12") and smaller sleeves shall be rated for 200 psi working pressure. Sixteen-inch (16") and larger sleeves shall be rated for 150 psi working pressure.

❖ **Mechanical joint tapping sleeve**

Mechanical joint tapping sleeves shall be furnished complete with joint accessories including split glands, split end gaskets, bolts, etc., and shall be compatible with the type and class of pipe being tapped. Mechanical joint tapping sleeves shall have mechanical joint seals conforming to AWWA C111, with outlet flange and drilling conforming to ANSI B16.1, class 125. Flange gaskets shall be of the rubber type rated to 250 psi, with three rows of raised o-rings. Flange gaskets shall be Flange-Tyte® by U.S. Pipe or approved equal. Mechanical joint tapping sleeves shall be Mueller Co. Model H-615 or approved equal.

❖ **Stainless steel tapping sleeve**

Stainless steel tapping sleeves shall be manufactured from type 304 stainless steel. The outlet shall be mechanical joint to be used with a standard mechanical joint valve. The mechanical joint outlet shall be either ductile iron or stainless steel. The gasket

MATERIALS SPECIFICATIONS

shall be a grid pattern design and shall provide full circumferential sealing around the pipe to be tapped. The sleeve shall include a test plug for pressure testing the installed sleeve prior to making the tap. All welds shall be passivated for corrosion resistance.

Stainless steel tapping sleeves shall be Model numbers H-304ss by Mueller, SST-460 to SST-2650 by Romac, 662, 663, 664, or 665 by Smith Blair, or approved equal.

Threaded Rods

Threaded rods used for thrust restraint shall be 3/4" high-strength, low-alloy steel rods which conform to ASTM A242. The minimum yield strength shall be 36,000 psi and the tensile strength shall be at least 60,000 psi.

Tie Bolts

Tie bolts used for thrust restraint shall be Star Figure No. SST 7 (or SST 756) - 3/4" high-strength, low-alloy steel tie bolts. High-strength, low-alloy steel washers and tie nuts shall be used with all tie bolts.

Valves (Air Release)

All air release valves shall be two-inch in size and conforming to ANSI/AWWA C512. All interior iron surfaces of the air valve shall be coated with a minimum of 8 mils of fusion bonded epoxy or liquid epoxy in accordance with ANSI/AWWA C550. All internal working parts shall be stainless steel. All valves shall be furnished with back flushing attachments and vacuum check unit. The bronze ball valve curb stops shall have a minimum working pressure of 300 psi. Air release valves shall be (pressure air valve with an operating pressure 0-200 psi) Crispin Model #PL-20, Val-Matic Model #VM-45, or an approved equal.

Valves (Curb Stop Ball)

All curb stop ball valves for water service shall be made of red brass in accordance with ASTM B62/AWWA C800. Red brass shall consist of 85% copper, 5% lead, 5% zinc, and 5% tin and shall be of the ball or plug valve type with AWWA inlet threads. The following materials are acceptable:

Manufacturer	1 ½-inch	2-inch
Ford	B41-666-G	B41-777-G
A.Y. McDonald	6102Q	6102Q
Mueller	B25172	B25172

Valves (Gate)

All gate valves shall be resilient-seated gate valves which meet the specifications of ANSI/AWWA C509 or ANSI/AWWA C515. The valve body, bonnet and seal plate shall be coated on all exterior and interior surfaces with a minimum of 8-10 mils of fusion bonded epoxy in accordance with ANSI/AWWA C550. The valve shall incorporate a guide system with guide lugs on the wedge or on the body. The wedge shall be gray or ductile iron, fully encapsulated with rubber (including guide lugs and stem nut holder). Non-rising stem valves shall have two O-ring seals above the stem thrust collar that can be replaced with the valve under pressure. Non-rising stem valves shall also have a thrust washer on the stem thrust collar. Valves used for buried service will have a non-rising stem, mechanical joint end connections, and a 2" square operating nut. The word "OPEN" and an arrow to indicate the direction of opening the valve shall be cast on the flanged base of the operating nut. All above ground valves, unless otherwise specified, will have an outside screw and yoke rising stem or a non-rising stem, flanged end connections, and a hand wheel to operate the valve. The word "OPEN" and an arrow to indicate the direction of opening the valve shall be cast on the rim of the hand wheel.

All valves will open by turning the nut or hand wheel counterclockwise. Valves installed in manholes will normally be considered to be buried service valves and valves installed in vaults will normally be considered to be above ground valves.

Resilient-seated gate valves shall be designed for a minimum working pressure of 200 psi. Each valve shall be seat tested at the rated working pressure and shell tested at twice the rated working pressure in accordance with ANSI/AWWA C509 - Section 5 or ANSI/AWWA C515 - Section 5. All valves shall be warranted for 10 years from date of purchase against defective materials and workmanship. Gate valves furnished under these specifications must be manufactured by one of the following:

- American Flow Control
- Clow Valve Company
- Kennedy Valve Company
- M & H Valve Company
- Mueller Company
- U.S. Pipe and Foundry Company

Valves (Swing Check)

All swing check valves shall meet the specifications of AWWA C508. The valves shall have an iron body, be of the clear waterway type and have bronze to bronze or rubber to bronze seat construction. End connections can be flanged or mechanical joint. Check valves shall be designed for a working pressure of 175 psi for 2-12 inch valves. Assembled check valves shall be subjected to the following hydrostatic tests in accordance with AWWA C508-Section 5:

- Shell Test: 350 psi for 2-12 inch valves

300 psi for 16-24 inch valves

- Seat Test: 175 psi for 2-12 inch valves
150 psi for 16-24 inch valves

Check valves normally will be lever and weight or lever and spring operated only if used for above ground service, but may be used at any time if so specified by the City. All valves shall have two coats of asphalt varnish applied to the outside ferrous metal surfaces. All interior iron surfaces (including the disc, clapper and clapper arm) shall be coated with a minimum of 8 mils of fusion bonded epoxy or liquid epoxy in accordance with ANSI/AWWA C550. Check valves furnished under these specifications must be manufactured by one of the following:

- American Flow Control
- M & H Valve Company
- Mueller Company

Valves (Tapping)

Tapping sleeves and valves shall be used for “wet” taps into existing water mains. The tapping valve shall meet all specifications for “gate valves” except that the valve shall have an inlet flange (with centering ring) for connection to the flanged sleeve outlet conforming to AWWA C207, Class D, ANSI 150 lb. drilling, mechanical joint end conforming to AWWA C111. Tapping valves shall be supplied with mechanical joint accessories, high strength low alloy steel bolts, and heavy hexagon nuts conforming to ANSI/AWWA C111/A21.11. Tapping valve seal plates and bonnets shall have 316 stainless steel bolts and nuts. Approved tapping valves are as follows:

- American Flow Company
- Clow Valve Company
- Kennedy Valve Company
- M & H Valve Company
- Mueller Company
- U.S. Pipe and Foundry Company

Valve Boxes (Round Top)

Cast iron valve boxes will conform to ASTM A48, Class 30B. All valve boxes shall be screw type and will conform to the shape and dimensions shown on the City of Newton Standard Detail Drawing W-13.0 and will be free from holes, cracks or any other defects. Lid shall be clearly be labeled "WATER". Lids must have a minimum 1-1/2" skirt and weigh at least 13 lbs. Valve box extensions are to be of ductile iron in and along roadways or areas that may be widened. Unless directed plastic valve box extensions such as C-900 are acceptable in other areas. Valve boxes are to be manually adjusted to grade in roadways. Valve box risers are not allowed.

All casting will be thoroughly coated with an asphaltic varnish. Valve boxes that do not meet specifications shall be rejected. Cast iron valve boxes furnished under these specifications shall be supplied by one of the following or approved equal:

- East Jordan Iron Works 8550 Series – Made in USA
- Tyler/Union Utilities 6850 Series - Made in USA

Water Service Connection (¾ inch and 1 inch)

All brass hardware for ¾" and 1" shall be manufactured of Red Brass, copper alloy UNS No. C83600 consisting of 85% copper, 5% lead, 5% zinc, and 5% tin, in accordance with ASTM B-62. All valves shall be ball valves rated at 300 PSI.

Corporation Stop ball valves shall have CC tapered inlet threads in accordance with ANSI/AWWA C800, and compression outlet fittings for copper tubing.

Angle Meter ball valve shall have compression inlet fittings for copper tubing, lock wing, and installed with yoke star nut recessed for a rubber washer.

Water services shall be installed per City of Newton Detail W-3.0. (The City is not responsible for incorrect or changes in part numbers. Correct hardware must be installed.) See table of approved fittings and part numbers below:

MATERIALS SPECIFICATIONS

Manufacturer	¾" Meter	1" Meter
<i>Ford</i>		
Corporation Stop Ball Valve	FB1000-3-G	FB1000-4-G
Meter Copper Setters	VBHC41-9W	VBHC44-9W
Compression fittings for all fittings and connections		
<i>Mueller</i>		
Corporation Stop Ball Valve	B-25008	B-25008
Meter Copper Setters	B-2702	B-2702
Compression fittings for all fittings and connections		
<i>A. Y. McDonald</i>		
Corporation Stop Ball Valve	4701BT	4701BT
Meter Copper Setters	24-209WDTD33	24-209WDTD33
Compression fittings for all fittings and connections		

Water Service Connection (1-inch and 2 inch)

All brass hardware for 1" and 2" water service connections shall be manufactured of Red Brass, copper alloy UNS No. C83600 consisting of 85% copper, 5% lead, 5% zinc, and 5% tin, in accordance with ASTM B-62. All valves shall be ball valves rated at 300 PSI. Curb Stop line ball valves shall have compression outlets for copper tubing and threaded outlet for threaded brass pipe nipple. Brass and copper meter yokes shall be constructed of two locking angle ball valves rated to 300 PSI, with meter flanges, and a bypass with a 300 PSI ball line valve. Acceptable products include the following or approved equivalent:

1. Ford LSVBB11-77-9547601, meter spacing of 39.5"

Plan Guidelines

In addition to all on-site improvements, all off-site improvements required for a fully functional development project and which are to be performed as part of the development project must be included in the Plan submittal.

Each set of Drawings shall include (if applicable):

1. Site Plan
2. Grading Plan
3. Erosion Control Plan
4. Stormwater Management
5. Landscaping
6. Water and Sewer Extensions
7. Floor Plan
8. Fire Protection
9. Electrical
10. Plumbing
11. Mechanical
12. HVAC

Additional information, plan sheets, and/or calculations may be requested to ensure appropriate design of facilities.

Datum and State Plane Coordinates

All horizontal control shall be correlated to the North Carolina State Plane Coordinate System. All vertical control shall be correlated to the North American Datum (NAD) 1983/86 and North American Vertical Datum (NAVD) 88. All digital files must be tied to the State Plane Coordinate System using two City of Newton or NCGS Monuments. **Assumed elevations will NOT be accepted.**

General Notes for All Drawing Sets

The following construction notes are to be placed on the General Notes sheet for all construction plans submitted for review.

General Notes:

1. Contractor is responsible for locating all existing utilities prior to start of construction.
2. All erosion control devices shall be installed prior to the commencement of grading and maintained in accordance with the most current standards of the Land Quality Section of NCDENR.

3. Stabilization stone is required under piping when conditions warrant or as required by the City Inspector.
4. As a minimum requirement, all graded areas not under pavement and within the right-of-way and/or easements shall be prepared, fertilized and limed, seeded, and mulched immediately upon completion of construction as follows (Application rate PER 1,000 SQUARE FEET):

Type I Seeding (Lawns, shoulder, or other maintained areas):

100 lbs. of lime
15 lbs. of 19-23-12
4 lbs. of tall fescue, containing a blend of 2 or more tall fescues
1 lb. of sericea lespedeza (use unscarified seed August 15 to February 1)
¼ lb. of German millet (May 1 to August 15)
1 lb. of rye grain (prior to May 1 or after August 15)

Seeding mixtures other than those listed above shall be approved by the City Inspector prior to seeding.

5. Prior to final acceptance by the City, the Developer or his agent shall ultimately be responsible for administering the correction of all problems associated with the project.
6. The Contractor must have a copy of the approved NCDOT three-party encroachment agreement on the job site prior to beginning any work within NCDOT right-of-way.
7. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Said material shall be capable of being compacted by mechanical means and shall have no tendency to flow or behave in a plastic manner under the tamping blows or proof rolling.
8. Materials unsuitable for backfill purposes or as required by the City Inspector shall be removed and replaced with select backfill material.

Roadway and Drainage Notes:

1. The most current editions of The North Carolina Department of Transportation Standard Specifications for Roads and Structures and The North Carolina Department of Transportation Roadway Standard Drawings will govern all roadway construction unless otherwise specified herein.

2. Street catch basins shall be NCDOT 840.01 with type E grate as appropriate (NCDOT 840.03). Solid wall, precast concrete structures conforming to NCDOT 840.45 are acceptable. No waffle walls shall be allowed. All pipe openings in precast structures must be cast or cored. Unless the structure is stamped by the manufacturer as NCDOT approved, shop drawings must be submitted for approval prior to their installation.
3. Frames, grates and hoods shall be of cast iron and shall be of a design and weight which is recommended by the manufacturer as being adequate for HS-20 loadings. The number 840.03 and the name of the manufacturer must be permanently cast on the frame and on the grate.
4. No catch basins will be allowed in driveways.
5. All subgrade except the final 12" under paved areas, curb and gutter, sidewalk, and roadway shoulders shall be compacted to at least 95% of the maximum dry density as determined by AASHTO T99 and Section 500, "Fine Grading Subgrade, Shoulders, and Ditches," of the NCDOT Standard Specifications for Roads and Structures. The final 12" of subgrade shall be compacted to 100%. Density tests by an independent testing lab are to be made as directed by the City Inspector at no expense to the City. The subgrade shall be proof rolled by an overloaded tandem dump truck provided by the developer/owner and witnessed by the City Inspector prior to placement of stone or asphalt base. The developer/owner shall notify the Department at least 48-hours before the proof roll to schedule an appointment with the City Inspector. If rain occurs between the proof roll and prior to base placement, another proof roll may be required by the City Inspector. It is the responsibility of the Developer to make corrections to the subgrade when sections of the roadway fail the proof roll test. The proof roll shall provide a non-yielding surface (pumping, rutting, saturated soil, etc. are unacceptable).
6. All stone base shall be compacted to 100% of the dry unit weight as determined by AASHTO T180 and Section 520, "Aggregate Base Course," of the NCDOT Standard Specifications for Roads and Structures. The unit weight and optimum moisture content will be determined by proctor tests performed by an independent laboratory at the developer/owner's expense. Density tests are to be performed and made available to the Inspector for review. Moisture content must be no more than 50% of the optimum moisture content prior to paving. The stone base shall also be proof rolled and witnessed by the Inspector prior to paving. The proof roll shall provide a non-yielding surface (pumping, rutting, saturated stone, etc. are unacceptable). Stone from different quarries shall not be mixed.
7. Paving contractors and subcontractors shall be certified by NCDOT on all projects.

8. Asphalt must be tested by core sampling or nuclear gauge method in accordance with Article 609-5 D, "Field Compaction Quality Control," of the NCDOT Standard Specifications for Roads and Structures, latest edition.
9. All testing records shall be submitted to the City Inspector within 72 hours.
10. Underdrains to stabilize subgrade shall be required as directed by the City Inspector.
11. Existing curb and gutter and pavement shall be replaced or repaired as required to tie on to sound material as defined by the City.
12. Wheelchair ramps are required at intersections. See City Standard Drawings for "Wheelchair Ramp" for ramp construction.
13. Minimum diameter of pipe for storm drainage shall be 15 inches. The minimum earthen cover for all pipes is 18 inches.
14. Only reinforced concrete pipe (RCP) is allowed in the right-of-way or in drainage networks that receive runoff from the right-of-way. No other type of pipe shall be used without prior approval by the City. RCP within the right-of-way shall be minimum Class III and joints must have O-rings or flexible joint material, which conforms to AASHTO specification M-198 for Type B flexible plastic gaskets.
15. All concrete shall be minimum 3,600 psi compressive strength in 28 days.
16. The interior surfaces of all masonry storm drainage structures shall be pointed up, jointed and smoothed to an acceptable standard using mortar, which shall conform to the requirements of Section 1040, "Masonry," of the NCDOT Standard Specifications for Roads and Structures. The invert shall be formed of concrete such that no standing water is possible.
17. All pipe terminations in storm drain structures shall be flush with the inside wall.
18. Any storm drain structures over three (3) feet and six (6) inches (3'6") in height must have steps in accordance with NCDOT Standard Drawing No. 840.66, "Drainage Structure Steps."
19. All graded creek banks and slopes shall be at a maximum of two (2) feet horizontal to one (1) foot vertical (2:1) and not to exceed 10' in height without terracing.
20. Backfilling of pipe trenches shall be accomplished immediately after the pipe is laid. The fill around the pipe shall be placed in layers not to exceed six (6)

inches, each layer shall be thoroughly compacted to 95% of the maximum density obtainable with ASTM D698, the Standard Proctor Test (a density of 100% Standard Proctor is required for the top eight (8) inches).

21. Compaction requirements shall be attained by the use of mechanical compaction methods. Each layer of backfill shall be placed loose and thoroughly compacted in place.
22. Water shall not be permitted to rise in unbackfilled trenches after the pipe has been placed.

Water and/or Sanitary Sewer Notes:

1. The most current edition of the City of Newton Design Standards will govern all water and sanitary sewer construction.
2. Water meters, and sewer cleanouts shall be located at the right-of-way line.
3. Water and sewer connections shall be beside each other at the center of each lot. Connections are to be spaced not more than 30" center to center and have 2" x 2" stakes placed on each side. Stakes shall be flagged or painted for visibility.
4. Hydrants shall be placed preferably at lot lines a minimum of one foot behind the curb, within the planting strip.
5. Field construction materials tests by an independent testing lab are to be made as directed by the City of Newton Inspector at no expense to the City.
6. Inspection of pipe shall be made before backfilling of pipe by a City of Newton Inspector.

Introduction

1. The design standards described herein are the minimum requirements for roadways to be accepted and maintained by the City of Newton and for private streets. Design criteria not established in this Manual shall be as set forth by the North Carolina Department of Transportation (NCDOT), Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) various guidelines and requirements. Where these minimum requirements conflict with those of the NCDOT or AASHTO, the more restrictive requirements shall apply.
2. All proposed public streets shall be designed to become part of the overall street system and be identified as such on all approved plans. All streets and roads shall align with other designated roadways for continuity in the City's street system.
3. Proposed streets, which are obviously in alignment with other streets, shall bear the assigned name of the existing street. In no case shall the name for a proposed street duplicate or be phonetically similar to an existing street name in Catawba County; irrespective of the use of the suffix; street, avenue, boulevard, drive, place, court, etc. All street names shall be approved by the County 911 Addressing Coordinator.
4. A North Carolina Professional Engineer must sign and seal all construction plans and revisions submitted for review. A Professional Land Surveyor may certify As-Built drawings verifying that the construction was completed according to plans.

Roadway Classifications

1. All streets within the City's jurisdiction shall comply with the requirements of one of the following street classifications. The City shall determine the classification of the street in accordance with the thoroughfare plan and supporting documentation.
 - **Local Streets (R-1.0, R-2.0, R-3.0)** – A street intended solely for access to adjacent properties. Consists of all roads not defined as arterials or collectors; primarily provides access to land with little or no through movement. Local streets are further classified as (1) Residential, (2) Commercial or (3) Industrial.
 - **Collector Streets (R-4.0, R-5.0)** – A street that provides direct service to and from local areas, routing traffic to the arterial (“thoroughfare”) street system. A Collector Street provides the primary means of circulation between adjacent neighborhoods and can serve as a local bus route.

The Street provides the dual purpose of land access and local traffic movement. Generally, these roadways are not used for through trips. Provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials. Collector streets are further classified as either (1) Major, or (2) Neighborhood.

- **Arterial Streets (R-6.0, R-7.0)** – A thoroughfare; used primarily for through traffic rather than for access to abutting land. Arterial streets are typically characterized by high vehicular capacity and continuity of movement. Provides the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control. Arterial streets are further classified as either two-lane, or four-lane (with median).
- **Alleys (R-25.0)** – Private or City maintained streets that provide rear access to properties, reduce curb cuts and access points along frontage streets, permit unencumbered pedestrian access along frontage streets, and provide less visible access for service functions. Alley streets exhibit minimum pavement width to accommodate single direction movement of vehicles, adequate right-of-way width to accommodate passing, and an inverted section for drainage. Parking shall not be allowed along an Alley with exceptions to clearly marked areas.
- **Private Streets** – Privately maintained streets may be used within commercial and multi-family developments. Private streets within subdivided single family developments are generally prohibited. Private streets must be built to the same standards as City streets.

Roadway Design Standards

1. Minimum design speed, right-of-way width and pavement widths shall be as summarized in the following table and as shown on Standard Details **R-1.0 – R-7.0**:

DESIGN SPEED ROW AND STREET WIDTH				
Street Classification	Standard Detail Number	Design Speed (mph)	Minimum Right-of-Way Width (feet)	Minimum Street Width¹ (feet)
Local Residential	R-1.0	30	50	22
Local Commercial	R-2.0	30	55	24
Local Industrial	R-3.0	30	55	28
Major Collector	R-4.0	40	100	68
Neighborhood Collector	R-5.0	30	55	24
2-Lane Arterial	R-6.0	40	55	24
4-Lane Arterial	R-7.0	40	100	68

1. Street widths are measured from lip of curb to lip of curb and spanning a median, if present.

2. If the property is located on or adjacent to a thoroughfare, all rights-of-way shall be dedicated in accordance with the applicable thoroughfare plan.
3. Block lengths shall be a minimum of 400 feet and shall not exceed 1,200 feet. Block length shall be measured from the centerlines of intersecting roads.
4. Loop roads shall not exceed 1,200 feet and shall be measured from the intersection of origin (which provides outlet to the loop road), around the entire loop, and back to the original intersection. The City may require the connection, continuation, or stub out of proposed streets both internally and/or to adjacent property.
5. Cul-de-Sacs and other dead end roads shall not exceed 750 feet in length. All dead end streets shall provide a terminating turnaround, which meets the requirements set forth in Appendix D of the International Fire Code (**R-9.0**).
6. Cul-de-sacs shall not be used to avoid connection with existing streets. To encourage future development, in an orderly manner street rights-of-way may be extended to adjacent property and a temporary cul-de-sac provided. In such instances, the width of the right-of-way of the approaching street may be extended to the adjacent property. Curb and gutter is not required on temporary turnarounds.

7. Permanent T-shaped turnarounds shall be built in accordance with this manual and utilized only when topography prohibits the construction of a circular cul-de-sac. In cases where a street is to be built to the adjoining property lines, and said street is to be extended in the near future, or said street is less than 300' from the nearest adjoining street, a modified T-shaped turnaround may be used in accordance with this manual.
8. Roadways shall have a minimum grade of 0.5 percent. The minimum centerline radius shall be as given below. No super-elevation will be permitted without approval. Sight distance and maximum grade parameters used for the design of vertical curves shall be as follows:

ROADWAY DESIGN PARAMETERS							
Sight Distance Parameter	Design Speed (mph)						
	30	35	40	45	50	55	60
Posted Speed (mph)	25	25	35	40	45	50	55
Maximum Grade	8%	8%	8%	7%	7%	6%	6%
Min. Horizontal Radius (feet) ¹	333	510	762	1039	1389	1833	2400
Min. Stopping Sight Distance (feet)	200	250	305	360	425	495	570
Min. "K" Value for Crest Curve (feet per percent change in grade)	30	30	44	61	84	114	151
Min. "K" Value for Sag Curve (feet per percent change in grade)	37	49	64	79	96	115	136

1. Min. horizontal radius is measured to the inside of the edge of pavement.

9. Normal crown cross-slope shall be 1/4" per foot (2%).
10. Maximum cut and fill slope is three-to-one (3:1) in residential areas and two-to-one (2:1) in other areas.
11. Grades should not exceed 3% for the first 300 feet from collector and arterial [intersection] centerlines. Grades should not exceed 5% for the first 100 feet from the centerline [intersections] of local residential streets.
12. Intersections shall intersect at 90 degrees when possible. The minimum angle of intersection shall be 60 degrees
13. Intersections shall have a minimum radius of 20' at the face of the curb. A larger radius may be required as determined by the City on a project-by-project basis.
14. Offset intersections shall be avoided. However, when necessary, a minimum distance of 200 feet between centerlines shall be provided. A minimum distance of 800 feet shall be provided between arterial (thoroughfare) and collector street intersections.

15. Site triangles of 25 feet by 25 feet shall be preserved for all intersections. Additional sight triangles of 10 feet by 70 feet may be required on arterial streets and NCDOT maintained roads. Site triangles shall be noted on all plans and plats.
16. Turn lanes shall have a minimum width of 12 feet and be incorporated when required by traffic considerations. Tapers shall be used as necessary in street design. Approach tapers are used to shift lanes laterally. The following equations shall be used as applicable:
 - L = WS for posted speeds of 45 mph and greater;
 - $L = WS^2 / 60$ for posted speeds of 40 mph or less;
 - L = Length in feet
 - S = Speed in miles per hour
 - W = Lateral offsets in feet
17. Turn lane tapers shall be at least 15:1 (L:W) for posted speeds of 45 miles per hour and more. The minimum turn lane taper allowed for streets posted less than 45 miles per hour is 8:1. Symmetrical reverse curve tapers are recommended for non-thoroughfare streets. Storage lengths for the turn lanes shall be calculated using an acceptable method and approved by the Director of Utilities. The minimum storage lane length shall be 150 feet.
18. Plans for all widening shall show that the contractor will saw and remove the top 1-1/2" of existing pavement a minimum of 12" from the edge, or as directed by the City, and place new pavement over the existing base.
19. Concrete traffic islands designed to direct turning movements are acceptable and shall be constructed and placed as per NCDOT standard specifications.
20. Guardrail shall be installed in any area where there is a risk of a vehicle going off the roadway in accordance with appropriate AASHTO requirements or when required by the Planning Director.
21. Minimum on-street parking width shall be 8 feet as measured from the face of the curb. On-street parking requires a minimum travel lane width of 12 feet. When on-street parking is allowed, a minimum travel way width of 20 feet shall be maintained at all times.
22. Concrete traffic islands designed to direct turning movements are acceptable and shall be constructed and placed as per NCDOT standard specifications. Concrete traffic islands shall be a minimum of 4 feet wide. Concrete traffic islands are required when there are two or more left turn lanes.

23. Medians designed to direct turning movements are acceptable and shall be constructed and placed as per NCDOT standard specifications. Medians shall be a minimum of 4 feet wide as measured from the back of curb to back of curb.
24. A median is required at all intersections with dual left turn lanes. The median shall extend at least the length of the storage bay.

Drainage/Curb & Gutter

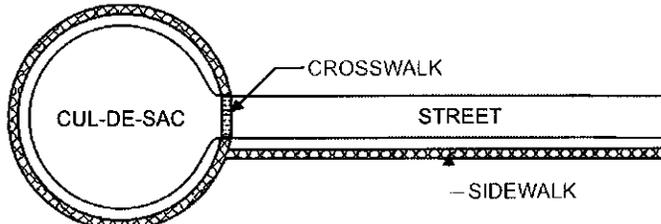
1. Curb-and-gutter is required on both sides of all new street construction.
2. Curb and gutter shall be per Std. Detail R-10.0 (S-3), 2' 6" curb and gutter and shall be required on all streets. Residential curb and gutter (valley gutter) shall conform to Standard Detail R-10.0 (S-3) and may only be used on local streets, cul-de-sacs, or other approved local road terminations (permanent and temporary).
3. Major drainage structures, i.e. Bridges, dams, and creek crossings, shall be reviewed on an individual basis.
4. All streets and all commercial and industrial parking and access areas shall have curb and gutter. 2' -6" curb and gutter of 2' -0" valley curb and gutter shall be used on all public streets as limited in the standard details. 18" wide curb and gutter may be used around commercial and industrial parking and access areas.
5. Culvert crossings shall be designed with the following clear zone distances:

Design ADT	Clear Zone from Edge of Pavement	
	Tangent Section	Curve (within 125' of culvert)
Under 750	10'	15'
750-1500	12'	18'
1500 - 6000	14'	21'
Over 6000	16'	24'

6. Handrails shall be installed behind the sidewalk unless a 10-foot pedestrian clear zone is provided behind the sidewalk. A pedestrian clear zone shall be defined as any slope at 6:1 or flatter. Handrails must extend a minimum of 20' past the end of the wingwall. Slope from handrail or edge of pedestrian clear zone shall be at a slope of 2:1 or flatter.

Sidewalks

1. Sidewalks of at least 5 feet in width shall be installed along one side of all subdivision streets. The SRB may require sidewalks on both sides and/or sidewalks of widths that exceed the minimum when such requirement is in the interest of pedestrian safety. Sidewalks along cul de sac streets shall extend the full circumference of the bulb with a crosswalk at the throat as indicated below;



2. Sidewalks shall be installed at the time of roadway construction or installed in phases as approved by the City. The minimum thickness of concrete sidewalks shall be four (4) inches, designed to reach a 28-day compressive strength of 3,600 psi. At locations where a driveway crosses a sidewalk, a six (6) inch depth is required. Sidewalks shall be a minimum width of five (5) feet. The City may require a planting strip in developments where traffic conflicts and/or utility placement warrant.
3. Where sidewalks and/or greenways intersect any section of curb and gutter, wheel chair ramps are required. The current NCDOT wheelchair ramp standards shall apply. Approved colors for truncated domes are black, red, and yellow.

Street Trees

Trees shall be installed as the last construction step, or a performance guarantee submitted for their installation.

Existing Trees

Existing trees may be preserved as street trees, provided the trees:

1. are shown on the preliminary plat
2. are flagged in the field
3. are of a species identified by these specifications
4. do not impose a drainage problem
5. are within 5 feet of the right-of-way line (either side)

Planting Season

Trees should be planted from November 15 through April 15.

Planting

Planting Season

Trees should be planted from November 15 through April 15.

Planting

Trees shall be planted either 1' from the right-of-way line, inside the right-of-way, or centered within a planting strip provided that the planting strip is minimum of 6' in width. In the event that a planting strip is located on just one side on a street the trees planted on the side with no planting strip should be planted behind the curb at a distance equal to half the width of the planting strip. Trees and other objects within this area are prohibited within the sight triangle, as to maintain proper sight distances at intersections.

All trees shall be planted in accordance with the standard details in this manual. Professional nursery guidelines shall be obtained and followed for individual species requirements.

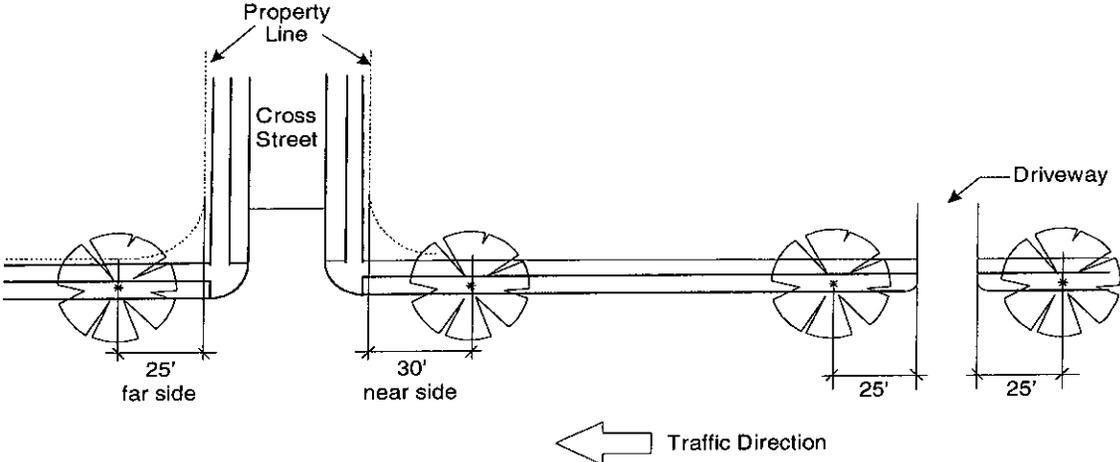
Single leader trees shall be a minimum of 1 ½ inches in diameter measured just above the ground and shall be a minimum of 8 to 10 feet tall depending on the species.

Multi-leader trees shall be a minimum of 8 to 10 feet tall measured from ground level to the average uppermost point of growth.

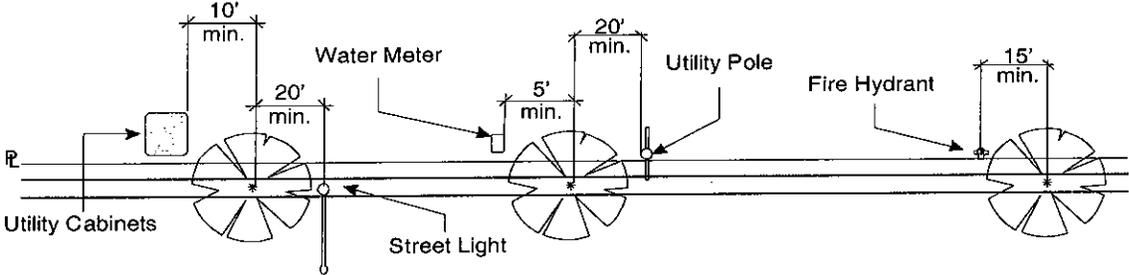
Trees shall be spaced 50' apart, measured on center. Intervals may be modified if required to plant around obstacles.

Planting Around Obstacles

Plantings around obstacles must be approved by the City. Generally, the following spacings are recommended:



TREE PLANTING CLEARANCE AT TYPICAL INTERSECTIONS



TREE PLANTING CLEARANCE AROUND TYPICAL UTILITIES

Trees directly under overhead power lines shall be small trees with a mature heights of no more than 20'.

Tree Selection

The trees recommended for use can be found on the following page. The developer should consider factors of tree shape, maintenance requirements, growth habits, and aesthetics, when selecting street trees. Trees that are not on the list can be approved by the Subdivision Review Board on a case by case basis taking in consideration the trees characteristics.

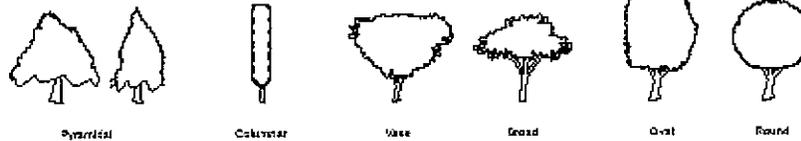
Guarantee

Trees shall be guaranteed for one year after planting or approval of the final plat in the case of existing trees. Trees which die or are destroyed shall be replaced as soon as possible within a planting season.

CITY OF NEWTON RECOMMENDED STREET TREE LIST

COMMON NAME	SCIENTIFIC NAME	SHAPE	GROWTH RATE	HEIGHT	SPREAD
Baldcypress	<i>Taxodium distichum</i>	Pyramidal	Medium	90	90
Birch, Dutchess	<i>Betula nigra</i> 'Dutchess'	Oval	Fast	90	25
Birch, Honbige	<i>Betula nigra</i> 'Honbige'	Oval	Fast	90	40
Cedar, Eastern Red	<i>Juniperus virginiana</i>	Pyramidal	Fast	35	20
Creechorn, Royal	<i>Malis</i> 'Royal'	Vase	Medium	25	25
Crapechille, Snow Pink	<i>Legastomatia indica</i> 'Snow'	Vase	Medium	20	15
Crypenyita, Natchez White	<i>Legastomatia x 'Natchez'</i>	Vase	Medium	25	20
Dawn Redwood	<i>Metasequoia glyptostroboides</i>	Pyramidal	Fast	85	25
Dogwood, Kona	<i>Cornus kousa</i>	Vase	Slow	30	30
Elm, Laceleaf	<i>Ulmus parvifolia</i>	Round	Medium	45	40
Ginkgo (Male Form Only)	<i>Ginkgo biloba</i>	Pyramidal	Slow	90	25
Holly, Nellie Stevens (Triflorin)	<i>Ilex x 'Nellie R. Stevens'</i>	Pyramidal	Fast	90	15
Hambree, American	<i>Carpinus Caroliniana</i>	Oval	Slow	25	25
Japanese cypress	<i>Cryptomeria japonica</i>	Pyramidal	Medium	90	30
Japanese swordfll	<i>Syrinx japonica</i>	Oval	Medium	25	25
Magnolia	<i>Magnolia virginiana</i>	Pyramidal	Medium	90	25
Oac, Nutt	<i>Quercus nuttallii</i>	Round	Fast	80	35
Oak, Willow	<i>Quercus phellos</i>	Pyramidal	Medium	90	30
Red Maple, Blandyville	<i>Acer rubrum</i> 'Blandyville'	Oval	Medium	30	15
Red Maple, October Glory	<i>Acer rubrum</i> 'October Glory'	Oval	Fast	90	40
Red Maple, Red Sunset	<i>Acer rubrum</i> 'Red Sunset'	Oval	Fast	90	30
Red Maple, Summer Red	<i>Acer rubrum</i> 'Summer Red'	Oval	Medium	40	25
Red Maple, Sun Valley	<i>Acer rubrum</i> 'Sun Valley'	Oval	Fast	40	25
Redbud, Glaberrima	<i>Caecilia canadensis</i> ssp. <i>glaberrima</i>	Round	Medium	90	20
Salvico Berry	<i>Asplenium canadensis</i>	Broad	Medium	15	20
Sugar Maple, Legacy	<i>Acer saccharum</i> 'Legacy Sugar Maple'	Pyramidal	Slow	90	35
Sweetgum, Slender S. Thruout Sweetgum	<i>Liquidambar styraciflua</i> 'Slender S. Thruout'	Columnar	Fast	80	8
Tulip Poplar, Arnold	<i>Liriodendron tulipifera</i> 'Arnold'	Columnar	Fast	90	15
Zakova, Mowalino	<i>Zakova serrata</i> 'Mowalino'	Columnar	Medium	45	15
Zakova, Village Green	<i>Zakova serrata</i> 'Village Green'	Vase	Medium	90	45

TREE SHAPES



Signage

1. A signage plan must be submitted to the Planning Department for approval and all signage must be paid for in accordance to the City's signage price list prior to any signage being installed. All signage in the right-of-way must be installed by the City of Newton including but not limited to street name signs, regulatory signs, warning signs, etc. All signs must be in accordance with MUTCD standards. Developers or Homeowners Association may not remove, replace or add to the City installed signage.

Driveways

1. Driveways should be placed as to avoid conflicting turn movement.
2. Driveways and other curb cuts will be reviewed during the plan review process. A separate driveway permit is not required. However, a driveway inspection is required prior to pouring concrete or placing asphalt.

Once the driveway location has been approved and concrete forms set, the Director of Public Works & Utilities must be notified for an inspection. Failure to request a driveway inspection to ensure compliance with City specifications may result in the Director's request for removal and replacement of driveway improvements at the owner's expense.

3. Driveways shall be free of all obstructions including, but not limited to such facilities as water meters, cleanouts, wheelchair ramps, and storm drainage structures.

STANDARD STORM DRAINAGE DETAILS:

- D-1.0 PRECAST DOUBLE CATCH BASIN 15" THRU 24" PIPE
- D-2.0A PERCAST DOUBLE CATCH BASIN 30" THRU 36" PIPE
- D-2.0B PRECAST DOUBLE CATCH BASIN 30" THRU 36" PIPE
- D-3.0A FLARED END SECTION PLAN, END, SKEWED VIEW AND
 INSTALLATION SECTION VIEW
- D-3.0B FLARED END SECTION SECTION X-X, GENERAL NOTES
 AND DIMENSIONS



STORM DRAINAGE
INDEX

NTS

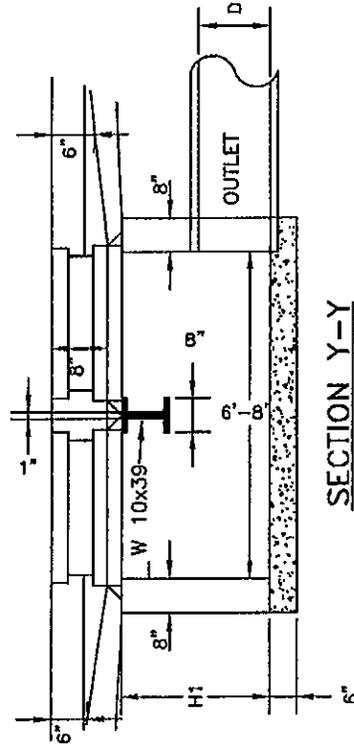
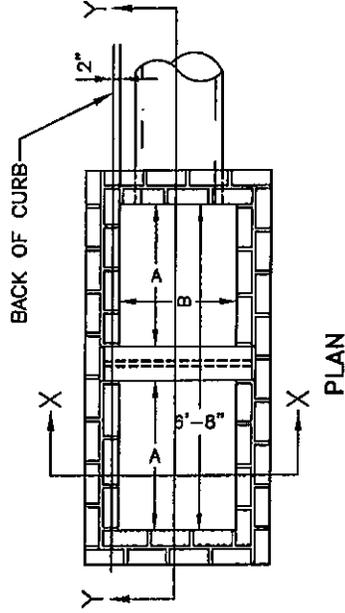
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GENERAL NOTES:

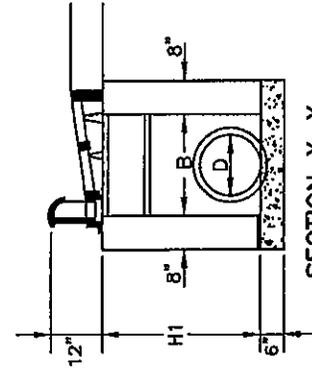
1. ALL CONCRETE TO BE 3600 PSI MIN. COMPRESSIVE STRENGTH.
2. MORTAR JOINTS SHOULD BE BETWEEN 3/8" AND 5/8" THICK.
3. ALL CATCH BASINS OVER 3'-6" IN DEPTH TO BE PROVIDED WITH METAL STEPS ON 1'-2" +/- CENTERS.
4. PRECAST CONCRETE BOXES SHALL BE USED JUMBO BRICK WILL BE PERMITTED.
5. FOR MANHOLE DEPTH OF 8'-0" OR LESS USE 8" WALL FOR MANHOLE DEPTH OVER 8'-0" USE 8" FROM TOP OF WALL AND 12" FOR REMAINING DEPTH. (SEE DETAIL "A" THIS SHEET)
6. FOR FRAME AND GRATE DETAIL SEE NCDOT STANDARD 840.03
7. ALL PIPE IN STORM DRAIN STRUCTURE SHALL BE STRUCK EVEN WITH THE INSIDE WALL, GROUTED AND BRUSHED SMOOTH.
8. WEEP HOLE(S) SHALL BE PLACED IN BACK WALL. A STONE DRAIN CONSISTING OF 1 (ONE) CUBIC FOOT OF NUMBER 78M STONE CONTAINED IN A BAG OF POROUS FABRIC SHALL BE PLACED AT EACH WEEP HOLE.
9. WHERE 2'-6" CURB AND GUTTER IS USED, CATCH BASINS MAY BE LOCATED AT THE END OF A RADIUS.

DIMENSIONS OF BOX AND PIPE

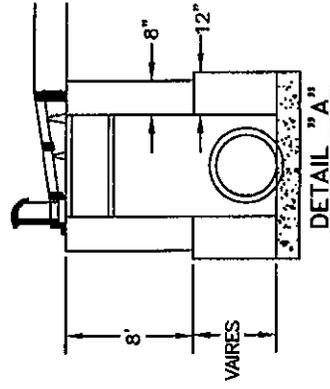
PIPE D	SPAN A	WIDTH B	HEIGHT MIN. H1	W 10 LENGTH
15"	3'-0"	2'-4"	2'-6"	2'-10"
18"	3'-0"	2'-4"	2'-10"	2'-10"
24"	3'-0"	2'-4"	3'-4"	2'-10"



SECTION Y-Y



SECTION X-X



DETAIL "A"



STORM DRAINAGE
PRECAST DOUBLE CATCH BASIN
15" THRU 24" PIPE

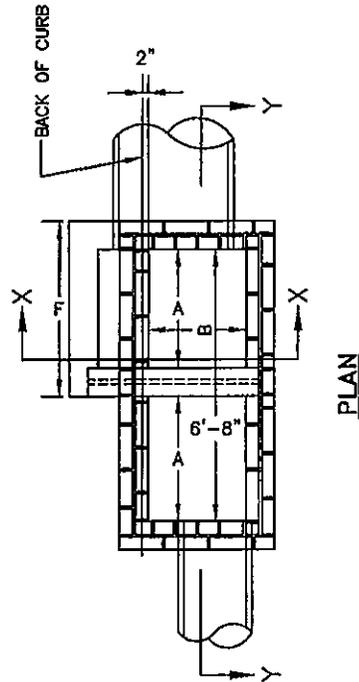
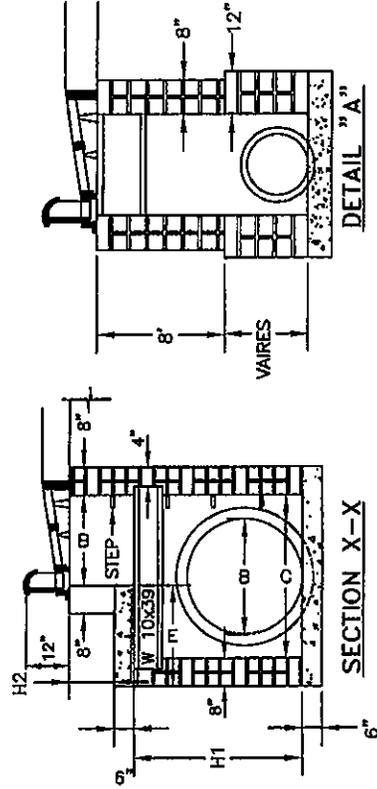
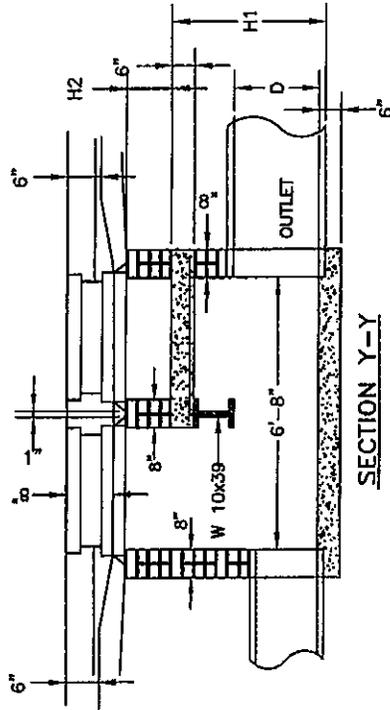
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D - 1.0

GENERAL NOTES:

1. ALL CONCRETE TO BE 3600 PSI MIN. COMPRESSIVE STRENGTH.
2. MORTAR JOINTS SHOULD BE BETWEEN 3/8" AND 5/8" THICK.
3. ALL CATCH BASINS OVER 3'-6" IN DEPTH TO BE PROVIDED WITH METAL STEPS ON 1'-2" +/- CENTERS.
4. CONCRETE BRICK MAY BE USED IN LIEU OF HARD COMMON CLAY BRICK. JUMBO BRICK WILL BE PERMITTED.
5. FOR MANHOLE DEPTH OF 8'-0" OR LESS USE 8" WALL FOR MANHOLE DEPTH OVER 8'-0" USE 8" FROM TOP OF WALL AND 12" FOR REMAINING DEPTH. (SEE DETAIL "A" THIS SHEET)
6. FOR FRAME AND GRATE DETAIL SEE NCDOT STANDARD 840.03
7. ALL PIPE IN STORM DRAIN STRUCTURE SHALL BE STRUCK EVEN WITH THE INSIDE WALL, GROUTED AND BRUSHED SMOOTH.
8. WEEP HOLE(S) SHALL BE PLACED IN BACK WALL. A STONE DRAIN CONSISTING OF 1 (ONE) CUBIC FOOT OF NUMBER 78M STONE CONTAINED IN A BAG OF POROUS FABRIC SHALL BE PLACED AT EACH WEEP HOLE.
9. SEE STANDARD NUMBER D-2.0B (SHEET 2 OF 2) FOR DIMENSION TABLE AND BAR SPECIFICATIONS

NOTE: MINIMUM DEPTH (H1) TO BE DETERMINED BY SIZE OF OUTLET PIPE.





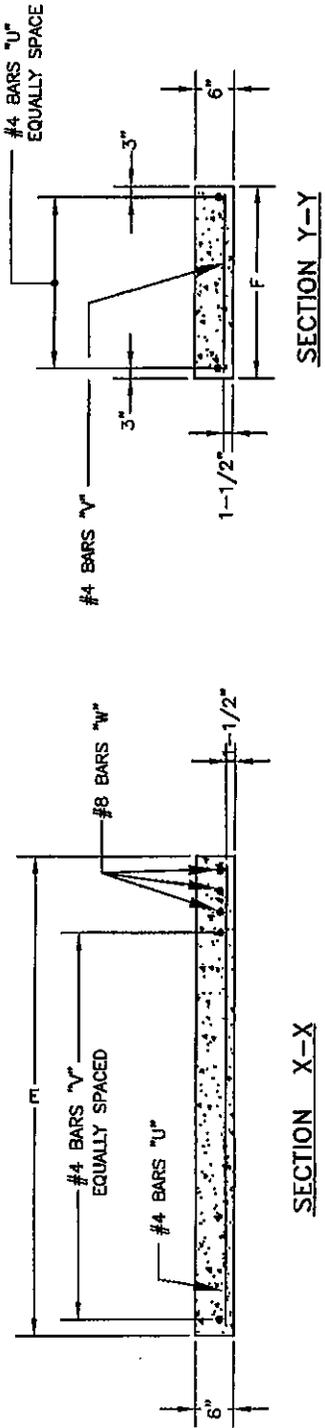
STORM DRAINAGE
BRICK DOUBLE CATCH BASIN
30" THRU 36" PIPE

NTS

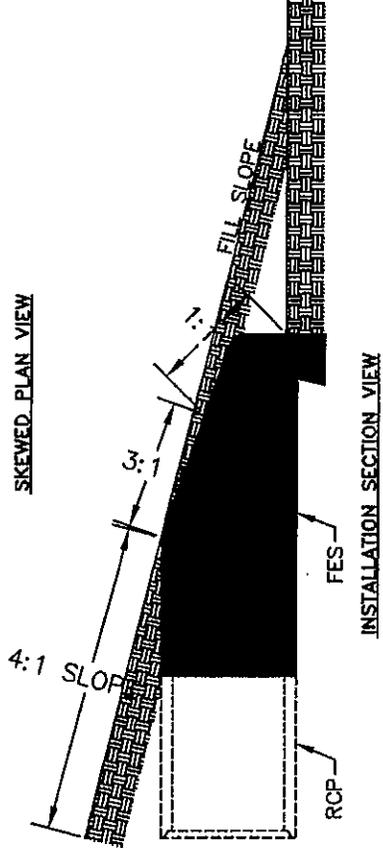
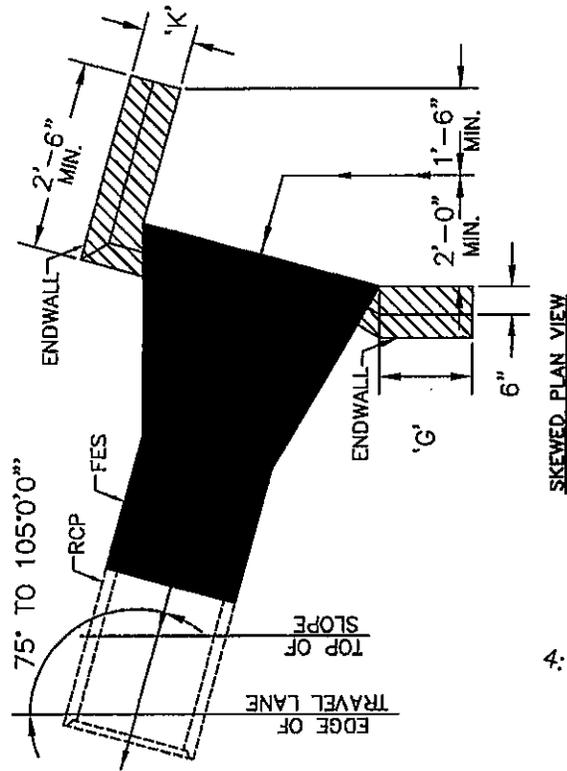
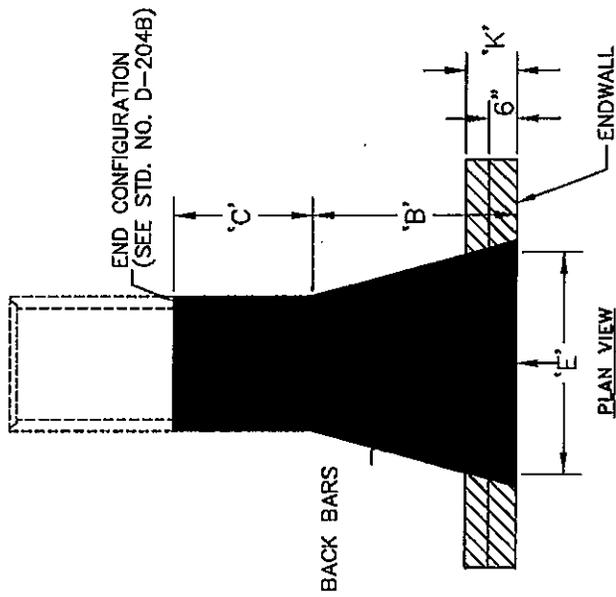
D - 2.0B

30" THRU 36" PIPE

DIMENSIONS OF BOX AND PIPE				COVER				TOP SLAB REINFORCEMENT										
PIPE	SPAN	WIDTH	HEIGHT	W	H1	H2	LENGTH	E	F	BARS - U	NO.	LENGTH	BARS - V	NO.	LENGTH	BARS - W	TOT.	
30"	3'-0"	2'-4"	3'-2"	3'-4"	3'-2"	VAR.	4'-0"	1'-10"	4'-4"	4	1'-6"	3	4'-1"	3	4'-1"	3	4'-1"	45
36"	3'-0"	2'-4"	3'-8"	3'-10"	3'-8"	VAR.	4'-6"	2'-4"	4'-4"	4	2'-0"	4	4'-1"	3	4'-1"	3	4'-1"	49



SEE STANDARD NUMBER D-2.0A (SHEET 1 OF 2) FOR PLAN AND SECTION VIEWS



SEE STD. NO D-3.0B FOR GENERAL NOTES, SECTION X-X AND DIMENSIONS



STORM DRAINAGE
FLARED END SECTION
PLAN, END, SKEWED VIEW AND
INSTALLATION SECTION VIEW

NTS

D - 3.0A

STORM DRAINAGE
FLARED END SECTION
SECTION X-X, GENERAL NOTES
AND DIMENSIONS

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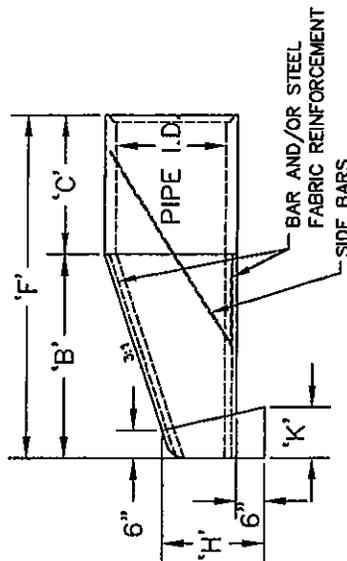
D - 3.0B

PIPE I.D.	DIMENSIONS AND CONCRETE QUANTITIES FOR END SECTIONS AND ENDWALLS														
	END SECTIONS						STRAIGHT ENDWALLS (COMMON DIM)						SKEWED ENDWALLS		
	'A'	'B'	'C'	'E'	'F'	'T'	'G'	'H'	'K'	'L'	Y0 ³	'G'	'L'	Y0 ³	
12"	4"	2'-0"	4'-1"	2'-0"	6'-1"	1 7/8"	1'-2"	1'-6"	0'-9"	4'-4"	0.1	1'-0"	6'-4"	0.2	
15"	6"	2'-3"	3'-10"	2'-6"	6'-1"	1 7/8"	1'-2"	1'-6"	0'-9"	4'-10"	0.1	1'-0"	6'-10"	0.2	
18"	9"	2'-3"	3'-10"	3'-0"	6'-1"	2"	1'-5"	1'-9"	0'-11"	5'-10"	0.2	1'-3"	7'-7"	0.3	
24"	10"	3'-8"	2'-6"	4'-0"	6'-2"	2 1/2"	1'-8"	1'-10"	0'-11"	7'-4"	0.2	1'-5"	8'-9"	0.3	
30"	1'-0"	4'-6"	1'-8"	5'-0"	6'-2"	2 1/2"	1'-11"	2'-1"	1'-1"	8'-10"	0.3	1'-8"	10'-0"	0.4	
36"	1'-3"	5'-3"	2'-11"	6'-0"	8'-2"	3"	2'-3"	2'-5"	1'-3"	10'-8"	0.4	2'-0"	11'-4"	0.6	
42"	1'-10"	5'-3"	2'-11"	6'-6"	8'-2"	3 1/2"	2'-9"	2'-11"	1'-6"	12'-0"	0.7	2'-6"	12'-4"	0.9	
48"	2'-1"	6'-0"	2'-2"	7'-0"	8'-2"	4"	3'-4"	3'-3"	1'-8"	13'-8"	1.0	3'-0"	13'-4"	1.2	

PIPE DIA.	FLARED END SECTION - REINFORCEMENT	
	QTY. & DIM OF RODS	STEEL #'S
12"	(2) #3x4'-0" SIDE RODS	3.0
15"	(2) #3x4'-0" SIDE RODS	3.0
18"	(2) #3x4'-0" SIDE RODS	3.0
24"	(2) #3x6'-0" SIDE RODS	4.5
30"	(2) #4x6'-0" SIDE RODS	8.0
36"	(2) #4x8'-0" SIDE RODS	10.7
42"	(2) #4x8'-0" SIDE RODS	10.7
48"	(2) #4x8'-0" SIDE RODS	10.7
36" - 48"	(2) #4x6'-0" BACK RODS	8.0

GENERAL NOTES:

1. CLASS 'B' CONCRETE TO BE USED IN ENDWALLS.
2. CHAMFER ALL EXTERIOR CORNERS 1".
3. FLARED END SECTIONS ARE NORMALLY USED ON PIPES WITH SKEW ANGLES FROM 75° TO 105°.
4. FLARED END SECTION CONFIGURATION INLET LOCATION - TONGUE
OUTLET LOCATION - GROVE



SECTION X-X

SEE STD. NO D-3.0A FOR PLAN, END, SKEWED AND INSTALLATION SECTION VIEW

STANDARD MISCELLANEOUS DETAILS:

M-1.0 STABILIZED CONSTRUCTION ENTRANCE

M-2.0 TEMPORARY CONCRETE WASHOUT FACILITY

M-3.0 DUMPSTER PAD BOLLARD



MISCELLANEOUS DETAILS

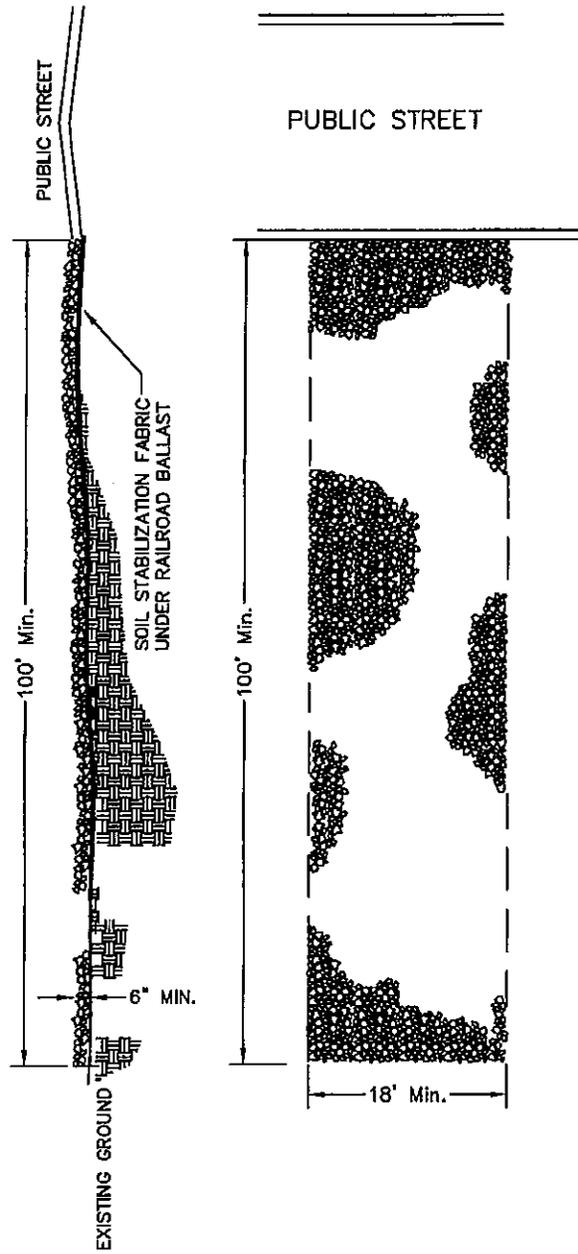
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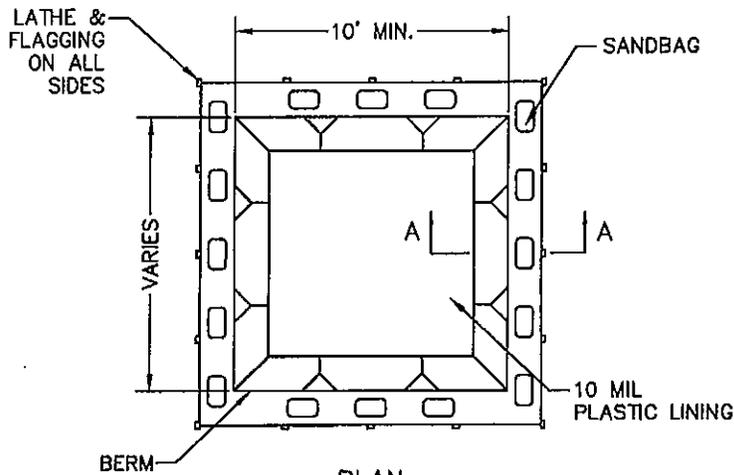
NTS

M

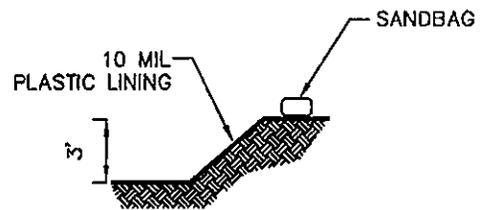
NOTES:

1. A STABILIZED ENTRANCE PAD OF RAIL ROAD BALLAST (2-3" MINIMUM) SHALL BE LOCATED WHERE TRAFFIC WILL ENTER OR LEAVE THE CONSTRUCTION SITE ONTO A PUBLIC STREET.
2. FILTER FABRIC OR COMPACTED NCDOT ABC STONE SHALL BE USED AS A BASE FOR THE CONSTRUCTION ENTRANCE.
3. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC STREETS OR EXISTING PAVEMENT. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS WARRANT AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
4. ANY SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO STREETS MUST BE REMOVED IMMEDIATELY.
5. WHEN APPROPRIATE, WHEELS MUST BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTERING A PUBLIC STREET. WHEN WASHING IS REQUIRED, IT SHALL BE DONE IN AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT BASIN.

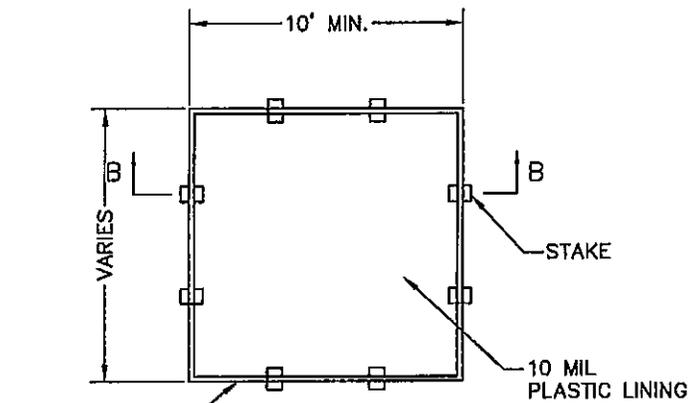




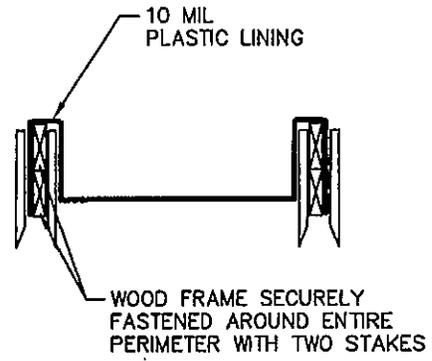
PLAN
NTS
TYPE "BELOW GRADE"



SECTION A-A
NTS



PLAN
NTS
TYPE "ABOVE GRADE"



SECTION B-B
NTS

NOTES:

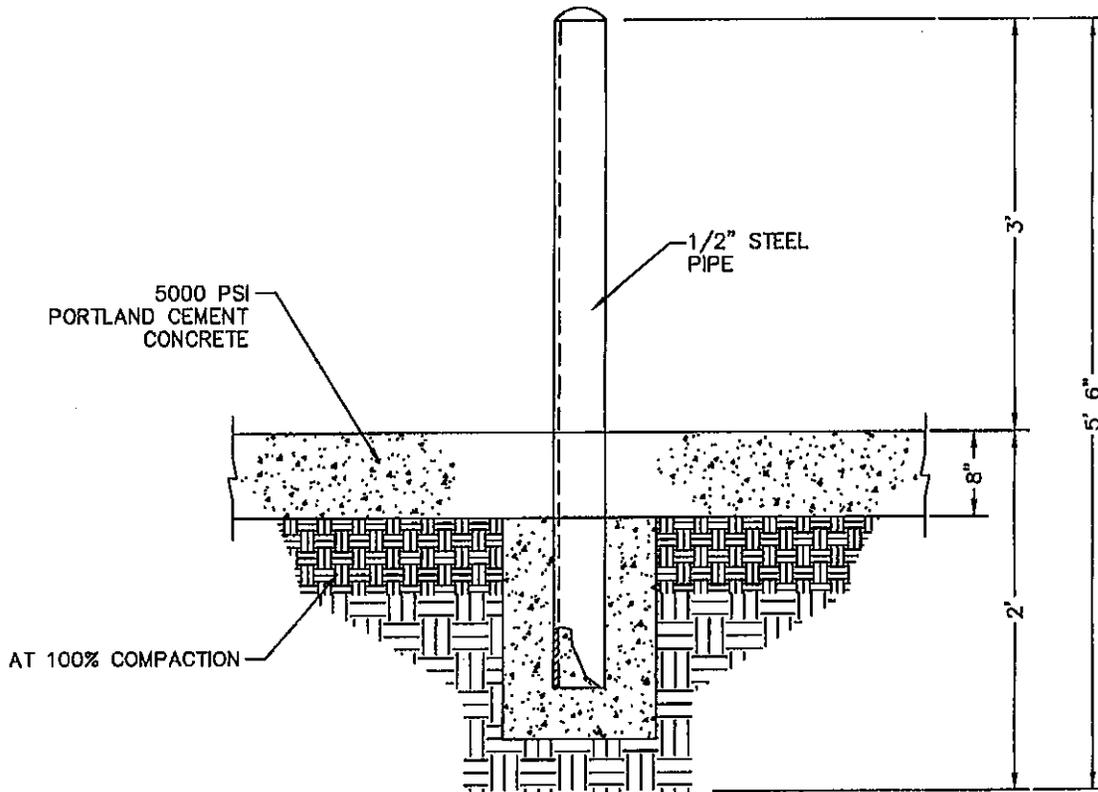
1. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE LOCATED A MINIMUM OF 50' FROM STORM DRAIN INLETS, OPEN DRAINAGE FACILITIES, AND WATER COURSES.
2. ACTUAL LAYOUT SHALL BE DETERMINED IN FIELD.
3. A SIGN SHOULD BE INSTALLED ADJACENT TO THE FACILITY TO INFORM CONCRETE EQUIPMENT OPERATORS TO USE THE PROPER FACILITIES.
4. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30' OF THE TEMPORARY WASHOUT FACILITY.
5. ONCE CONCRETE WASTES ARE WASHED INTO THE DESIGNATED AREA AND ALLOWED TO HARDEN, THE CONCRETE SHOULD BE BROKEN UP, REMOVED, AND DISPOSED OF.
6. WASHOUT FACILITIES MUST BE CLEANED, OR NEW FACILITIES CONSTRUCTED AND READY FOR USE ONCE THE WASHOUT IS 75% FULL.



MISCELLANEOUS DETAILS
TEMPORARY CONCRETE
WASHOUT FACILITY

NTS

M-2.0



NOTES:

1. DUMPSTER PADS SHOULD BE CONSTRUCTED OF CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI.
2. THE PAD APRON SHOULD BE A MINIMUM OF 8" THICK.
3. TWO CONCRETE FILLED 6" I.D. STEEL PIPE BOLLARDS SHOULD BE INSTALLED 4' APART AND 1' FROM THE REAR EDGE OF THE PAD BEHIND EACH DUMPSTER TO PROTECT THE ADJACENT SCREENING MATERIALS.
4. THESE BOLLARDS SHALL BE SET IN CONCRETE FOOTINGS A MINIMUM OF 2 FEET IN DEPTH.
5. BOLLARDS SHALL BE PAINTED YELLOW.



**MISCELLANEOUS DETAILS
DUMPSTER PAD
BOLLARD**

NTS

M-3.0

STANDARD ROADWAY DETAILS:

- R-1.0 LOCAL RESIDENTIAL STREET TYPICAL SECTION
- R-2.0 LOCAL COMMERCIAL STREET TYPICAL SECTION
- R-3.0 LOCAL INDUSTRIAL STREET TYPICAL SECTION
- R-4.0 MAJOR COLLECTOR STREET TYPICAL SECTION
- R-5.0 NEIGHBORHOOD COLLECTOR STREET TYPICAL SECTION
- R-6.0 TWO-LANE ARTERIAL STREET TYPICAL SECTION
- R-7.0 FOUR-LANE ARTERIAL STREET TYPICAL SECTION
- R-8.0 STANDARD 'T' TURN AROUND
- R-9.0 CUL-DE-SAC DETAIL
- R-10.0 CURB & GUTTER
- R-11.0 CURB TRANSITION 2'-6" CURB & GUTTER TO 2'-6" RESIDENTIAL CURB & GUTTER
- R-12.0 CURB & GUTTER EXPANSION JOINT
- R-13.0 CONCRETE SIDEWALKS
- R-14.0 MONOLITHIC CONCRETE CURB & SIDEWALK
- R-15.0 DRIVEWAY WITH SIDEWALK ABUTTING CURB (2'-6" CURB & GUTTER)
- R-16.0 DROP CURB DRIVEWAY MONOLITHIC CONCRETE CURB & SIDEWALK
- R-17.0 DROP CURB COMMERCIAL DRIVEWAY WITH PLANTING STRIP (2'-6" CURB & GUTTER)
- R-18.0 DROP CURB RESIDENTIAL DRIVEWAY WITH PLANTING STRIP (2'-6" CURB & GUTTER)
- R-19.0A ACCESSIBLE RAMP STANDARD WITH PLANTING STRIP (2'-6" CURB & GUTTER)
- R-19.0B ACCESSIBLE RAMP SECTIONS WITH PLANTING STRIP (2'-6" CURB & GUTTER)
- R-20.0A ACCESSIBLE RAMP WITHOUT PLANTING STRIP (2'-6" CURB & GUTTER)
- R-20.0B ACCESSIBLE RAMP SECTIONS WITHOUT PLANTING STRIP (2'-6" CURB & GUTTER)
- R-21.0 PAVEMENT REPAIR DETAIL
- R-22.0 RIGHT IN/RIGHT OUT ISLAND
- R-23.0 SLOTTED ASPHALT SPEED HUMP MARKING & SIGNAGE
- R-24.0 INDUSTRIAL DRIVEWAY ENTRANCE
- R-25.0 TYPICAL ALLEY SECTION

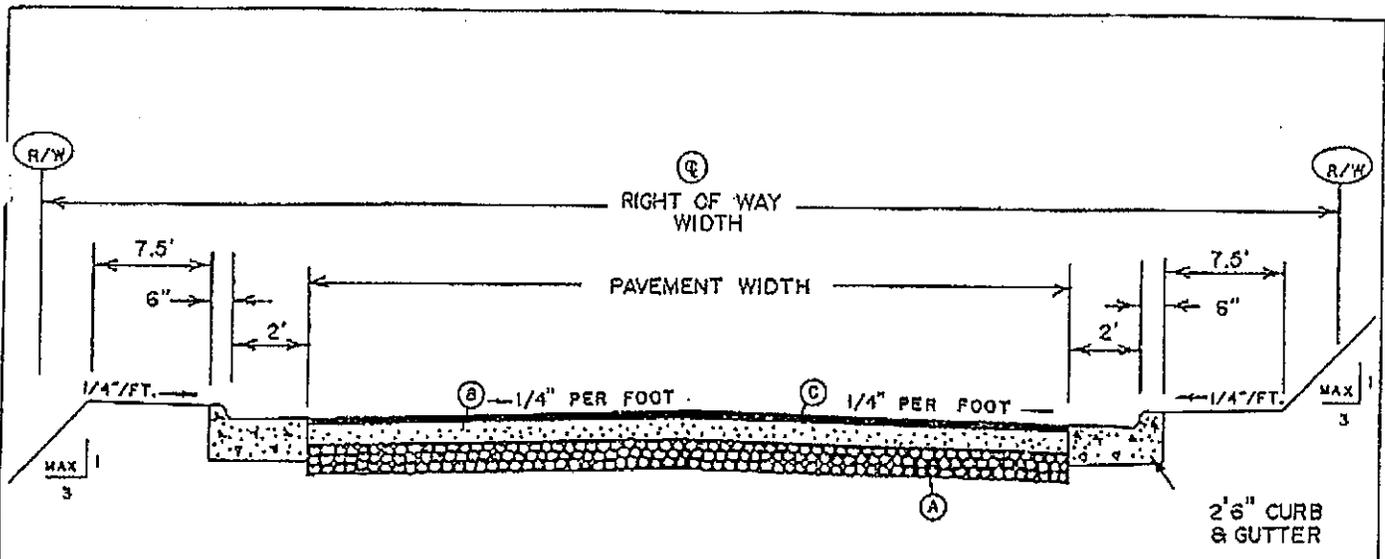


ROAD SYSTEMS
INDEX

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TYPICAL CROSS SECTION
ARTERIAL STREETS OR MAJOR THOROUGHFARES, COLLECTOR,
STREETS OR MINOR THOROUGHFARES, LIMITED ACCESS STREETS,
COMMERCIAL AND INDUSTRIAL STREETS

PAVEMENT SCHEDULE

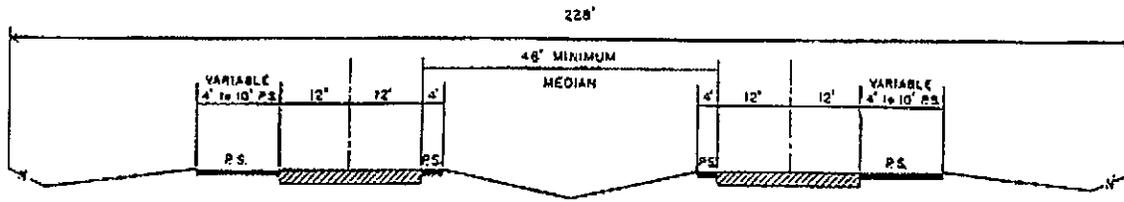
- (A) 10" COMPACTED AGGREGATE BASE COURSE OR 5" BITUMINOUS CONCRETE BASE COURSE HB.
- (B) 2" BITUMINOUS CONCRETE H-BINDER, PLACED IMMEDIATELY UPON FINAL PREPARATION OF ABC STONE BASE.
- (C) 2" BITUMINOUS CONCRETE SURFACE COURSE, TYPE I-2, PLACED IN ONE LIFT WITH TACK COAT BETWEEN BINDER AND SURFACE COURSE. TYPE I-1 REQUIRED FOR COMMERCIAL AND INDUSTRIAL STREETS.

THE TYPE OF STREET IS TO BE DETERMINED BY THE CITY. SEE SUBDIVISION REGULATIONS FOR ADDITIONAL INFORMATION.

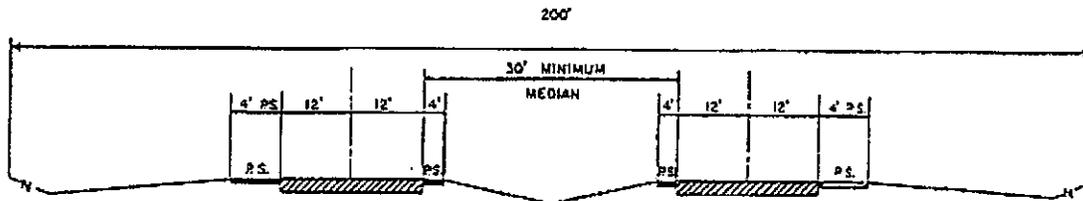
STREET TYPE	MINIMUM RIGHT OF WAY WIDTH (FEET)	MINIMUM PAVEMENT WIDTH* (FEET)
ARTERIAL STREET OR MAJOR THOROUGHFARE	80	44
COLLECTOR STREET	60	32
MARGINAL ACCESS	50	24
COMMERCIAL AND INDUSTRIAL	PAVEMENT & MEDIAN WIDTH PLUS 24'	12' PER LANE

*PAVEMENT WIDTHS DO NOT INCLUDE CURB & GUTTER

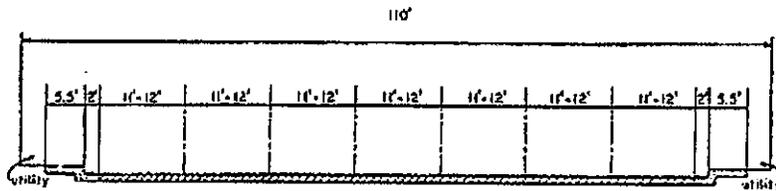
CITY OF NEWTON, N.C. STANDARD DETAIL	DATE: MARCH, 1988
ROADS	NOT TO SCALE
DESIGN STANDARDS	STANDARD S- 1



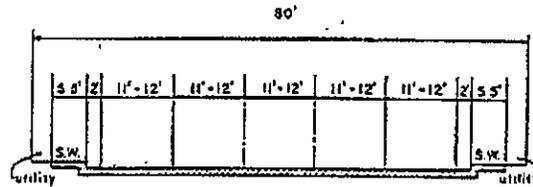
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY



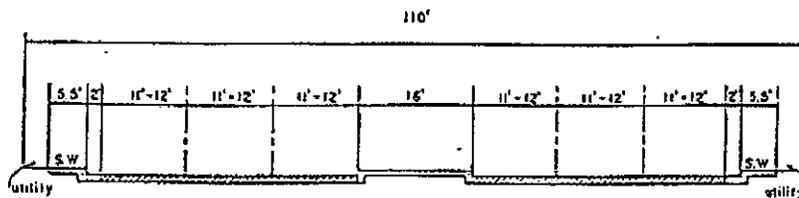
FOUR LANES DIVIDED WITH MEDIAN - RURAL



SEVEN LANES - URBAN



FIVE LANES - URBAN



SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

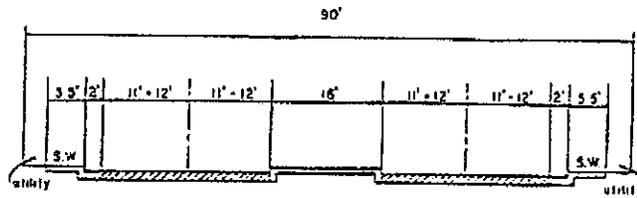
CITY OF NEWTON, N.C. STANDARD DETAIL

DATE: MARCH, 1988

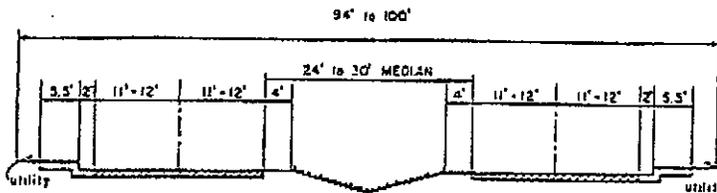
THOROUGHFARE CROSS SECTIONS
DESIGN STANDARDS

NOT TO SCALE

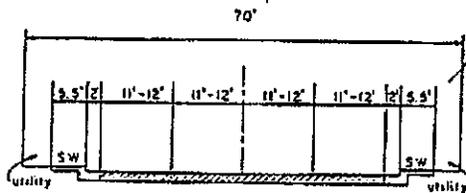
STANDARD S- 1A



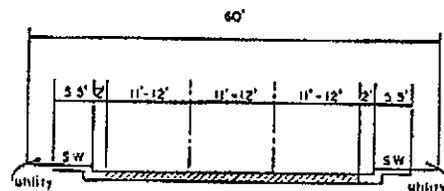
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN



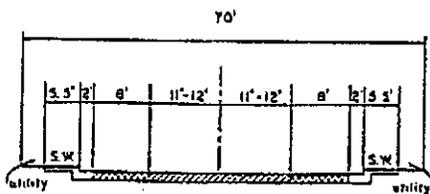
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN



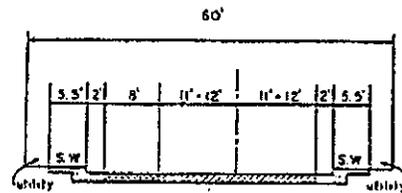
FOUR LANES - MEDIAN



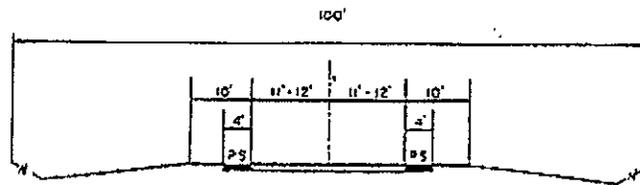
THREE LANES - URBAN



TWO LANES - URBAN
PARKING ON EACH SIDE

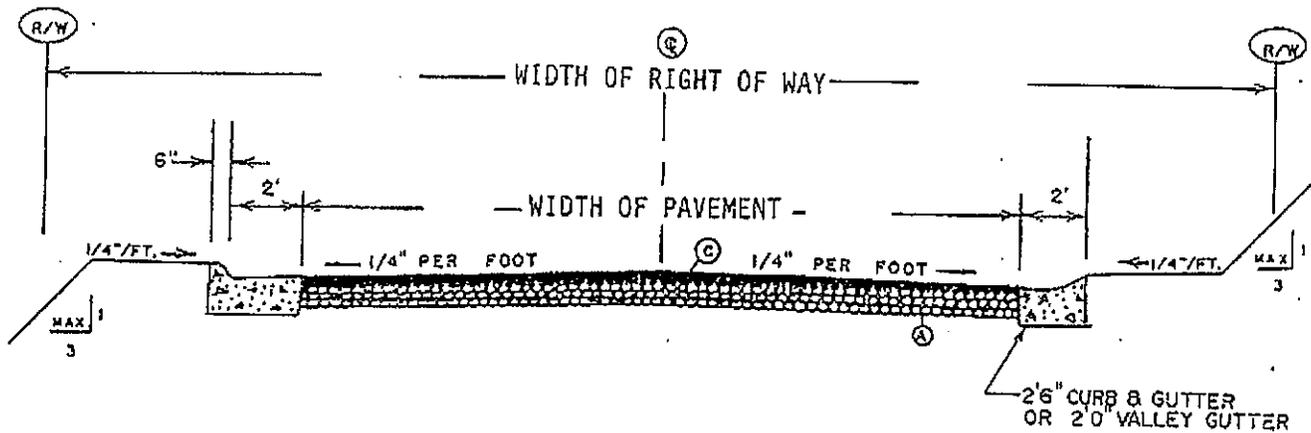


TWO LANES - URBAN
PARKING ON EACH SIDE



TWO LANES - RURAL

CITY OF NEWTON, N.C. STANDARD DETAIL	DATE: MARCH, 1988
THOROUGHFARE CROSS SECTIONS DESIGN STANDARDS	NOT TO SCALE
	STANDARD S- 1B



TYPICAL CROSS SECTION
MINOR, OR LOCAL STREETS, AND CUL DE SACS

PAVEMENT SCHEDULE

- (A) 6" COMPACTED AGGREGATE BASE COURSE OR
4" BITUMINOUS CONCRETE BASE COURSE, TYPE HB
- (B) 1 1/2" BITUMINOUS CONCRETE SURFACE COURSE,
TYPE I-2 TO BE PLACED IMMEDIATELY UPON
FINAL PREPARATION OF ABC STONE BASE.
STONE TO BE PRIMED

NOTES

1. USE 2'6" STANDARD CURB AND GUTTER, OR USE 2'0" VALLEY GUTTER.
2. TYPE OF STREET IS DETERMINED BY THE CITY.

STREET TYPE	MINIMUM RIGHT OF WAY WIDTH (FEET)		MINIMUM PAVEMENT WIDTH (FEET)	
	CURB CROSS SECTION	SHOULDER CROSS SECTION	CURB CROSS SECTION	SHOULDER CROSS SECTION
LOCAL				
SERVING 1-10 DWELLING UNITS	40	45	20	20
SERVING 11-125 DWELLING UNITS	45	50	22	22
ALLEY	20	20	15	15

CITY OF NEWTON, N.C. STANDARD DETAIL

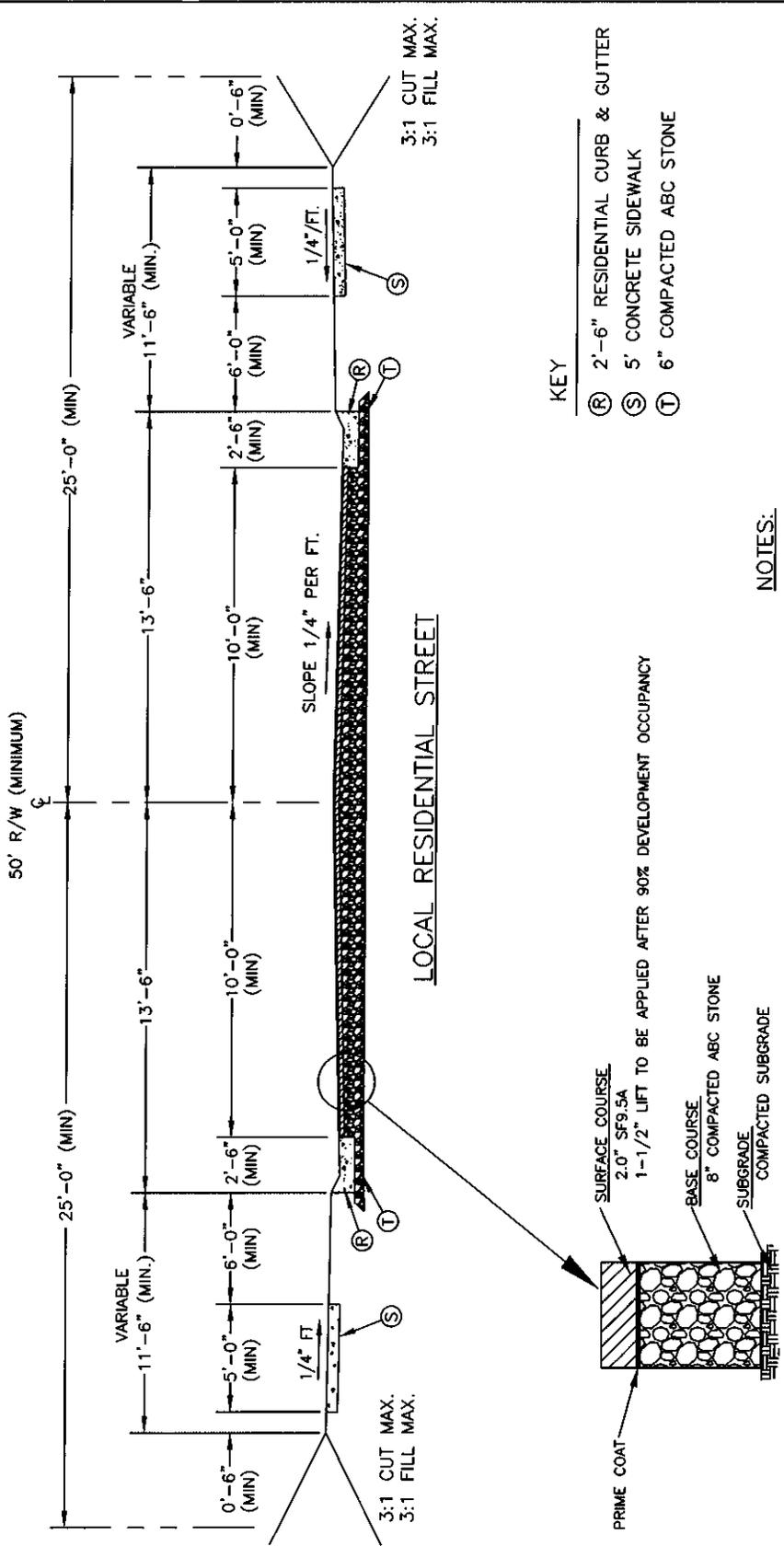
DATE: MARCH, 1988

ROADS

NOT TO SCALE

DESIGN STANDARDS

STANDARD S- 2



- KEY
- (R) 2'-6" RESIDENTIAL CURB & GUTTER
 - (S) 5' CONCRETE SIDEWALK
 - (T) 6" COMPACTED ABC STONE

NOTES:

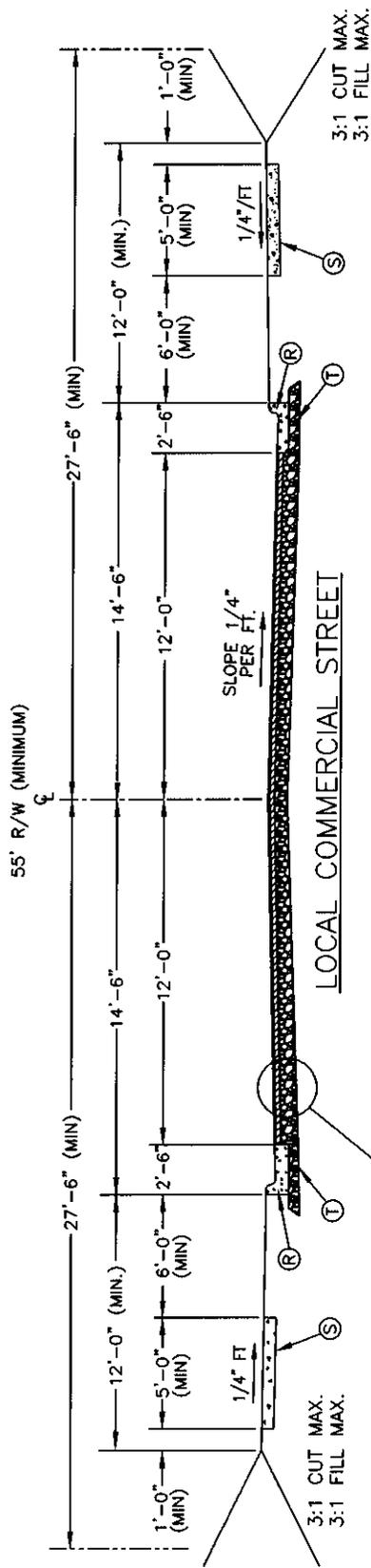
1. SIDEWALK SHALL BE PROVIDED ON ONE SIDE OF STREET A MINIMUM OF 6' FROM BACK OF CURB.
2. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BY THE CITY OF NEWTON BASED ON SPECIFIC TRAFFIC PARAMETERS.
3. DEVELOPER MAY SUBMIT AN ALTERNATIVE PAVEMENT DESIGN OF EQUAL OR GREATER STRENGTH TO THE DIRECTOR OF UTILITIES FOR APPROVAL.

TYPICAL PAVEMENT SECTION



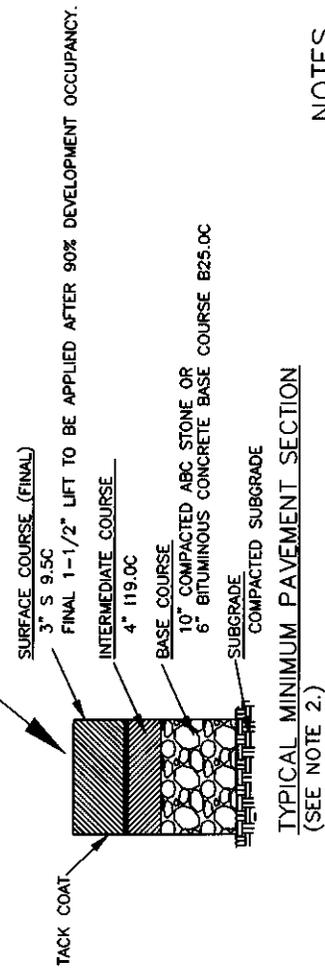
ROAD SYSTEMS
LOCAL RESIDENTIAL STREET
TYPICAL SECTION

SEPTEMBER 2011	
NTS	R - 1.0



KEY

- (R) 2'-6" CURB AND GUTTER
- (S) 5' CONCRETE SIDEWALK
- (T) 10" COMPACTED ABC STONE OR 6" BITUMINOUS CONCRETE BASE COURSE B25.0C



TYPICAL MINIMUM PAVEMENT SECTION
(SEE NOTE 2.)

NOTES

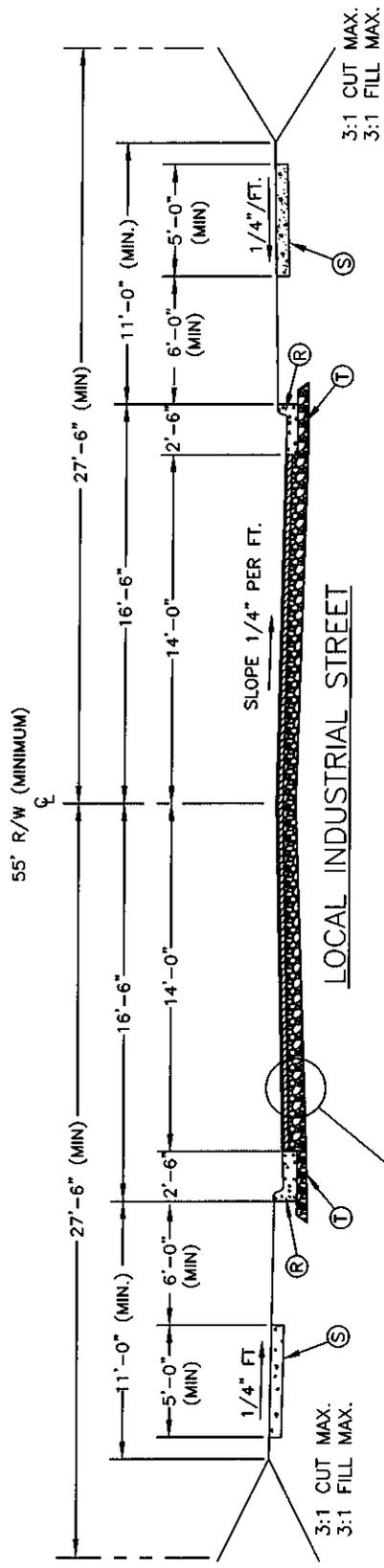
1. SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF STREET A MINIMUM OF 6' FROM BACK OF CURB.
2. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BY THE CITY OF NEWTON BASED ON SPECIFIC TRAFFIC PARAMETERS.
3. DEVELOPER MAY SUBMIT AN ALTERNATIVE PAVEMENT DESIGN OF EQUAL OR GREATER STRENGTH TO THE DIRECTOR OF UTILITIES FOR APPROVAL.



ROAD SYSTEMS
LOCAL
COMMERCIAL STREET
TYPICAL SECTION

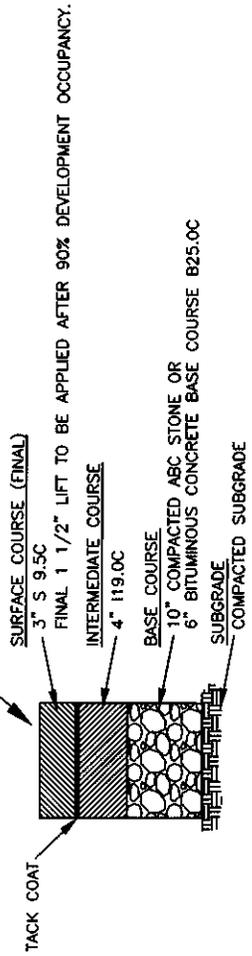
SEPTEMBER 2011

NTS R - 2.0



KEY

- (R) 2'-6" CURB AND GUTTER
- (S) 5' CONCRETE SIDEWALK
- (T) SEE NOTE 2.



TYPICAL MINIMUM PAVEMENT SECTION
(SEE NOTE 2.)

NOTES:

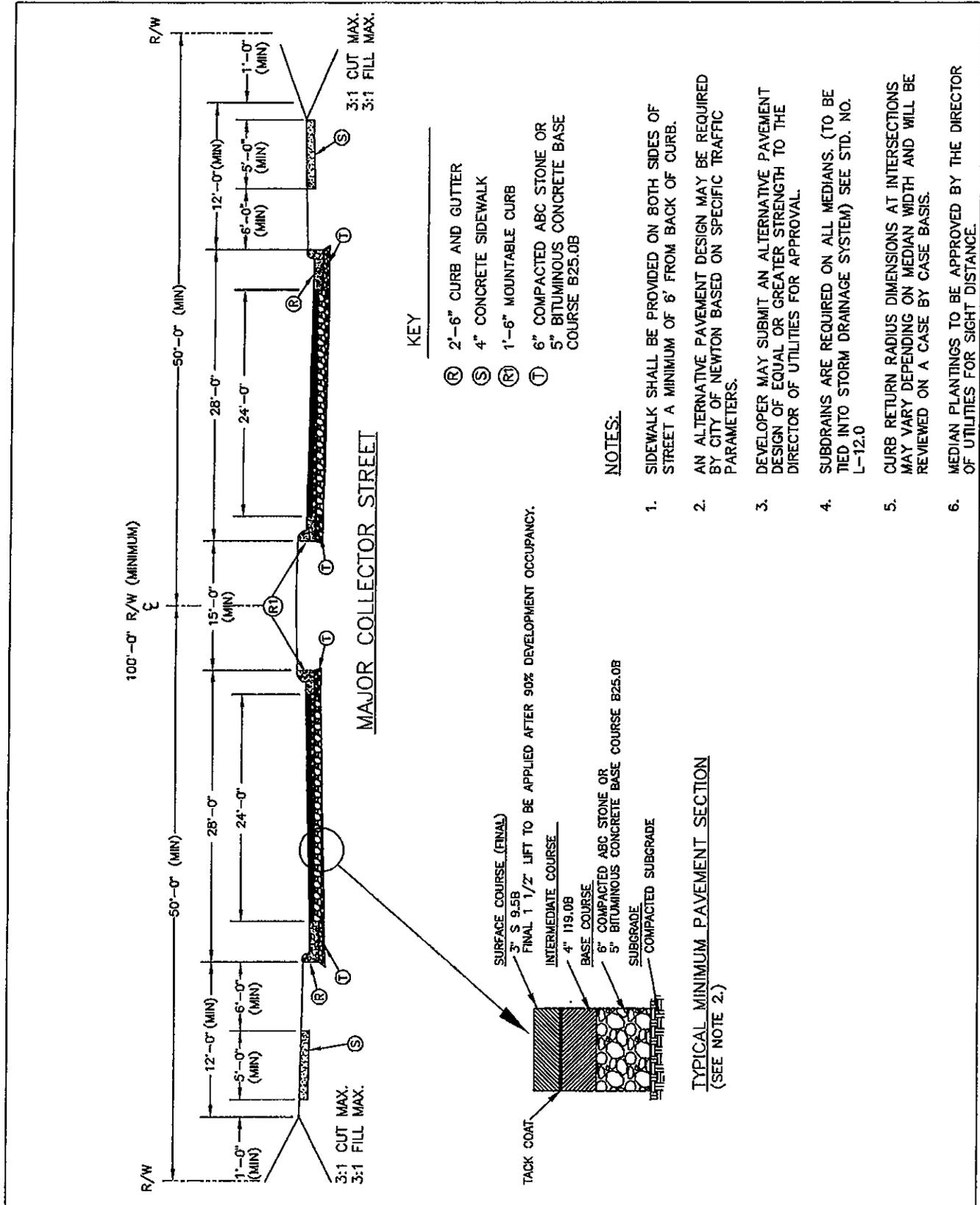
1. SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF STREET A MINIMUM OF 6' FROM BACK OF CURB.
2. PAVEMENT DESIGN SHALL BE SUBMITTED TO THE DIRECTOR OF UTILITIES FOR REVIEW AND APPROVAL.



ROAD SYSTEMS
LOCAL INDUSTRIAL STREET
TYPICAL SECTION

SEPTEMBER 2011

NTS R - 3.0



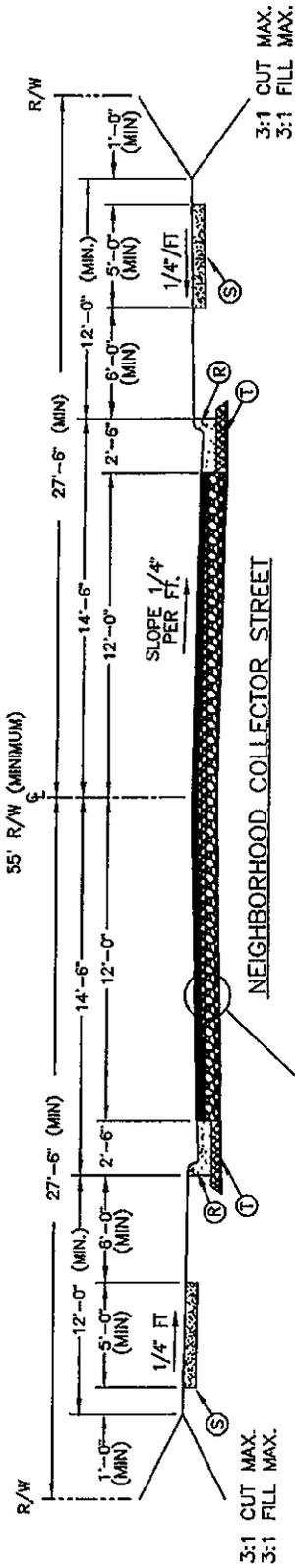
KEY

- (R) 2'-6" CURB AND GUTTER
- (S) 4" CONCRETE SIDEWALK
- (RT) 1'-6" MOUNTABLE CURB
- (T) 6" COMPACTED ABC STONE OR 5" BITUMINOUS CONCRETE BASE COURSE B25.0B

NOTES:

1. SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF STREET A MINIMUM OF 6' FROM BACK OF CURB.
2. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BY CITY OF NEWTON BASED ON SPECIFIC TRAFFIC PARAMETERS.
3. DEVELOPER MAY SUBMIT AN ALTERNATIVE PAVEMENT DESIGN OF EQUAL OR GREATER STRENGTH TO THE DIRECTOR OF UTILITIES FOR APPROVAL.
4. SUBDRAINS ARE REQUIRED ON ALL MEDIANS. (TO BE TIED INTO STORM DRAINAGE SYSTEM) SEE STD. NO. L-12.0
5. CURB RETURN RADIUS DIMENSIONS AT INTERSECTIONS MAY VARY DEPENDING ON MEDIAN WIDTH AND WILL BE REVIEWED ON A CASE BY CASE BASIS.
6. MEDIAN PLANTINGS TO BE APPROVED BY THE DIRECTOR OF UTILITIES FOR SIGHT DISTANCE.

TYPICAL MINIMUM PAVEMENT SECTION
(SEE NOTE 2.)



KEY

- (R) 2'-6" CURB AND GUTTER
- (S) 4" CONCRETE SIDEWALK
- (T) 6" COMPACTED ABC STONE OR 5" BITUMINOUS CONCRETE BASE COURSE 825.08

NOTES:

1. SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF STREET A MINIMUM OF 6' FROM BACK OF CURB.
2. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BY THE CITY OF NEWTON BASED ON SPECIFIC TRAFFIC PARAMETERS.
3. DEVELOPER MAY SUBMIT AN ALTERNATIVE PAVEMENT DESIGN OF EQUAL OR GREATER STRENGTH TO THE DIRECTOR OF UTILITIES FOR APPROVAL.

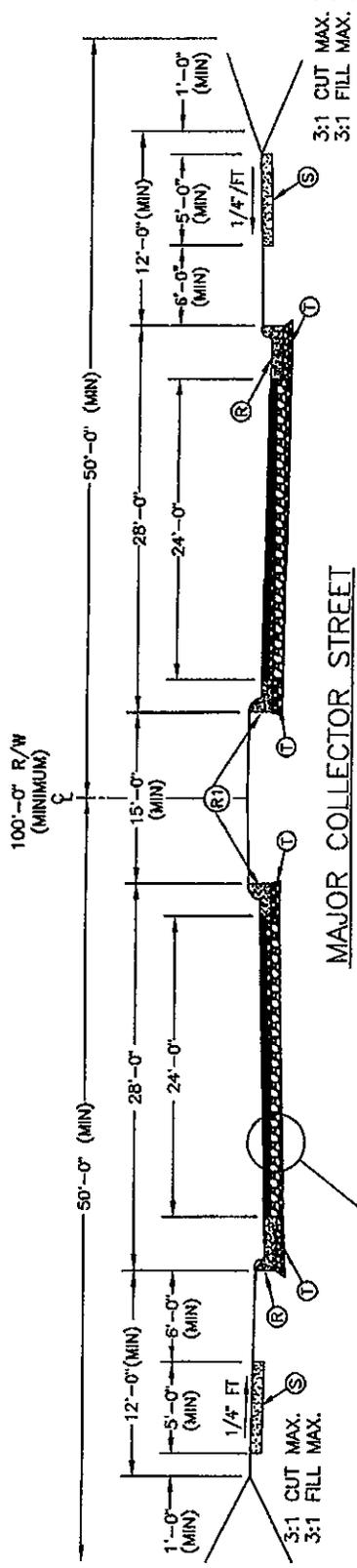
TYPICAL MINIMUM PAVEMENT SECTION
(SEE NOTE 2.)



**ROAD SYSTEMS
NEIGHBORHOOD
COLLECTOR STREET
TYPICAL SECTION**

APRIL 2008

NTS R - 5.0

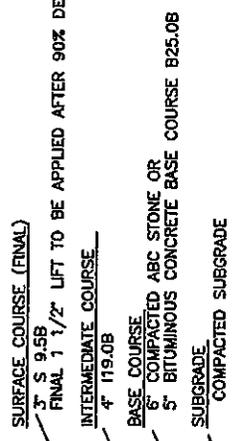


KEY

- (R) 2'-6" CURB AND GUTTER
- (S) 4" CONCRETE SIDEWALK
- (RT) 1'-6" MOUNTABLE CURB
- (T) 6" COMPACTED ABC STONE OR 5" BITUMINOUS CONCRETE BASE COURSE B25.0B

NOTES:

1. SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF STREET A MINIMUM OF 6' FROM BACK OF CURB.
2. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BY THE CITY OF NEWTON BASED ON SPECIFIC TRAFFIC PARAMETERS.
3. DEVELOPER MAY SUBMIT AN ALTERNATIVE PAVEMENT DESIGN OF EQUAL OR GREATER STRENGTH TO DIRECTOR OF UTILITIES FOR APPROVAL.
4. SUBDRAINS ARE REQUIRED ON ALL MEDIANS. (TO BE TIED INTO STORM DRAINAGE SYSTEM) SEE STD. NO. L-12.0
5. CURB RETURN RADIUS DIMENSIONS AT INTERSECTIONS MAY VARY DEPENDING ON MEDIAN WIDTH AND WILL BE REVIEWED ON A CASE BY CASE BASIS.
6. MEDIAN PLANTINGS TO BE APPROVED BY DIRECTOR OF UTILITIES FOR SIGHT DISTANCE.



TYPICAL MINIMUM PAVEMENT SECTION
(SEE NOTE 2.)

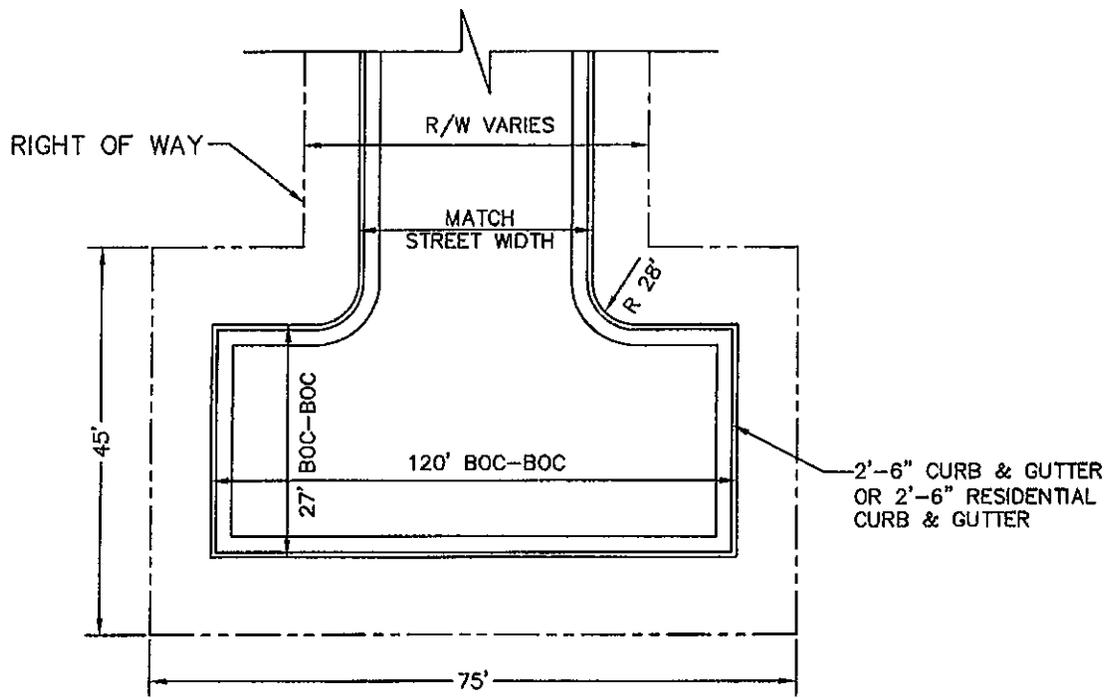


ROAD SYSTEMS
FOUR-LANE
ARTERIAL STREET
TYPICAL SECTION

APRIL 2008

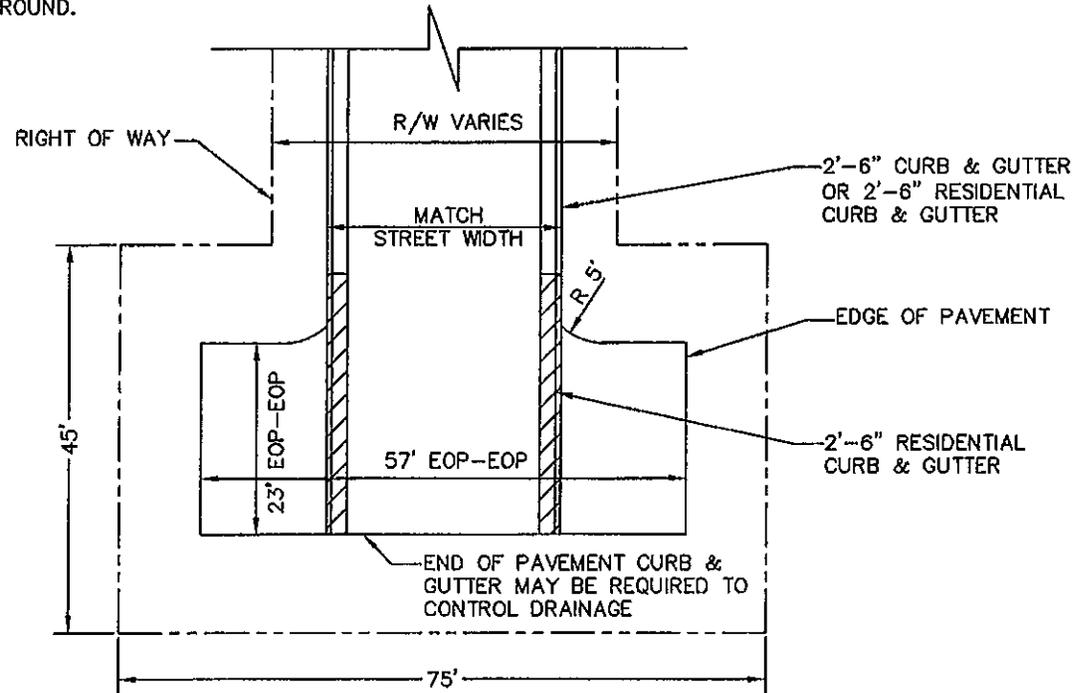
NTS

R - 7.0



PERMANENT

NOTE:
DESIGNER MUST CONSIDER
AND ALLOW FOR DRAINAGE
OF THE TURN AROUND.



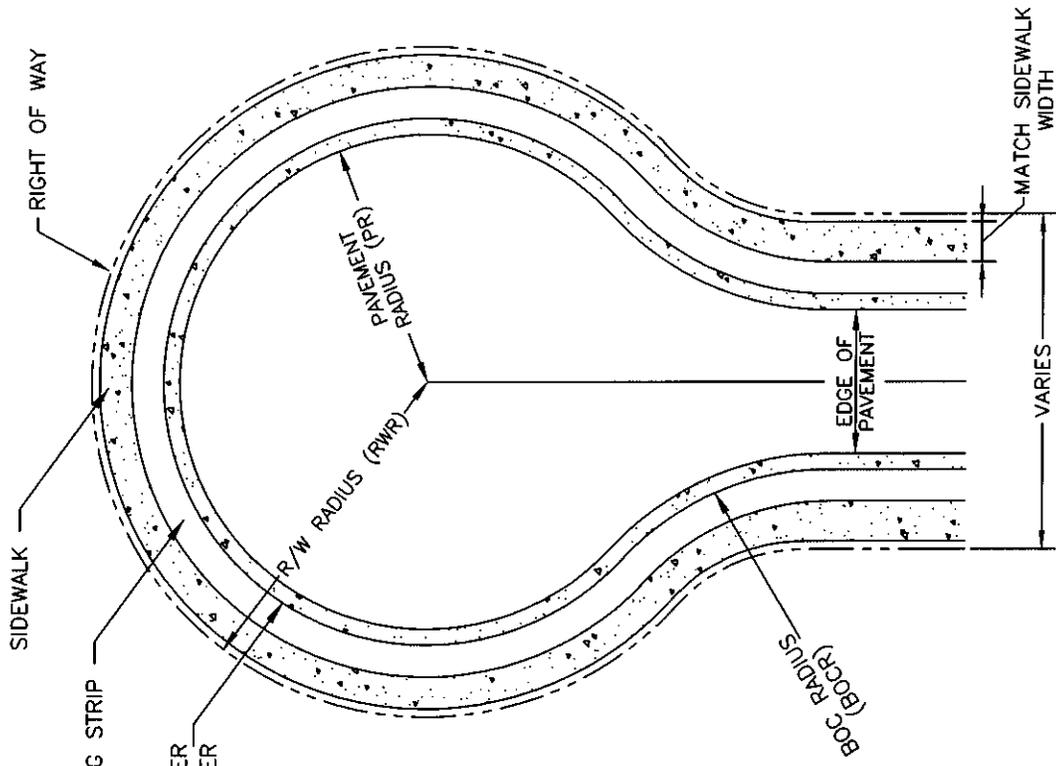
TEMPORARY



ROAD SYSTEMS
STANDARD
'T' TURN AROUND

APRIL 2008

NTS R - 8.0



2'-6" CURB AND GUTTER
OR 2'-6" RESIDENTIAL CURB & GUTTER

NOTES:

1. ALTERNATIVE CUL-DE-SAC DESIGNS, INCLUDING ISLANDS SHALL BE SUBMITTED TO THE DIRECTOR OF UTILITIES FOR REVIEW AND APPROVAL. ANY ALTERNATIVE MUST MEET THE TURNING REQUIREMENTS OF SERVICE VEHICLES.
2. PAVEMENT SECTION SHALL CONFORM WITH THE DESIGN REQUIREMENTS FOR COMMERCIAL OR RESIDENTIAL STREETS.
3. THE CROWN FOR PAVEMENT SHALL BE 1/4" PER FT. FROM THE CENTER OF THE CUL-DE-SAC.

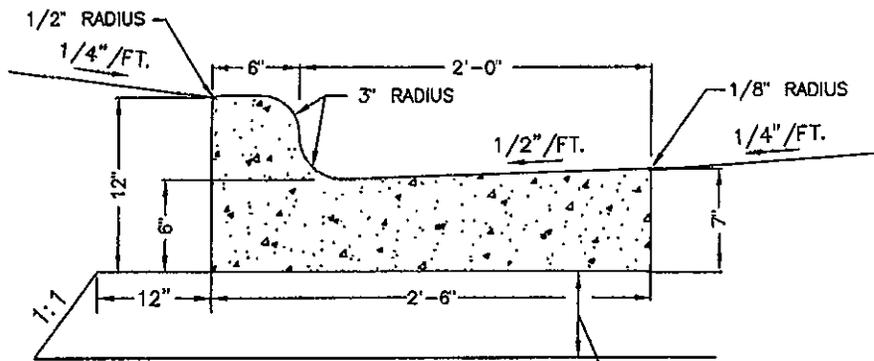
STREET CLASSIFICATION	PR	RWR	BOCR
COMMERCIAL	48'	55'	35'
RESIDENTIAL	48'	55'	28'



ROAD SYSTEMS
CUL-DE-SAC DETAIL

SEPTEMBER 2011

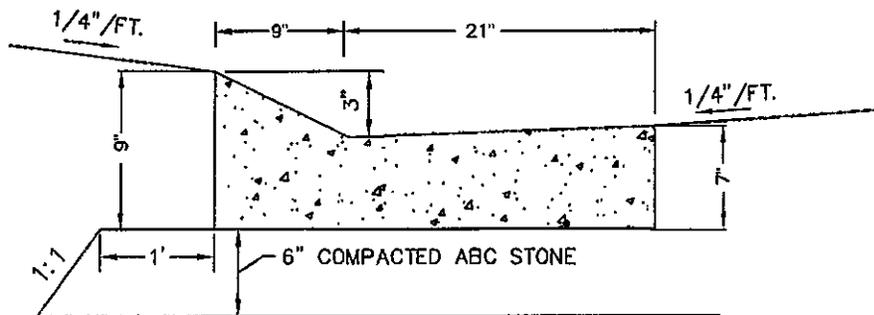
NTS R - 9.0



2'-6" CURB AND GUTTER

COLLECTOR STREET
 6" COMPACTED ABC STONE
 OR 5" BITUMINOUS CONCRETE
 BASE COURSE B25.0B

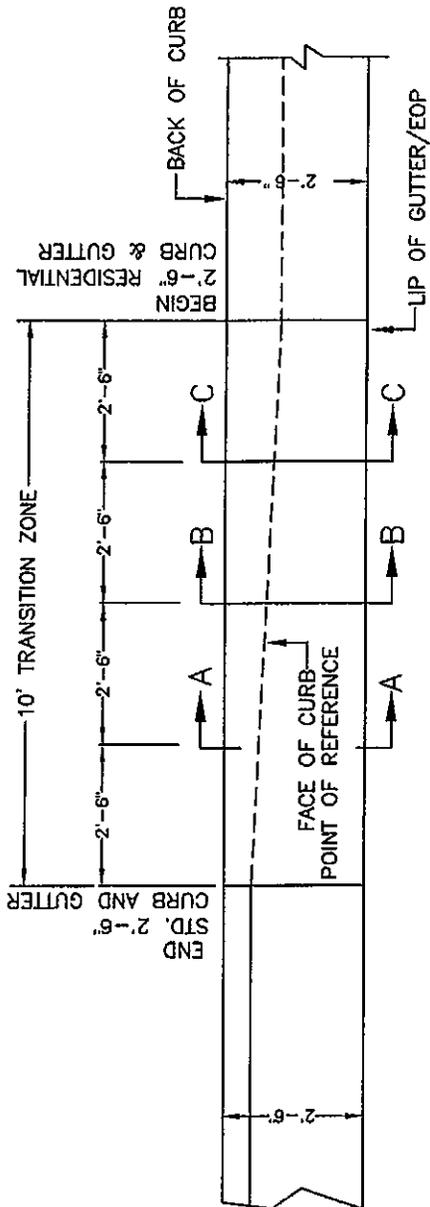
COMMERCIAL STREET/THOROUGHFARE
 10" COMPACTED ABC STONE
 OR 6" MIN. BITUMINOUS CONCRETE
 BASE COURSE B25.0C



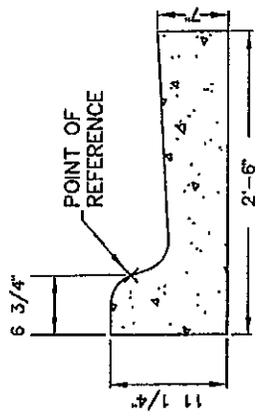
2'-6" RESIDENTIAL CURB & GUTTER

NOTES:

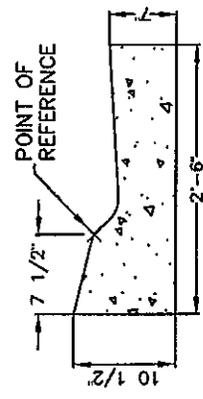
1. CONTRACTION JOINTS SHALL BE PROVIDED AT 10' INTERVALS FOR ALL CURB AND GUTTER TYPES AND METHODS OF PLACEMENT. ON REPAIR SECTIONS 5' MIN. INTERVALS ARE REQUIRED.
2. PROVIDE 1/2" EXPANSION JOINTS AT 90' INTERVALS AND AT ALL STRUCTURES.



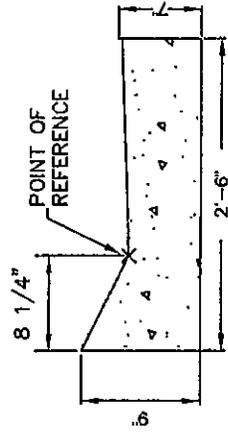
PLAN VIEW



SECTION A-A



SECTION B-B



SECTION C-C

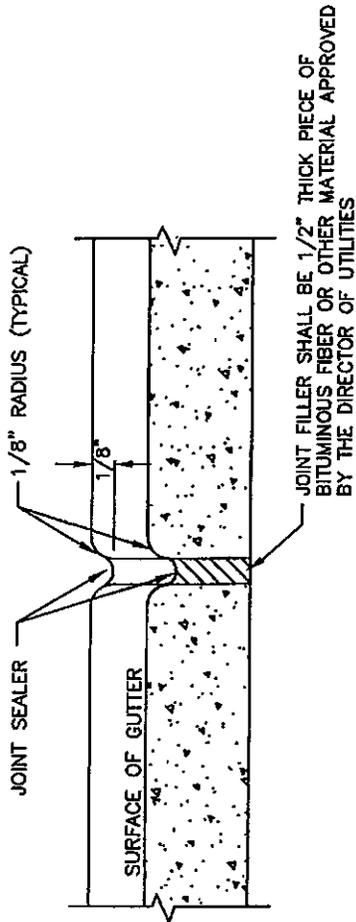
NOTES:

1. TRANSITION IS NOT TO BE LOCATED WITHIN THE CURB RADIUS.
2. NO CATCH BASINS ARE ALLOWED INSIDE THE TRANSITION ZONE.



ROAD SYSTEMS
CURB TRANSITION
2'-6" CURB AND GUTTER TO
2'-6" RESIDENTIAL C & G

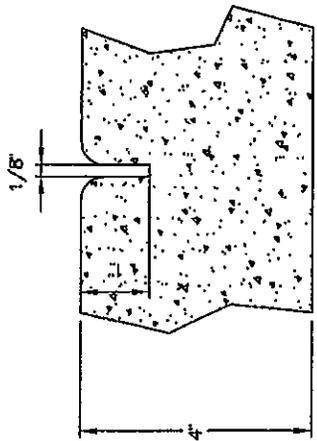
NTS	R - 11.0
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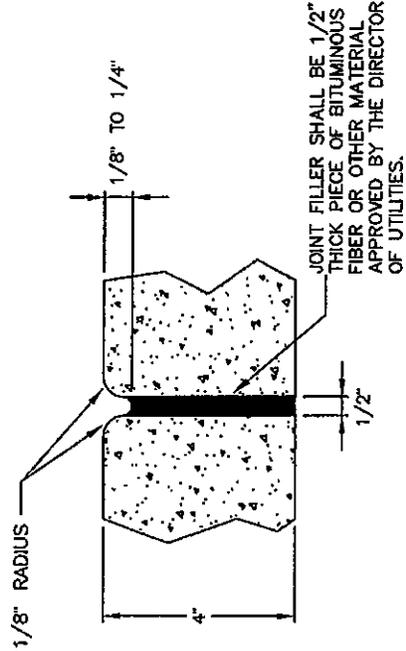
TRANSVERSE EXPANSION JOINT

NOTES:

1. CONTRACTION JOINTS SHALL BE SPACED AT 10-FOOT INTERVALS. JOINT SPACING MAY BE ALTERED BY THE ENGINEER TO PREVENT UNCONTROLLED CRACKING.
2. CONTRACTION JOINTS MAY BE INSTALLED BY THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS. WHERE SUCH JOINTS ARE NOT FORMED BY TEMPLATES, A MINIMUM DEPTH OF 1 1/2" SHALL BE OBTAINED.
3. ALL EXPANSION JOINTS SHALL BE SPACED AT 90-FOOT INTERVALS, AND ADJACENT TO ALL RIGID OBJECTS. JOINTS IN SIDEWALK SHALL MATCH JOINTS IN CURB. (WITH OR WITHOUT PLANTING STRIP)
4. CONCRETE COMPRESSIVE STRENGTH SHALL BE 3600 P.S.I. IN 28 DAYS.
5. CURB SHALL BE DEPRESSED AT INTERSECTIONS TO PROVIDE FOR FUTURE ACCESSIBLE RAMPS.
6. TOP 6" OF SUBGRADE BENEATH THE CURB AND GUTTER SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.



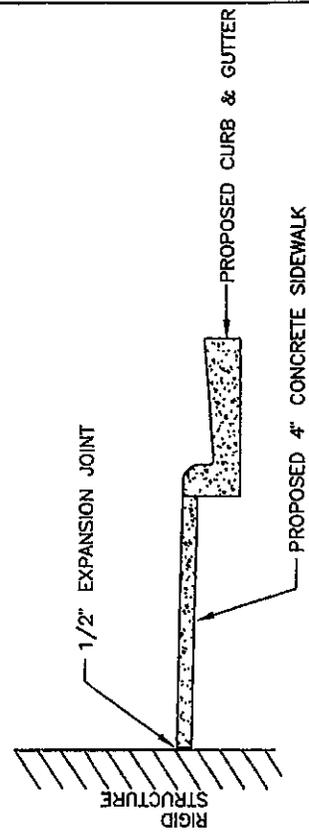
CONTRACTION JOINT IN SIDEWALK



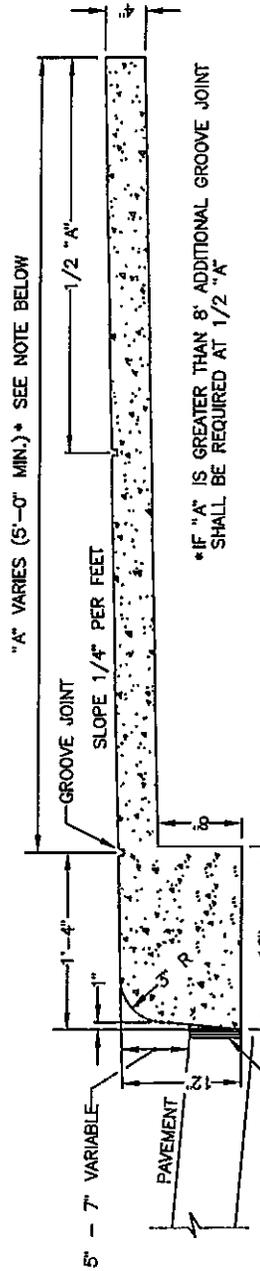
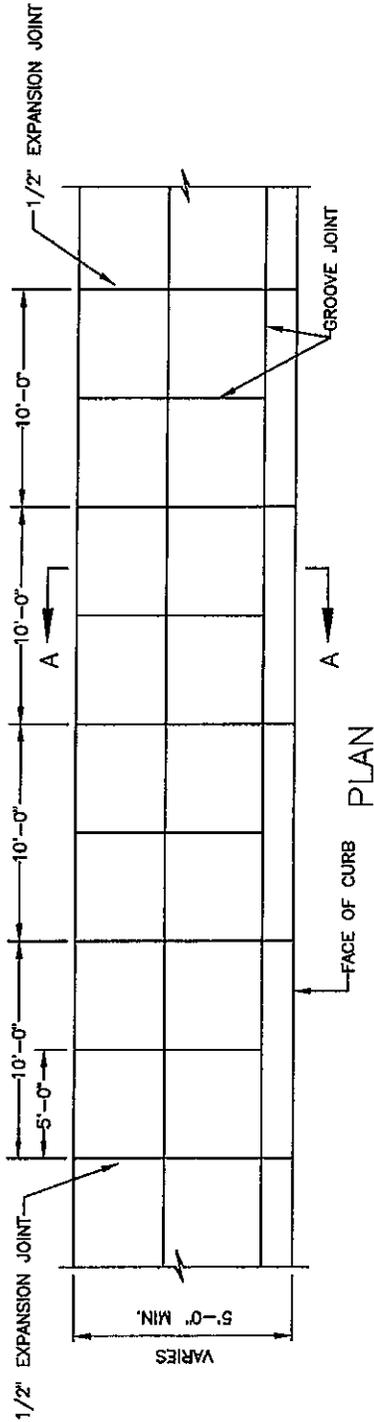
TRANSVERSE EXPANSION JOINT IN SIDEWALK

GENERAL NOTES:

1. A CONTRACTION JOINT 1" DEEP WITH 1/8" RADII SHALL BE REQUIRED IN THE CONCRETE SIDEWALK AT 5' INTERVALS. ONE 1/2" EXPANSION JOINT WILL BE REQUIRED AT 45' INTERVALS NOT TO EXCEED 50' AND MATCHING EXPANSION/CONSTRUCTION JOINT IN ADJACENT CURB AND GUTTER. A SEALED 1/2" EXPANSION JOINT WILL BE REQUIRED WHERE THE SIDEWALK JOINS ANY RIGID STRUCTURE.
2. SIDEWALK AT DRIVEWAY ENTRANCES SHALL BE 6" THICK.
3. WIDTH OF SIDEWALKS SHALL BE A MINIMUM OF 4'.
4. SIDEWALK TO BE POURED TO END OF RADIUS AT INTERSECTING STREETS.
5. CONCRETE COMPRESSIVE STRENGTH SHALL BE 3600 PSI. IN 28 DAYS.



DETAILS SHOWING EXPANSION JOINTS IN CONCRETE SIDEWALK



SECTION A-A

TWO 1/2" THICK PIECES BITUMINOUS FIBER REQUIRED IF SUBBASE IS CONCRETE. MUST BE SEALED WITH APPROVED JOINT SEALER.

GENERAL NOTES:

1. A GROOVE JOINT 1" DEEP WITH 1/3" RADII SHALL BE REQUIRED IN THE CONCRETE SIDEWALK AT 5' INTERVALS. ONE 1/2" EXPANSION JOINT WILL BE REQUIRED AT 45' INTERVALS. A 1/2" EXPANSION JOINT WILL BE REQUIRED WHERE THE SIDEWALK JOINS ANY RIGID STRUCTURE.
2. ALL CONCRETE TO BE 3600 P.S.I. COMPRESSIVE STRENGTH.
3. SEE STANDARD R-12.0 FOR DETAIL OF EXPANSION JOINT AND GROOVE JOINT.
4. SEE STANDARD R-15.0 FOR DETAIL OF DRIVEWAY.
5. MONOLITHIC CURB AND SIDEWALK TO BE CONSTRUCTED ONLY WHEN REPLACING GRANITE CURB OR AT LOCATIONS APPROVED BY THE DIRECTOR OF UTILITIES.



ROAD SYSTEMS
MONOLITHIC CONCRETE
CURB AND SIDEWALK

APRIL 2008

NTS

R - 14.0



ROAD SYSTEMS
 DRIVEWAY WITH SIDEWALK
 ABUTTING CURB
 (2'-6" CURB AND GUTTER)

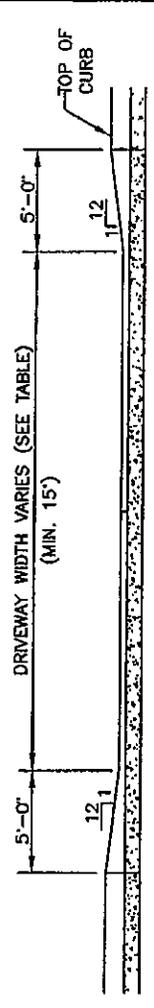
NTS R - 15.0

- NOTE:**
- 1/2" EXPANSION JOINTS REQUIRE INSTALLATION OF ONE 1/2" THICK PIECE OF BITUMINOUS FIBER OR OTHER APPROVED MATERIAL THROUGH THE ENTIRE SLAB.
 - ALL DRIVEWAYS MUST MEET THE CURRENT TOWN DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.

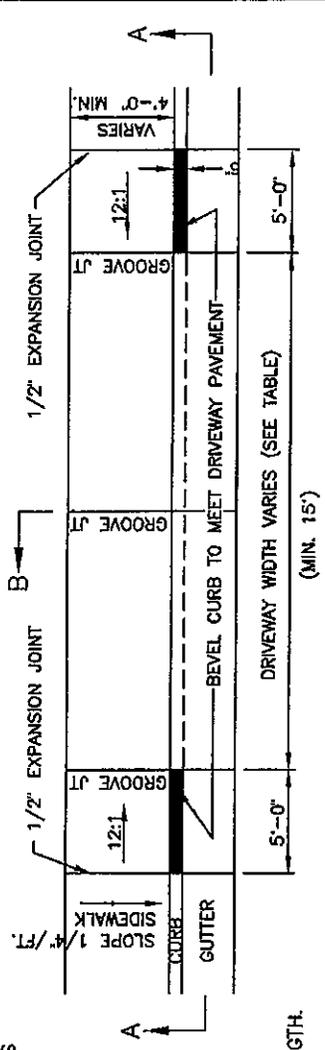
GENERAL NOTES:
 ALL CONCRETE TO BE 3600 P.S.I. COMPRESSIVE STRENGTH.
 ALL CURB OR CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO THE NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT.
 SEE STD. R-12.0 FOR DETAIL OF EXPANSION JOINT AND CONTRACTION JOINT.

DRIVEWAY WIDTHS		
TYPE	MIN.	MAX.
RESIDENTIAL	15'	30'
COMMERCIAL	20'*	50'

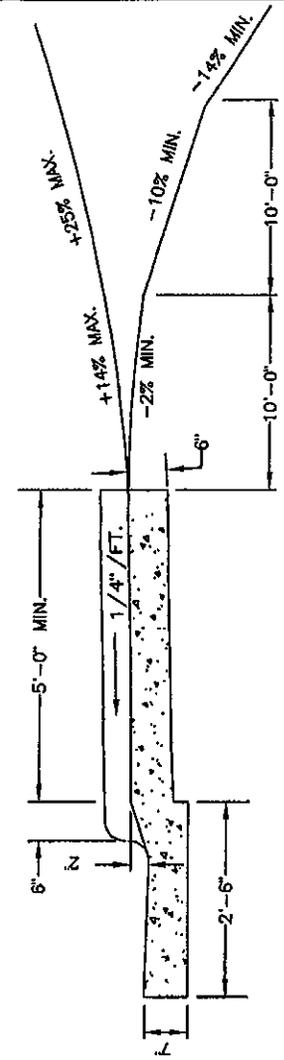
*24' MIN. WIDTH REQUIRED FOR TWO-WAY TRAFFIC



SECTION A - A



PLAN



SECTION B - B

GENERAL NOTES:

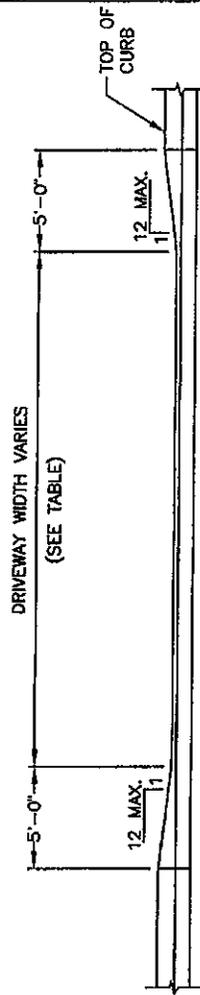
ALL CONCRETE TO BE 3600 P.S.I. COMPRESSIVE STRENGTH.

A 1/2" EXPANSION JOINT WILL BE REQUIRED WHERE THE SIDEWALK JOINS ANY RIGID STRUCTURE. SEE STANDARD R-12.0.

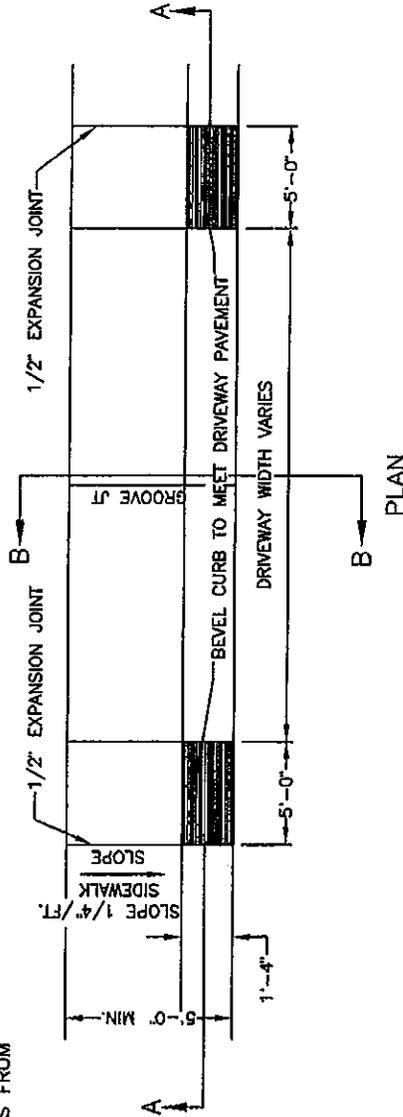
THIS DETAIL TO BE USED ONLY IN CONJUNCTION WITH MONOLITHIC SIDEWALK AS ON STANDARD NO. R-14.0.

NOTES:

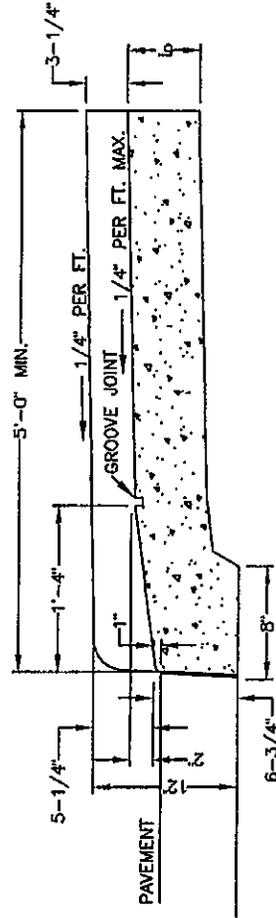
1. ALL DRIVEWAYS MUST MEET THE CURRENT TOWN DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCES AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.



SECTION A-A



PLAN



SECTION B-B

DRIVEWAY WIDTHS		
TYPE	MIN.	MAX.
RESIDENTIAL	15'	30'
COMMERCIAL	20'*	50'

*24' MIN. WIDTH REQUIRED FOR TWO-WAY TRAFFIC



STANDARD DETAIL

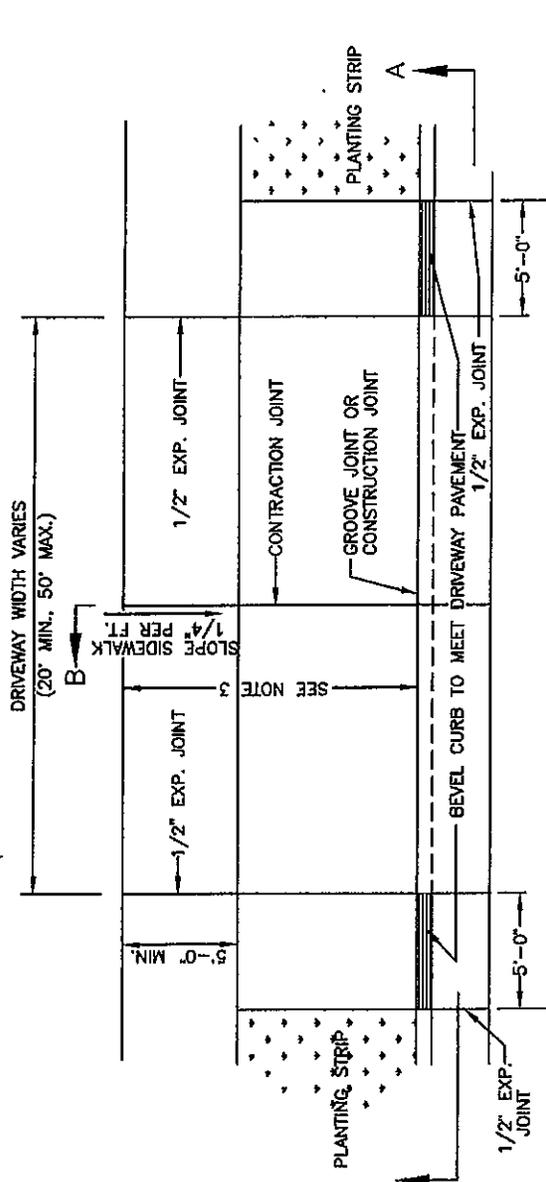
ROAD SYSTEMS
DROP CURB DRIVEWAY
MONOLITHIC CONCRETE
CURB AND SIDEWALK

NTS

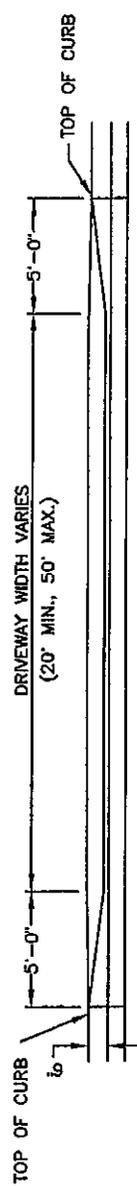
R - 16.0

NOTES:

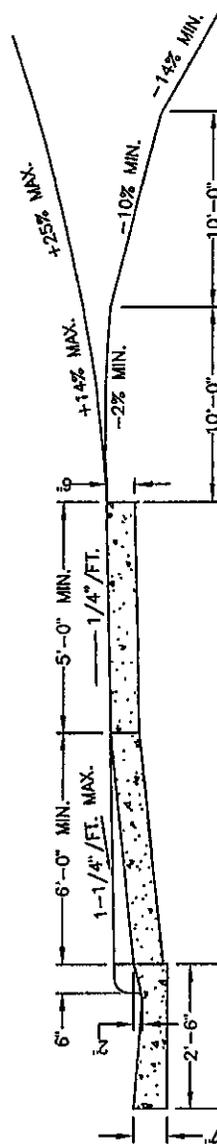
1. ALL CONCRETE TO BE 3600 P.S.I.
2. ALL CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT. SEE STD. NO. R-12.0 FOR JOINT DETAIL.
3. ALL DRIVEWAYS MUST MEET THE CURRENT TOWN DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.



PLAN VIEW



SECTION A - A



SECTION B - B



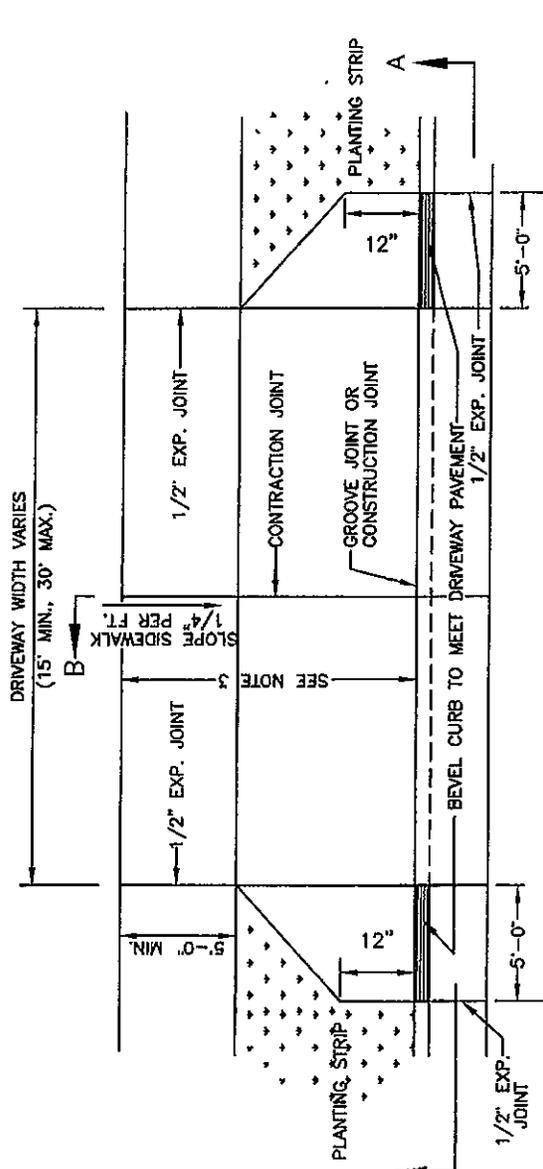
ROAD SYSTEMS
 DROP CURB COMMERCIAL
 DRIVEWAY WITH PLANTING STRIP
 (2'-6" CURB AND GUTTER)

NTS

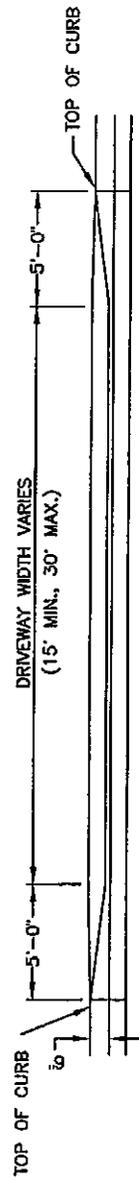
R - 17.0

NOTES:

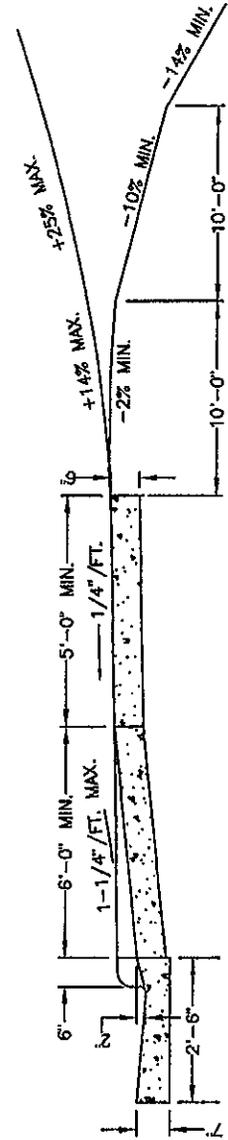
1. ALL CONCRETE TO BE 3600 P.S.I.
2. ALL CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT. SEE STD. NO. R-12.0 FOR JOINT DETAIL.
3. ALL DRIVEWAYS MUST MEET THE CURRENT TOWN DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.



PLAN VIEW



SECTION A - A



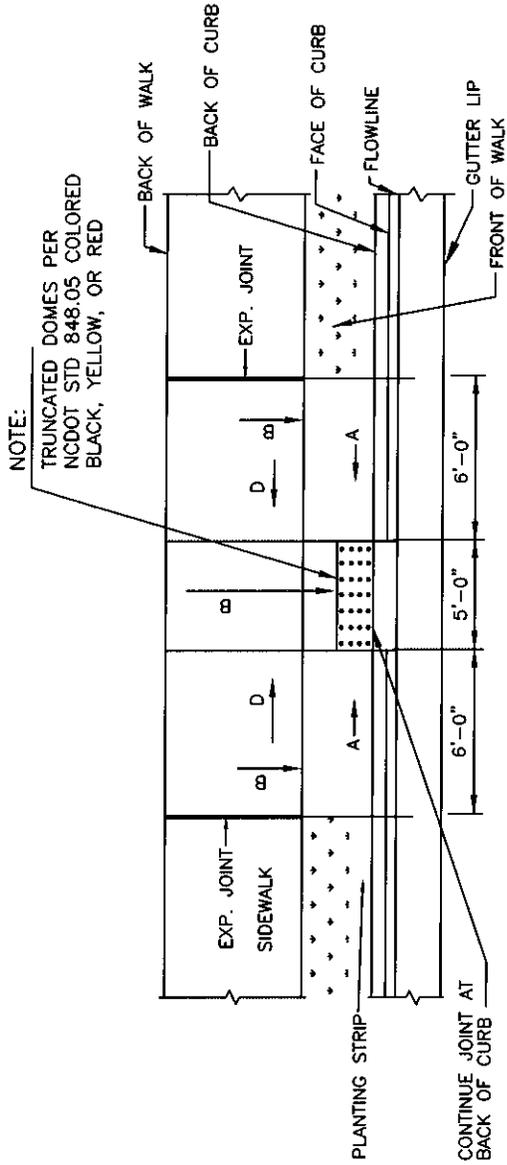
SECTION B - B



ROAD SYSTEMS
 DROP CURB RESIDENTIAL
 DRIVEWAY WITH PLANTING STRIP
 (2'-6" CURB AND GUTTER)

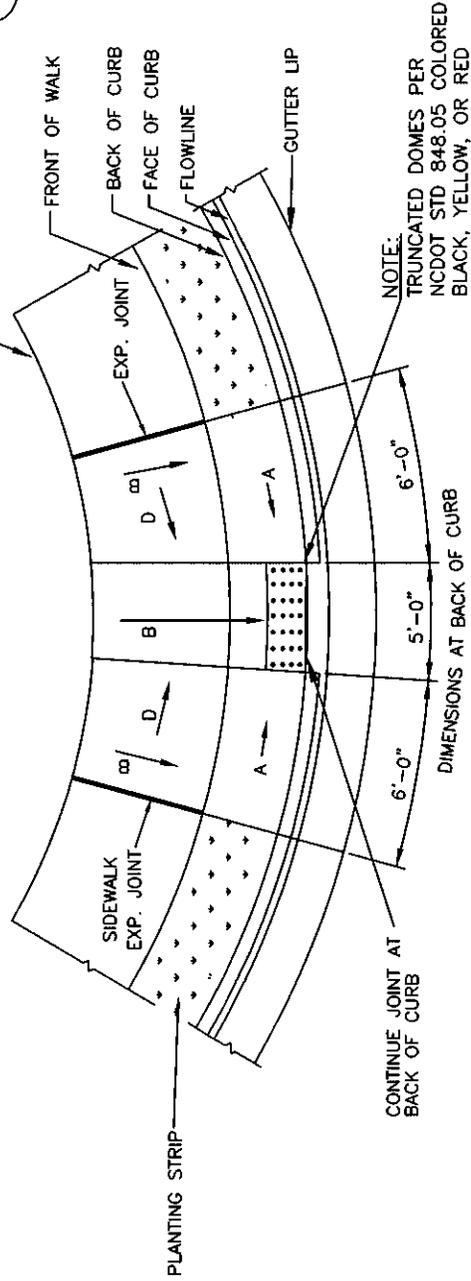
NTS

R - 18.0



SLOPE "A"	12:1
SLOPE "B"	1/4"/FT
SLOPE "D"	3/8"/FT

PLAN VIEW—PARALLEL RAMP
WITH PLANTING STRIP



PLAN VIEW—DIAGONAL RAMP WITH PLANTING STRIP

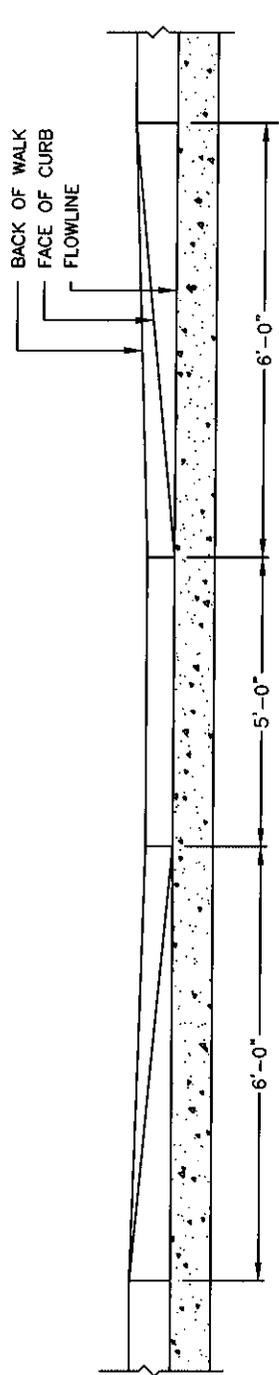


ROAD SYSTEMS
ACCESSIBLE RAMP STANDARD
WITH PLANTING STRIP
(2'-6" CURB AND GUTTER)

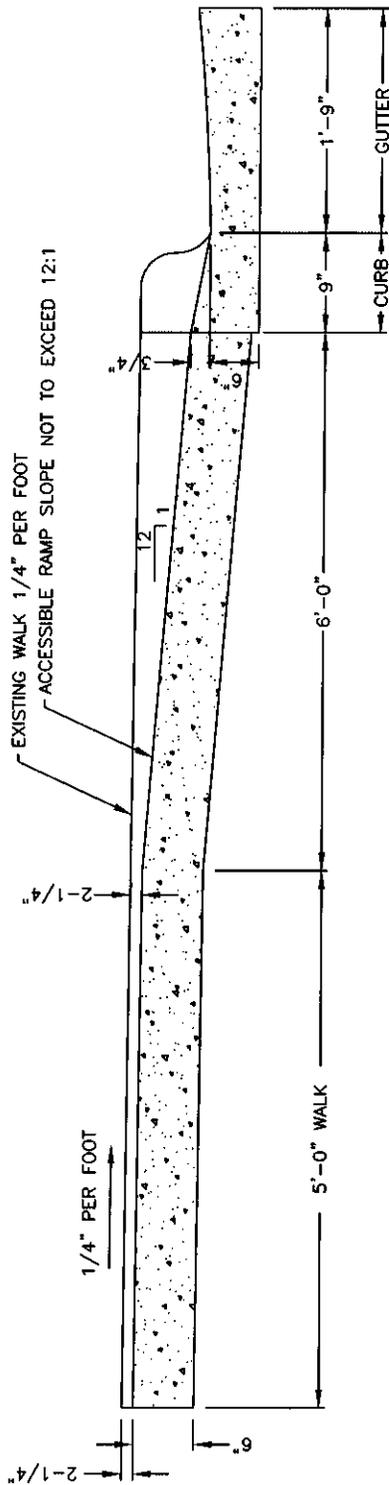
SEPTEMBER 2011

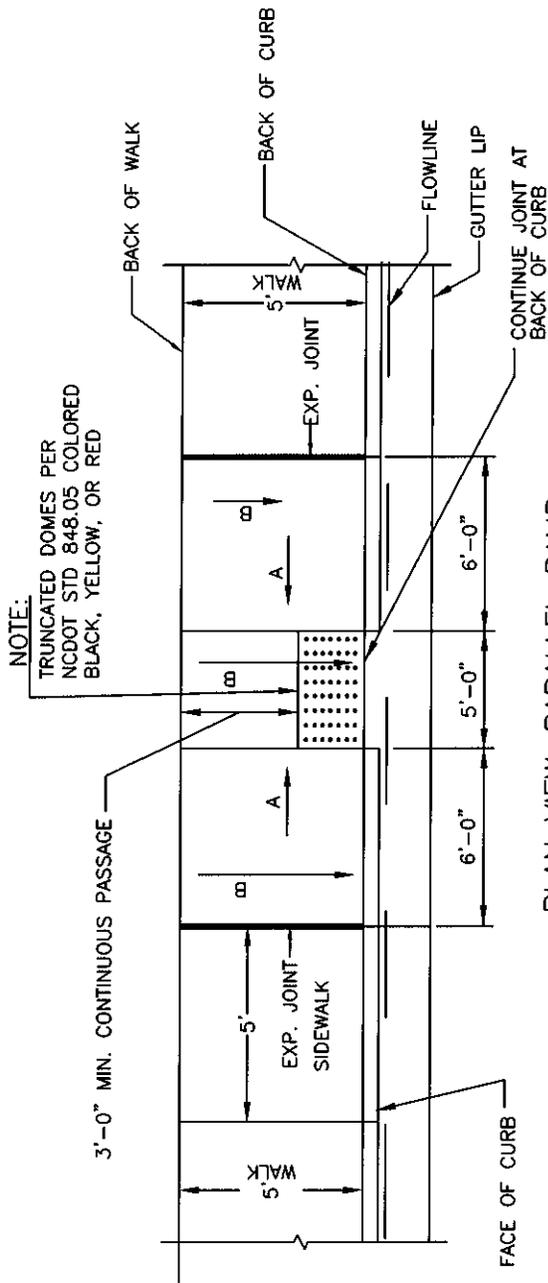
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R - 19.0A



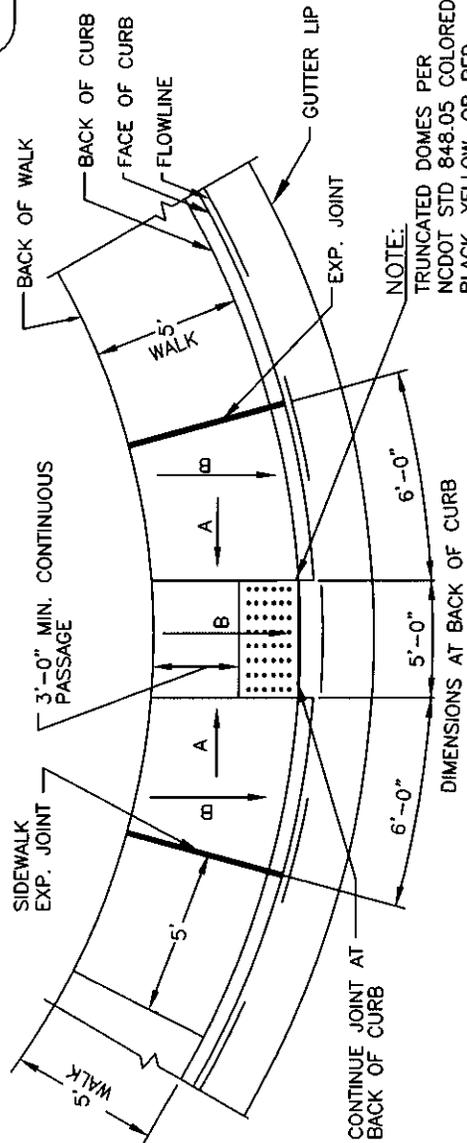
ELEVATION



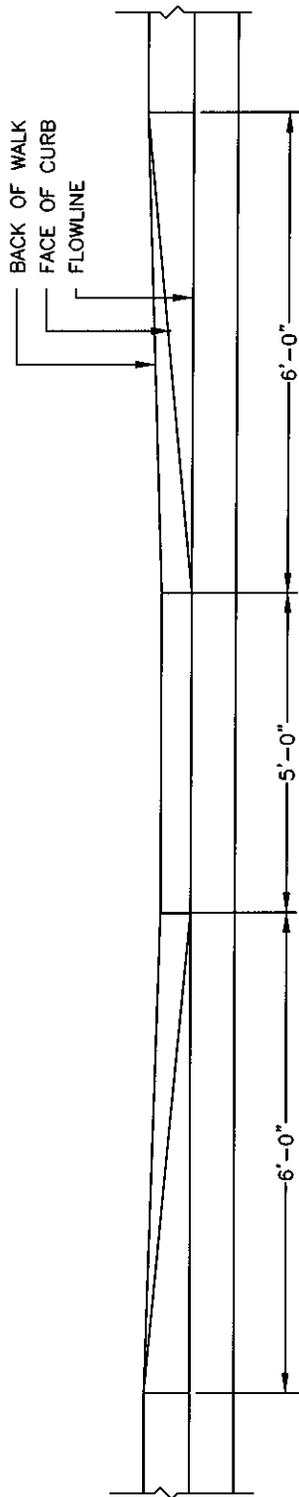


PLAN VIEW—PARALLEL RAMP
WITHOUT PLANTING STRIP

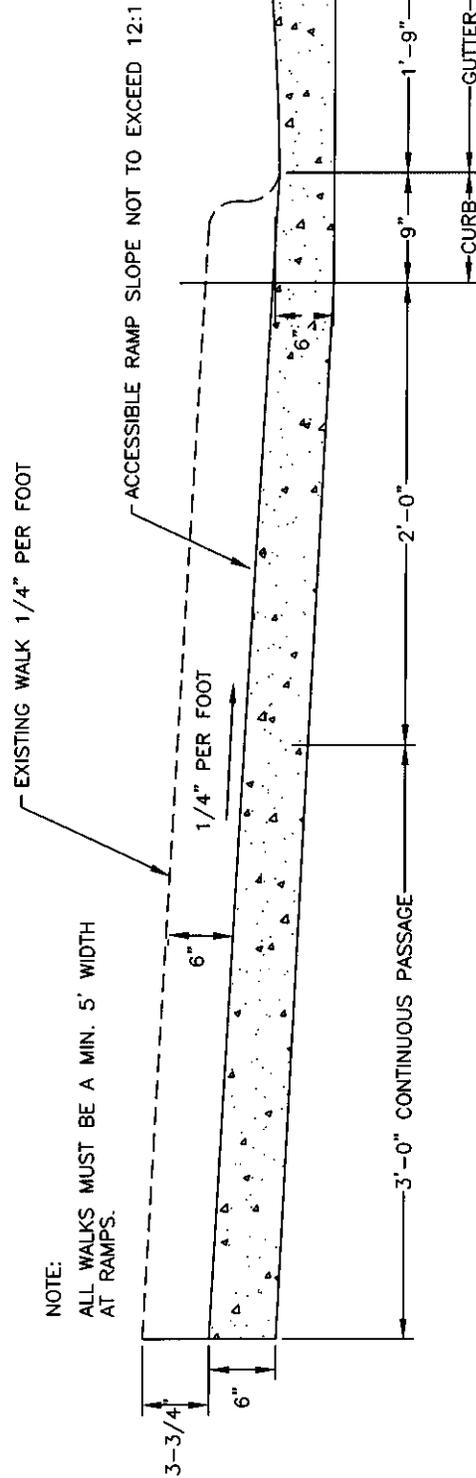
SLOPE "A"	12:1
SLOPE "B"	1/4"/FT
SLOPE "C"	5/8"/FT



PLAN VIEW—DIAGONAL RAMP WITHOUT PLANTING STRIP



SECTION THROUGH FLOWLINE



TYPICAL RAMP SECTION

NOTE:
ALL WALKS MUST BE A MIN. 5' WIDTH
AT RAMPS.

ACCESSIBLE RAMP SLOPE NOT TO EXCEED 12:1

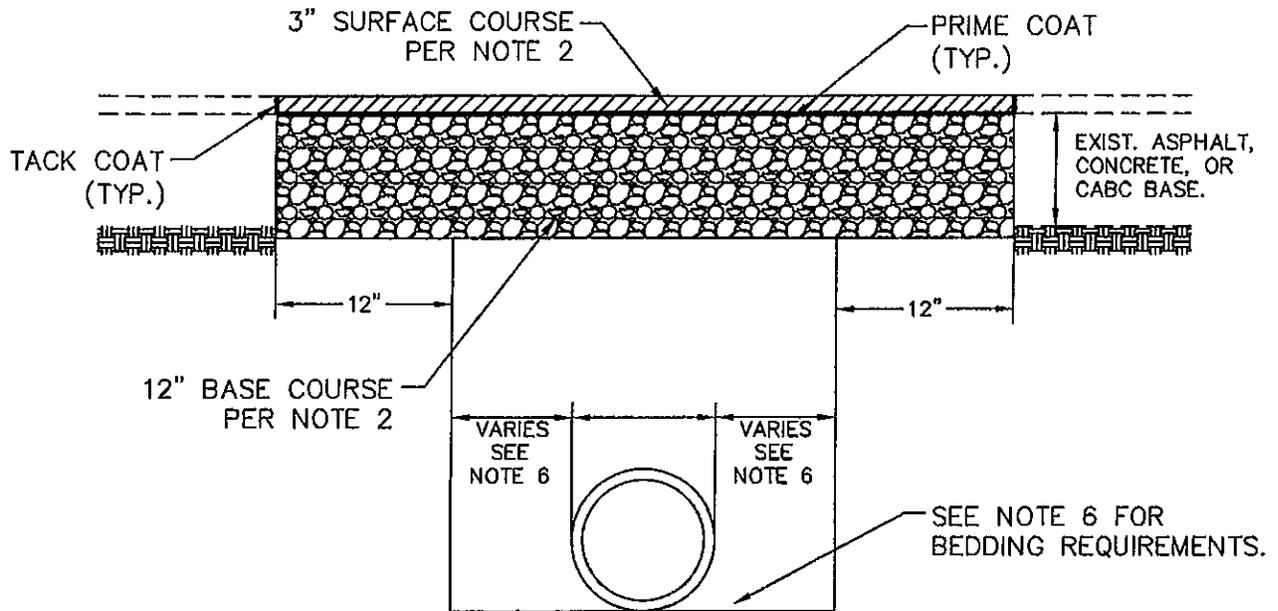


ROAD SYSTEMS
ACCESSIBLE RAMP SECTIONS
WITHOUT PLANTING STRIP
(2'-6" CURB & GUTTER)

SEPTEMBER 2011

NTS

R - 20.0B



ELEVATION SECTION

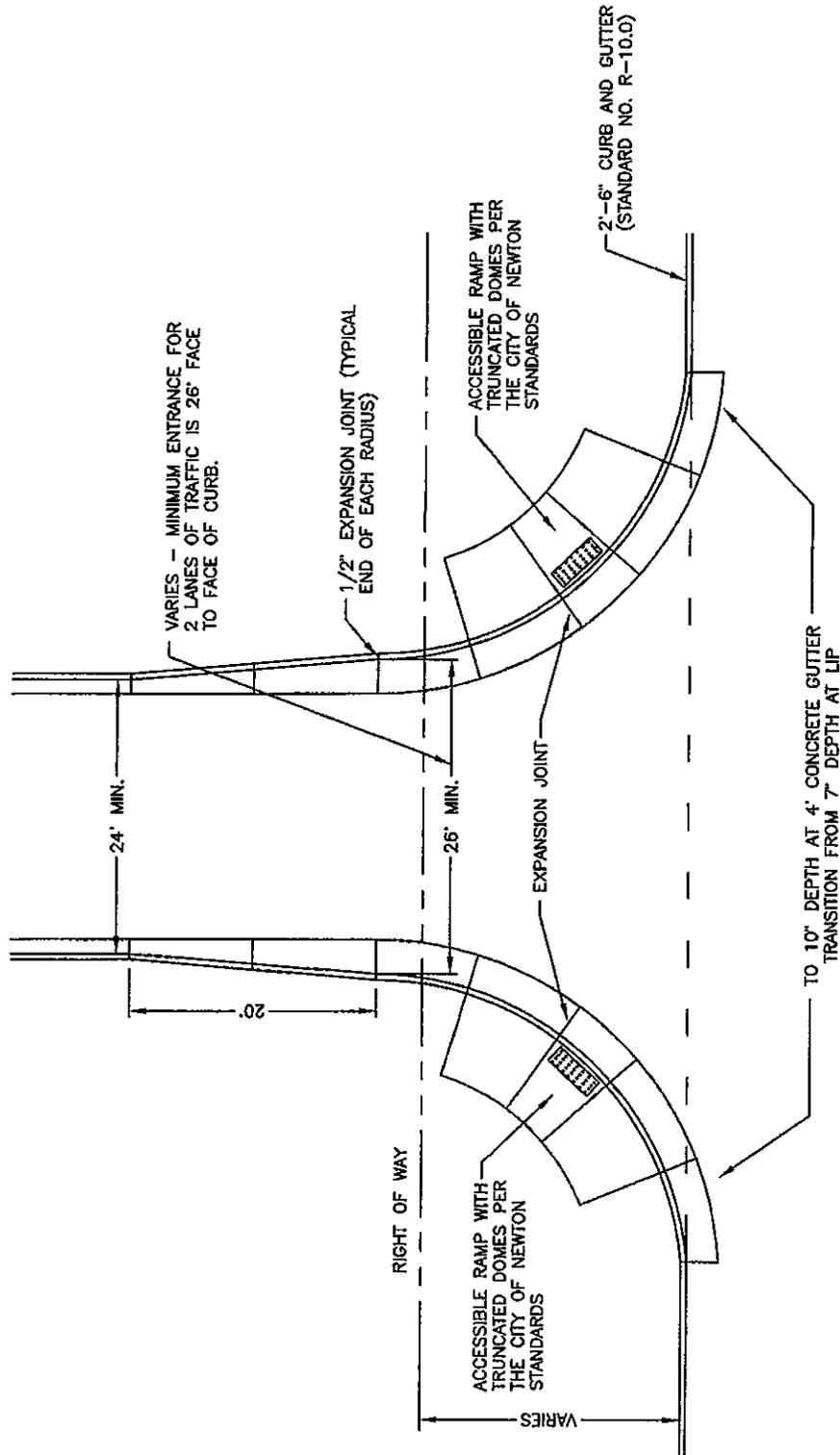
NOTES

1. ALL CONCRETE AND ASPHALT PAVEMENT, INCLUDING DRIVEWAYS, TO BE CUT WITH A SAWCUT A MINIMUM DEPTH OF 3".
2. REQUIRED SURFACE AND BASE COURSE:

STREET TYPE	SURFACE	BASE
RESIDENTIAL STREET	SF9.5A	ABC STONE
COLLECTOR STREET	S 9.5B	B25.0B
COMMERCIAL/THOROUGHFARE	S 9.5C	B25.0C
3. ALL PAVEMENT REPAIRS ARE SUBJECT TO APPROVAL BY THE CITY OF NEWTON OR NCDOT AS APPLICABLE.
4. 12-INCH MINIMUM CUT OUTSIDE TRENCH IS ALSO REQUIRED FOR SLOPED WALLS.
5. SHORING REQUIRED IN ACCORDANCE WITH OSHA STANDARDS PART 1926, SUBPART P.
6. SEE THE LAND DEVELOPMENT STANDARDS MANUAL SEWER DETAILS S-11.0, S-12.0, OR S-13.0, OR WATER DETAILS W-8.0 AS APPROPRIATE FOR TRENCH WIDTH, BEDDING AND BACKFILL REQUIREMENTS.
7. WHEN PAVEMENT REPAIR IS ADJACENT TO THE CURB, THE SAW CUT MUST BE 2' FROM THE LIP OF CURB.
8. ANY PAVEMENT REPLACEMENT OTHER THAN THE SECTION ABOVE MUST BE APPROVED BY THE PUBLIC WORKS OPERATIONS MANAGER

NOTES:

1. THE DRIVEWAY MUST RISE 6" FROM THE GUTTER LINE TO PREVENT RUNOFF FROM ENTERING DRIVEWAY.
2. ALL DRIVEWAYS MUST MEET THE CURRENT CITY DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE, AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.



PLAN

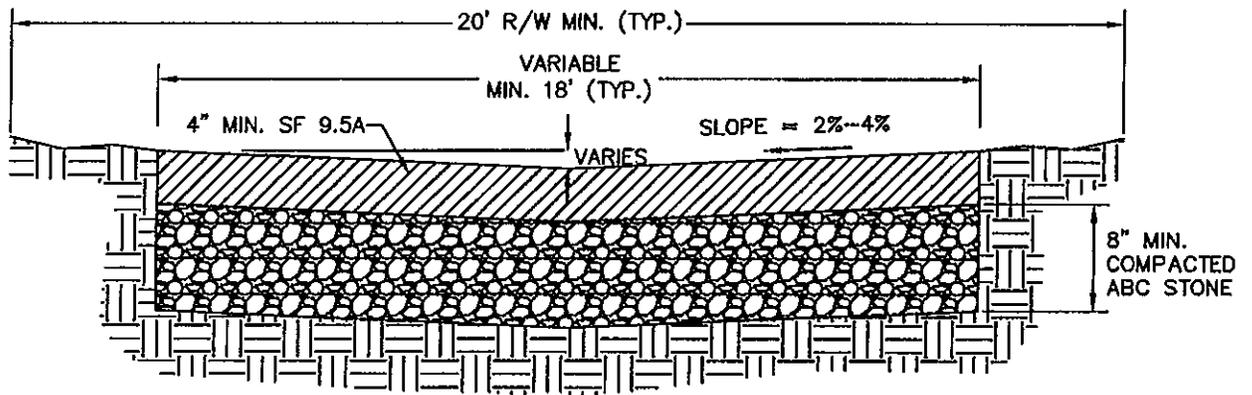


ROAD SYSTEMS
INDUSTRIAL DRIVEWAY
ENTRANCE

APRIL 2008

NTS

R - 24.0



ASPHALT PAVEMENT

NOTES:

1. A SOILS REPORT SHALL BE OBTAINED AND WILL BE THE BASIS FOR FINAL PAVEMENT DESIGN FOR CONCRETE AND ASPHALT SECTIONS.
2. NO PARKING ALLOWED
3. MIN. RADIUS OF 25' TO THE EDGE OF PAVEMENT REQUIRED WHERE ALLEYS INTERSECT STREETS OR OTHER ALLEYS.

Introduction

Please review the General Information section for detailed instructions concerning permits and approvals.

Construction Records

As-built drawings shall be prepared to reflect all changes made during construction. A field survey to locate all new manholes and to determine the inverts of new sewer lines as well as location of all water line, hydrants, bends and connection points shall be conducted by the owner/developer. As-built drawings shall show locations of all sewer laterals and water services referenced to fixed points so as to be easily located in the event that the markers are destroyed. The method of location on the as-built drawings shall be as directed by the Director of Public Works. The owner/developer shall mark the location of sewer lateral ends with a steel post painted yellow, extending at least three (3) feet above ground.

Inspection

Construction inspection of sewer installations is required. Inspections must be conducted by a registered Professional Engineer (PE). Upon completion, the Engineer must submit a statement that is acceptable to Local and State Agencies, indicating that the system was constructed in accordance with the approved plans and specifications.

Acceptance of Facilities by the CITY OF NEWTON

The City shall accept new facilities upon completion of the following:

1. All construction is complete and all tests satisfactory
2. Statement of Inspection has been received from Engineer of record.
3. Receipt of As-Built plan drawings.
4. Proper filing of permit approvals, easements, and rights-of-way.
5. The site must be clear of construction debris and equipment
6. Removal of all sediment and erosion control structures.
7. Any other releases, as required by the City.

Performance Guarantee

Work shall be guaranteed by the owner/developer for a period of one year from acceptance by the City. The guarantee shall cover materials and workmanship. Any defective work or materials shall be repaired or replaced at no expense to the City.

Design Requirements

1. All projects which use these guidelines shall be designed in accordance with and shall meet all requirements of North Carolina Administrative Code (NCAC). It is the responsibility of the Engineer of Record to ensure that all requirements are met. In cases where a statement herein conflicts with such requirements, the more restrictive shall apply. Variations or exceptions to the following guidelines must be approved by City of Newton Director of Public Works & Utilities.
2. Sewer design must be consistent with the City's current Water and Sewer Master Plan and overall needs of the sewer basin, following the natural drainage pattern of the basin. All sub basins and any other basins or sub basins that may or will be pumping into the sewer being designed must be identified. The Engineer of Record shall furnish topographic maps, zoning maps, and design data to substantiate sizing of all major basin outfalls. Installation depths shall be minimized during the design process.
3. Sewer mains must be extended on outfalls, in streets, or other easements to the property line or as required by the Director of Public Works & Utilities. The sewer design shall ensure future service is available to the remainder of the drainage basin and or adjacent properties.
4. Sewer design is to result in a long lasting facility, where low maintenance and ease of maintenance is the objective.
5. Average daily flow for residential units shall be established as 120 gallons per day per bedroom with each residential unit having a minimum of two bedrooms. Single family residential usually consists of three (3) bedrooms, while multi-family and attached housing usually consists of two (2) bedrooms.
6. Open cut construction on existing paved roads shall be avoided. Existing paved roads shall be bored or tunneled as appropriate unless approval from the Director of Utilities is obtained.

Sewer Mains and Services

1. Gravity sewer sizes shall remain constant between manholes. In manholes with smaller upstream sewer line and larger downstream line, the crowns of the two sewer lines shall match. All sewers shall have a straight alignment between manholes. Sewers shall be designed with uniform slope between manholes.
2. Minimum diameter pipe for gravity sanitary sewer applications shall be 8 inches, with a minimum of 4 inches for sanitary service laterals. Velocity

calculations for determining pipe diameter shall be based on Manning's formula, minimum velocity of 2 ft/sec with an "n" value of 0.014.

3. Minimum cover for all sewer lines shall be 3.0 feet, unless ductile iron pipe is used.
4. Maximum cover for all sewer lines shall be 18.0 feet, unless ductile iron pipe is used.
5. Sewer depths greater than 12' for all sewer lines must have a letter requesting a variation submitted with necessary documentation showing all alternatives, substantiating the depth of the sewer required to serve the project, basin, or adjacent property. The variation must be approved by the Director of Public Works & Utilities.
6. Sewer depths for all sewer lines along road right-of-ways must consider future road widening. Projections of future road grades may require increased depths or additional easements.
7. Four inch laterals may connect to the main line via a tee, wye, or tee/wye, per Detail S-15.0 and S-16.0, or directly to the manhole, per Detail S-14.0A or S-14B.
8. Tapping saddle connections shall be per the Materials Specifications section of this manual.
9. Laterals 6" or larger must connect to manholes per Detail S-14.0A. (S-14.0B with prior approval from the Director of Public Works & Utilities)
10. Rubber couplings or "No-hub bands" are not allowed on sewer laterals or sewer lines. Mechanical joint sleeves or approved equal must be used on pipe material transitions. However, transitions from Vitrified Clay Pipe must use a rubber coupling (repair clamp). Approved couplings must have a wide solid stainless steel center band .012" thick, with 4 stainless steel screw clamps. Approved couplings are provided in the Materials Specifications section of this Manual.
11. Sewer laterals less than 3 feet in depth, over 12 feet deep, or as directed by the Director of Public Works & Utilities must be ductile iron pipe. Otherwise Schedule 40 PVC pipe can be used for sewer laterals.
12. Pipe bedding shall be NCDOT No. 57 washed stone, unless site conditions warrant otherwise, from a minimum of 4" below the pipe to Full Encasement of pipe as shown in the Standard Details. Bedding stone below pipe will be excavated to allow room for pipe bells. The bedding should support only the pipe barrel.

13. Pipe material requirements are based on specific use and installation conditions. The following types of pipe are allowable for gravity sewer applications (see Material Specifications):

- ASTM D3034 Polyvinyl Chloride (PVC) SDR 21 (Up to 15" Diameter)
- ASTM F679 Polyvinyl Chloride (PVC) (18" to 36")
- DIP Class 350, Protecto 401 Ceramic Epoxy Lining (per ASTM/AWWA standard)
- AWWA C900 DR 18 (PVC)

ALLOWABLE APPLICATIONS OF GRAVITY SEWER PIPE MATERIALS			
TYPE OF PIPE	DEPTH	CORROSIVE (EX: FORCE MAIN IS CHARGE)	AERIALS and CREEK CROSSINGS
PVC SDR 21	4' to 15'	ALLOWED	NOT ALLOWED
DIP	3' to 28'	NOT ALLOWED	ALLOWED
DIP Lined	3' to 28'	ALLOWED	ALLOWED
PVC DR 18	3' to 28'	ALLOWED	NOT ALLOWED

14. Deflection Testing of PVC Pipe: Not less than 30 days following completion of backfill, PVC pipe shall be tested for deflection with a 5% mandrel sized as defined in ASTM D-3034. Mandrels shall be furnished by the Contractor. The mandrel shall be pulled through each section of pipe from manhole to manhole. The mandrel must slide freely through the pipe with only a nominal hand force applied. No mechanical device shall be used in pulling the mandrel. Any pipe which refuses the mandrel shall be removed and replaced or re-rounded and the bedding shall be properly constructed as specified to prevent excessive deflection. Such sections shall be re-tested for deflection after completion of backfill.

15. Where design velocities are projected to be greater than 15 feet per second, the sewers and manholes shall be protected against displacement by erosion and impact. Design velocities greater than 15 feet per second must have a letter submitted with necessary documentation showing all alternatives, substantiating the design, and must be approved by the Director of Utilities. Ductile iron pipe (DIP) material is required when design velocities are 15 feet per second or greater.

16. Pipes designed at minimum slopes should be avoided. Minimum slopes are difficult to maintain during installation, and limits the ability to make

necessary field changes. Minimum slopes should only be used in outfalls and areas where it is necessary based on surface topography. Pipe designed to be constructed at minimum slopes must have a letter submitted with necessary documentation showing all alternatives, substantiating the design, and must be approved by the Director of Utilities. Minimum slope is 1 percent, for dead-end lines or where low flows are expected. Otherwise, **minimum slopes must conform to the following Table:**

PIPE DIA. (in)	MIN. DESIGN SLOPE	MAX. DESIGN SLOPE
8	0.6%	18%
10	0.3%	16%
12	0.3%	13%
15	0.2%	9%
18	0.2%	7%
24	0.1%	5%
30+	0.1%	4%

17. Bores, encasement pipes, creek crossings or other grade limiting situations are not to be designed with minimum slopes. Manholes shall be placed adjacent to these situations and adjacent sewer lines shall be designed to allow for field changes in grade.
18. Permanent Utility Easement (PUE) shall be a minimum width of 20-feet. Larger pipe or deeper sewers may require additional permanent easement as required by the Director of Utilities and as summarized in the following:

PIPE SIZE	MIN. PERMANENT UTILITY EASEMENT WIDTH
8"	20'
12"	20'
15"	20'
18"	20'
24"	30'
30"	35'
36"	35'
42"	40'

19. A Temporary Construction Easement (TCE), of an additional 12.5' on each side of the PUE, shall be in place for only the duration of the construction project.
20. Buoyancy of sewers shall be considered and flotation of the pipe shall be prevented with appropriate construction where shallow cover and high groundwater or flooding conditions are anticipated. For design purposes, assume water to top of pipe and pipe is empty.

Sewers In Relation To Streams And Other Water Bodies

1. Permanent stream crossings for maintenance access shall be provided, per Detail S-21.0, as required by the Director of Utilities. As a result, additional easements may be necessary to construct creek crossings for maintenance adjacent to aerial stream crossings.
2. **Cover Depth:** The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. The following cover requirements shall be met:
 - One foot of cover where the sewer is located in rock
 - Three feet of cover in other material unless ferrous pipe is specified. In major streams, more than three feet of cover may be required; and
 - In paved stream channels, the top of the sewer line should be placed below the bottom of the channel pavement.
3. **Horizontal Location:** Sewers located along streams, lakes or impoundments, shall be located at least 10 feet outside of the stream bank or sufficiently removed therefrom to provide for future possible stream widening and to prevent siltation of the stream during construction. A distance of 50 feet shall be maintained between sewers and water classified as WS-II, WS-III, B, SA, ORW, HQW, or SB (from normal high water [or tide elevation]). Sewer lines less than 100 feet from a water supply well shall be DIP with water-tight joints. Sanitary sewer lines shall not be located less than 25 feet from a private well.
4. **Structures:** The sewer outfalls, headwalls, manholes, gate boxes, or other structures shall be located so they do not interfere with the free discharge of flood flows of the stream.
5. **Alignment:** Sewers crossing streams shall be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade. Sewer systems shall be designed to minimize the number of stream crossings.
6. **Materials:** Sewers entering or crossing streams shall be constructed of ferrous material pipe with mechanical joints. Material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other materials which will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe.

7. **Aerial Stream Crossings:** Aerial stream crossings are to be avoided and must be substantiated, and approved by the Director of Utilities. Restrained joints and adequate supports to prevent excessive flexion shall be provided for all aerial pipe crossings. DIP is required and pipe spans must be installed to manufacturer's specifications. Suspended joints and adjacent joints shall be Mech-Lok® Rigid Restrained joint by Griffin Pipe (or approved equal). Supports shall be designed to prevent frost heave, overturning, and settlement.
 - Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sewers. Where buried sewers change to aerial sewers, special construction techniques shall be used to minimize heaving.
 - For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe should be placed no lower than the elevation of the 25-year flood. Ductile iron pipe with mechanical joints shall be required.
 - Steel H-Piles are required for creek crossings and areas subject to erosion, per Details S-23.0, S-24.0, and S-25.0. Concrete piers are only allowed if sufficient penetration cannot be obtained for a steel pile.
8. **Anti-Seepage Collars:** In areas where the sewer trench has the potential to drain wetlands, anti-seepage collars shall be installed. Please be advised, in these areas, a Water Quality Certification (401/404) permit may be required.

Manholes

1. Manholes shall be installed on all gravity sewer mains at: the end of each line, changes in grade, changes in main size, changes in alignment, and all intersections.
2. Manholes spacing shall not exceed 400 feet for all sewers 15 inches or less in diameter. For sewers 18 inches and above in diameter, 500-foot spacing may be used.
3. Flat top manholes, per Detail S-6.0, shall be provided in floodplain areas, along outfalls, and as required by the Director of Utilities. Otherwise, all manholes shall be Standard Manholes conforming to the requirements of Detail S-1.0.
4. Manhole rings and covers shall be:

- **STANDARD (Detail S-2.0):** For standard manholes located in roadways, where manholes are to be centered in the travel way. If manhole is subject to standing water, a sealed manhole cover shall be required.
- **SECURED (Detail S-4.0):** Bolted down manhole rings and covers shall be installed on all sanitary sewer outfalls and as required by the Director of Utilities.
- **SEALED (Detail S-4.0):** Water tight and bolted down rings and covers shall be installed on standard manholes in areas subject to flooding or runoff, including roadways.
- **FLAT-TOP SEALED (Detail S-7.0):** Water tight bolted down covers with rings shall be cast in place on Flat Top Manholes.

5. Manholes will be furnished with the following clear inside diameters according to depth and the sewer main diameter:

Pipe Size Range	Pipe Depth (ft)	Manhole Size (ft)
8" - 18"	< 12	4
8" - 18"	>12	5
21" - 36"	All Depths	5
39" - 54"	All Depths	6
54" or >	All Depths	8

6. Minimum manhole depth shall be 4.0 feet.
7. Manholes over 12 feet deep shall have appropriately designed extended bases to resist flotation and provide structural stability.
8. The minimum drop between manhole invert in and invert out is 0.10 feet on straight junctions and 0.25 feet at 90° horizontal turns.
9. A drop manhole shall be used only when the difference between incoming and outgoing pipe inverts is 24" or greater.
10. Outside drop manholes, per Detail S-8.0, shall be avoided and must be substantiated and approved by the Director of Public Works & Utilities. Indicate invert elevations of all pipes. Inside drop manholes shall only be allowed on new construction projects with approval by the Director of Public Works & Utilities.
11. Manholes shall be pre-cast, 4000 psi concrete, designed for H-20 loads, conforming to ASTM C478, with pre-cast inverts designed to avoid turbulent flow. Inverts shall be the depth and width of the outside diameter of the pipe. Each lateral connection shall have an invert the depth and width of the

outside diameter of the lateral pipe. Tees, crosses, laterals or connections must smoothly direct flow to the outlet to eliminate surcharging other connections or sewer lines, promoting proper flow of sewer. Pre-cast barrel sections shall be assembled with butyl sealant between joints, per AASHTO M198, and 6" butyl tape on the outside of joints.

12. Flexible sleeves with stainless steel bands shall be used on all pipe connections, per Detail S-10.0. Cast in place A-Lok gaskets are also allowed and are required on lines 24 inches or larger.
13. Steps for pre-cast manholes shall be poly-coated steel located 16-inches on center. Manhole steps shall conform to the requirements of the Materials Specifications section of this manual.
14. Manholes may be adjusted to grade with concrete leveling rings or bricks. However, adjustments 1 foot or more must use full diameter pre-cast barrel sections to raise manholes. Metal grade rings cannot be used to adjust grade between ring and cover. When a manhole is to be raised in an existing asphalt paved area, saw-cut an octagonal or hexagonal shaped opening around frame. Fill paved area with black colored concrete.
15. Ring and covers above grade shall be bolted to the manhole cone with four approved stainless steel expansion concrete anchors $\frac{3}{4}$ " diameter, per Detail S-3.0.
16. Connections to existing manholes may match inverts or be slightly higher. Existing and future flow must be considered in the connection design. The connection must have an invert the depth and width of the outside diameter of the connecting pipe. The invert must direct sewer towards existing flow direction and avoid turbulent flow of sewer. Surcharging of sewers lines by new or existing flow is not acceptable.
17. Top of manholes on sanitary sewer outfalls shall be 2 to 3 feet above final grade. Manholes in an improved, maintained, and well-drained area (parking lot, drive, lawn, etc.) may be flush with grade and may require a sealed ring and cover.
18. Flat-Top Sealed and Vented Manholes shall be a minimum of 2 to 3 feet above final grade, per Detail S-6.0. Vent pipe must be at least 2 foot above FEMA 100-year flood plain elevation, or known flood elevation, if higher. If the 100-year flood elevation cannot be readily established, the Director of Public Works & Utilities shall establish the elevations to which the manhole rims or stack shall be extended. Conditions may require manholes to be more than 3 foot above grade as directed by Director of Public Works & Utilities. Steps may be required on the outside of manholes 3.5 feet above grade.

19. Buoyancy shall be considered and flotation of the manholes shall be prevented with appropriate construction where high groundwater or flooded conditions are anticipated. For design purposes, assume water to top of manhole and that the manhole is empty.

Pumping Stations and Force Mains

1. Whenever possible, sanitary sewerage facilities shall be designed so as to avoid the necessity of providing pumping stations.
2. Sanitary sewer pump station design information must be submitted for approval along with all other civil design drawings and specifications.
3. The City will specify the pump station type based on the functionality of the station. Regional pumping stations are typically of the wet well/dry well type, while smaller pumping stations are of the wet well (submersible) variety.
4. A stand-by internal combustion power source shall be provided for pumping stations. As an alternate, the Director of Public Works & Utilities may require a dual connection to the power system as a method of providing stand-by power in cases where such an alternate would provide an equal degree of reliability and would provide an economy to the City over the useful life of the alternate stand-by power system. All stand-by power sources must be installed in a weatherproof building structure suitable to accommodate the power source, controls, alarm system, and all required appurtenances. The structure must be large enough to allow for servicing of all equipment and must meet all building codes.
5. Force mains shall be designed and constructed of epoxy coated ductile iron pipe per the Materials Specifications. PVC pipe will not be allowed.

SANITARY SEWER PLANS CHECKLIST

(Sanitary sewer plans shall contain the following minimum information)

1. Plan and profile on 24" x 36" page.
2. Vertical sea level elevation scale on left of profile and station numbers along bottom of profile.
3. North arrow, all sheets.
4. Plan and profile both run left to right.
5. Centerline intersections of line crossings with sewer noted on profile.
6. Street names above or below corresponding profile, when more than one street is on a page.
7. Label type of manhole and appropriate ring and cover in the profile view of drawings for all outfalls and indicate the elevations of the (1) Rim, (2) All Invert Ins and Outs, and (3) Pipe sizes.
8. When connecting to an existing manhole, plans must clearly show invert elevation, shelf elevation, top of manhole elevation, vent pipe elevation, alignment of existing line and name
9. Identify location of drop manholes in both plan and profile.
10. Include vent elevation to 0.1' on profile, and the existing and proposed grades.
11. Pipe grade to 0.01% and size and type of pipe between manholes.
12. Size and type of existing pipe and direction of flow between each manhole on plan.
13. Station numbers and designation of "Existing" or "New" on each manhole on plan and profile.
14. Indication of "identical" manholes where profile is broken.
15. Location and size of all existing and proposed street and sewer rights of way.
16. Existing pavement on plan, indicate width, and any portion to be cut.
17. Where a line is to be bored indicate location and length of casing and type of pipe on plan and profile.

18. All existing underground utilities in the area.
19. Where ductile iron is to be used, indicate limits on plan and profile. Show shaded on profile.
20. Use ductile iron where storm drain and sewer have less than 2 feet vertical clearance.
21. All aerial crossings shall be ductile iron pipe, use concrete piers at 18' intervals, indicate on plans and profile, include details of design for the piers and anchorage.
22. Total distance between existing manholes or proposed manholes on the plan and the bearing if the line is not within the street right of way.
23. All lot lines.
24. All street names on plan.
25. Flood plain elevation in all flood plain areas.
26. Creek flow line.
27. All Railroad crossings must be accompanied by a separate encroachment map showing plan and profile and all other information required by the railroad in accordance with their standards.
28. Vicinity map showing the location of lines and a visual index of plan sheets on the cover sheet.
29. Sanitary sewer plans and specifications shall be sealed by a Professional Engineer, licensed to practice in North Carolina.

STANDARD SEWER SYSTEM DETAILS:

- S-1.0 STANDARD MANHOLE
- S-2.0 STANDARD RING & COVER
- S-3.0 SEALED MANHOLE
- S-4.0 SEALED RING & COVER
- S-5.0 DOGHOUSE MANHOLE
- S-6.0 FLAT TOP SEALED AND VENTED MANHOLE
- S-7.0 FLAT TOP SEALED RING & COVER
- S-8.0 OUTSIDE DROP MANHOLE
- S-9.0 MANHOLE INVERTS
- S-10.0 FLEXIBLE MANHOLE SLEEVE
- S-11.0 GREASE TRAP
- S-12.0 DUCTILE IRON PIPE SEWER BEDDING
- S-13.0 PVC SEWER PIPE BEDDING
- S-14.0A SEWER LATERAL TO MANHOLE
- S-14.0B INSIDE DROP SERVICE CONNECTION
- S-15.0 4" SEWER LATERAL TO MAIN
- S-16.0 DEEP 4" SEWER LATERAL
- S-17.0 STEEP SEWER PIPE RESTRAINT
- S-18.0 ANTI-SEEPAGE CONCRETE COLLAR
- S-19.0 CASING
- S-20.0 CASING SPIDER
- S-21.0 PERMANENT STREAM CROSSING
- S-22.0 STABILIZATION AT SUBAQUEOUS CREEK CROSSING
- S-23.0 AERIAL CREEK CROSSING ON STEEL H-PILES
- S-24.0 STEEL H-PILES
- S-25.0 PIER CRADLE 24" PIPE & SMALLER
- S-26.0 AERIAL CREEK CROSSING ON PIERS
- S-27.0 REINFORCED CONCRETE ANCHOR
- S-28.0 REINFORCED CONCRETE PIER
- S-29.0 PIER FOOTING ON ROCK
- S-30.0 PIPE STRAP FOR PIERS
- S-31.0 SEWER EASEMENTS
- S-32.0 FENCE GATE SEWER OUTFALLS
- S-33.0A AIR RELEASE VALVE MANHOLE
- S-33.0B ODOR CONTROL MANHOLE



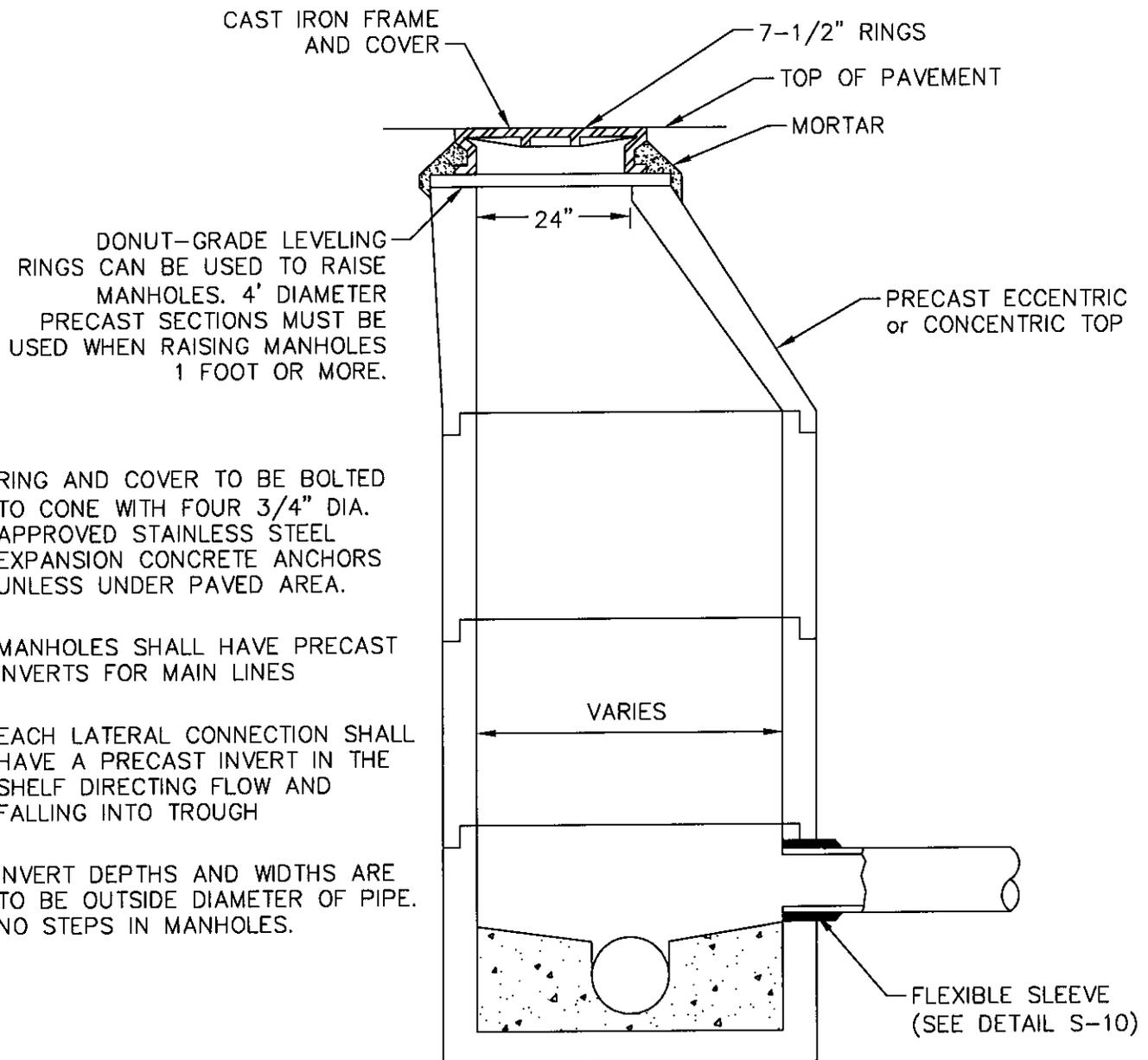
SEWER SYSTEMS

INDEX

OCTOBER 2008

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S



DONUT-GRADE LEVELING RINGS CAN BE USED TO RAISE MANHOLES. 4' DIAMETER PRECAST SECTIONS MUST BE USED WHEN RAISING MANHOLES 1 FOOT OR MORE.

RING AND COVER TO BE BOLTED TO CONE WITH FOUR 3/4" DIA. APPROVED STAINLESS STEEL EXPANSION CONCRETE ANCHORS UNLESS UNDER PAVED AREA.

MANHOLES SHALL HAVE PRECAST INVERTS FOR MAIN LINES

EACH LATERAL CONNECTION SHALL HAVE A PRECAST INVERT IN THE SHELF DIRECTING FLOW AND FALLING INTO TROUGH

INVERT DEPTHS AND WIDTHS ARE TO BE OUTSIDE DIAMETER OF PIPE. NO STEPS IN MANHOLES.

NOTES:

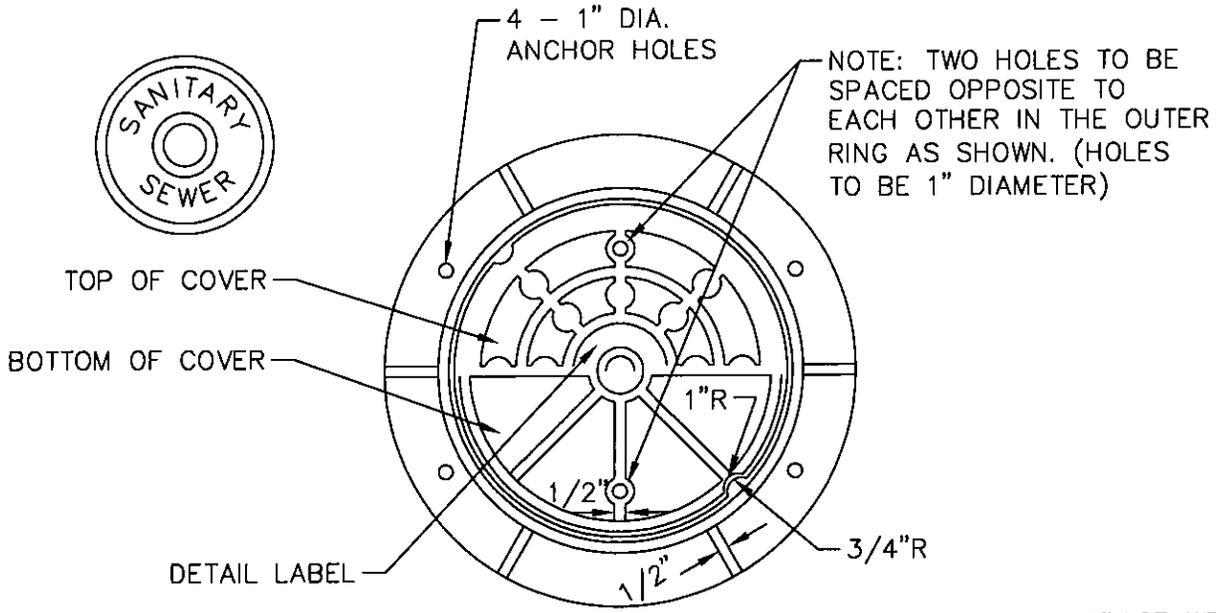
1. PRECAST MANHOLE SHALL CONFORM TO ASTM C478, WITH AASHTO M198 BUTYL SEALS BETWEEN JOINTS AND 6" ADHESIVE BUTYL TAPE ON THE OUTSIDE OF JOINTS.
2. MANHOLE RIM SHALL BE FLUSH WITH PAVED SURFACES AND LAWNS AND 2 TO 3 FEET ABOVE GRADE IN UNIMPROVED AREAS.
3. SEE DETAIL S-9 FOR PRECAST MANHOLE INVERTS.
4. MANHOLES SHALL BE BEDDED ON STABILIZATION STONE AS NEEDED OR AS DIRECTED BY INSPECTOR OR SOIL ENGINEER.



SEWER SYSTEMS
STANDARD MANHOLE

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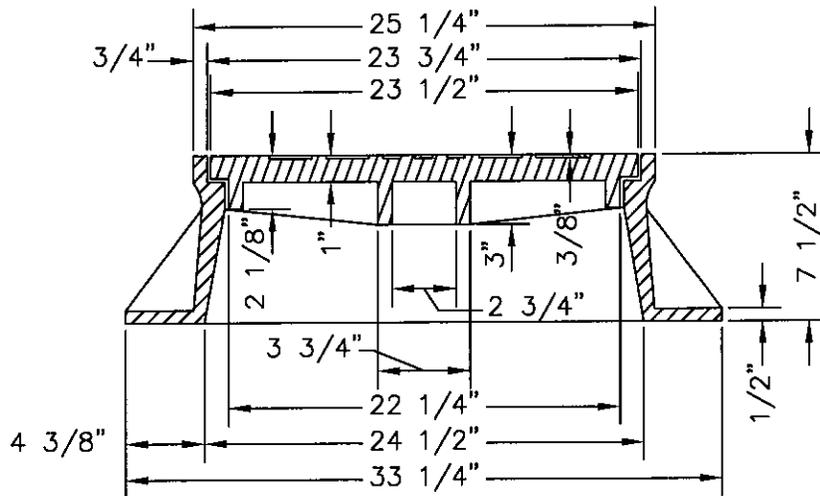
NTS S - 1.0



NOTE: TWO HOLES TO BE SPACED OPPOSITE TO EACH OTHER IN THE OUTER RING AS SHOWN. (HOLES TO BE 1" DIAMETER)

MINIMUM AVERAGE WEIGHTS	
RING	190 LBS.
COVER	120 LBS.
	310 LBS.

PLAN



SECTION

NOTES:

1. RING AND COVER WILL HAVE MACHINED SEAT AND WILL CONFORM TO ASTM A48, CLASS 35B. RING AND COVER WILL BE DESIGNED TO SUPPORT AN H-20 WHEEL LOAD ALSO MEETING NCDOT STANDARD 840.54.
2. DIMENSIONS MAY VARY BUT MANHOLE RING AND COVER ARE TO BE INTERCHANGEABLE WITH DIMENSIONS SHOWN.
3. FOUR-INCH RINGS IN ROADWAYS MUST BE APPROVED BY THE DIRECTOR OF UTILITIES, AND SHALL BE BOLTED TO THE CONE WITH FOUR 3/4-INCH DIA. STAINLESS STEEL ANCHORS.

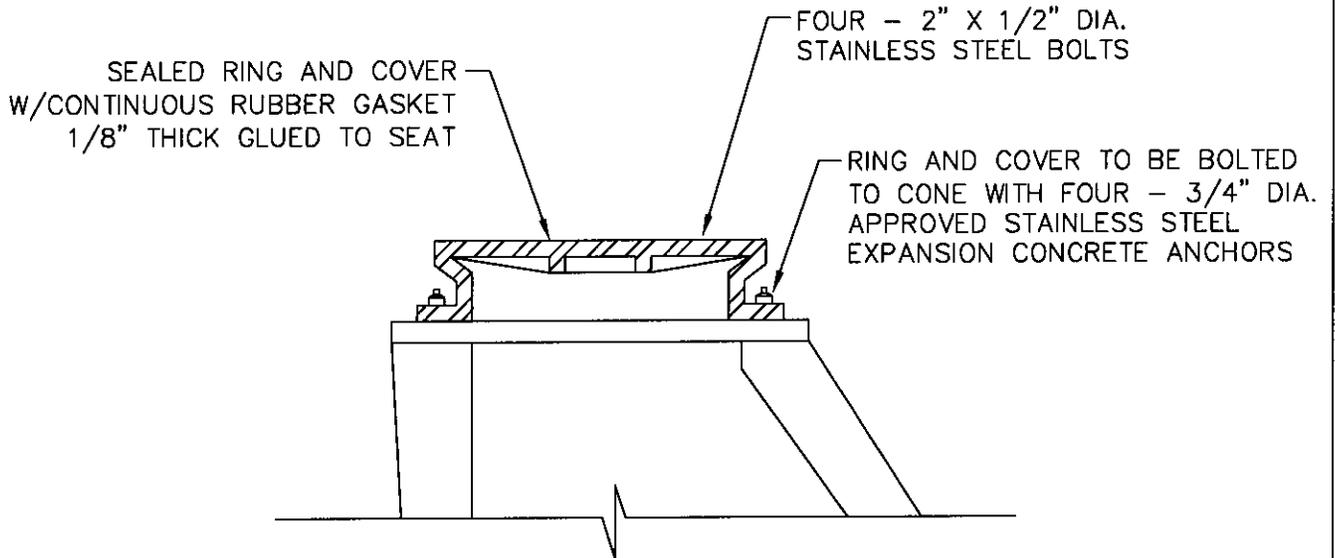


SEWER SYSTEMS
STANDARD RING & COVER

OCTOBER 2008

NTS

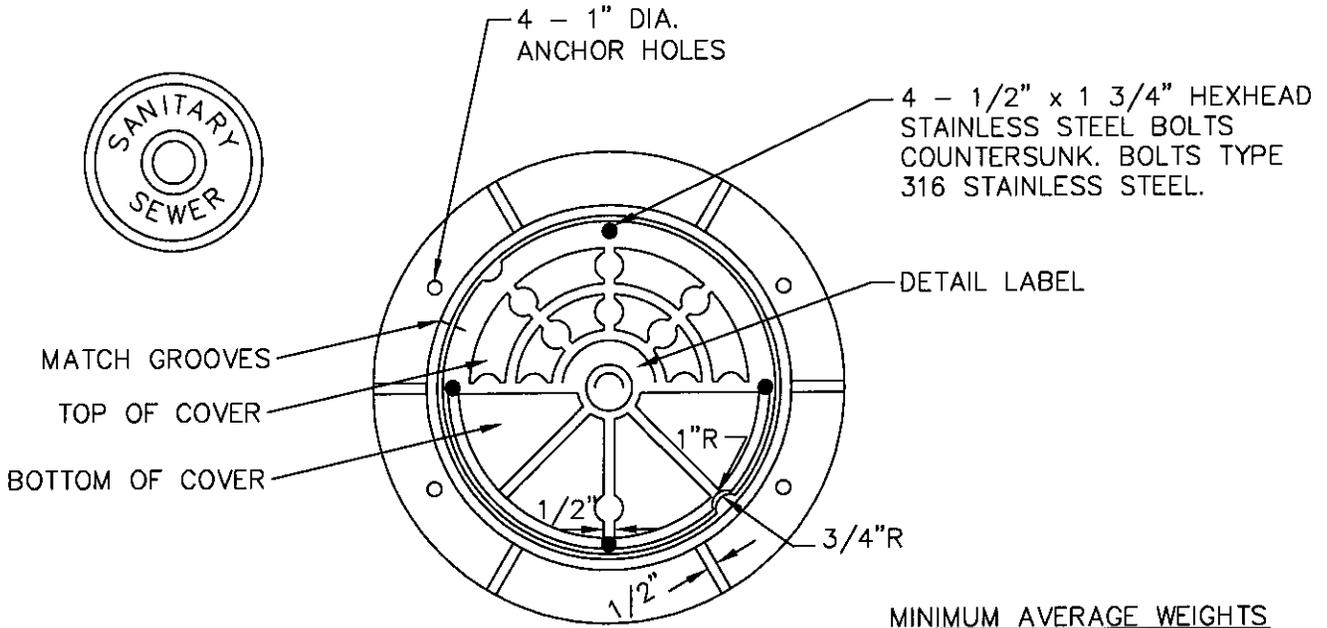
S-2.0



SECTION

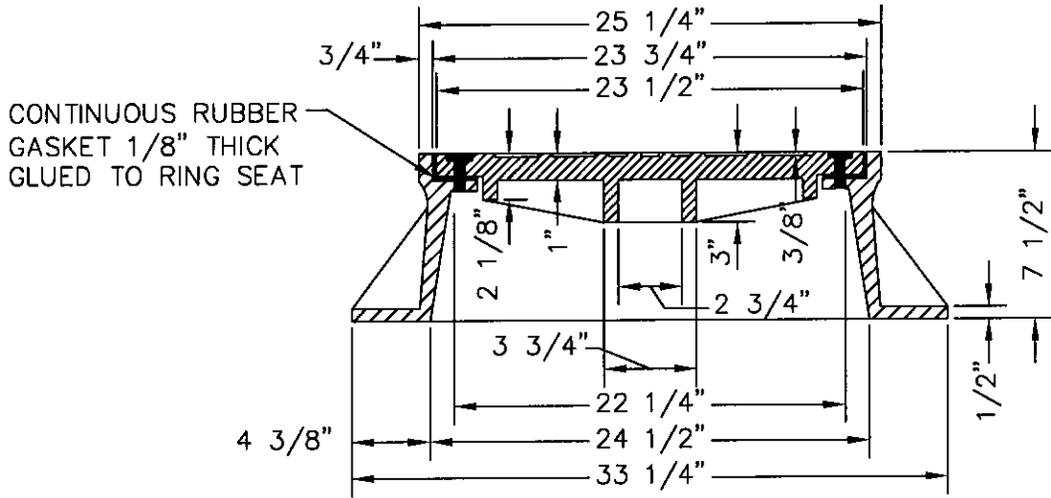
NOTE:

1. SEE DETAIL S-1 FOR MANHOLE DETAILS.



MINIMUM AVERAGE WEIGHTS	
RING	190 LBS.
COVER	120 LBS.
	310 LBS.

PLAN



SECTION

- NOTES:**
- RING AND COVER WILL HAVE MACHINED SEAT AND WILL CONFORM TO ASTM A48, CLASS 35B. RING AND COVER WILL BE DESIGNED TO SUPPORT AN H-20 WHEEL LOAD ALSO MEETING NCDOT STANDARD 840.54.
 - DIMENSIONS MAY VARY BUT MANHOLE RING AND COVER ARE TO BE INTERCHANGEABLE WITH DIMENSIONS SHOWN.

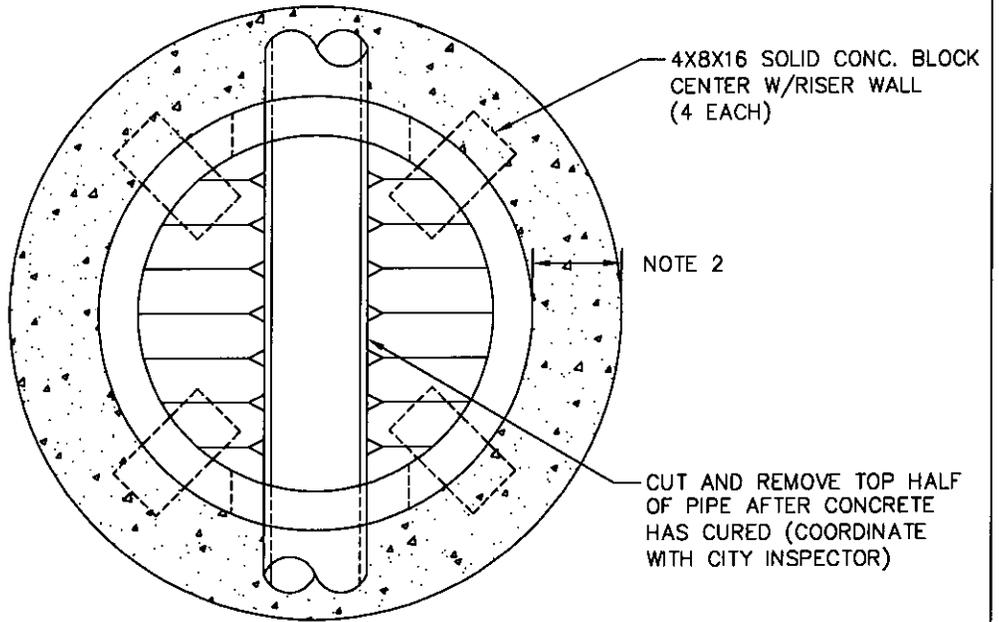


SEWER SYSTEMS
SEALED RING & COVER

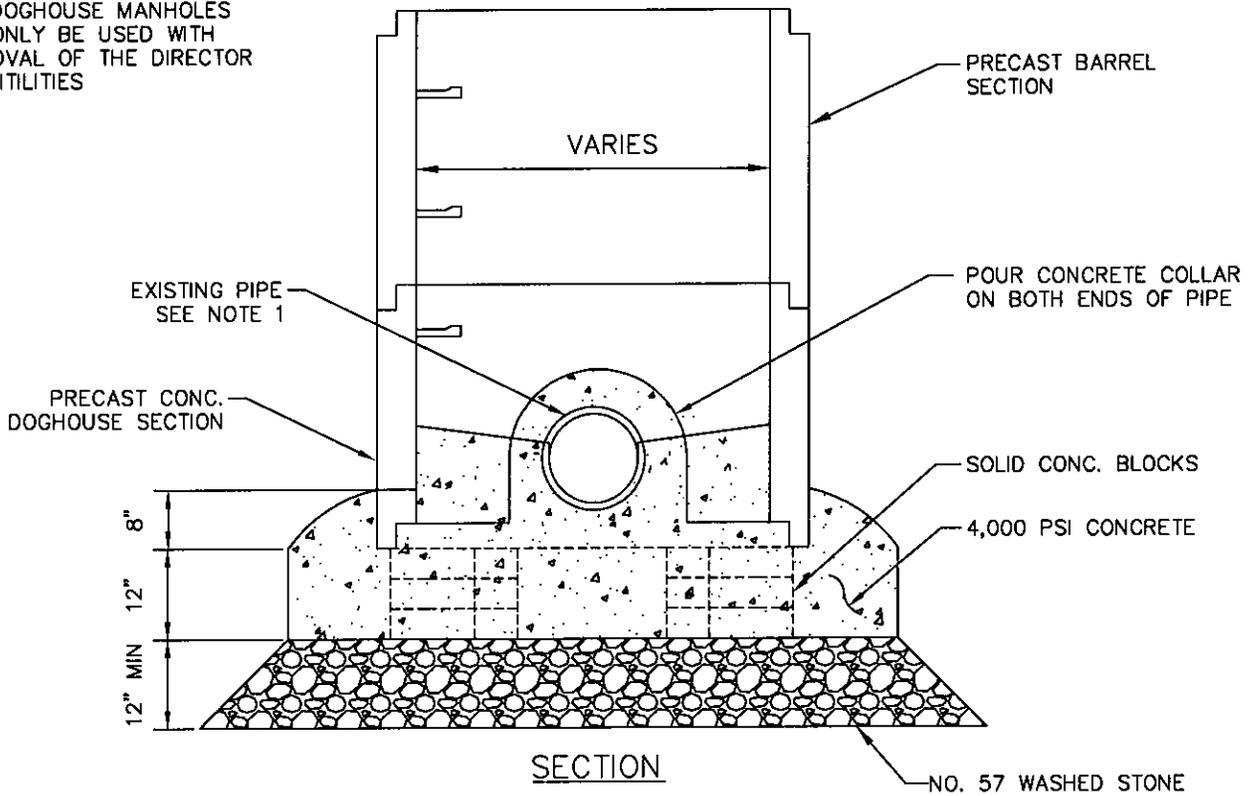
APRIL 2008	
NTS	S-4.0

NOTES:

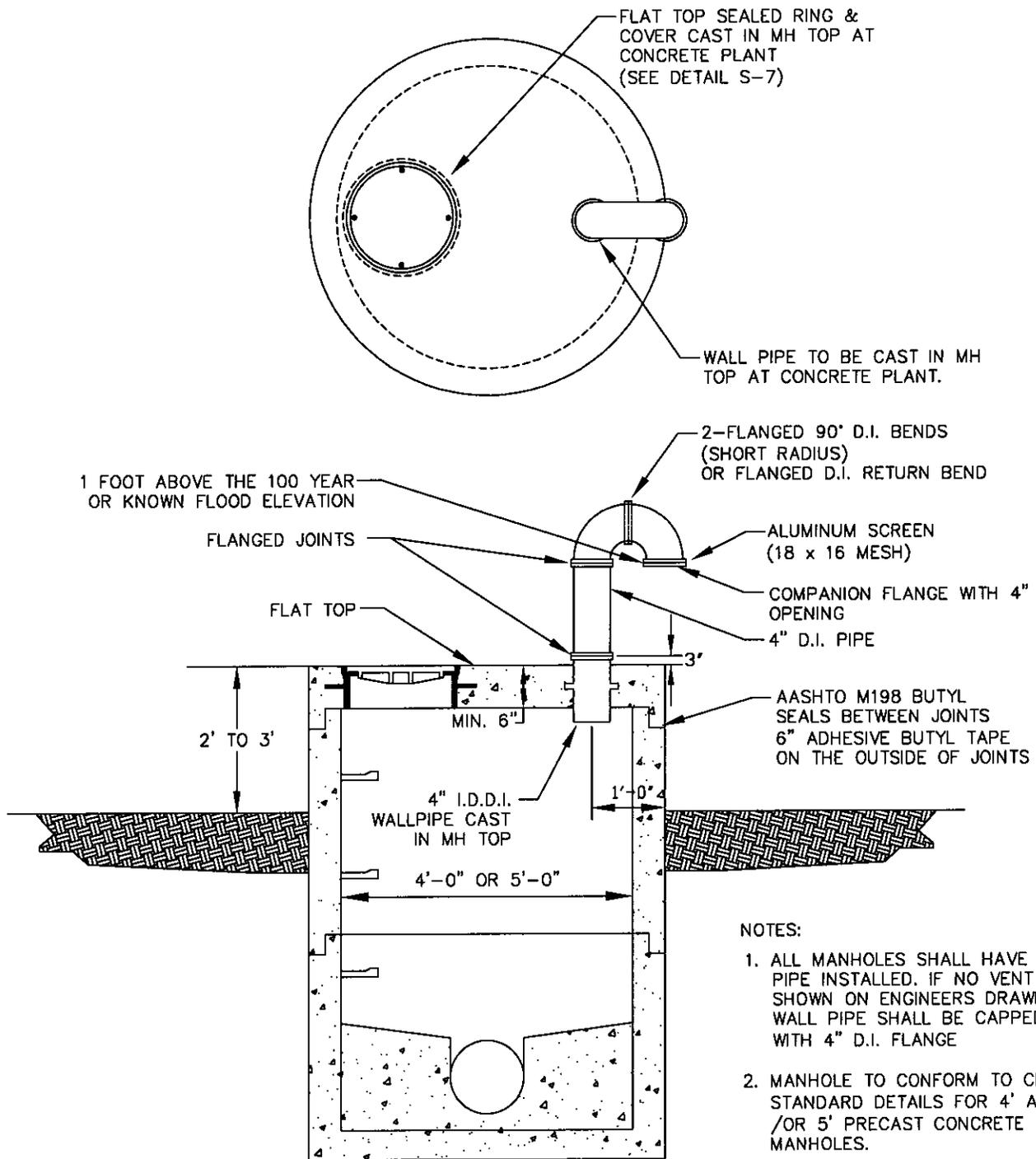
1. FILL DOGHOUSE OPENING AROUND EXISTING PIPE WITH 4,000 PSI CONCRETE.
2. ALLOW CONC. TO FLOW A MIN. 12" BEYOND BASE OF STRUCTURE.
3. MANHOLE TO BE BUILT IN ACCORDANCE WITH CITY STANDARD DETAILS FOR 4' AND/OR 5' MANHOLES.
4. HOLES IN PRECAST UNITS ARE TO BE 4" MIN. TO 8" MAX. LARGER THAN THE O.D. OF THE EXISTING PIPE.
5. DOGHOUSE MANHOLES WILL ONLY BE USED WITH APPROVAL OF THE DIRECTOR OF UTILITIES



PLAN



SECTION



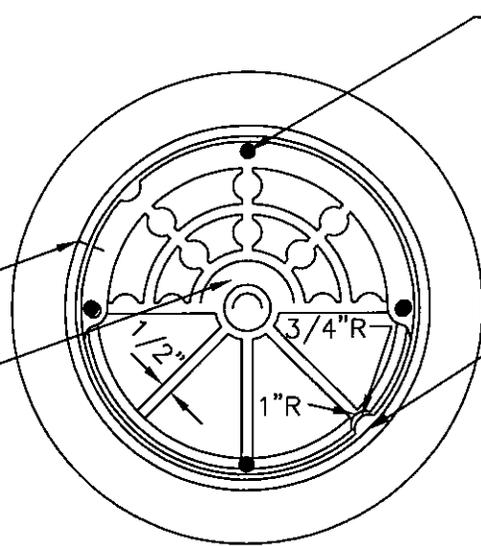
NOTES:

1. ALL MANHOLES SHALL HAVE ALL PIPE INSTALLED. IF NO VENT IS SHOWN ON ENGINEERS DRAWING, WALL PIPE SHALL BE CAPPED WITH 4" D.I. FLANGE
2. MANHOLE TO CONFORM TO CITY STANDARD DETAILS FOR 4' AND /OR 5' PRECAST CONCRETE MANHOLES.
3. INVERT DEPTHS ARE TO BE DIAMETER OF PIPE



MATCH GROOVES

DETAIL LABEL



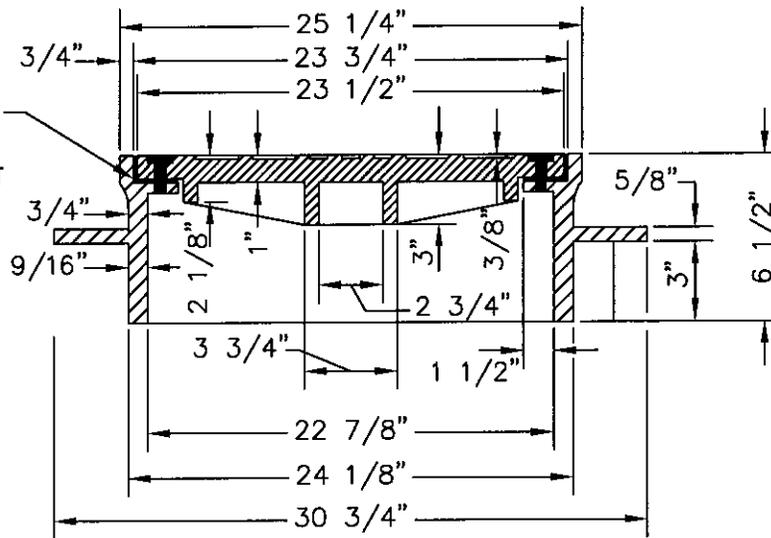
4 - 1/2" x 1 3/4" HEXHEAD STAINLESS STEEL BOLTS
COUNTERSUNK. BOLTS TYPE 316 STAINLESS STEEL.

2 - NON-PENETRATING PICK HOLES

PLAN

<u>MINIMUM AVERAGE WEIGHTS</u>	
RING	190 LBS.
COVER	120 LBS.
	310 LBS.

CONTINUOUS RUBBER GASKET 1/8" THICK
GLUED TO RING SEAT



SECTION

NOTES:

1. RING AND COVER WILL HAVE MACHINED SEAT AND WILL CONFORM TO ASTM A48, CLASS 35B. RING AND COVER WILL BE DESIGNED TO SUPPORT AN H-20 WHEEL LOAD ALSO MEETING NCDOT STANDARD 840.54.
2. DIMENSIONS MAY VARY BUT MANHOLE RING AND COVER ARE TO BE INTERCHANGEABLE WITH DIMENSIONS SHOWN.



SEWER SYSTEMS
FLAT TOP SEALED
RING & COVER

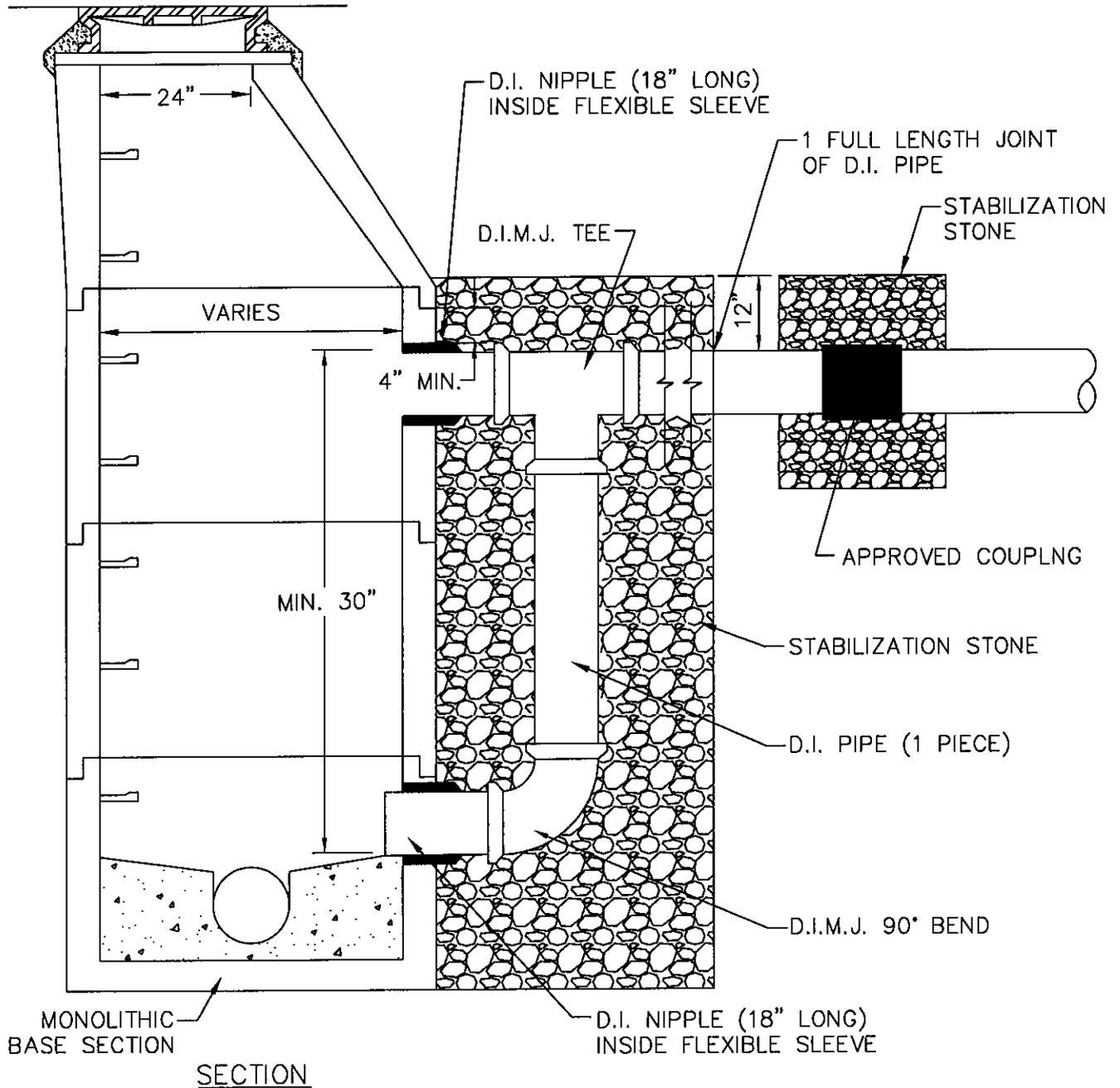
APRIL 2008

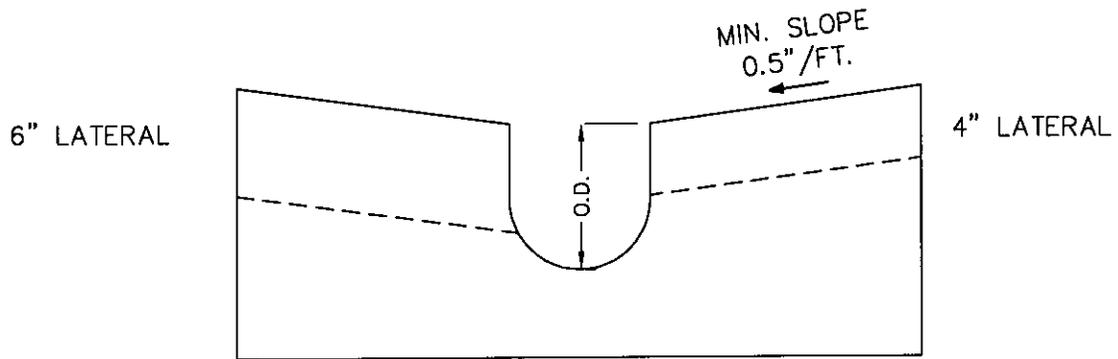
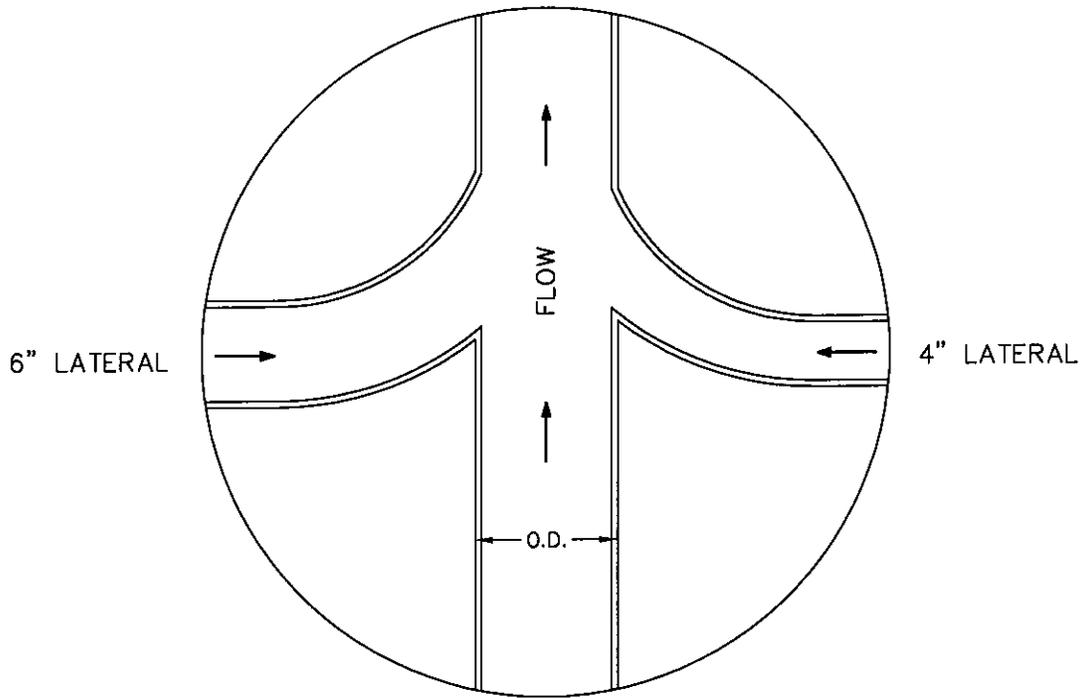
NTS

S-7.0

NOTES:

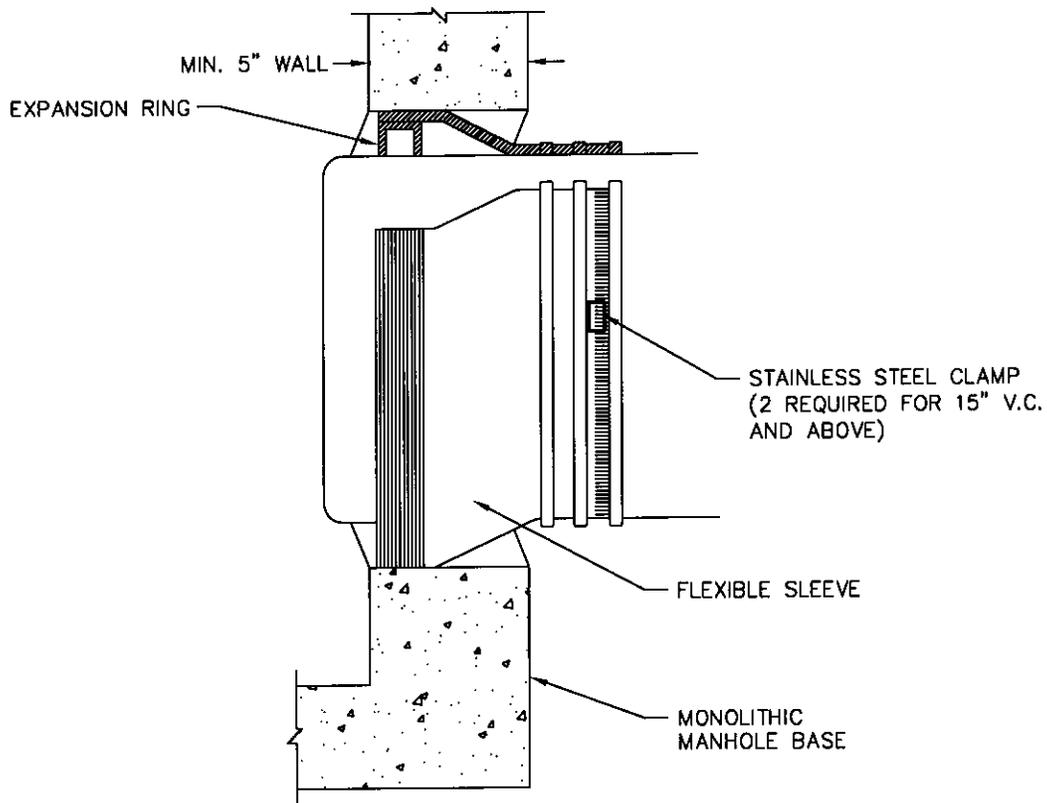
1. MANHOLE TO BE BUILT IN ACCORDANCE WITH CITY STANDARD DETAILS FOR 4' AND/OR 5' MANHOLES.
2. OUTSIDE DROP SHALL NOT ENTER MANHOLE IN CONE SECTION.
3. DROP MANHOLES REQUIRE APPROVAL BY DIRECTOR OF UTILITIES.
4. TEE AND 90° BEND CONNECTED TO PIPE WITH MEGA-LUG TYPE RIGID RESTRAINTS.
5. REQUIRE OUTSIDE DROP TO ENTER MANHOLE ABOVE SHELF OF MANHOLE.





NOTES:

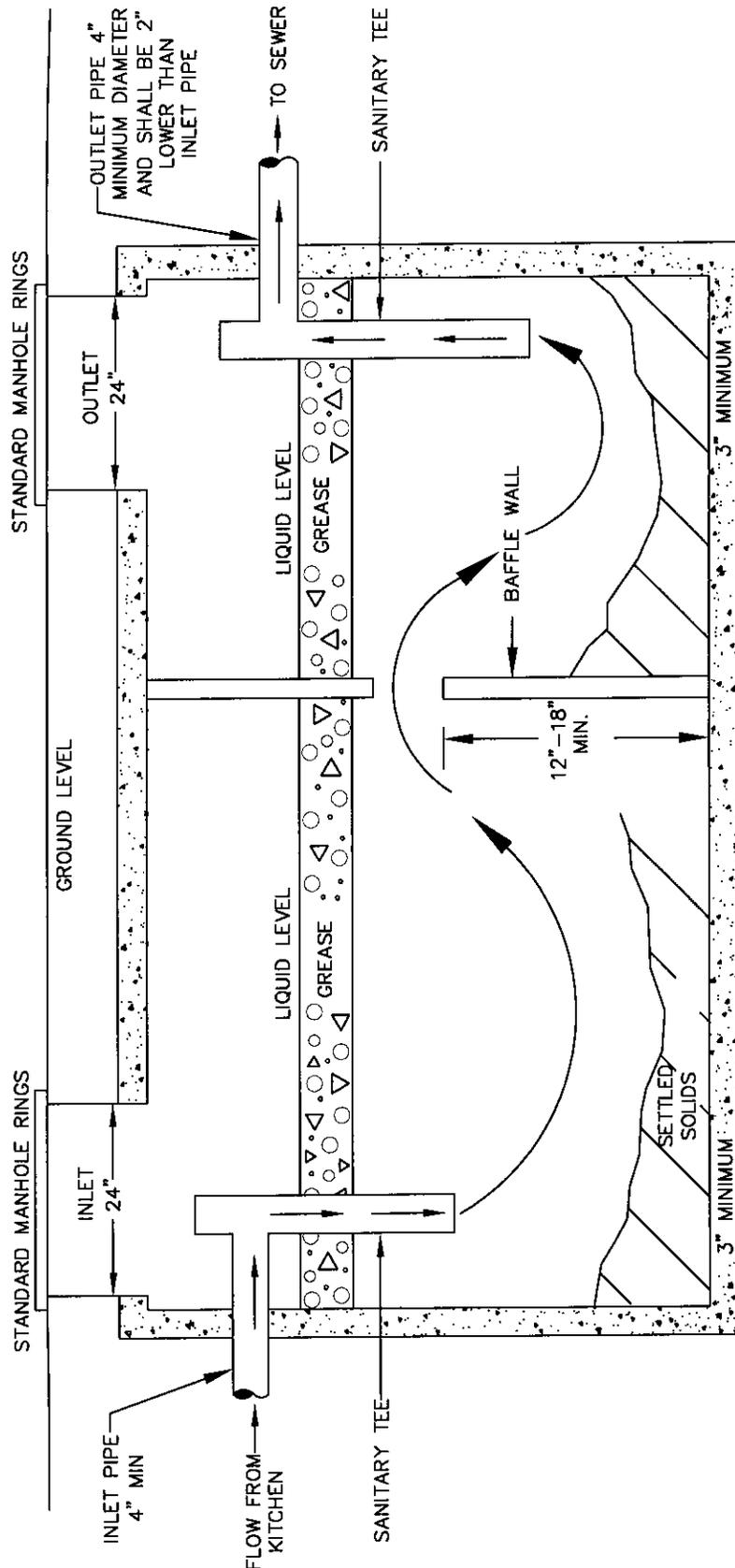
1. O.D. = SEWER MAIN OUTSIDE PIPE DIAMETER. (MIN. 8 INCHES)
2. MANHOLES SHALL HAVE PRECAST, 4000 PSI CONCRETE INVERTS.
INVERT DEPTH = OUTSIDE DIAMETER OF PIPE
INVERT WIDTH = OUTSIDE DIAMETER OF PIPE
3. EACH LATERAL CONNECTION SHALL HAVE A PRECAST INVERT
DIRECTING FLOW IN THE DIRECTION OF THE SEWER.
INVERT DEPTH = OUTSIDE DIAMETER OF PIPE
INVERT WIDTH = OUTSIDE DIAMETER OF PIPE



NOTES:

1. FLEXIBLE MANHOLE SLEEVES SHALL CONFORM TO ASTM 923. SLEEVES BY PRESS-SEAL GASKET CORPORATION, EPCO INC. OR NPC INC. OR EQUIVALENT ARE ACCEPTABLE. MAXIMUM DEFLECTION FOR SLEEVE IS 7' (12%). SLOPES GREATER THAN 12% MUST HAVE SLEEVES DESIGNED FOR HIGHER DEFLECTION.
2. 1/2" x 3" RUBBER LINER ADAPTER GASKET BY PRESS-SEAL GASKET CORP. GASKET TO BE INSTALLED UNDER S.S. CLAMP BETWEEN PIPE AND FLEXIBLE SLEEVE.

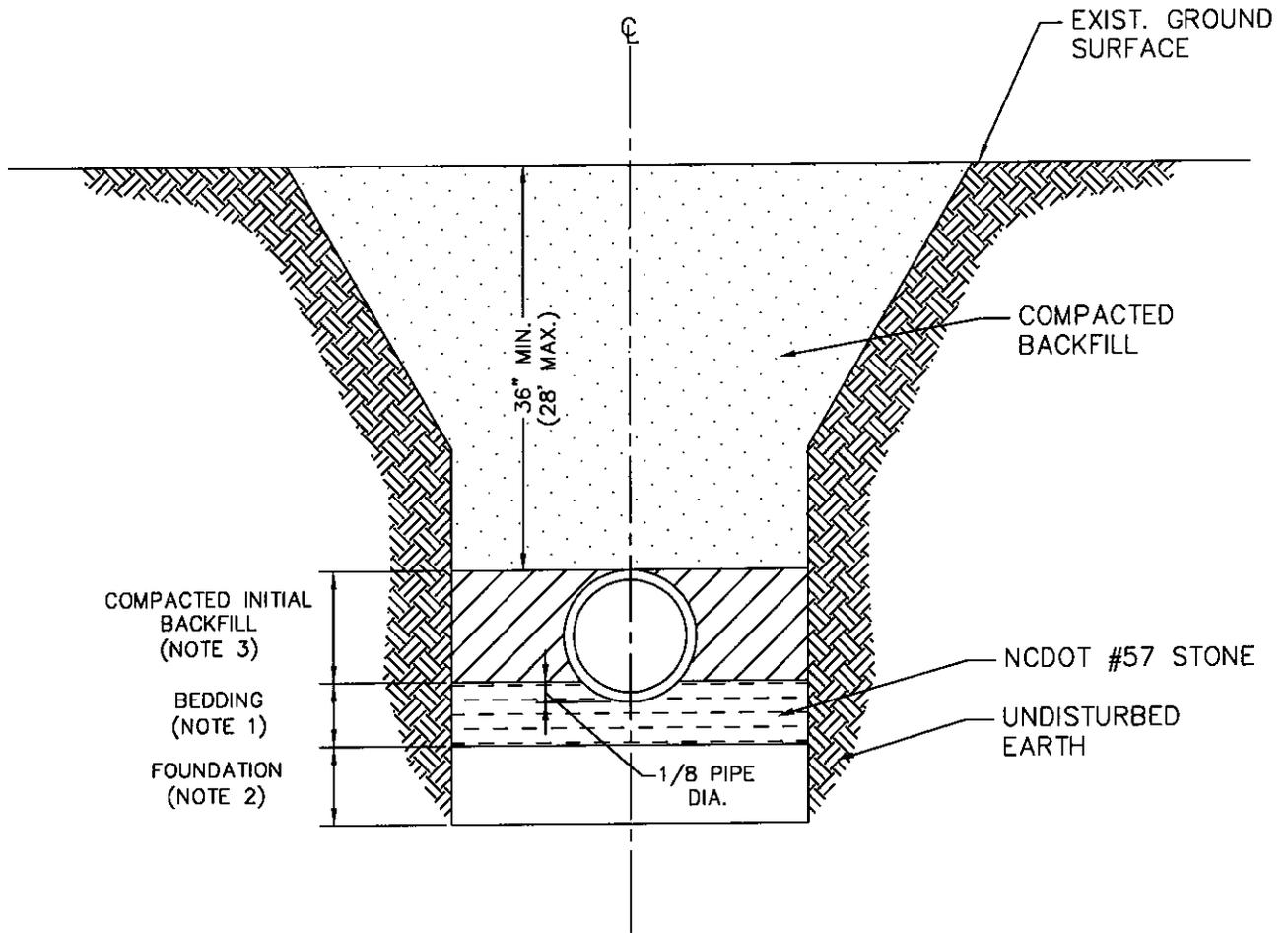
1,000 GALLON OUTDOOR IN-GROUND GREASE INTERCEPTOR



SIDE VIEW

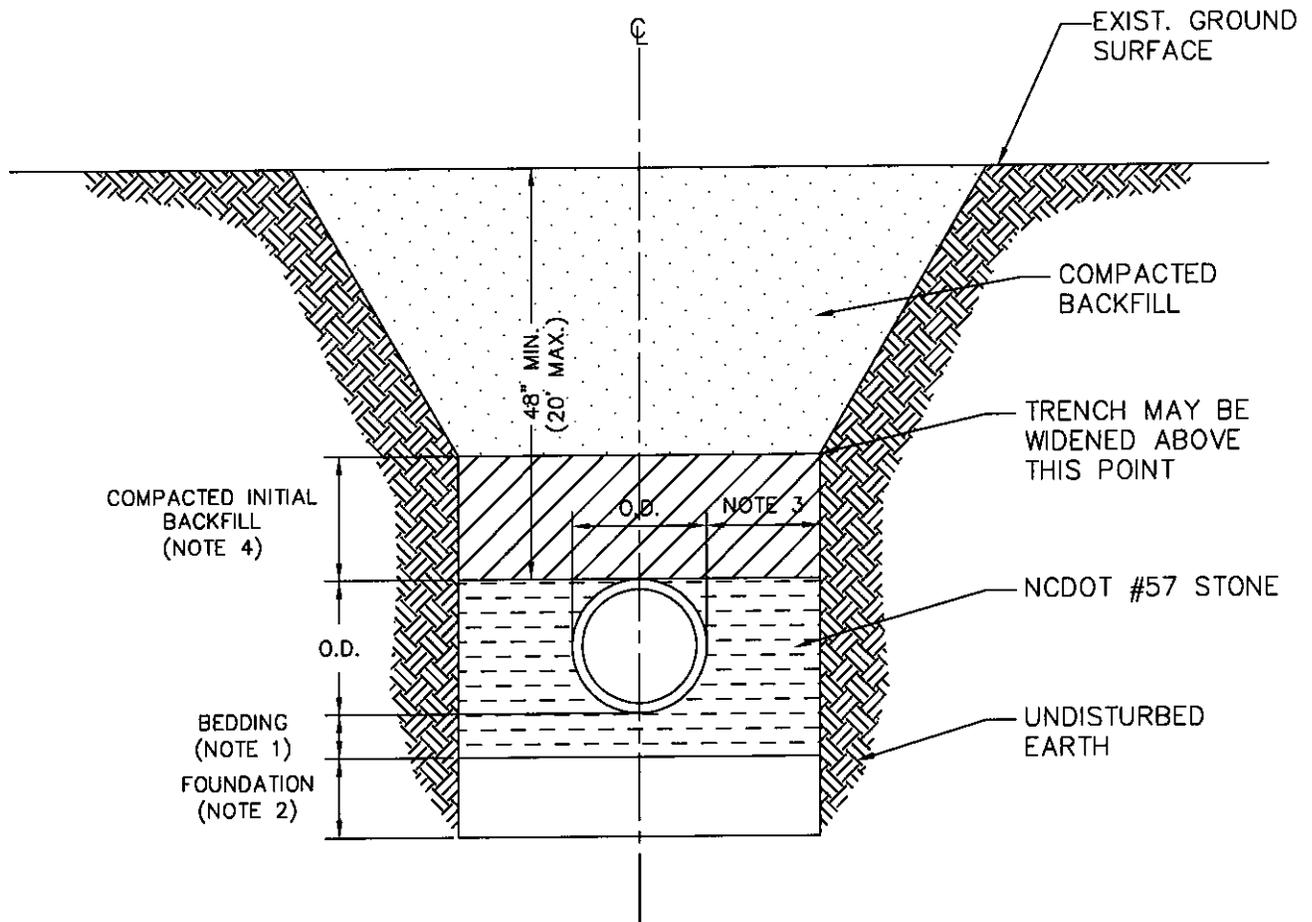
NOTES :

- (1) THIS IS THE SMALLEST TRAP TO BE INSTALLED. TRAPS SHALL BE SIZED FOR MINIMUM 30 MINUTES DETENTION TIME BASED ON AVERAGE DAILY FLOW.
- (2) FIBERGLASS OR 4" BRICK COULD BE USED FOR THE BAFFLE.
- (3) GREASE TRAP SHALL BE LOCATED SO AS TO BE ACCESSIBLE FOR CLEANING
- (4) INLET AND OUTLET SANITARY TEES SHOULD BE OPEN AT TOP TO ALLOW VENTING
- (5) 2" ELEVATION DIFFERENCE BETWEEN INLET AND OUTLET INVERTS
- (6) FLOW THROUGH SECTION IN BAFFLE WALL SHOULD BE A MINIMUM OF 12" - 18" OFF BOTTOM
- (7) ANY VARIANCE FROM THIS DETAIL MUST HAVE PRIOR APPROVAL



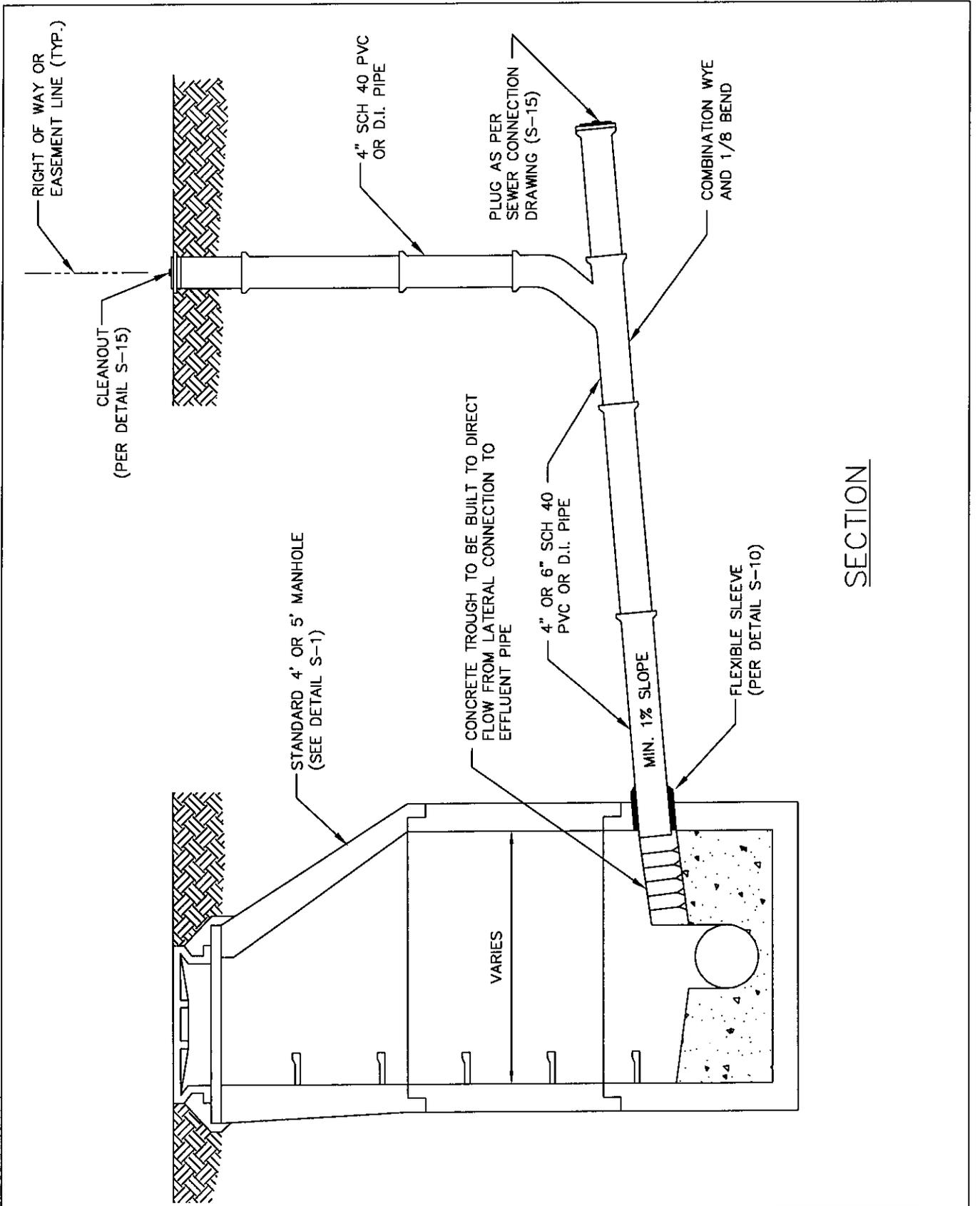
NOTES:

1. 4" TYPICAL, 6" DEPTH IF IN ROCK.
2. FOUNDATION STONE REQUIRED WHEN SOIL CONDITIONS ARE UNSTABLE.
3. INITIAL BACKFILL SHALL BE PLACED IN 6" LIFTS AND COMPACTED. INITIAL BACKFILL SHALL CONTAIN NO MATERIAL OVER 1 1/2" IN DIAMETER, FROZEN LUMPS, OR DEBRIS.
4. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.

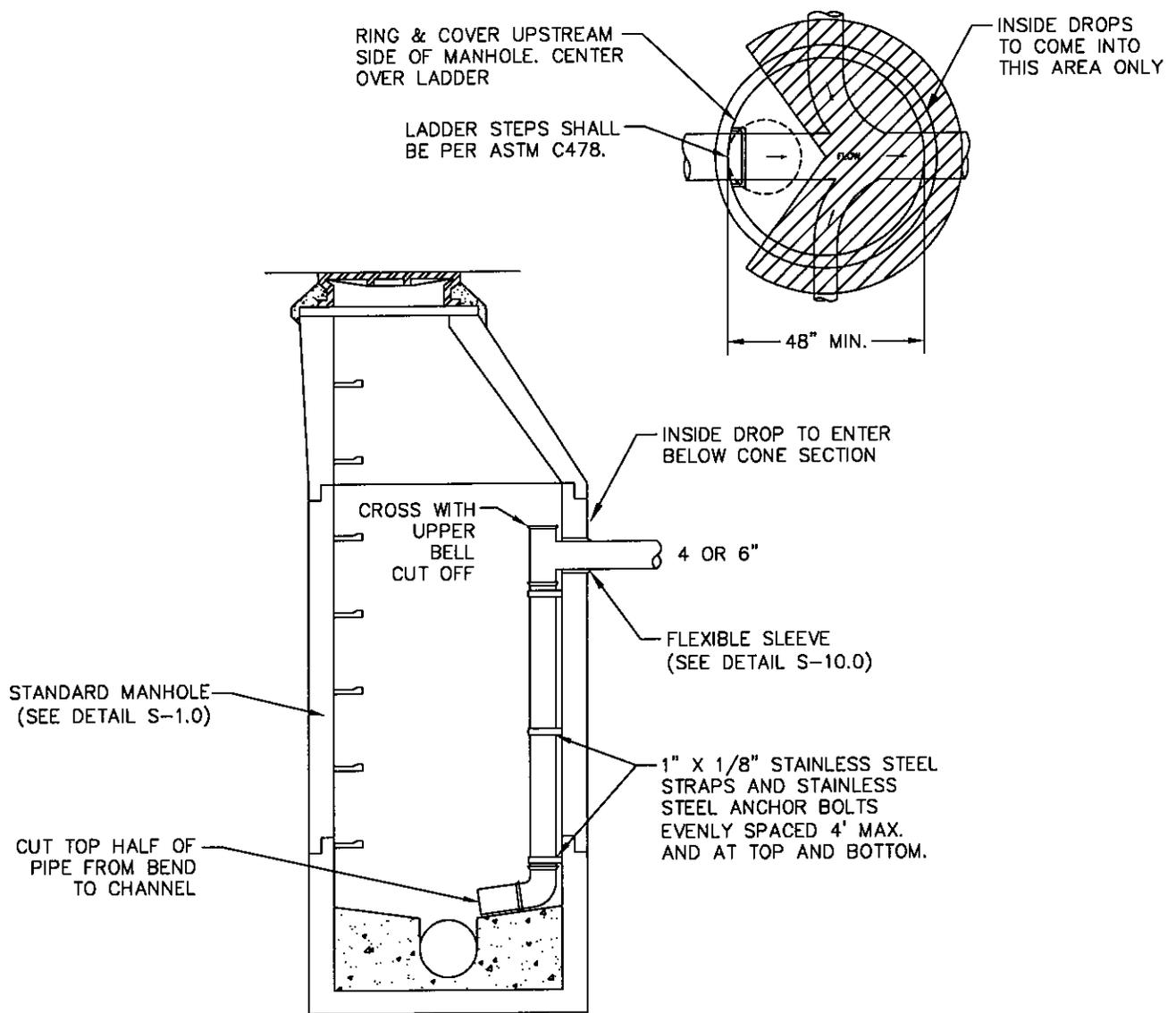


NOTES:

1. 4" TYPICAL, 6" DEPTH IF IN ROCK.
2. FOUNDATION STONE REQUIRED WHEN SOIL CONDITIONS ARE UNSTABLE.
3. CLEAR DISTANCE NOT LESS THAN 6" OR MORE THAN 12" EACH SIDE.
4. INITIAL BACKFILL SHALL BE PLACED IN 6" LIFTS AND COMPACTED. INITIAL BACKFILL SHALL CONTAIN NO MATERIAL OVER 1-1/2" IN DIAMETER, FROZEN LUMPS, OR DEBRIS.
5. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
6. PVC PIPE MATERIAL SHALL BE ASTM 03034 WITH A DR OF 21 OR LESS, OR AWWA C900 DR 18.



SECTION



SECTION

NOTES

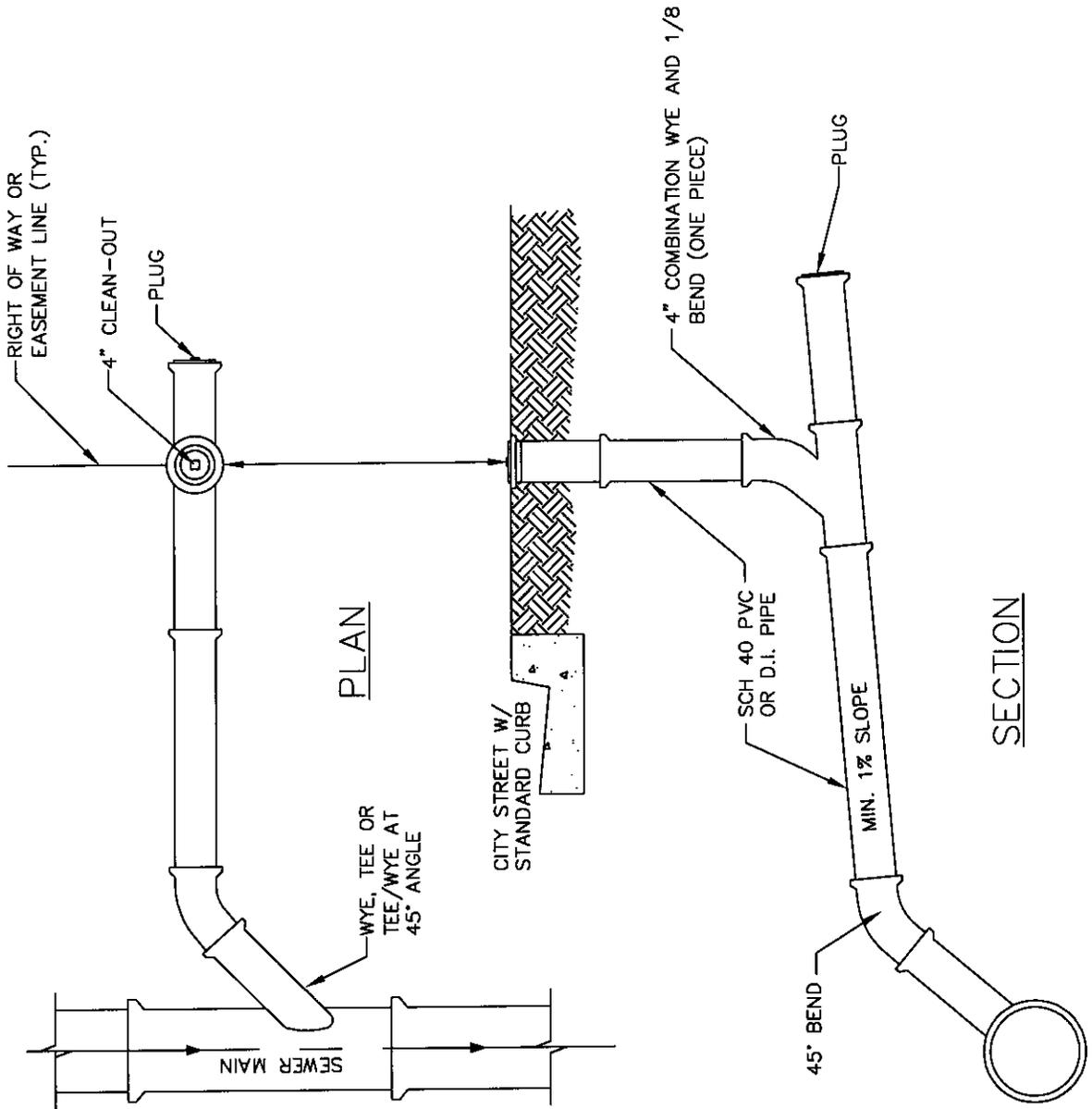
1. INSIDE DROP CONNECTION WILL TYPICALLY NOT BE ALLOWED. WHEN EXTENUATING CIRCUMSTANCES ARE ENCOUNTERED, THE DIRECTOR OF UTILITIES MAY APPROVE. IF APPROVED, ALL CONSTRUCTION MUST BE COMPLETED PER THIS DETAIL AND AS DIRECTED BY THE DIRECTOR OF UTILITIES.
2. DROP CONNECTION PIPE DIAMETER AND FITTINGS SHALL BE EQUAL TO OR GREATER THAN THE DIAMETER OF THE SEWER SERVICE. PIPE MATERIALS AND FITTINGS SHALL MEET THE REQUIREMENTS OF THE CITY STANDARD SPECIFICATIONS FOR SEWER SERVICE LINES.



SEWER SYSTEMS
**INSIDE DROP
 SERVICE CONNECTION**

APRIL 2008

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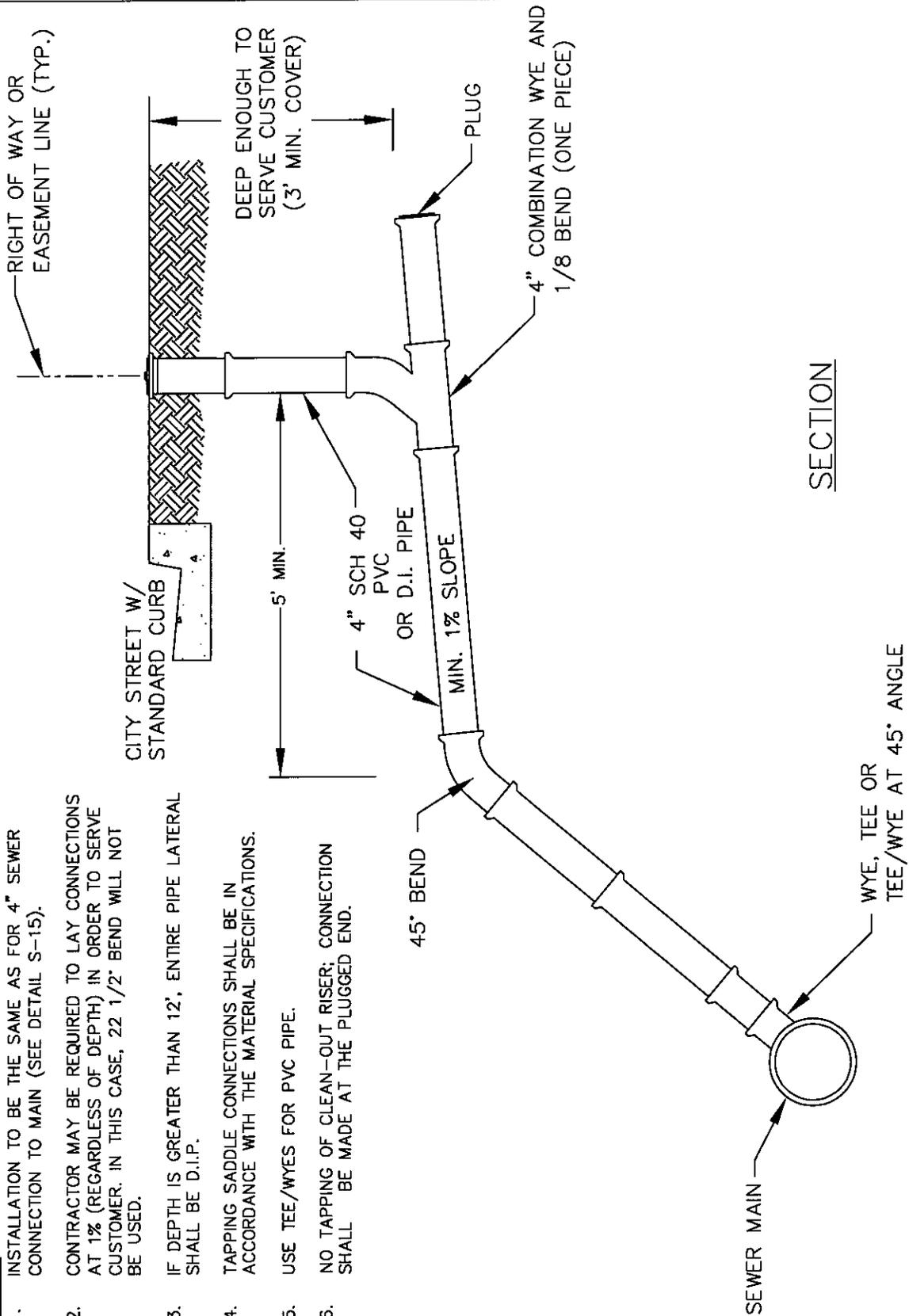


NOTES:

1. LOCATE CLEAN-OUT AT ROW OR EASEMENT LINE.
2. DO NOT INSTALL C.O. INSIDE A FENCE.
3. IF LATERAL HAS LESS THAN 3' OF COVER, LATERAL MUST BE DIP.
4. LATERAL MUST BE INSTALLED PERPENDICULAR TO MAIN AND EXTENDED TO THE ROW OR EASEMENT LINE.
5. NO TAPPING SADDLES ALLOWED FOR NEW CONSTRUCTION. IF USED OTHERWISE, SADDLE SHALL BE ROMAC INDUSTRIES STYLE CB OR EQUAL TO.
6. USE TEE/WYES FOR PVC PIPE.
7. NO TAPPING OF CLEANOUT RISER, CONNECTION MUST BE MADE AT THE PLUGGED END.

NOTES:

1. INSTALLATION TO BE THE SAME AS FOR 4" SEWER CONNECTION TO MAIN (SEE DETAIL S-15).
2. CONTRACTOR MAY BE REQUIRED TO LAY CONNECTIONS AT 1% (REGARDLESS OF DEPTH) IN ORDER TO SERVE CUSTOMER. IN THIS CASE, 22 1/2" BEND WILL NOT BE USED.
3. IF DEPTH IS GREATER THAN 12', ENTIRE PIPE LATERAL SHALL BE D.I.P.
4. TAPPING SADDLE CONNECTIONS SHALL BE IN ACCORDANCE WITH THE MATERIAL SPECIFICATIONS.
5. USE TEE/WYES FOR PVC PIPE.
6. NO TAPPING OF CLEAN-OUT RISER; CONNECTION SHALL BE MADE AT THE PLUGGED END.



SECTION

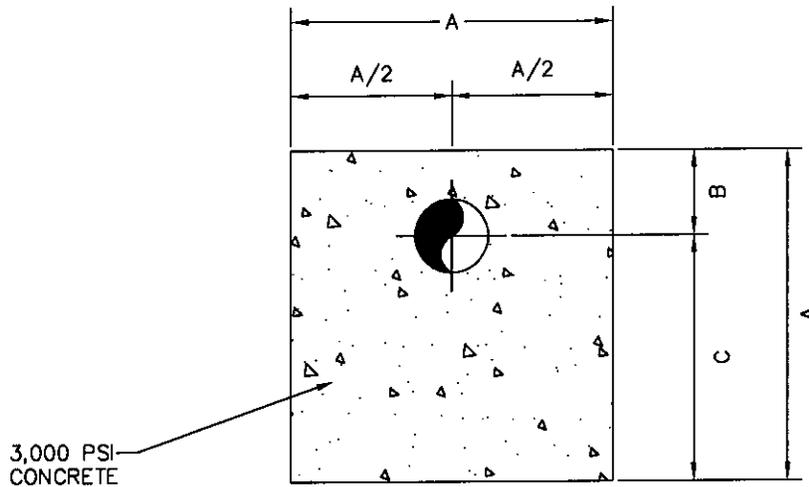


SEWER SYSTEMS
DEEP 4" SEWER
LATERAL

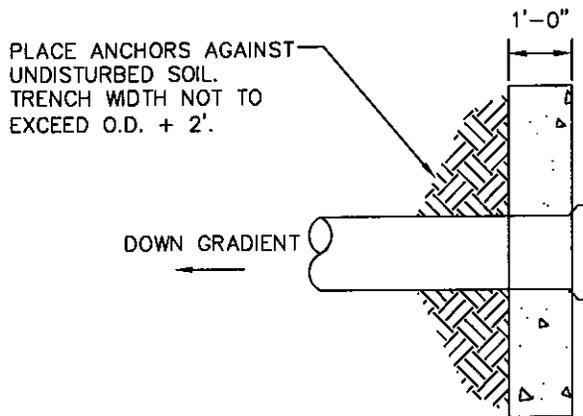
OCTOBER 2008

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SECTION

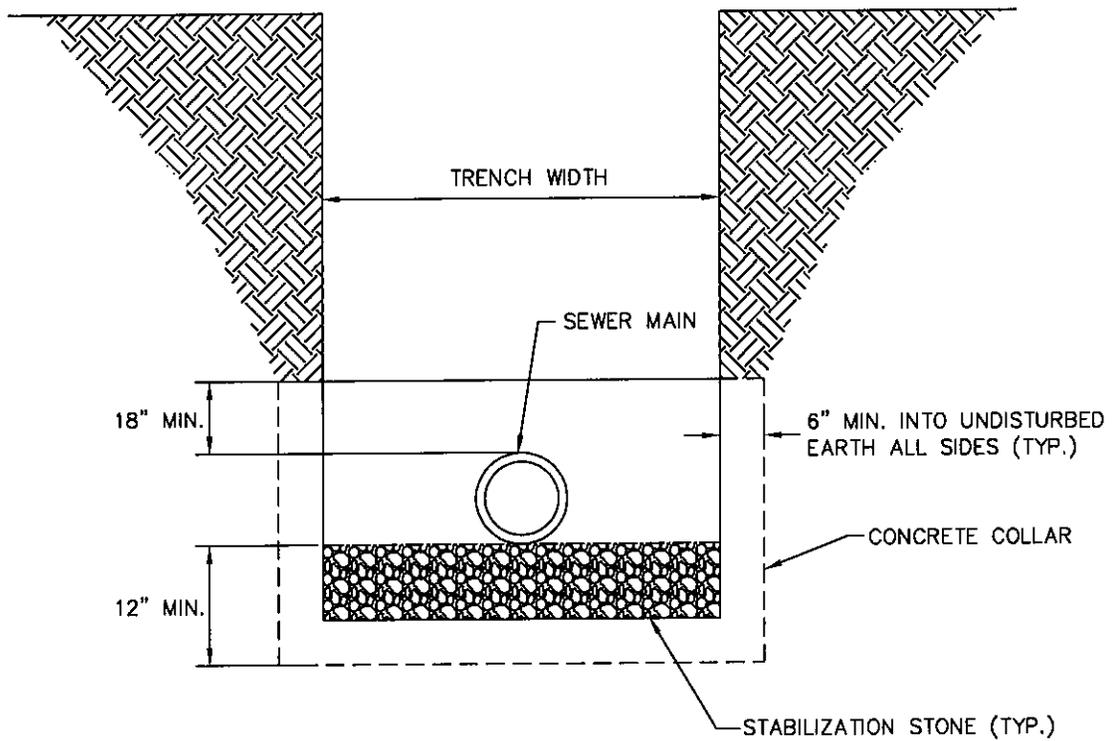
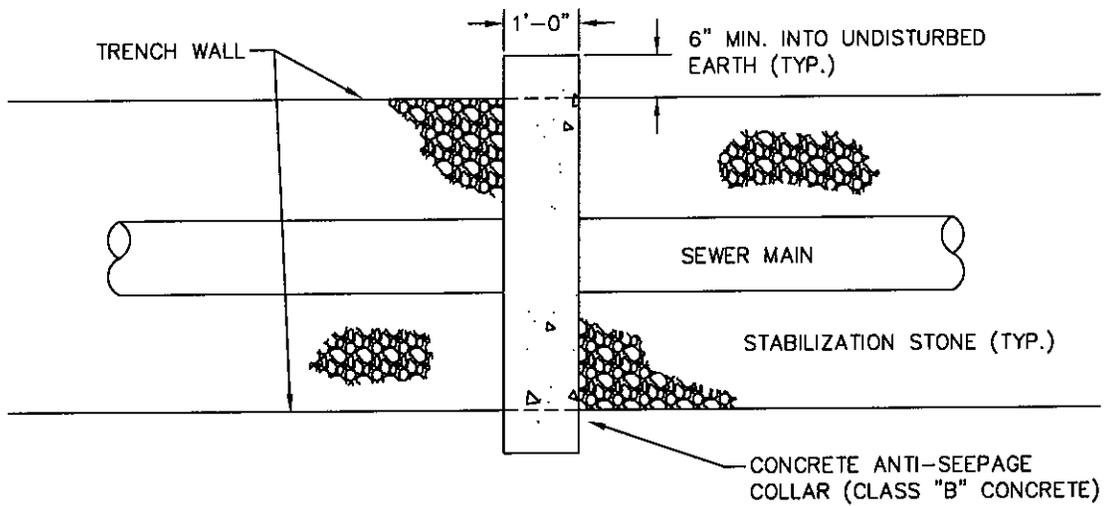


PLAN

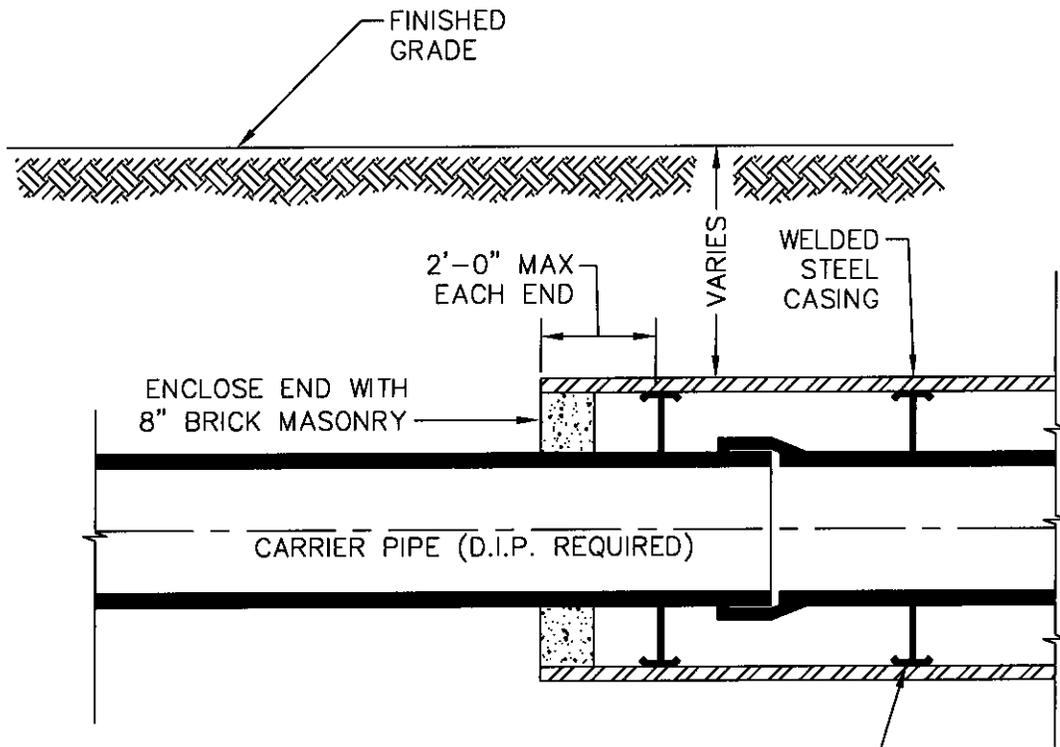
	"A" DIMENSION	"B" DIMENSION	"C" DIMENSION
8" DIP	3'	1'	2'

NOTES:

1. ANCHORS REQUIRED FOR SEWERS WITH SLOPES GREATER THAN 20%.
2. ANCHORS SHALL BE PLACED DIRECTLY BEHIND THE BELL WITH THE BELL FACING UPSTREAM.
3. MINIMUM SPACING: SLOPES 18% TO 35% - 36 FEET
SLOPES 36% TO 50% - 18 FEET



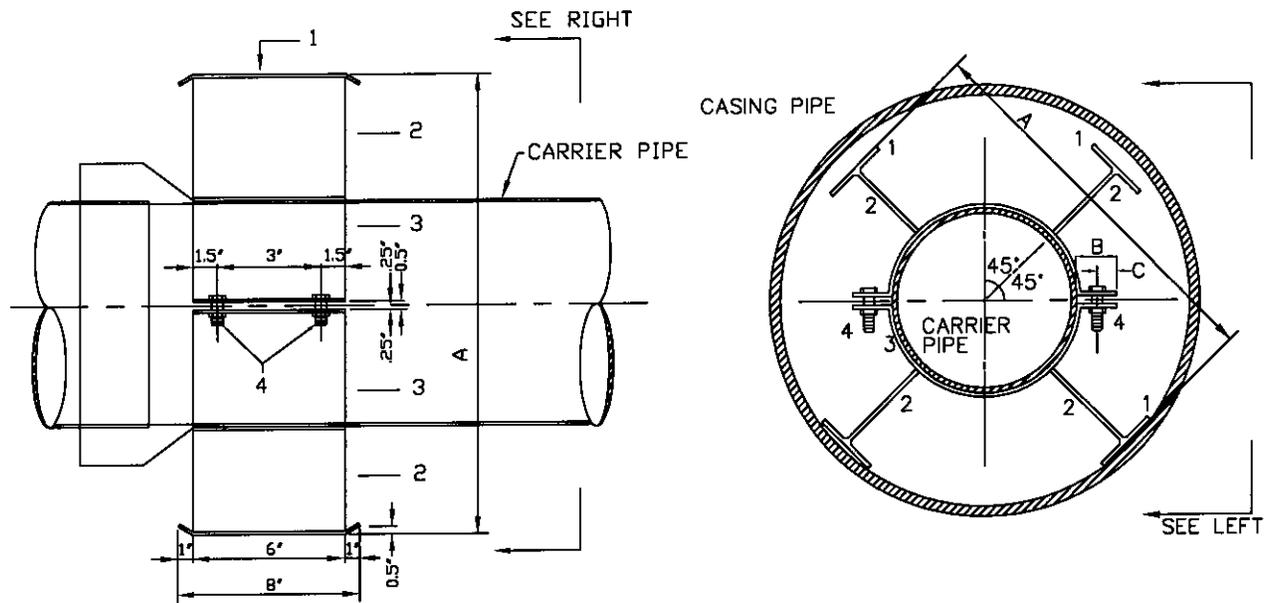
NOTE:
COLLAR TO BE INSTALLED AS DIRECTED BY
DIRECTOR OF UTILITIES.



CASING SPIDERS @ 9' O.C. MAX.
 SPACERS TO BE FABRICATED AFTER
 BORE IS COMPLETE. DIMENSION AS
 NECESSARY TO PROVIDE DESIGN
 SLOPE OF SANITARY SEWER.
 (SEE DETAIL S-20)

NOTES:

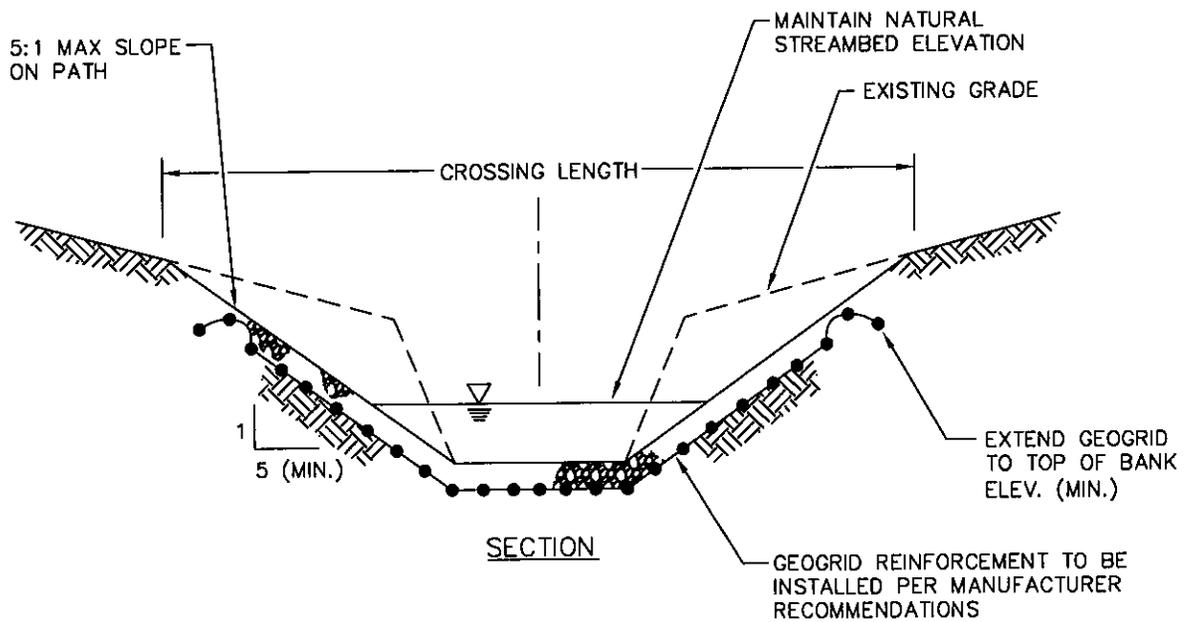
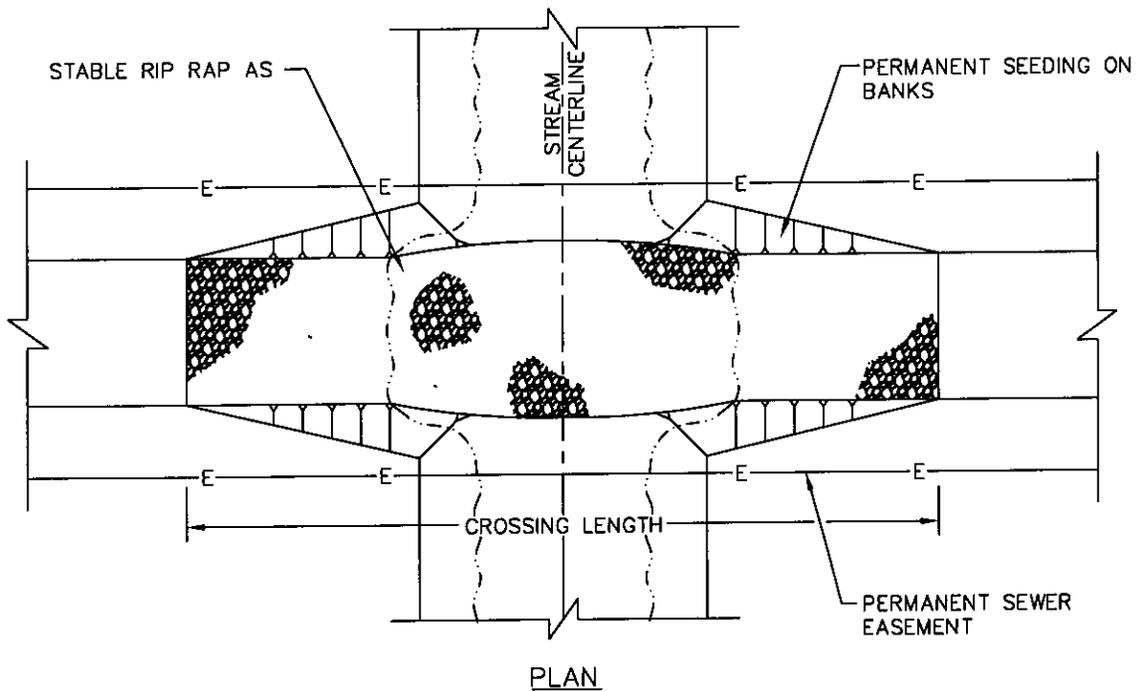
1. CASING SHALL MEET THE REQUIREMENTS OF N.C. DEPARTMENT OF TRANSPORTATION, RAILROAD OR OTHER APPLICABLE REGULATORY AGENCY.
2. CASING SPIDERS TO BE APPROVED BY DIRECTOR OF UTILITIES.
3. ALL CARRIER PIPE SHALL BE RESTRAINED JOINT D.I.P.



CARRIER PIPE		DIMENSIONS		
NOMINAL DIA.	O. D.	A	B	C
6"	6.90"	11"	1 1/4"	5/8"
8"	9.05"	16 1/2"	2 1/4"	1"
12"	13.20"	22 1/2"	3"	1 1/4"
16"	17.40"	28 1/2"	3 1/2"	1 1/2"
24"	25.80"	34 1/4"	4"	2"
PIPE SUPPORT ASSEMBLY MARK NUMBER				
NOMINAL DIA.	1	2	3	4
6"	8" x 2" x 1/4" PL	6" x 1 1/2" x 1/4" PL	6" x 1/4" PL	3/8" NUT & BOLT
8"	8" x 3" x 1/4" PL	6" x 3 1/4" x 1/4" PL	6" x 1/4" PL	1/2" NUT & BOLT
12"	8" x 4" x 1/4" PL	6" x 3 5/8" x 3/8" PL	6" x 3/8" PL	1/2" NUT & BOLT
16"	8" x 4" x 3/8" PL	6" x 4 3/4" x 3/8" PL	6" x 3/8" PL	1/2" NUT & BOLT
24"	8" x 4" x 3/8" PL	6" x 5 1/2" x 3/8" PL	6" x 3/8" PL	1/2" NUT & BOLT

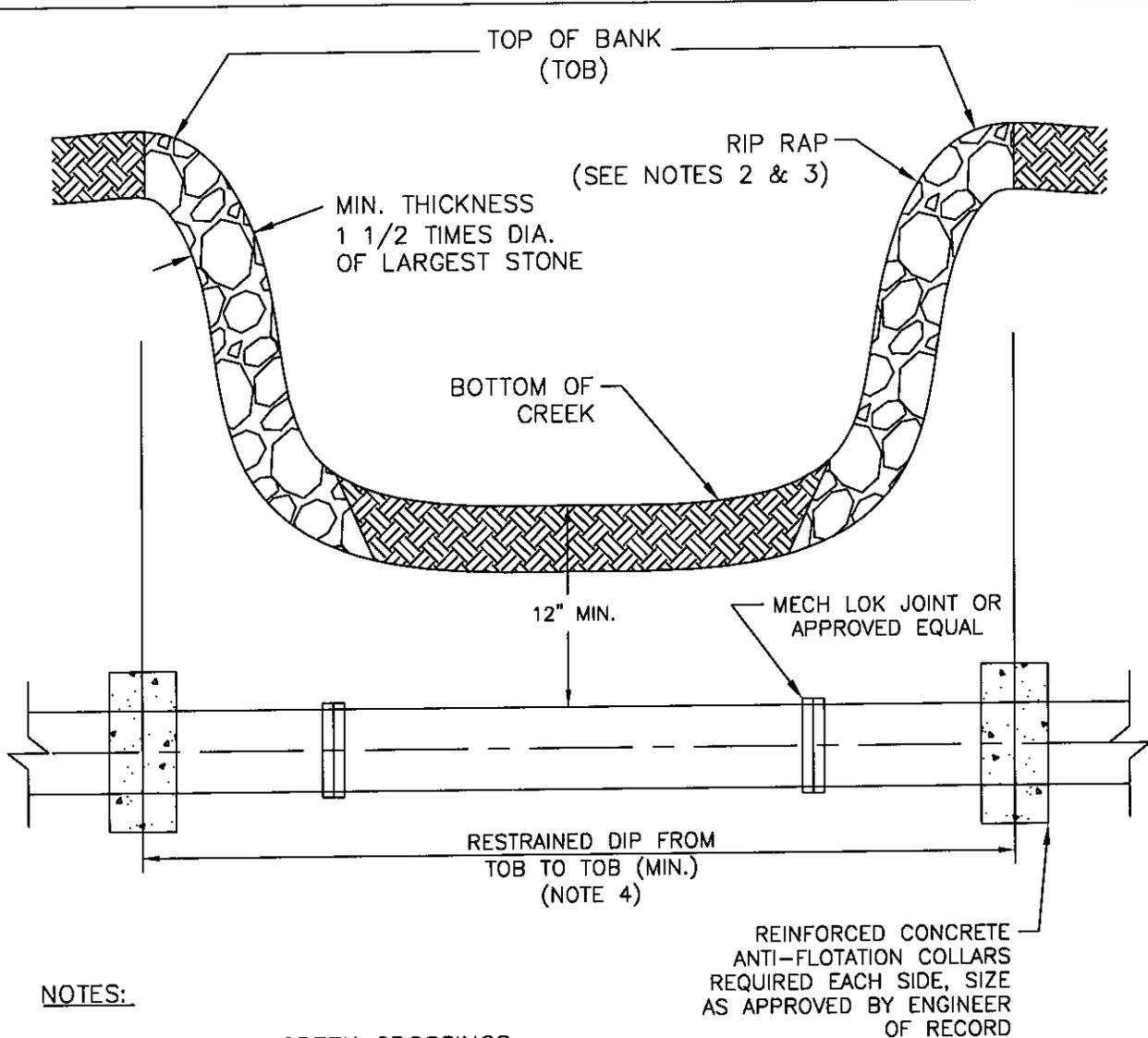
NOTES:

1. PROVIDE TWO SPIDERS PER JOINT OF CARRIER PIPE.
2. SPIDERS, NUTS, & WASHERS SHALL BE STAINLESS STEEL.
3. ADJUST HEIGHT OF SPIDERS AS NECESSARY TO MAINTAIN SPECIFIED SLOPE.
4. CASING PIPE NOT SHOWN.
5. LEGS ROTATED OUT OF POSITION FOR CLARITY.



NOTES:

1. CROSSING LOCATION TO BE COORDINATED WITH THE DIRECTOR OF UTILITIES.
2. COVER RIP RAP WITH 4" OF STABILIZATION STONE.
3. SIZE OF RIP RAP MUST BE LARGE ENOUGH TO REMAIN IN PLACE AND GRADED LEVEL TO ALLOW MAINTENANCE VEHICLES TO CROSS.



NOTES:

1. TYPICAL ALL CREEK CROSSINGS.
2. RIP RAP TO BE PLACED ON STREAM BANK. QUANTITY AND SIZE TO BE BASED ON SIZE OF STREAM, ACCORDING TO STATE EROSION CONTROL RULES AND CATAWBA COUNTY REQUIREMENTS.
3. FILTER FABRIC TO BE PLACED UNDER RIP RAP AND KEYED INTO EMBANKMENT.
4. CENTER OF DIP JOINT TO BE AT STREAM CENTERLINE.
5. BACKFILL MATERIAL WITHIN STREAM SHALL BE STONE, COARSE AGGREGATE, WASHED GRAVEL OR OTHER MATERIAL THAT WILL NOT READILY ERODE, CAUSE SILTATION, OR CORRODE THE PIPE.
6. NUMBER OF STREAM CROSSINGS SHALL BE MINIMIZED.
7. SEWERS CROSSING STREAMS SHALL BE DESIGNED TO BE PERPENDICULAR TO STREAM FLOW.

REINFORCED CONCRETE ANTI-FLOTATION COLLARS REQUIRED EACH SIDE, SIZE AS APPROVED BY ENGINEER OF RECORD

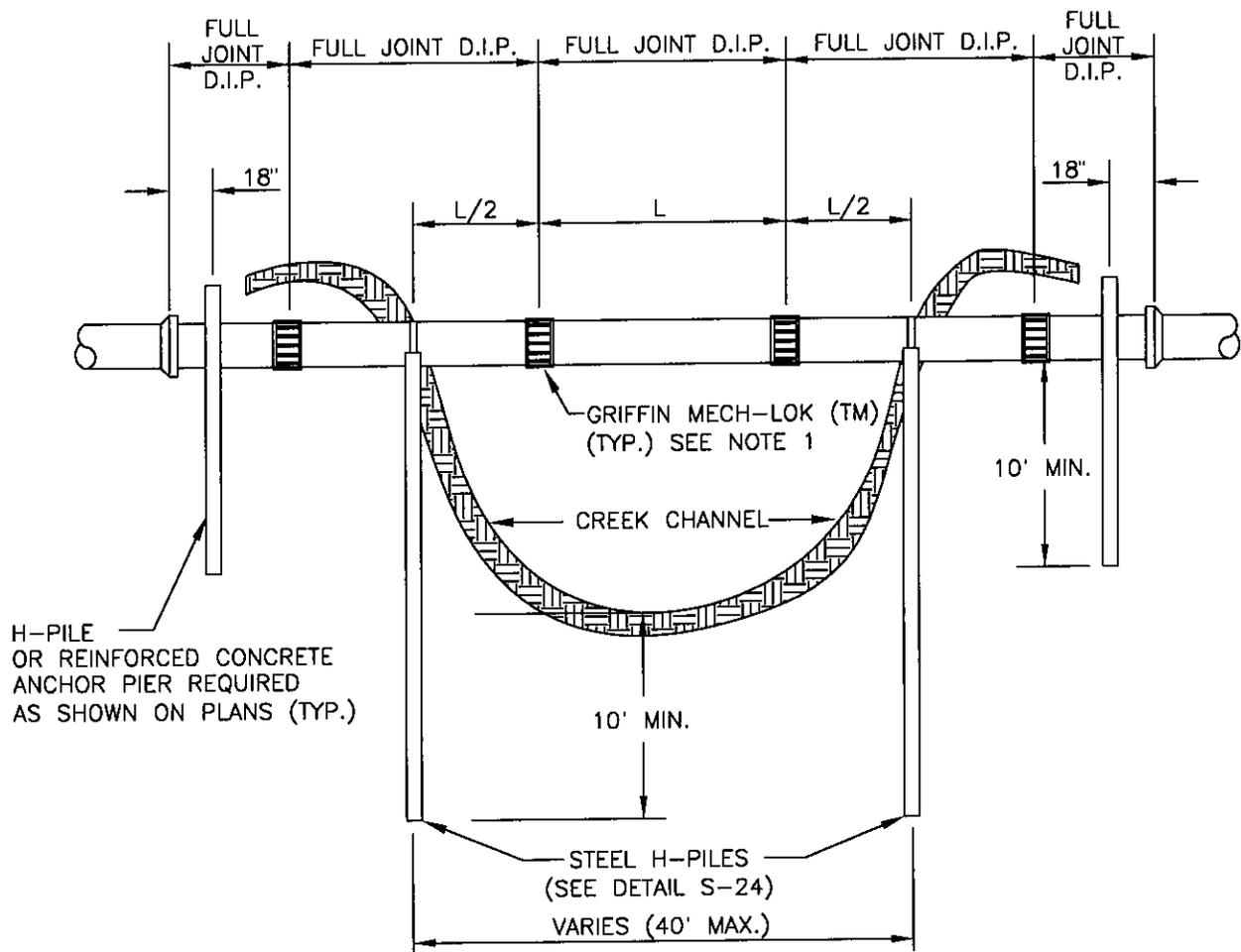


SEWER SYSTEMS
STABILIZATION AT
SUBAQUEOUS CREEK
CROSSING

APRIL 2008

NTS

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H-PILE
OR REINFORCED CONCRETE
ANCHOR PIER REQUIRED
AS SHOWN ON PLANS (TYP.)

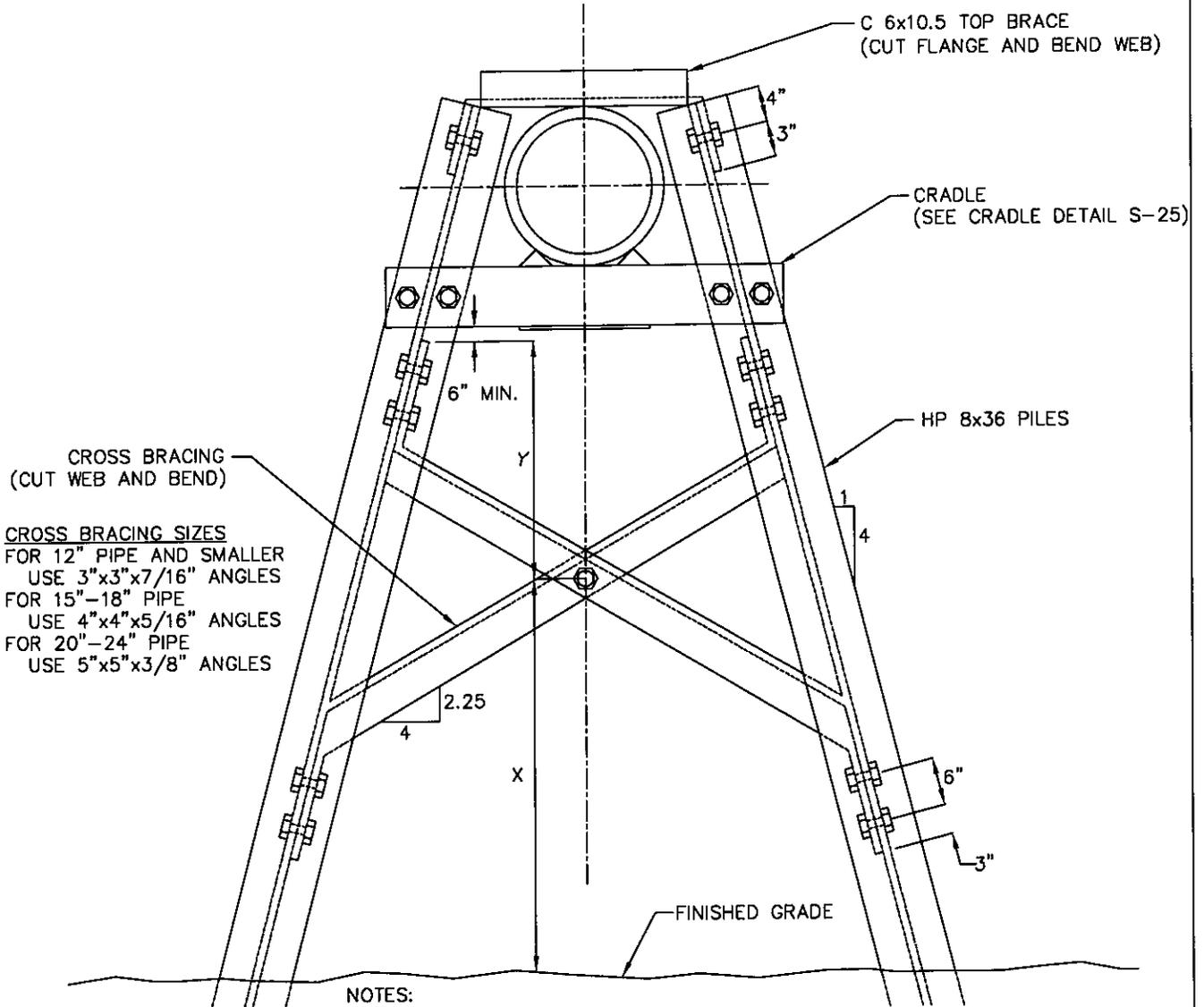
- NOTES:
1. ALL JOINTS AND PIPE BETWEEN SUPPORTS SHALL BE GRIFFIN MECH-LOK (TM) OR APPROVED EQUIVALENT. PIPE SHALL BE DIP PER THE MATERIAL SECTION.
 2. MINIMUM DEPTHS SHALL BE IN UNDISTURBED SOIL.
 3. MAXIMUM HEIGHT FROM PIPE TO UNDISTURBED SOIL IS 20 FEET.
 4. MAX. CLEAR SPAN IS 40' AND MAX. DIAMETER IS 36".
 5. AERIAL CROSSING SHALL BE AVOIDED AND MUST BE APPROVED BY THE DIRECTOR OF UTILITIES.



SEWER SYSTEMS
AERIAL CREEK CROSSING
ON STEEL H-PILES

APRIL 2008

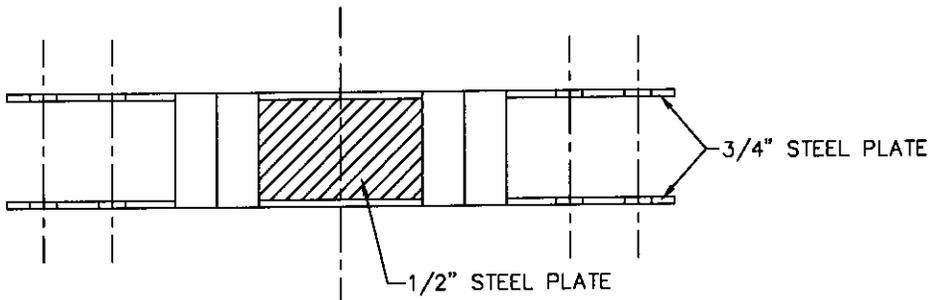
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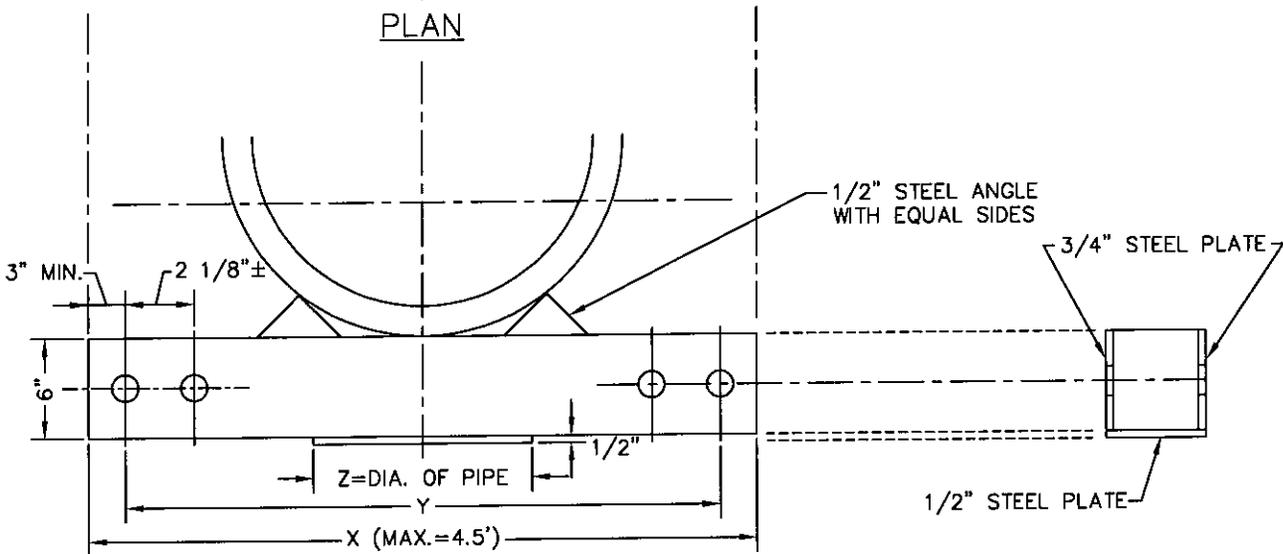
CROSS BRACING SIZES
 FOR 12" PIPE AND SMALLER
 USE 3"x3"x7/16" ANGLES
 FOR 15"-18" PIPE
 USE 4"x4"x5/16" ANGLES
 FOR 20"-24" PIPE
 USE 5"x5"x3/8" ANGLES

NOTES:

1. MAXIMUM HEIGHT FROM PIPE TO UNDISTURBED SOIL IS 20 FEET.
2. PIPE SHALL FIT SNUGLY.
3. X SHALL EQUAL Y OR AS APPROVED.
4. FOR 8 INCH TO 18 INCH PIPE ALL BOLTS SHALL BE 7/8" IN DIAMETER AND MEET ASTM A325. FOR 24" PIPE, BOLTS ON THE CRADLE SHALL BE 1" IN DIAMETER AND MEET ASTM A490. BOLTS SHALL BE AT LEAST 2 1/2" LONG. PLAIN ROUND WASHERS WILL BE REQUIRED.
5. BOLT HOLES SHALL BE 1/16" LARGER THAN THE DIAMETER OF THE BOLT AND SHALL BE DRILLED.
6. ALL STEEL SHALL BE A36 STEEL.
7. SEE STEEL H-PILE SPECIFICATIONS.
8. PILES SHALL BE DRIVEN TO A MINIMUM DEPTH OF TEN (10) FEET BELOW GROUND OR AS DIRECTED BY THE ENGINEER.
9. PILES SHALL BE DRIVEN TO A DEPTH AT WHICH PILE BEARING CAPACITY IS TWENTY (20) TONS OR AS APPROVED BY THE ENGINEER.
10. THESE PIERS SHALL BE USED FOR DUCTILE IRON PIPE OR HIGH STRENGTH STEEL PIPE ONLY.
11. CONTRACTOR MAY SUBSTITUTE W8x35 FOR HP8x36 FOR THE PILES.



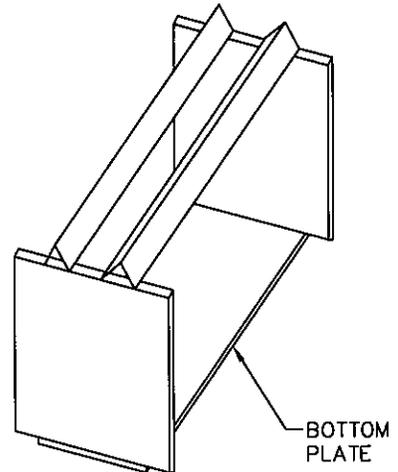
PLAN



SECTION

NOTES:

1. DIMENSIONS X AND Y VARY ACCORDING TO PIPE SIZE AND ELEVATION OF PIPE. THE MAXIMUM LENGTH OF X IS 4.5'.
2. DIMENSION Z IS EQUAL TO THE DIAMETER OF THE PIPE.
3. ALL STEEL PLATES SHALL MEET ASTM A36.
4. FOR 8 INCH - 18 INCH PIPE ALL BOLTS SHALL BE 7/8" IN DIAMETER AND MEET ASTM A325. FOR 24 INCH PIPE, BOLTS ON THE CRADLE SHALL BE 1" DIAMETER AND MEET ASTM A490. BOLTS SHALL BE AT LEAST 2 1/2" LONG. PLAIN ROUND WASHERS WILL BE REQUIRED.
5. BOLT HOLES SHALL BE 1/16" LARGER THAN THE DIAMETER OF THE BOLT AND SHALL BE DRILLED.
6. THIS CRADLE SHALL NOT BE USED FOR PIPE LARGER THAN 24" DIAMETER.
7. ATTACH THE CRADLE TO THE PILES WITH FOUR (4) BOLTS ON EACH SIDE [TOTAL OF EIGHT (8) BOLTS].
8. ATTACH BOTTOM PLATE TO CRADLE SIDES WITH A CONTINUOUS 3/8" FILLET WELD.
9. THE 1/2" STEEL ANGLES SHALL BE SPOT WELDED TO THE SIDES OF THE CRADLE.

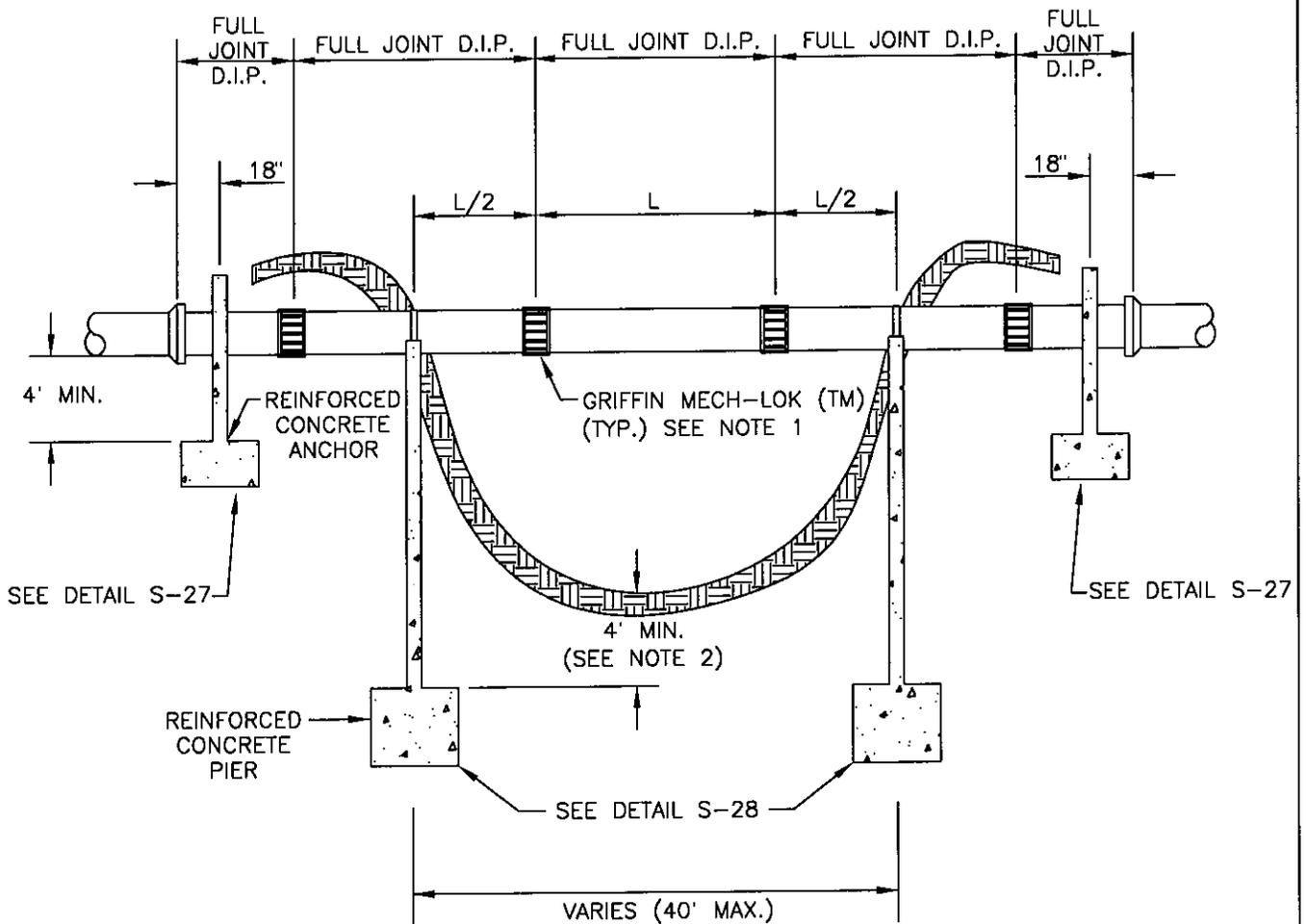


SEWER SYSTEMS
PIER CRADLE
24" PIPE & SMALLER

APRIL 2008

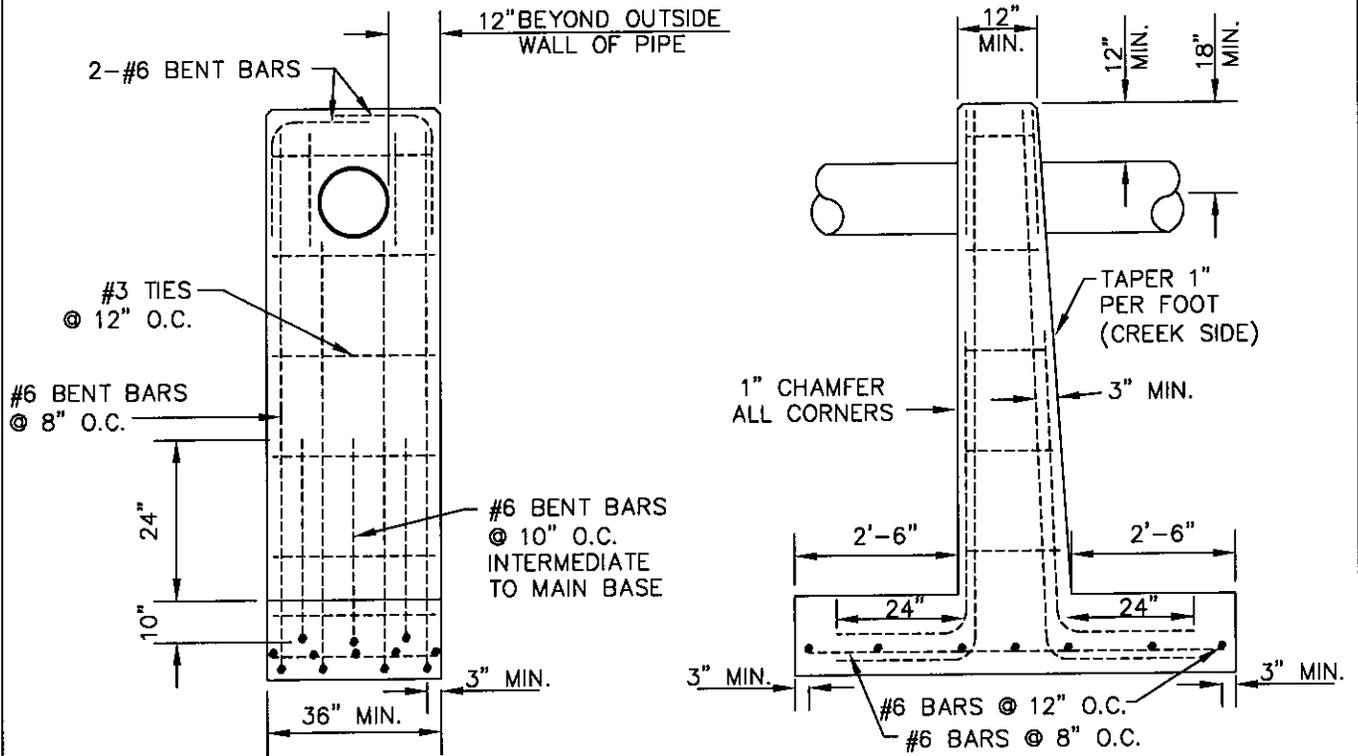
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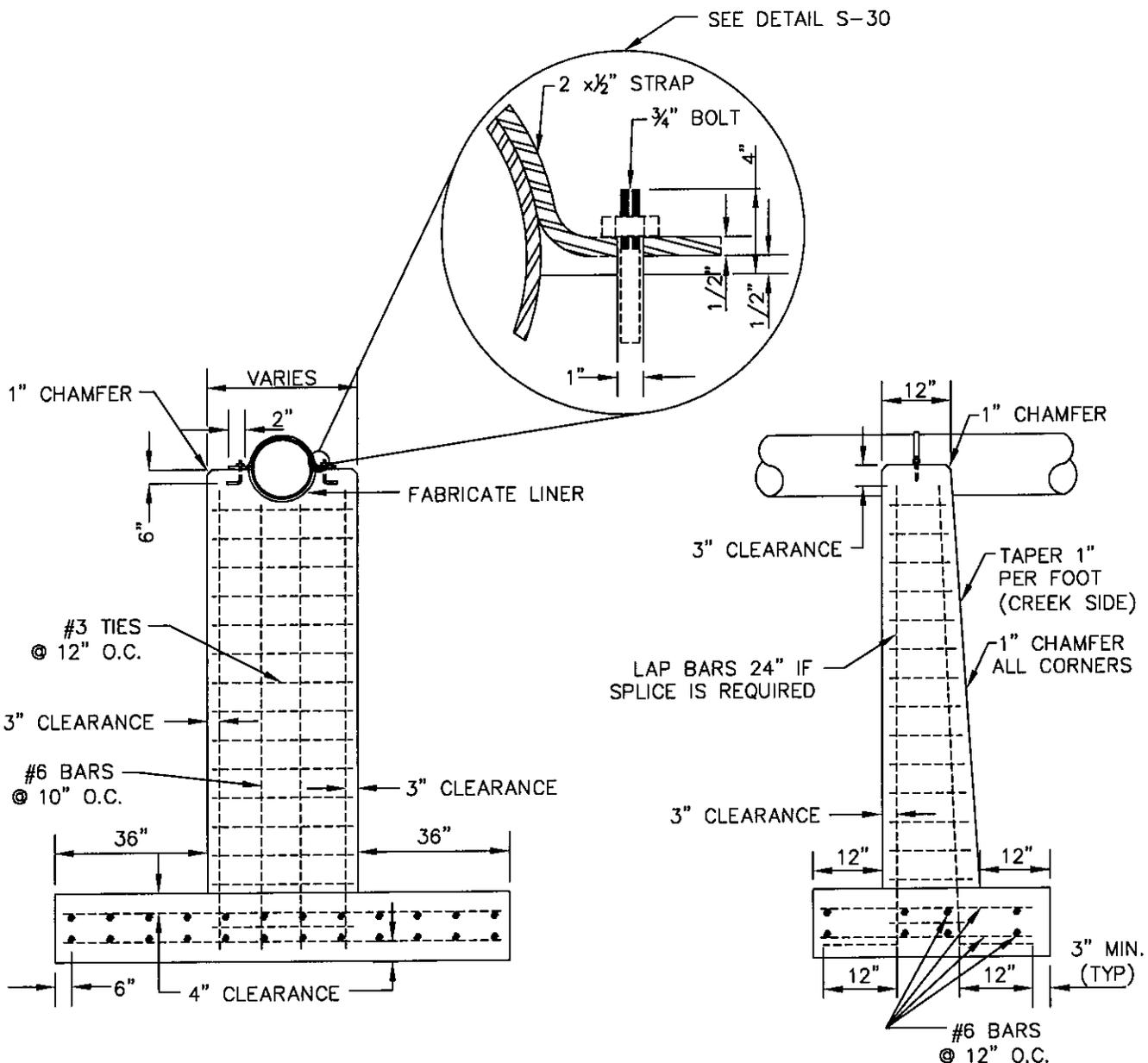
NOTES:

1. ALL JOINTS AND PIPE BETWEEN SUPPORTS SHALL BE GRIFFIN MECH-LOK (TM) OR APPROVED EQUIVALENT. PIPE SHALL BE DIP PER THE MATERIAL SECTION.
2. FOOTING DEPTH SHALL BE TO SUITABLE GRADE AND SHALL NOT BE LESS THAN SHOWN EXCEPT WHEN PIER IS ANCHORED TO SOLID ROCK.
3. MAX. CLEAR SPAN IS 40' AND MAX. DIAMETER IS 36".



NOTES:

1. ALL CONCRETE TO BE 4000 PSI
2. DEPTH OF PIERS TO BE TO SUITABLE GRADE.
3. FOOTING THICKNESS SAME AS BASE THICKNESS OF PIER, BUT NOT TO EXCEED 2'-0".
4. PIERS TO BE BUILT WITH LONG SIDE OF FOOTING PERPENDICULAR TO CREEK FLOW.
5. REINFORCING STEEL TO BE PLACED WITH A MINIMUM CLEARANCE OF 3" WITH THE SURFACE OF THE CONCRETE.



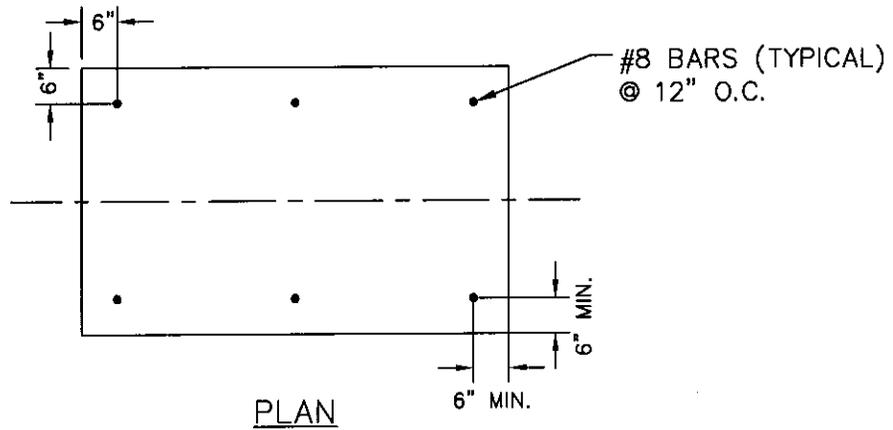
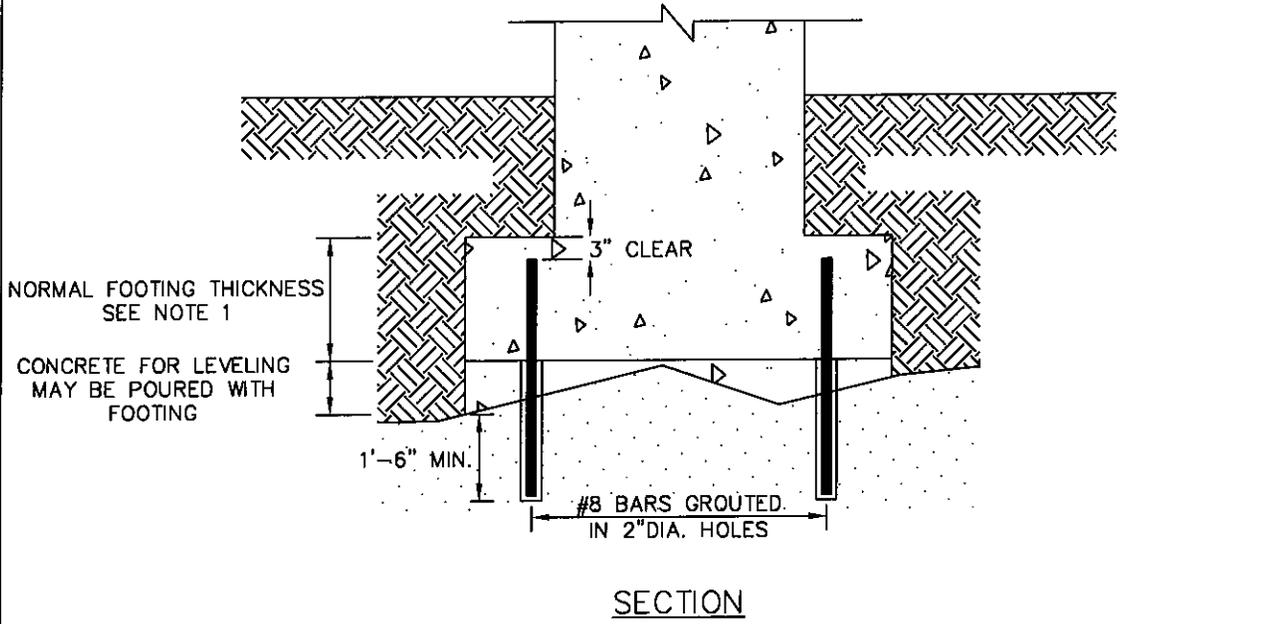
NOTES:

1. ALL CONCRETE TO BE 4000 PSI
2. MAXIMUM HEIGHT OF REINFORCED CONCRETE PIERS TO BE 20'-0"
3. FOOTING THICKNESS NOT TO EXCEED 2'-0"
4. PIERS TO BE BUILT WITH LONG SIDE PARALLEL TO CREEK FLOW.
5. PIPE TO BE SET 1/2" IN PIER AND 1/2" PROTUDING ABOVE PIER.
6. NO REINFORCING STEEL TO BE PLACED WITH A CLEARANCE OF LESS THAN 3" TO THE SURFACE OF THE PIER
7. DESIGN MUST BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN NC



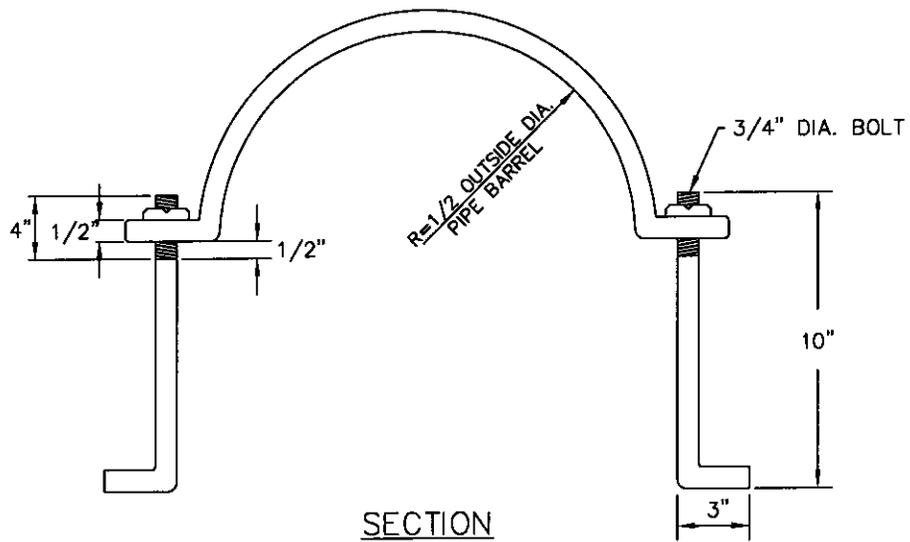
SEWER SYSTEMS
**REINFORCED CONCRETE
 PIER**

APRIL 2008
 NTS S - 28.0

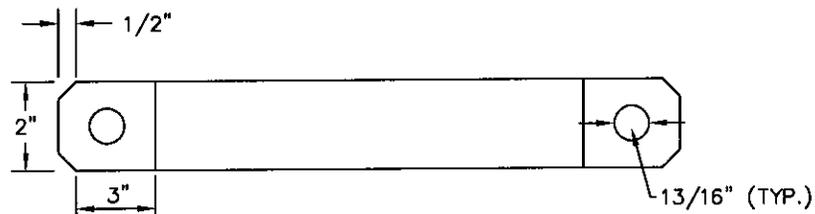


NOTES:

1. MINIMUM THICKNESS OF FOOTING ABOVE ROCK TO BE SAME AS BASE THICKNESS OF PIER.
2. MAT STEEL FOR FOOTING SHALL BE TIED TO DOWELS.
3. CONCRETE SHALL BE 4000 PSI.



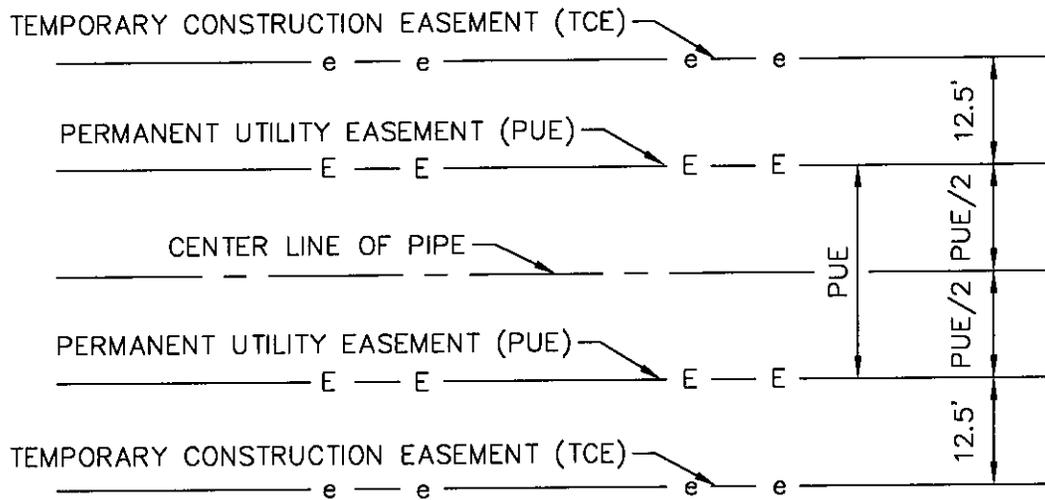
SECTION



PLAN

NOTES:

1. ANCHOR BOLTS AND STRAPS SHALL BE GALVANIZED AND HOT ASPHALT DIPPED.
2. GALVANIZED STEEL OR IRON CAN BE USED.
3. FOR PIPES 24" OR LARGER USE 1" DIA. BOLTS AND 1 1/16" DIA. HOLE IN STRAP.
4. HOLES TO BE DRILLED IN STRAP.
5. PROVIDE WASHERS UNDER STRAP SUCH THAT STRAP IS PULLED DOWN TIGHT.



PIPE SIZE	PERMANENT UTILITY EASEMENT WIDTH (PUE)
8"	25'
12"	25'
15"	25'
18"	30'
24"	35'
30"	35'
36"	40'
42"	50'

NOTES:

1. EASEMENTS SHOWN ARE MINIMUM FOR CITY OWNED UTILITIES. ADDITIONAL EASEMENTS MAY BE REQUIRED FOR DEEPER THAN AVERAGE OR LARGE LINES.
2. FOR PARALLEL LINES, EASEMENT SHALL BE PUE/2 FEET FROM CENTER OF EACH LINE.
3. TCE OF 12.5' ON EACH SIDE OF PUE.

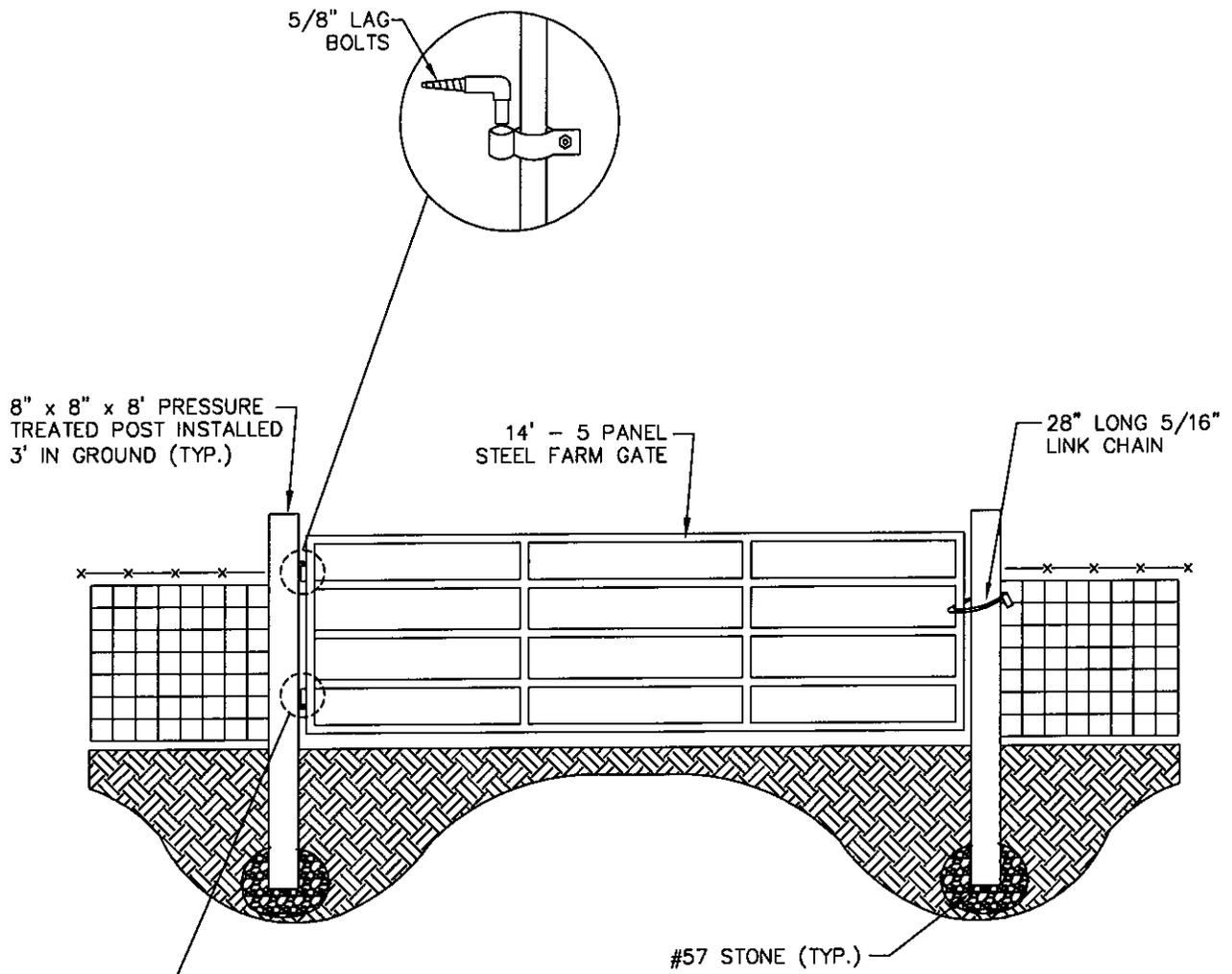


SEWER SYSTEM
SEWER EASEMENT

OCTOBER 2008

NTS

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NOTES:

1. PADLOCK TO BE PROVIDED BY THE CITY OF NEWTON.
2. ALL HARDWARE SHALL BE GALVANIZED STEEL.

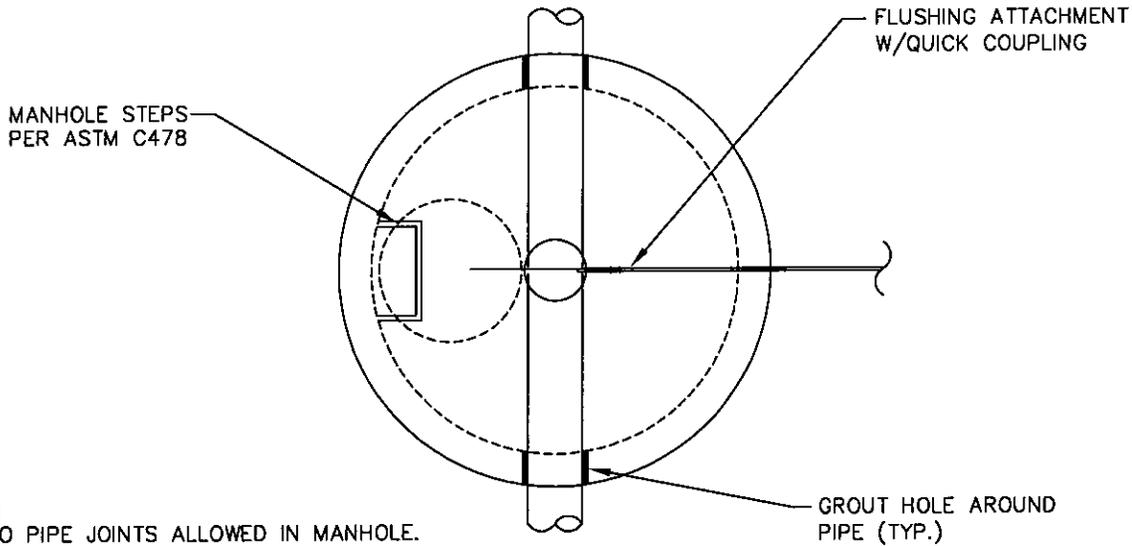


SEWER SYSTEMS
 FENCE GATE
 SEWER OUTFALLS
 & EASEMENTS

APRIL 2008

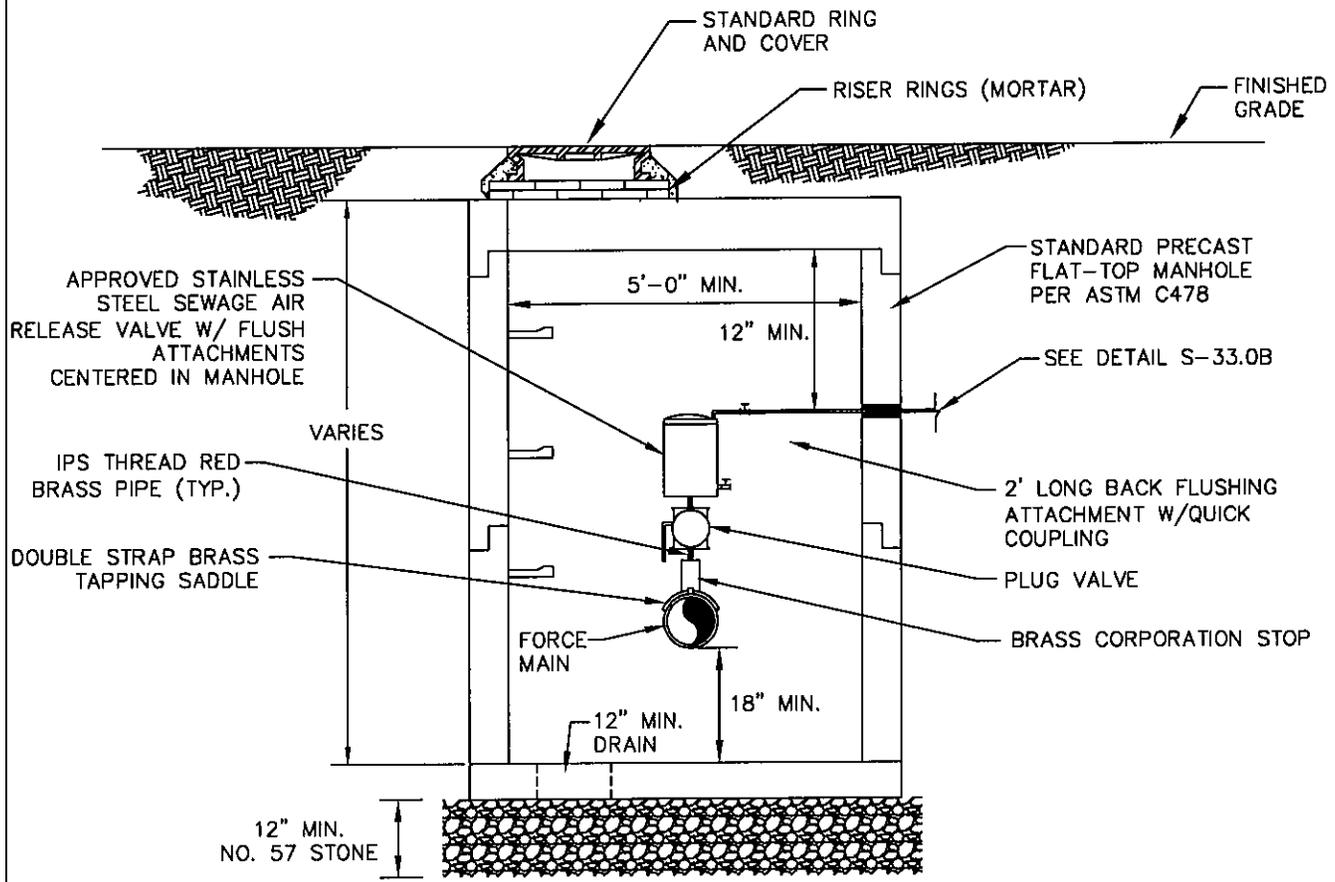
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- NOTES:
1. NO PIPE JOINTS ALLOWED IN MANHOLE. PIPE JOINT 2' MIN. FROM MANHOLE.
 2. AASHTO M198 BUTYL SEALS BETWEEN JOINTS AND 6" ADHESIVE BUTYL TAPE ON THE OUTSIDE OF JOINTS OF MANHOLE.

PLAN



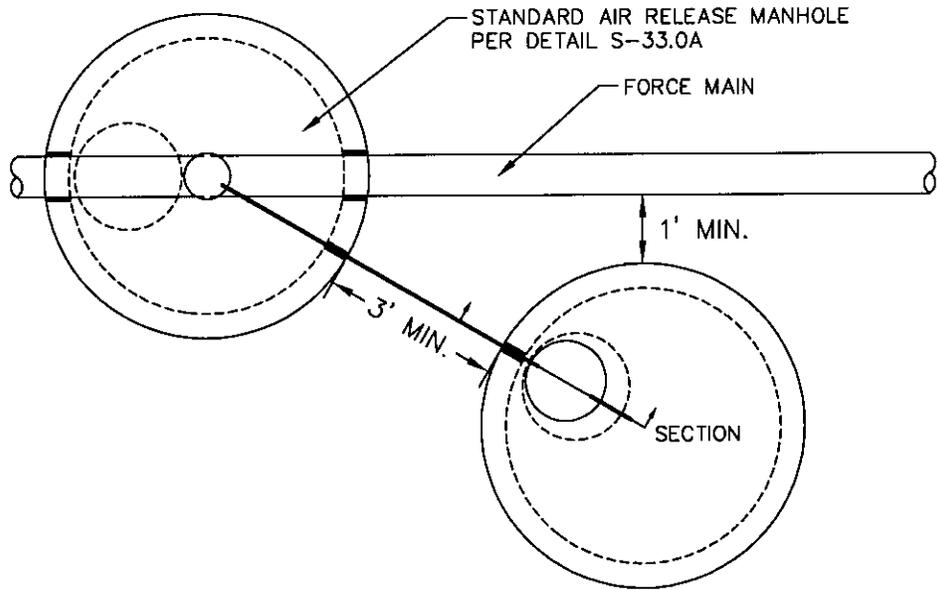
SECTION



SEWER SYSTEMS
AIR RELEASE MANHOLE

APRIL 2008

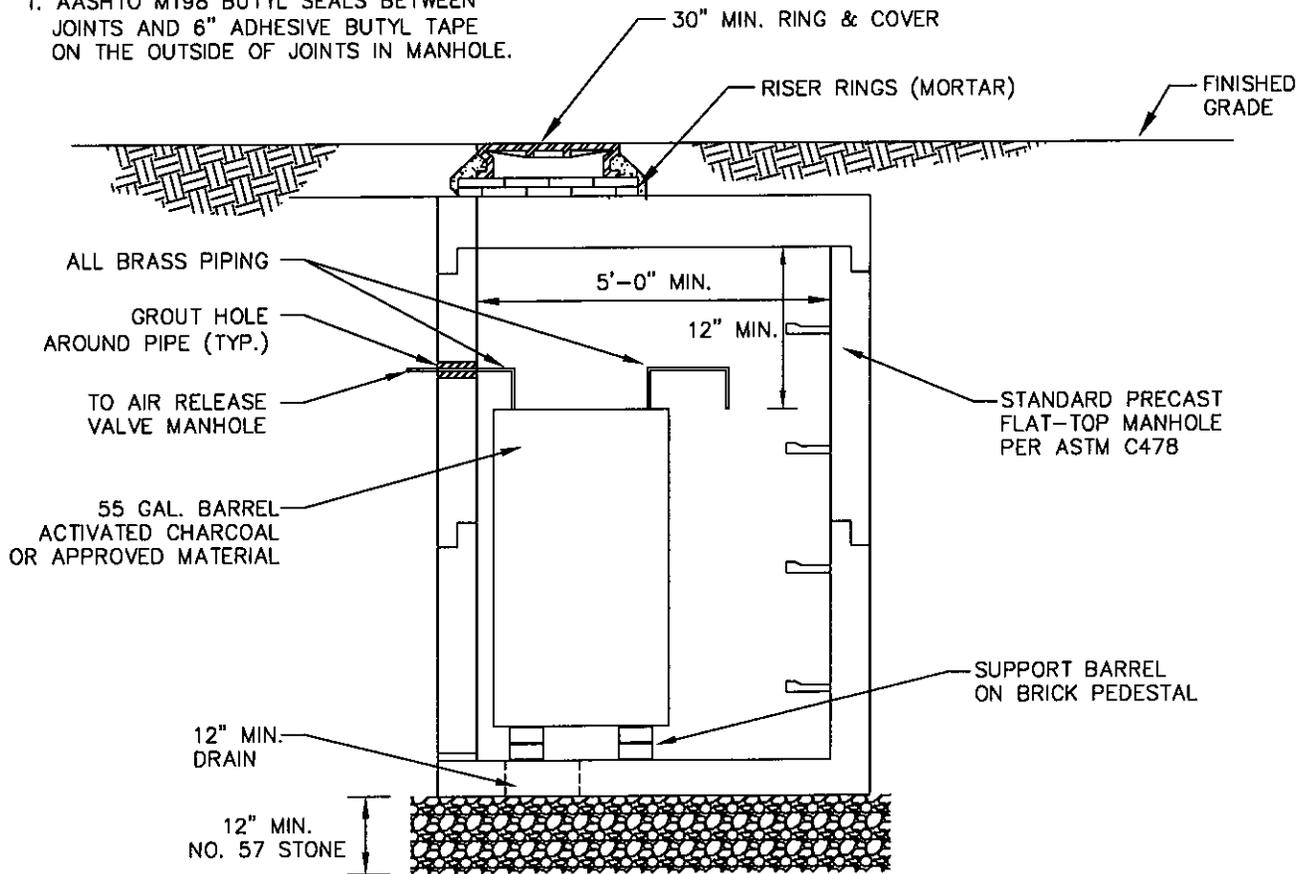
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PLAN

NOTES:

1. AASHTO M198 BUTYL SEALS BETWEEN JOINTS AND 6" ADHESIVE BUTYL TAPE ON THE OUTSIDE OF JOINTS IN MANHOLE.



SECTION

Introduction

Please review the General Information section for detailed instructions concerning permits and approvals.

Construction Records

As-built drawings shall be prepared to reflect all changes made during construction. A field survey to locate all new manholes and to determine the inverts of new sewer lines as well as location of all water line, hydrants, bends and connection points shall be conducted by the owner/developer. As-built drawings shall show locations of all sewer laterals and water services referenced to fixed points so as to be easily located in the event that the markers are destroyed. The method of location on the as-built drawings shall be as directed by the Director of Public Works & Utilities. The owner/developer shall mark the location of sewer lateral ends with a steel post painted yellow, extending at least three (3) feet above ground.

Inspection

Construction inspection of water installations is required. Inspections must be conducted by a registered Professional Engineer (PE). Upon completion, the Engineer must submit a statement that is acceptable to Local and State Agencies, indicating that the system was constructed in accordance with the approved plans and specifications.

Acceptance of Facilities by the CITY OF NEWTON

The City shall accept new facilities upon completion of the following:

1. All construction is complete and all tests satisfactory
2. Statement of Inspection has been received from Engineer of record.
3. Receipt of As-Built plan drawings.
4. Proper filing of permit approvals, easements, and rights-of-way.
5. The site must be clear of construction debris and equipment
6. Removal of all sediment and erosion control structures.
7. Any other releases, as required by the City.

Performance Guarantee

Work shall be guaranteed by the owner/developer for a period of one year from acceptance by the City. The guarantee shall cover materials and workmanship. Any defective work or materials shall be repaired or replaced at no expense to the City.

Design Requirements

1. All projects which use these guidelines shall be designed in accordance with and shall meet all requirements of North Carolina Administrative Code. It is the responsibility of the design Engineer to ensure that all requirements are met. In cases where a statement herein conflicts with such requirements, the more restrictive shall apply. Variations or exceptions to the following guidelines must be approved by City of Newton Director of Public Works & Utilities.
2. Water system design must be consistent with the City's current Water and Sewer Master Plan and overall needs of the City.
3. Water distribution systems shall be designed to provide adequate flow and pressure for both domestic supply and fire protection. The design is also to result in a long lasting product, where low maintenance and ease of maintenance is the objective.
4. When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of the State Insurance Services Office.
5. Design shall be based on a Hazen-William "C" value of 130 for ductile iron pipe (DIP). The acceptable range for pipeline velocity shall be 3-fps to 6-fps for normal working conditions. to prevent pipe scour, leakage, sediment accumulation and bacteriological growth.
6. Water mains shall be designed to provide a minimum residual service flow of 10 gallons per minute (gpm) at a pressure of 20 pounds per square inch (psi) at any point within the system during periods of combined average daily flow and fire flow.
7. The minimum average daily demands for residential units shall be established as 120 gallons per day (gpd) per bedroom with each residential unit having a minimum of two bedrooms. Average daily demand for non-residential demand shall be based on the proposed use and fire flows.
8. Fire flows shall be established in accordance with the latest requirements of the State Insurance Service Office. A minimum fire flow of 1,000 gpm shall be used for residential developments and 1,500 gpm for nonresidential. When requested by the Director of Public Works & Utilities, the Engineer of Record shall submit the calculations of fire flow requirements and domestic water demands for the project for review and approval.

9. The water distribution systems and any extensions shall be designed to supply the demands of all customers while maintaining the following minimum pressures and velocity:
 - 40 psi for maximum daily flow
 - 30 psi for peak hourly flow
 - 20 psi for instantaneous flow plus fire flow. If this requirement cannot be met due to system limitations, the minimum pipe diameter shall be 8-inches.
 - 4 feet per second (fps) for flushing
10. Average daily flow may be estimated at 1,500 gallons per day per acre. This estimate should be modified as necessary based on specific zoning and land use data. Maximum daily flow and peak hourly flow shall be determined as follows:
 - Maximum daily flow = Average daily flow times 1.5
 - Peak hourly flow = Average daily flow times 2.1
11. Transmission mains larger than 12-inches shall be designed on the basis of the most recent system wide demand data and hydraulic modeling.
12. Open cut construction on existing paved roads shall be avoided. Existing paved roads shall be bored or tunneled as appropriate unless approval from the Director of Public Works & Utilities is obtained.
13. Water lines shall be disinfected and hydrostatically tested in accordance with all NCDOT and City of Newton requirements.

Water Mains

1. All public water mains shall be a minimum of 6-inch diameter except when 2-inch pipe is allowed by the following conditions:
 - (a) In short cul-de-sacs (400 feet or less) serving less than five (5) lots
 - (b) On looped lines that do not otherwise require a fire hydrant and with approval of the Director of Public Works & Utilities
 - (c) No fire hydrant required/requested by fire official or the City
 - (d) On services

2. The following pipe materials per Materials Specification Section are approved for transmission and service lines:

Size (inches)	Material
2	Copper or PVC
6,8,12	DIP or PVC
> 16	DIP

3. Fittings furnished for DIP shall be mechanical joint, compact, pressure Class 350, cast from ductile iron, in accordance with AWWA C153. All cast fittings shall have a cement mortar lining of standard thickness in accordance with AWWA C104 or fusion bonded epoxy in accordance with AWWA C116. Flanged fittings are only used in meter connections. Gray iron fittings and glands shall not be used.
4. Thrust restraint for water mains shall be provided by approved restrained joints. Restrained joints shall be as specified in current Materials Specifications or as recommended by the pipe manufacturer and approved by the Director of Utilities. Restrained lengths shall be calculated by the Engineer of Record for each application. Calculations shall be based on a minimum test pressure of 200 PSI and skin friction coefficients supplied by the pipe manufacturer with a safety factor of 1.5.
5. Thrust blocks shall be used only where there is not sufficient pipe length to effectively use restrained joint pipe, or where tapping an existing unrestrained pipe.
6. Water mains will have a minimum of 3 feet of cover, unless reduced cover is required to avoid a conflict. Whenever depth of cover is less than 24-inches, the pipe must be encased in concrete. Encased water mains shall have at least one foot of cover over the casing. Designs resulting in less than 3 feet of cover or more than 10 feet of cover must be accompanied with a letter requesting a variation, documentation showing all alternatives, substantiating the depth of the water line. The letter must be approved by the Director of Public Works & Utilities.
7. Cul-de-sacs with more than 5 houses shall be served by a 6-inch water main straight through the cul-de-sac, with a fire hydrant at the end as the blow-off per Water Detail W-11.0. Hydrants shall be placed on the lot line.
8. Water mains shall be located within dedicated street rights-of-way or City utility easements. Water mains should, if possible, be located no closer than 5 feet from the lip of the curb. Permanent Utility Easement (PUE) shall be a

minimum width of 25-feet. Larger pipe or deep sewers may require additional permanent easement as required by the Director of Utilities and as summarized in the following Table:

Minimum Permanent Utility Easement (PUE) Width (feet)

Diameter (inches)	Maximum Pipe Invert Depth (ft)					
	10	12	14	16	18	20
6	25'	25'	30'	35'	40'	45'
8	25'	25'	30'	35'	40'	45'
10	25'	25'	30'	35'	40'	45'
12	25'	25'	30'	35'	40'	45'
14	25'	30'	30'	35'	40'	45'
16	25'	30'	30'	35'	40'	45'
18	25'	30'	30'	35'	40'	45'
20	25'	30'	30'	35'	40'	45'
24	25'	30'	30'	35'	40'	45'
30	25'	30'	35'	35'	40'	45'
36	25'	30'	35'	35'	40'	45'
42	25'	30'	35'	40'	40'	45'

9. A Temporary Construction Easement (TCE), of an additional 12.5' on each side of the PUE, shall be in place for the duration of the construction project.
10. Water main depths along road right-of-way shall consider future road widening. Projections of future grades may require increased depths or additional easements for the water main.
11. For taps on larger mains (24" and above), a saddle may be used in lieu of a sleeve, but only if the tap is less than or equal to half the size of the line to be tapped. All size on size taps require full body ductile iron mechanical joint tapping sleeves.
12. Automatic air release valves shall be located at all high points along water main transmission lines. Water mains with numerous service connections may require automatic air release valves as required by the Director of Utilities.
13. Blow-off assemblies or fire hydrants shall be located at water main dead ends. Fire hydrants shall function as the blow-off on the end of 6-inch, or larger, water mains. Two-inch blow-off assemblies are to be used for temporary dead end water mains, short two-inch water mains, or as directed by the City. Two-inch blow-off assemblies shall have a 2-inch full size valve with brass pipe and fittings per Detail W-10.0.
14. Repairs to main breaks:

- (a) Bell clamps will not be allowed, except in special situations and as directed by the Director of Utilities.
- (b) Solid sleeves are to be used for connecting spigot ends shall be of the long pattern type.
- (c) All repairs shall inspected by City personnel before backfilling.

Valves

1. Main line valves shall be located at all pipeline intersections and at changes in pipe diameter. Maximum valve spacing shall be 1500 feet. Two valves shall be provided at tees and three valves at crosses, with valves located either at road intersection radius points or as close to the fittings as possible. Where valves must be located away from intersections, they should be located at hydrant installations. If the line is a one way feed, the valve should be on the dead end side of the hydrant branch.
2. Install valves on loops so a maximum of 600 feet can be taken from service without affecting other areas.
3. Gate valves on water mains up to 24 inches in diameter must be of the resilient seat type in accordance with AWWA C-509 with a working pressure of 200 psi. Resilient seated gate valves must be furnished with durable opaque end shields to prevent ultra violet damage to the rubber discs. All gate valves shall open counter-clockwise rotation.
4. Fittings lists, including valves, shall be shown on the plan view for all intersecting water mains and at fire hydrants. Bends shall be labeled on the plan and profile views. Hydrant tees shall be used for hydrants and 6" stub-outs.
5. Valve boxes shall be provided for all valves per Detail W-13.0. DIP shall be used for valve box extensions. Provide concrete protective rings per Water Detail W-14.0 at all valve boxes.
6. When a valve is to be raised in an existing asphalt paved area; saw-cut an octagonal or hexagonal shaped opening around frame. Fill paved area with black colored concrete.

Service Lines and Meters

1. All water meters shall be sized in accordance with the latest revision of AWWA M22 (*Sizing Water Service Lines and Meters*). Meter size shall be approved by the Director of Utilities.
2. Meters (and clean-outs) must be located behind the sidewalk and at the center of the lots at the right-of-way line. Meters (and cleanouts) shall be located in the grass and shall not be located in streets, parking lots or driveways. Water meter shall be located a maximum distance of 30 inches from the sewer clean-out. Corner lots, basement lots, or lots with rear or side sewer connections may be exempted from this pending approval from the City.
3. Service lines for 3 inch or greater water meter service connections shall consist of restrained joint DIP, pressure class 350. Three-inch diameter PVC shall not be used.
4. Type K Copper tubing per ATSM B88 and AWWA C800, suitable for underground installation, shall be used for 2-inch or smaller meter connections per Details W-3.0 and W-4.0. Fittings for copper pipe shall be compression fittings per the Materials Specifications.
5. When the maximum static pressure in a new system exceeds 80 psi, businesses and/or residences shall be equipped with a pressure-reducing valve (PRV). The PRV shall be located on the outlet side of the meter. It is the property owner's responsibility to install and maintain the PRV.
6. All connections to the City's water system shall be made in accordance with the City of Newton and State of North Carolina requirements for backflow prevention. All irrigation and commercial connections shall be provided with an approved testable backflow prevention device.
7. All water service connections shall be metered.
8. When requested and with preapproval, meter assemblies upon payment of all tapping and meter fees shall be coordinated with the City before installation. All meter installation shall be as shown in the Standard Details.
9. Direct taps shall be made to DIP mains for 5/8 inch to 1 inch services. However, approved tapping saddles shall be used for taps to 2-inch PVC or Copper mains.
10. Approved tapping sleeves shall be used for service connections 3-inches and larger. Stainless steel tapping sleeves may be used for connections smaller than the existing main. Ductile iron tapping sleeves must be used for same size connections, per Detail W-2.0B.

Water Mains In Relation To Sewers

1. **Lateral Separation of Sewers and Water Main:** Water mains shall be laid at least 10 feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation--in which case:
 - The water main shall be laid in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer; or
 - The water main shall be laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.
2. **Crossing a Water Main Over a Sewer:** Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. In cases where local conditions or barriers prevent an 18 inch vertical separation, both the water main and the sewer shall be constructed of ferrous materials with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.
3. **Crossing a Water Main Under a Sewer.** Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.

Fire Hydrants

1. Fire hydrants shall meet the requirements of AWWA C502. All fire hydrants shall have two (2) 2 ½ in. hose outlets and one (1) 4 ½ in. steamer nozzle. All fire hydrants shall be National Standard Thread. Main Valve shall be 5 ¼ in.
2. Fire hydrants located inside the public right-of-way and/or to be maintained by the City shall be painted per the Materials Specifications. Fire hydrants located on private property and to be maintained privately shall be painted red.
3. "Out of Service" hydrant markers shall be immediately installed on all hydrants and not removed until the water line has been activated and accepted by the City. Bags shall not be used in-lieu of markers.
4. Hydrants in single-family detached residential areas shall be placed so that the centers of all lots are within 500 feet of a hydrant.

5. Hydrants in multi-family attached areas shall be placed so that the centers of all lots are within 250 feet of a hydrant.
6. Hydrants in commercial and industrial areas require a flow study to determine minimum distance.
7. All mains shall be a minimum of 6 in. diameter for fire hydrant applications.
8. Fire hydrant legs shall be restrained joint.
9. Location of fire hydrants shall meet the latest North Carolina Fire Code Appendix C, or as directed by the City of Newton Fire Marshal. Hydrants shall not be placed at the center of lots.
10. Water mains along major thoroughfares may require fire hydrants to be installed on each side of the road, as directed by the City of Newton Fire Marshal. Thoroughfare crossings shall be a minimum of 8 in. diameter restrained joint pipe, with a tee and valves for future extensions.
11. A reflective raised pavement marker shall be placed adjacent to the fire hydrant per NCDOT Standard Detail 1251.01 and Section 1086 "Pavement Marker" of the Standard Specifications for Roads and Structures.

Backflow Prevention

1. Backflow preventers shall be supplied for every service connection. For services up to 3/4-inch it shall be integral with the meter, for services larger than 3/4-inch up to 2-inch in a separate meter box and for backflow preventers larger than 2-inches, a vault shall be provided.
2. Vaults shall have aluminum or steel hatch doors with lift assist and shall be capable of withstanding expected traffic loads.
3. All bypasses, other than those with locking valves shall have detector check valves installed.
4. Reduced pressure principle backflow preventers are to be installed on all lines installation involving wet manufacturing processes, sprinkler systems or any other hazardous location as determined by the Director of Utilities.
5. Refer to the NCDENR Public Water Supply Section and City of Newton Ordinance regarding the need for and design of backflow prevention assemblies. Backflow standard details are included herein for the designer's reference.

WATER PLANS CHECKLIST

(Water line plans should, at the minimum, show the following information)

1. Water line drawings and specifications shall bear the seal of a registered professional engineer licensed to practice in North Carolina and the installation of the system shall be inspected and certified by the engineer in accordance with N.C.A.C.IOD.0903.
2. Location and dimension of all existing and proposed street and sanitary sewer rights of way.
3. Sanitary sewer and storm drain systems dotted in.
4. Invert of storm drains at crossings, storm drains closely paralleled by water lines.
5. Invert of sanitary sewers at crossings and at upstream and downstream manholes.
6. Size, lengths (or stationing), and type of lines (water, storm, sanitary).
7. All tees, gate valves, and blow offs shall be properly labeled and stationed.
8. Fire hydrants shall be labeled and stationed on plans.
9. Legend of symbols.
10. North arrow.
11. Street names.
12. Location(s) of nearest existing valves.
13. Existing pavement, and if applicable, width and length of cut.
14. Include "General Notes" on all plans.
15. Vicinity map, showing location of lines and a visual plan page index.

STANDARD WATER SYSTEM DETAILS:

- W-1.0 FIRE HYDRANT
- W-2.0A TAPPING SLEEVE & VALVE ASSEMBLY
- W-2.0B TAPPING SLEEVE & VALVE ASSEMBLY (SIZE ON SIZE)
- W-3.0 3/4" & 1" SERVICE CONNECTION
- W-4.0 1 1/2" TO 2" SERVICE CONNECTION
- W-5.0 3" AND LARGER SERVICE CONNECTION
- W-6.0 THRUST BLOCK
- W-7.0 AUTOMATIC AIR RELIEF MANHOLE
- W-8.0 DUCTILE IRON PIPE TRENCHING & BACKFILLING
- W-9.0 MINIMUM EASEMENT
- W-10.0 TEMPORARY 2" BLOWOFF VALVE ASSEMBLY
- W-11.0 FIRE HYDRANT BLOWOFF
- W-12.0 BACKFLOW PREVENTION DEVICE FOR FILLING NEW MAINS
- W-13.0 CAST IRON VALVE BOX
- W-14.0 ROUND TOP VALVE BOX INSTALLATION
- W-15.0 5-1/4" LOCKING DROP LID
- W-16.0 FIRE SERVICE CONNECTION
- W-17.0 MULTIPLE METER ASSEMBLY
- W-18.0 MARKER POST
- W-19.0 CONCRETE ENCASEMENT OF PIPE

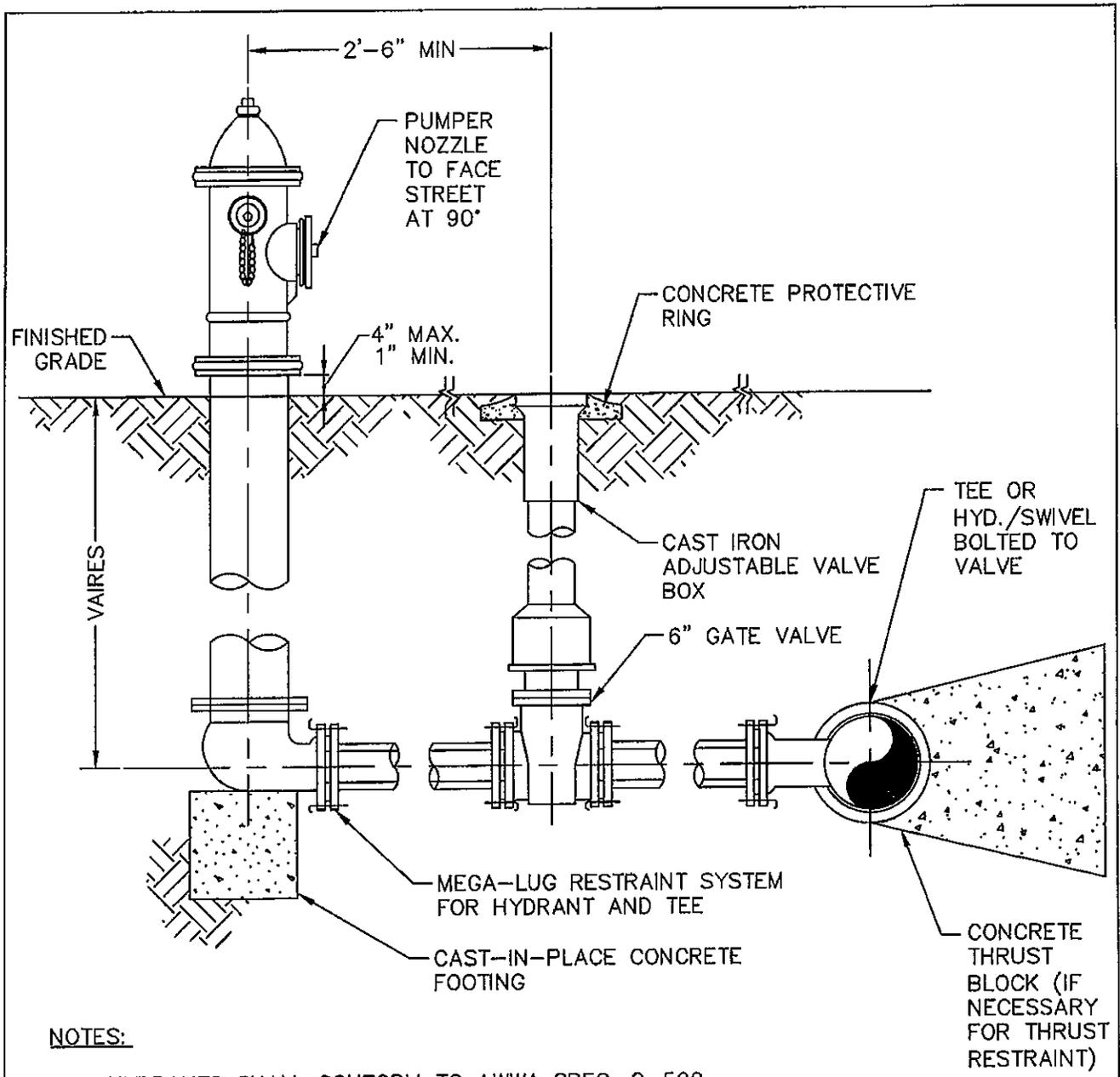


**WATER SYSTEMS
INDEX**

OCTOBER 2008

NTS

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NOTES:

1. HYDRANTS SHALL CONFORM TO AWWA SPEC. C-502.
2. HYDRANTS SHALL HAVE MAIN VALVE OPENINGS OF _____ " PUMPER CONNECTION FACING THE STREET AND TWO 2.5 INCH HOSE OUTLETS.
3. ALL HYDRANTS SHALL OPEN COUNTERCLOCKWISE.
4. PUBLIC AND PRIVATE HYDRANTS SHALL BE PAINTED PER MATERIALS SPECIFICATIONS



**WATER SYSTEMS
FIRE HYDRANT**

OCTOBER 2008

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W - 1.0

FIRE HYDRANTS CITY OF NEWTON

Fire hydrants shall conform to AWWA C502 as manufactured by Muller A421 Centurion or equal. Hydrants shall be furnished with a 4 ½ inch steamer nozzle and double 2 ½ inch hose connections with caps and chains, National Standard Threads, mechanical joint, 1 ½ inch pentagon operating nut, open left, **painted as per color scheme listed below and attached sheet**, bronze to bronze seating, a minimum 3 foot 6" bury depth with a break away ground line flange and break away rod coupling. The hydrant bonnet will be designed with a sealed oil or grease reservoir with o-ring seals and a Teflon thrust bearing as furnished by Muller "Centurion" (A421), or equal. Please state brand of hydrant.

Color of hydrant:

Body Safety yellow -#4308-9400

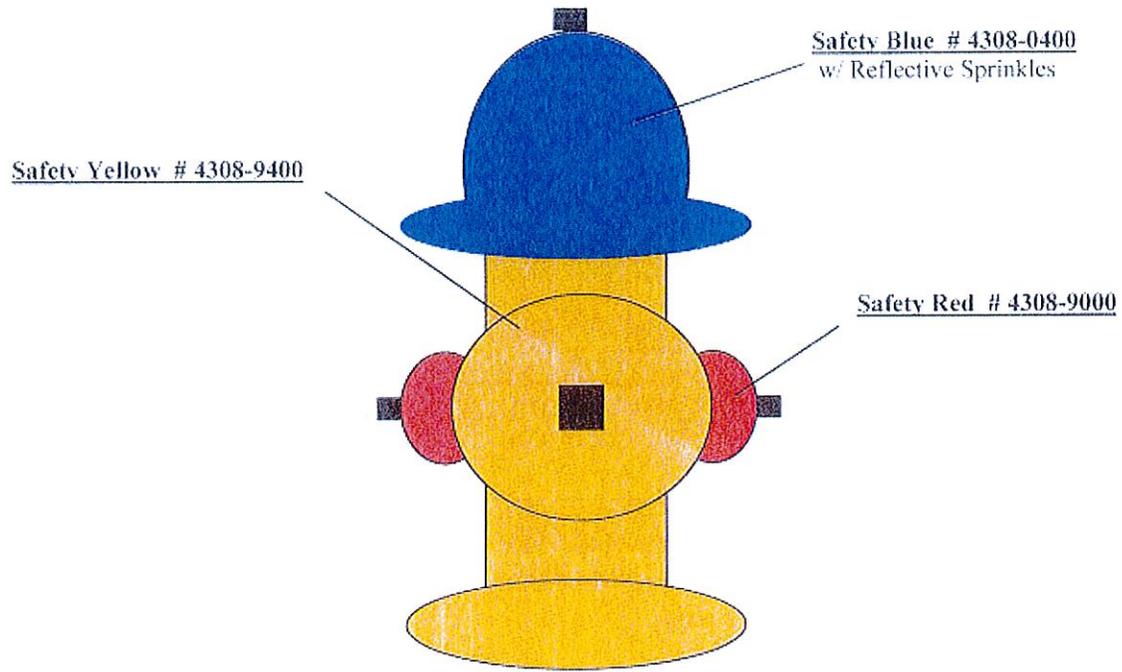
All Hose nozzle caps – Safety red #4308-9000

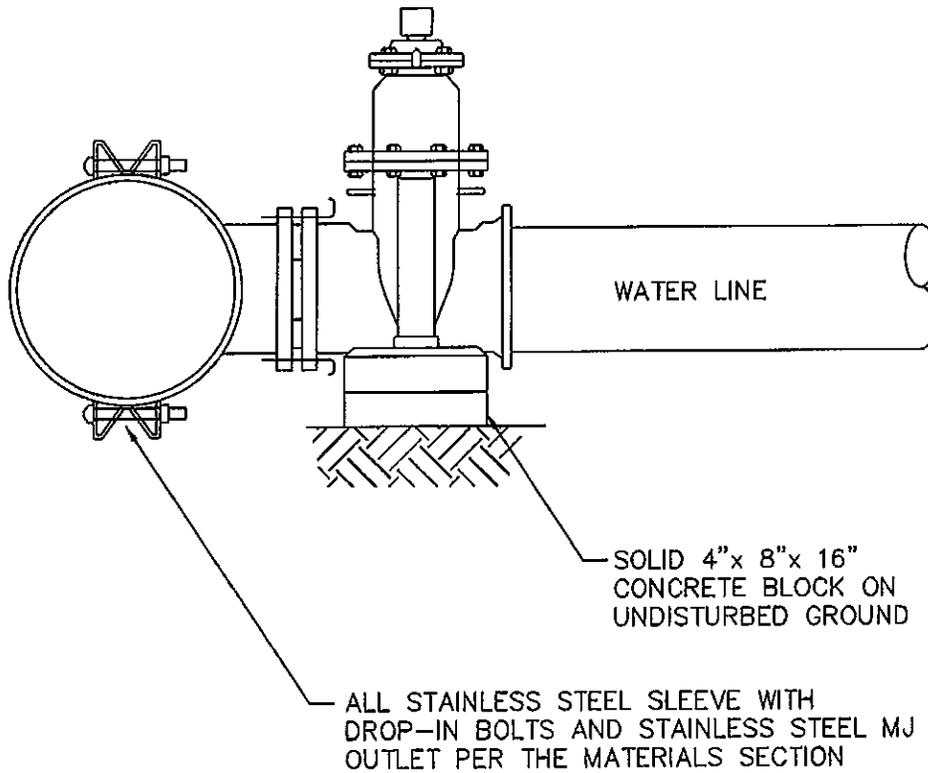
Bonnet (top) Safety blue - #4308-0400 with Reflective sprinkles

Paint numbers are from Devoe High Performance coatings Devguard – 4308 or equal.-

City of Newton Fire Hydrant Color Scheme

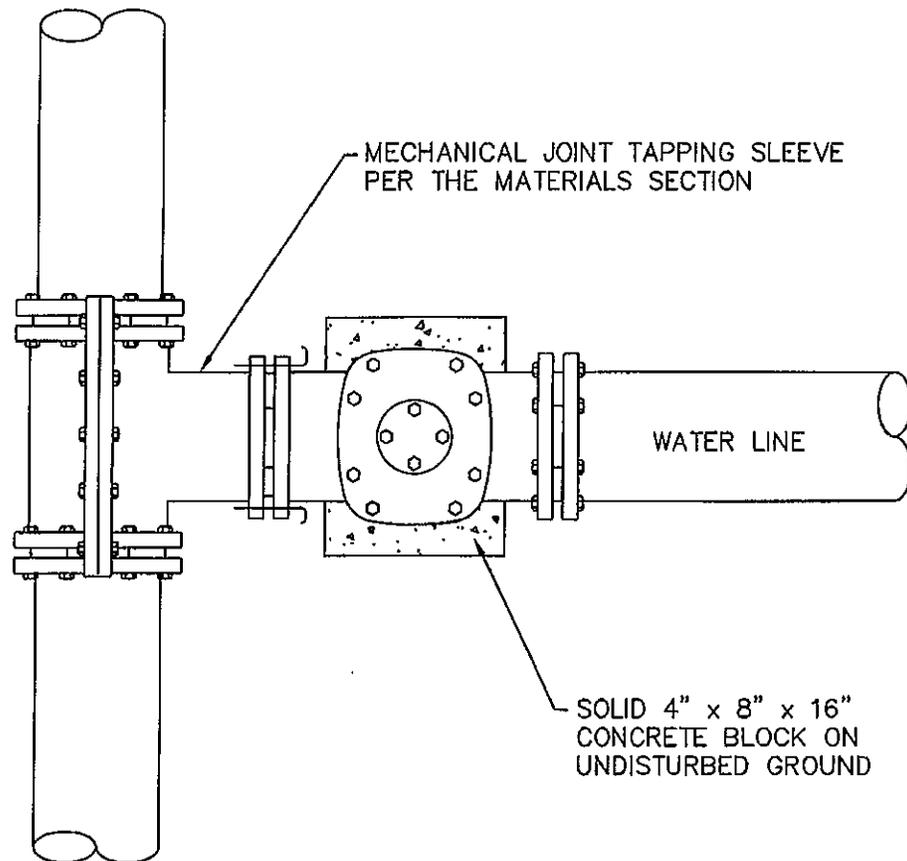
Paint Brand is Devco High Performance Coatings—
Devguard —4308





NOTES:

1. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
2. SEE APPROPRIATE STANDARD DETAIL FOR THRUST BLOCK DIMENSIONS.
3. WHEN NEW WATER LINE AND WATER LINE BEING TAPPED ARE OF THE SAME SIZE, A DUCTILE IRON TAPPING SLEEVE WITH MECHANICAL JOINT MUST BE USED. SEE W-2.0B.
4. CONCRETE THRUST BLOCKING MAY BE REQUIRED AT THE DISCRETION OF THE DIRECTOR OF UTILITIES.



NOTES:

1. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITINGS.
2. SEE APPROPRIATE STANDARD DETAIL FOR THRUST BLOCK DIMENSIONS.
3. WHEN NEW WATER LINE AND WATER LINE BEING TAPPED ARE OF THE SAME SIZE, A DUCTILE IRON TAPPING SLEEVE WITH MECHANICAL JOINT MUST BE USED.
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**WATER SYSTEMS
TAPPING SLEEVE &
VALVE ASSEMBLY
(SIZE ON SIZE)**

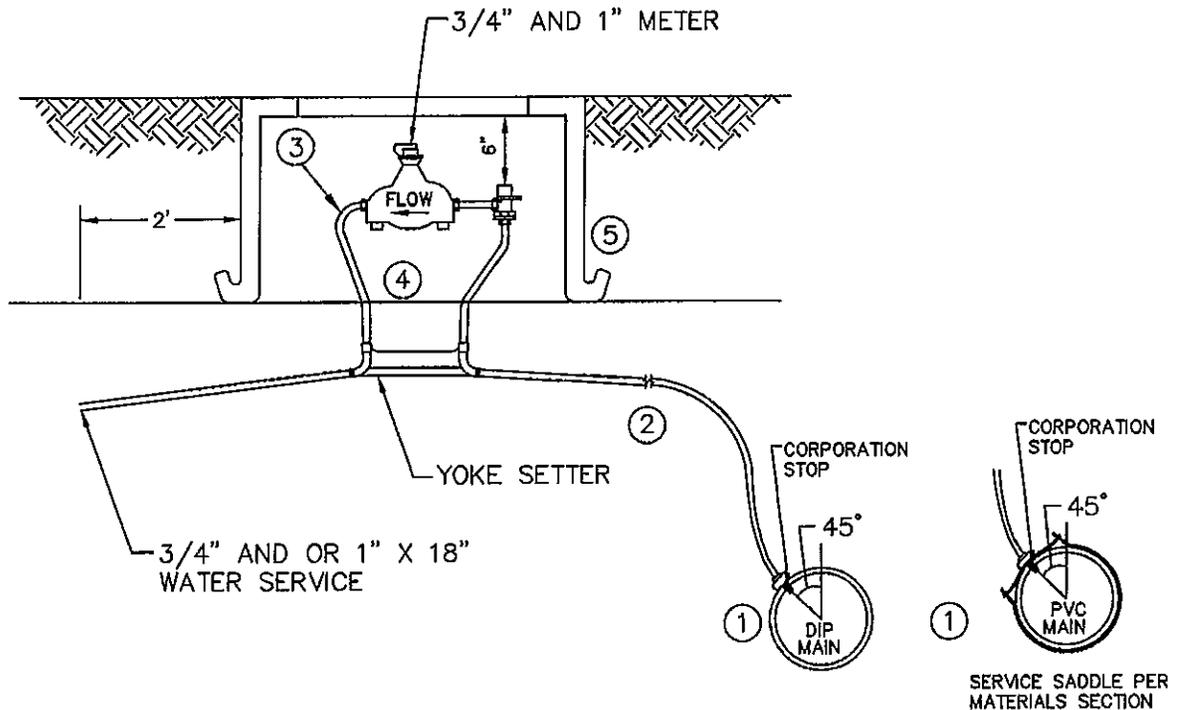
OCTOBER 2008

NTS

W - 2.0B

NOTES:

1. METER TO BE FURNISHED AND INSTALLED BY CITY OF NEWTON.
2. WATER METER IN ACCORDANCE WITH THE STANDING SPECIFICATIONS PER WATER DISTRIBUTIONS. ALL FITTINGS TO BE COMPRESSION JOINT TYPE AS APPROVED BY THE DIRECTOR OF UTILITIES.
3. MINIMUM TAP SPACING SHALL BE 8" O.C.
4. DIRECT TAPS 3/4-INCH AND 1-INCH CAN BE MADE TO 6-INCH OR LARGER DUCTILE IRON PIPE, PRESSURE CLASS 350. ALL OTHER APPLICATIONS SHALL INCORPORATE A SERVICE SADDLE.



LEGEND:

- ① COMPRESSION CORPORATION STOP PER MATERIALS SECTION.
- ② COPPER TUBING, TYPE K, WITH COMPRESSION JOINTS AND/OR 3/4" TYPE K SOFT COPPER PIPE OR 200 PSI POLY TUBING CTS PARR PE -- 3408 OR EQUAL
- ③ COMPRESSION YOKE 90° ANGLE BALL VALVE, WITH LOCK OUT WING, PER MATERIALS SECTION.
- ④ COPPER SETTER OUTLET PIECE GROOVED FOR WASHER, 90° OUTLET PER MATERIALS SECTION.
- ⑤ BLACK POLYETHYLENE OR CAST IRON METER BOX PER THE MATERIALS SECTION.

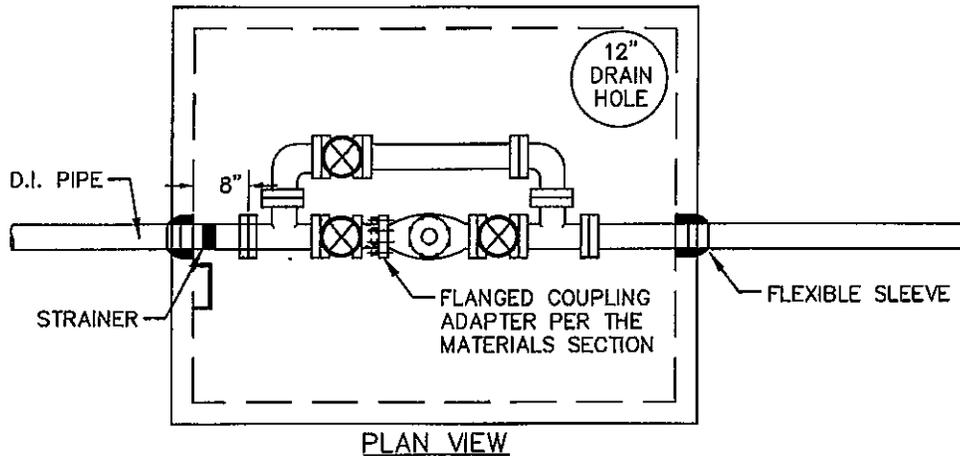
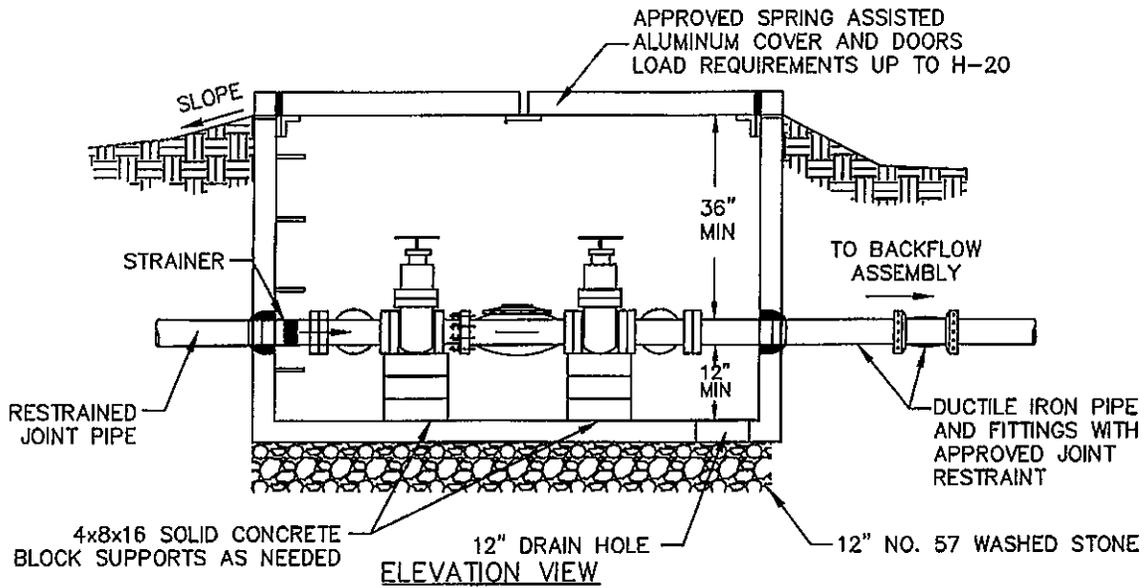


WATER SYSTEMS
3/4" & 1"
SERVICE CONNECTION

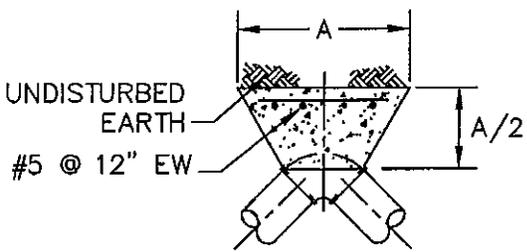
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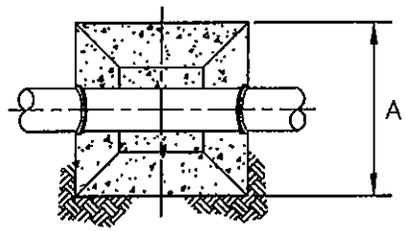
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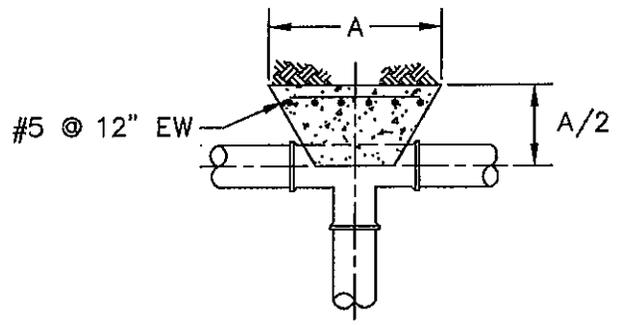
1. PIPE AND METER SIZE SHALL BE AS DETERMINED BY THE THE CITY OF NEWTON. MINIMUM PIPE DIAMETER OF 4 INCHES. USE FLANGED REDUCERS FOR 3" METERS CONNECTIONS.
2. ALL PIPE MUST BE DUCTILE IRON PIPE WITH APPROVED RESTRAINED JOINTS AND FITTINGS
3. METER VAULT MUST BE BEHIND CURB AND/OR WALK AND OUT OF VEHICULAR TRAFFIC. PRE-CAST CONCRETE VAULT REQUIRED (H-20 LOAD RATING)
4. MAIN LINE AND BYPASS VALVE WILL BE PER THE MATERIAL SECTION OF THE LAND DEVELOPMENT STANDARDS MANUAL. PROPERTY OWNERS VALVE MUST BE LOCATED OUTSIDE OF THE CITY OF NEWTON METER VAULT.
5. PRIOR APPROVAL REQUIRED BY THE DIRECTOR OF UTILITIES IF THE METER VAULT HEIGHT EXCEEDS 72-INCHES. METER MUST BE MODIFIED TO READ FROM TOP OF VAULT.
6. HATCH OPENING WILL BE 30"X30".
7. NOTCHES WHERE PIPING GOES THROUGH VAULT SHALL BE FILLED WITH MORTAR.
8. THE TOP OF METER VAULT SHALL BE AT AN ELEVATION SUCH THAT THE SURROUNDING GROUND SLOPES AWAY FROM THE VAULT.
9. STRAINER SHALL BE INSTALLED INSIDE METER VAULT



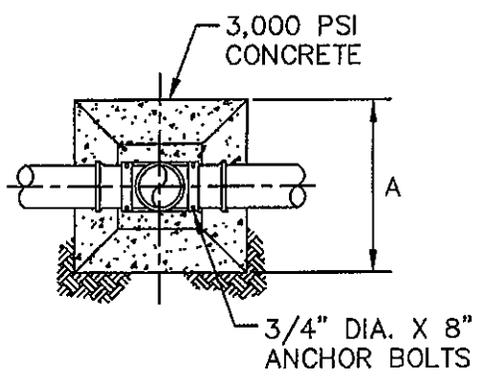
PLAN



ELEVATION



PLAN



ELEVATION

NOTES:

1. ALL FACES OF THE BLOCK SHALL REST AGAINST UNDISTURBED SOIL.
2. PIPE JOINTS, BOLTS, NUTS, RETAINER GLANDS ARE NOT TO BE ENCASED IN CONCRETE.
3. DIMENSIONS BASED ON 150 PSI TEST PRESSURE 1,000 PSF BEARING CAPACITY.
4. THRUST BLOCKS ARE ALLOWED ONLY WHEN THERE IS NOT ENOUGH PIPE LENGTH TO PROVIDE SUFFICIENT THRUST RESTRAIN VIA RESTRAINED JOINT PIPE, OR WHEN CONNECTING TO AN EXISTING PIPE THAT IS NOT A RESTRAINED JOINT.

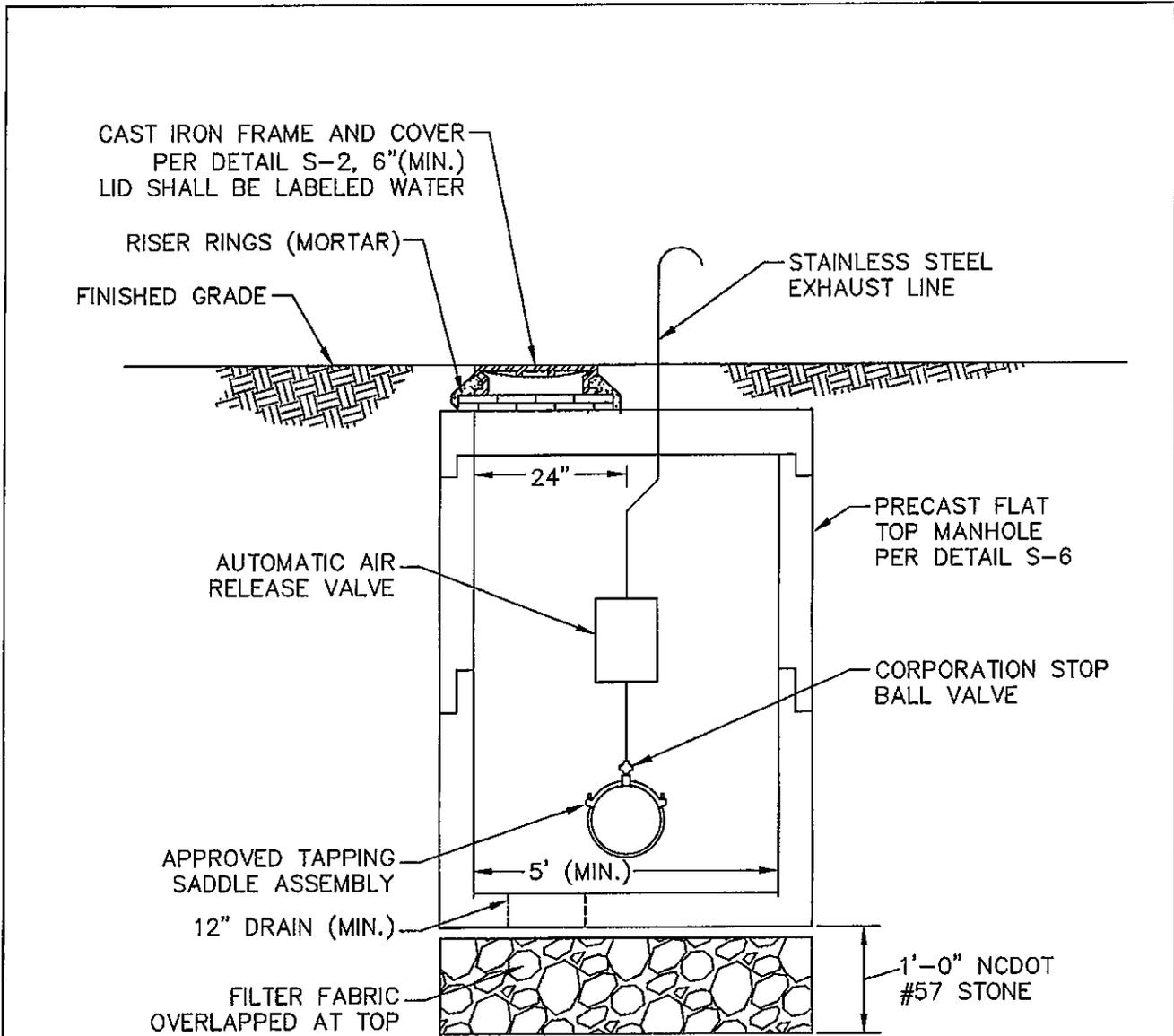
DIMENSION "A"				
FITTING	PIPE SIZE			
	4"	6"	8"	12"
11 1/4° BEND	1'-6"	1'-6"	1'-6"	2'-0"
22 1/2° BEND	1'-6"	1'-6"	2'-0"	2'-8"
45° BEND	1'-6"	2'-0"	2'-6"	3'-8"
90° BEND	1'-8"	2'-6"	3'-4"	5'-0"
TEE	1'-8"	2'-6"	3'-4"	5'-0"



WATER SYSTEMS
THRUST BLOCK

OCTOBER 2008

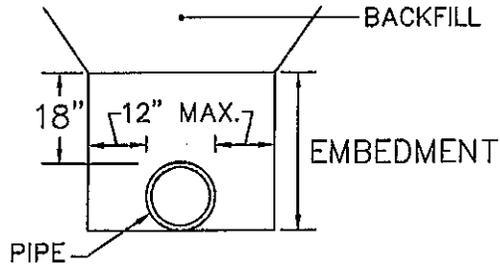
NTS W - 6.0



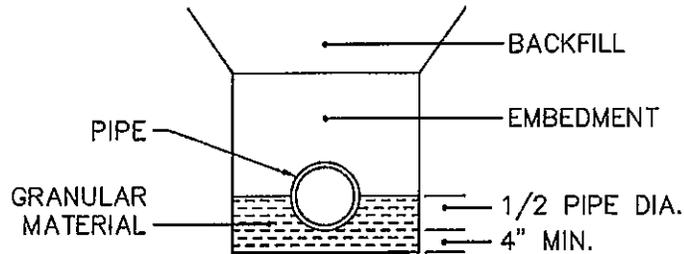
NOTES:

1. 1" AIR RELEASE VALVE AND 1" FITTINGS FOR WATER MAINS UP TO 12" IN DIAMETER.
2. 2" AIR RELEASE VALVE AND 2" FITTINGS FOR WATER MAINS GREATER THAN 12" IN DIAMETER.
3. MARKER POST SHALL BE PROVIDED FOR EXHAUST LINE PER DETAIL W-18.0.

 CITY OF Newton STANDARD DETAIL	WATER SYSTEMS AIR RELIEF MANHOLE		OCTOBER 2008	
			NTS	W - 7.0



ORDINARY PIPE BEDDING



TYPE "A" BEDDING

BEDDING	LIMITING INVERT DEPTHS			
	PIPE DIAMETER			
	6"	8"	10"	12"
ORDINARY	4'-20'	4'-15'	4'-10'	4'-10'
TYPE "A"	-	15'-20'	10'-20'	10'-20'

NOTES

1. PIPES AT DEPTHS GREATER THAN 12' MUST BE APPROVED BY THE DIRECTOR OF UTILITIES.
2. PIPE BEDDING SHALL BE DESIGNED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS, DUCTILE IRON PIPE RESEARCH ASSOCIATION OR OTHER APPLICABLE DESIGN STANDARDS.
3. PIPE EMBEDMENT SHALL BE PLACED IN A MAXIMUM OF 6" LAYERS & COMPACTED TO 95% OF THE MAXIMUM LABORATORY DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR METHOD.
4. PIPE EMBEDMENT SHALL EXTEND TO FINISHED GRADE FOR PIPELINES WITHIN ROAD RIGHT-OF-WAY.

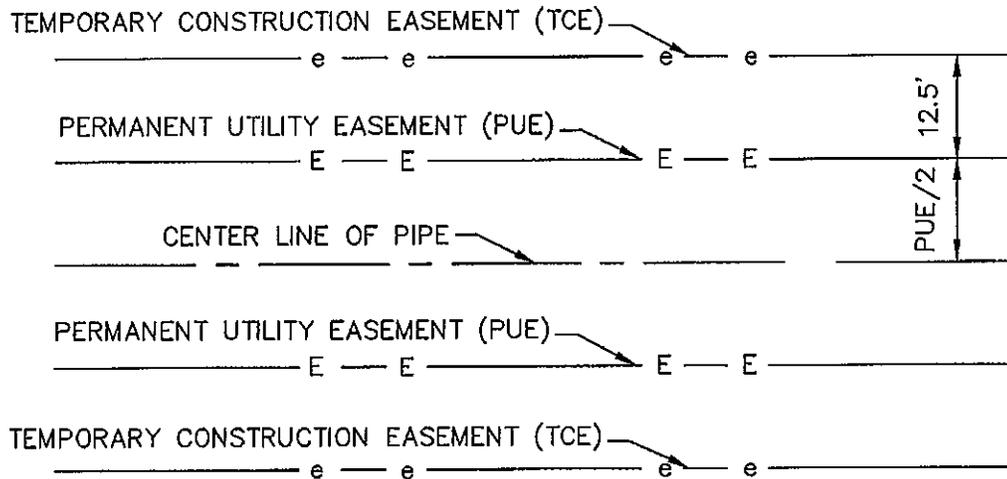


WATER SYSTEMS
DUCTILE IRON PIPE
TRENCHING & BACKFILLING
(UP TO 20' DEEP)

APRIL 2008

NTS

W - 8.0



MINIMUM PERMANENT UTILITY EASEMENT WIDTH (PUE)

DIAMETER (IN.)	MAXIMUM PIPE INVERT DEPTH (FT)					
	10'	12'	14'	16'	18'	20'
6"	25'	25'	30'	35'	40'	45'
8"	25'	25'	30'	35'	40'	45'
10"	25'	25'	30'	35'	40'	45'
12"	25'	25'	30'	35'	40'	45'
14"	25'	30'	30'	35'	40'	45'
16"	25'	30'	30'	35'	40'	45'
18"	25'	30'	30'	35'	40'	45'
20"	25'	30'	30'	35'	40'	45'
24"	25'	30'	30'	35'	40'	45'
30"	30'	35'	40'	45'	50'	50'
36"	30'	35'	40'	45'	50'	50'
42"	30'	35'	40'	45'	50'	50'

NOTES:

1. MINIMUM PUE WIDTH SHALL BE 25'.
2. EASEMENTS SHOWN ARE MINIMUM FOR CITY OWNED UTILITIES. ADDITIONAL EASEMENTS MAY BE REQUIRED FOR DEEPER THAN AVERAGE OR LARGE LINES.
3. FOR PARALLEL LINES, EASEMENT SHALL BE MINIMUM PUE/2 FEET FROM CENTER OF EACH LINE.
4. TCE OF 12.5' IS REQUIRED ON EACH SIDE OF PUE.



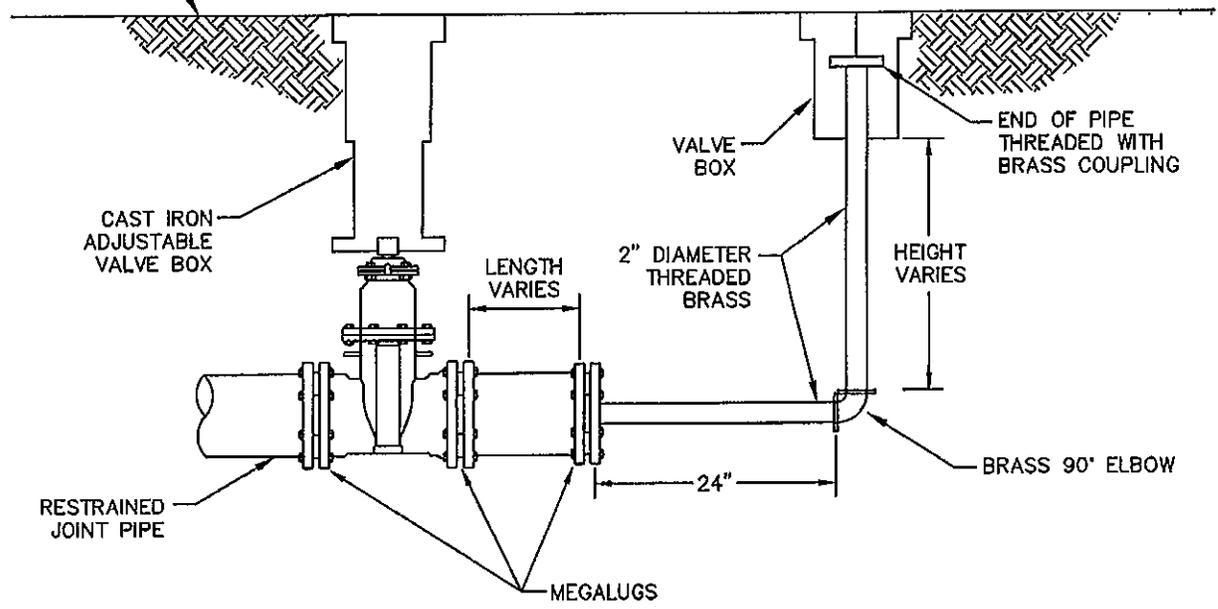
WATER SYSTEMS
MINIMUM EASEMENT

OCTOBER 2008

NTS

W - 9.0

FINISHED GRADE



BLOW-OFF SIZES

2" MAIN	3/4" COPPER
6" MAIN	1 1/2" COPPER
8" MAIN	2" COPPER

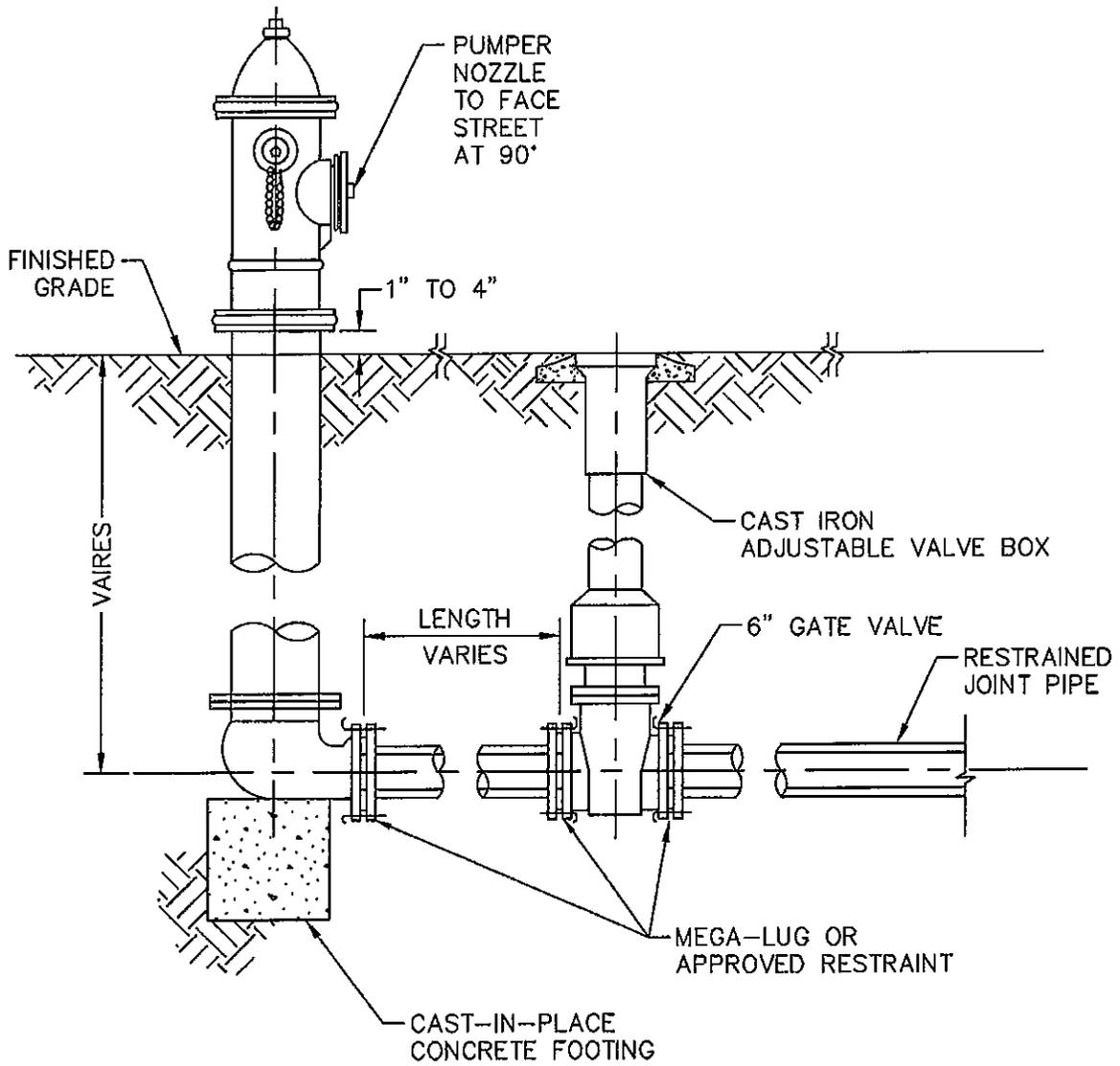


WATER SYSTEMS
 TEMPORARY 2"
 BLOWOFF ASSEMBLY

OCTOBER 2008

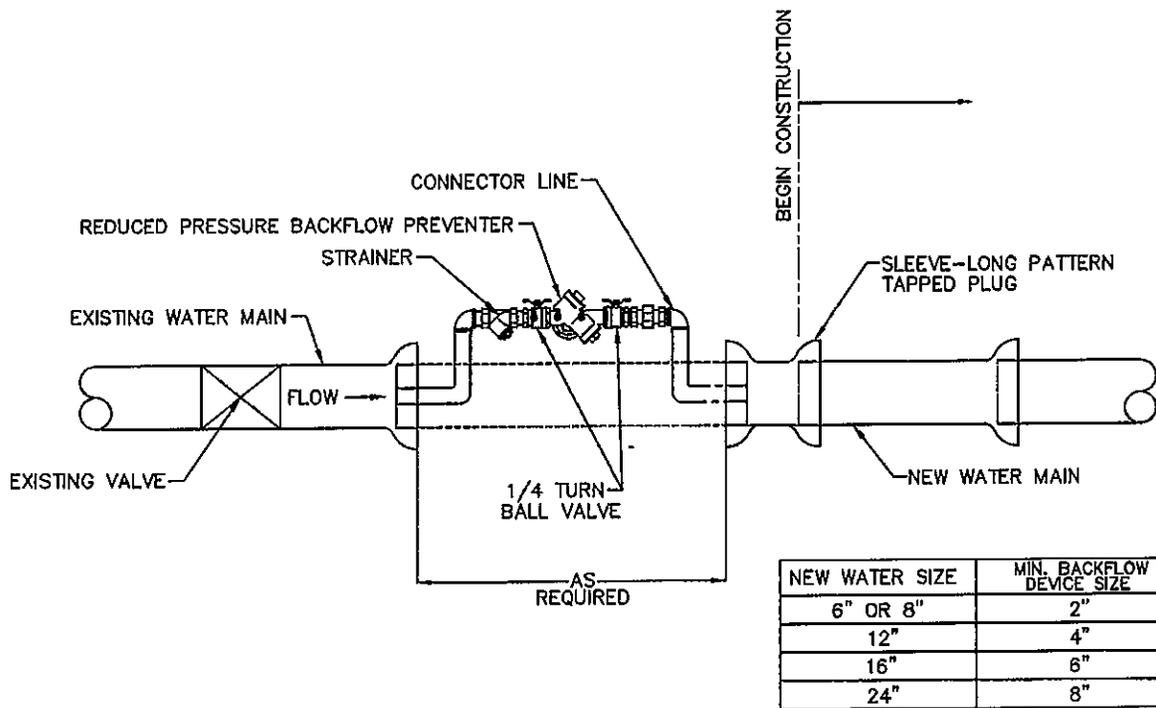
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NOTE:

1. WATER LINES 6" OR LARGER SHALL HAVE FIRE HYDRANT AS PERMANENT BLOW OFF.



BACKFLOW PREVENTION DEVICE

NOTES:

1. INSTALL FROM EXISTING BLOW OFF ASSEMBLY TO NEW MAIN FOR FILLING, TESTING AND STERILIZING NEW MAIN.
2. BACKFLOW PREVENTION DEVICE SHALL BE OPERATED INDEPENDENT OF EXISTING MAIN.
3. BLOCKING ON EXISTING LINE IS NOT TO BE DISTURBED.
4. DEVICE SHALL BE A MINIMUM OF 12 INCHES ABOVE EXISTING GROUND.
5. FINAL CONNECTION TO EXISTING MAIN TO BE MADE ONLY AFTER TOTAL PROJECT IS ACCEPTED BY THE OWNER.
6. VALVES ON EXISTING SYSTEM TO BE OPERATED BY OWNER FORCES ONLY.
7. ONLY ONE CONNECTION WILL BE ALLOWED BETWEEN THE EXISTING SYSTEM AND THE NEW CONSTRUCTION UNTIL TESTING AND DISINFECTION ARE COMPLETE.
10. REDUCED PRESSURE ZONE ASSEMBLIES (RP) MUST CONFORM TO CITY OF NEWTON BACKFLOW ORDINANCE. REFER TO CITY OF NEWTON APPROVED LIST OF BPA'S.
11. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL OF THE DIRECTOR OF UTILITIES AND MUST BE ON THE PROPERTY OWNER'S SIDE OF THE METER AND OUTSIDE OF THE RIGHT-OF-WAY.
12. EACH BPA IS REQUIRED TO BE TESTED BY AN APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.

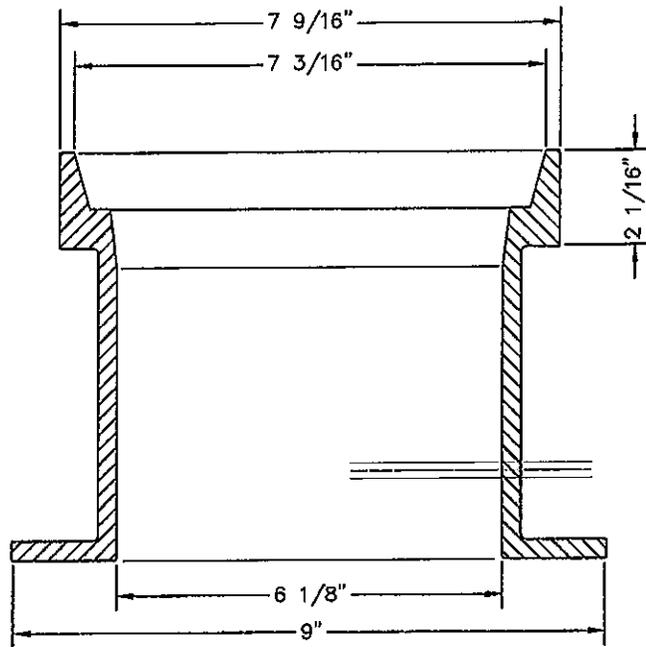


**WATER SYSTEMS
BACKFLOW PREVENTION
DEVICE FOR FILLING
NEW MAINS**

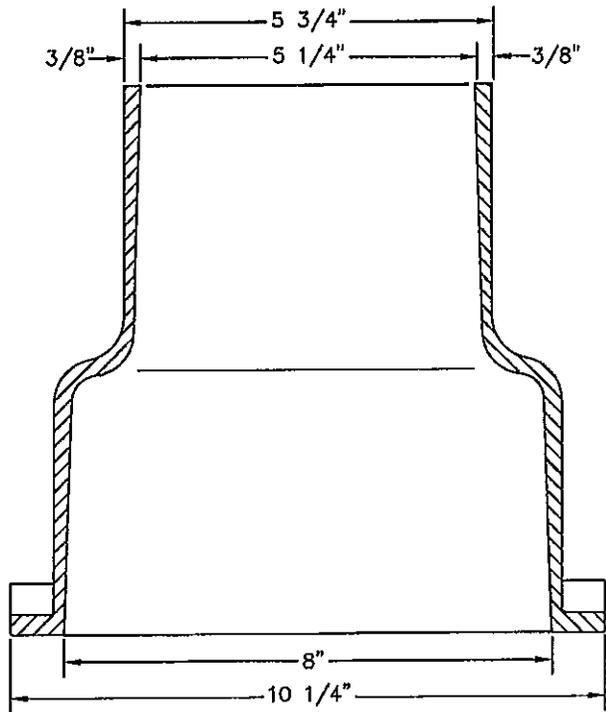
OCTOBER 2008

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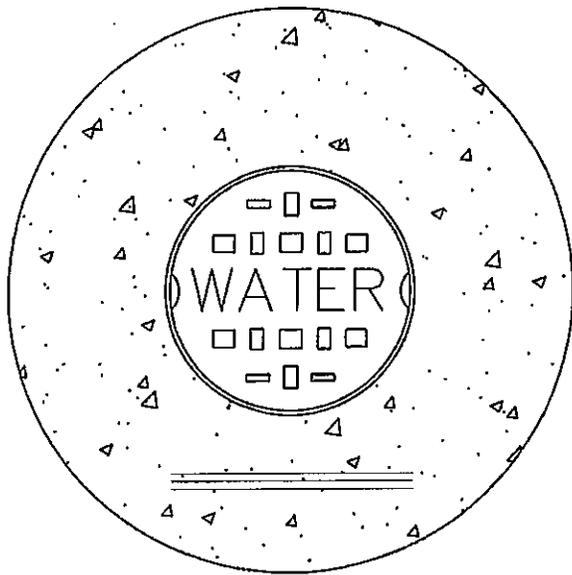
TOP SECTION



BOTTOM SECTION

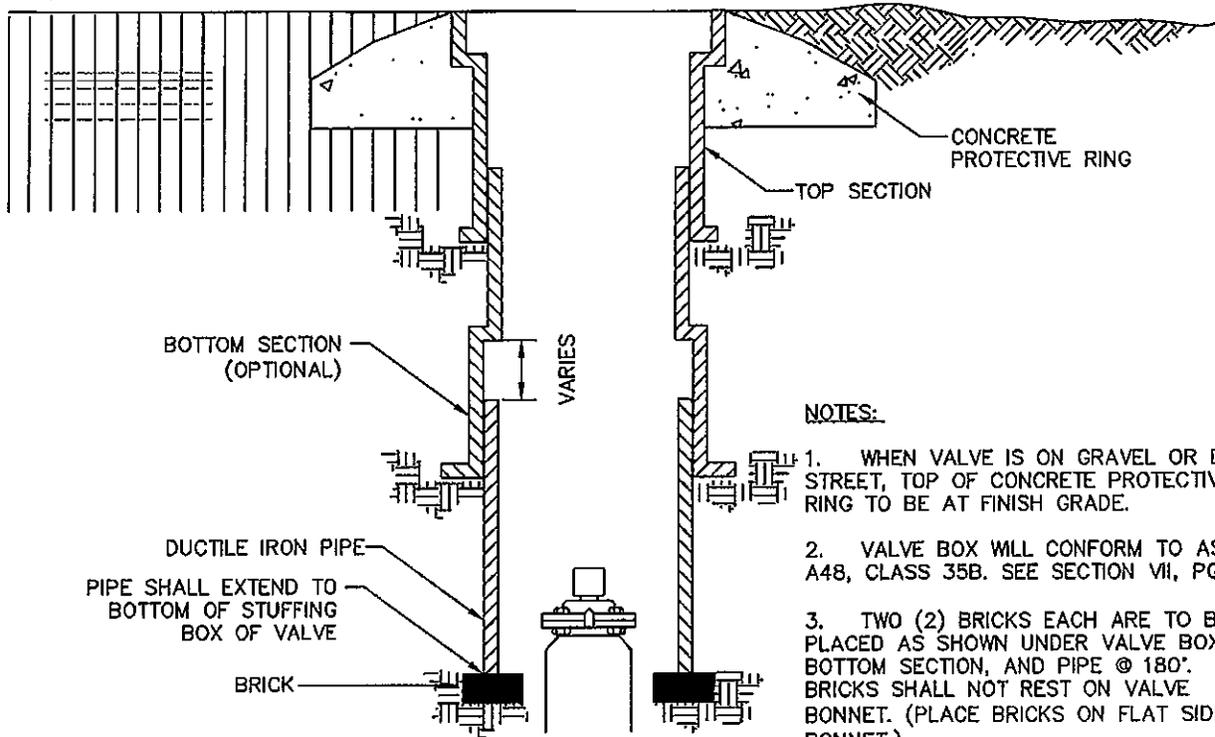
NOTES:

1. VALVE BOX WILL CONFORM TO ASTM A48, CLASS 35 B.
2. MINIMUM WEIGHTS:
 COVER.....13 LBS
 TOP SECTION.....60 LBS
 BOTTOM SECTION....49 LBS
 TOTAL....122 LBS
3. COVERS LOCATED IN CONCRETE OR PAVEMENT SHALL HAVE SKIRTS MIN. 4" DEEP AND COVERS SHALL WEIGH MIN. OF 24 LBS.



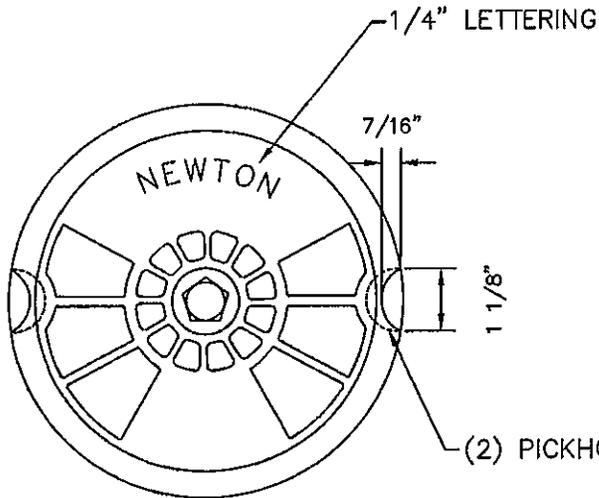
PAVEMENT
(INCLUDING GRAVEL & DIRT STREETS)

SHOULDER

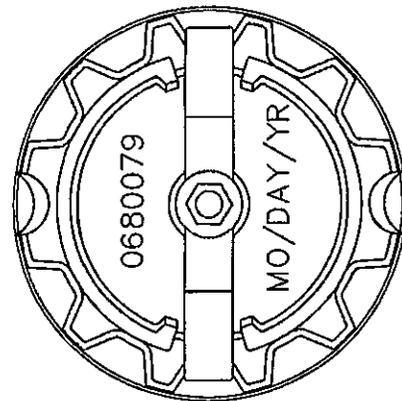


NOTES:

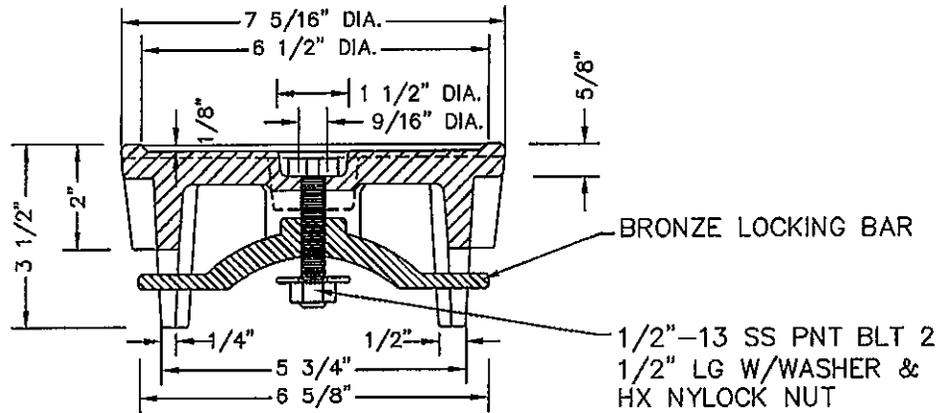
1. WHEN VALVE IS ON GRAVEL OR DIRT STREET, TOP OF CONCRETE PROTECTIVE RING TO BE AT FINISH GRADE.
2. VALVE BOX WILL CONFORM TO ASTM A48, CLASS 35B. SEE SECTION VII, PG. 33.
3. TWO (2) BRICKS EACH ARE TO BE PLACED AS SHOWN UNDER VALVE BOX, BOTTOM SECTION, AND PIPE @ 180°. BRICKS SHALL NOT REST ON VALVE BONNET. (PLACE BRICKS ON FLAT SIDE OF BONNET.)



TOP VIEW

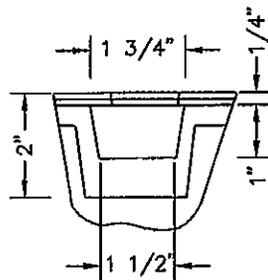


BOTTOM VIEW



SECTION VIEW

NOTE:
 LOCKING LIDS ARE REQUIRED IN
 VICINITY OF PRIVATE WATER
 SYSTEMS OR AS DIRECTED BY THE
 DIRECTOR OF UTILITIES.



PICK HOLE DETAIL

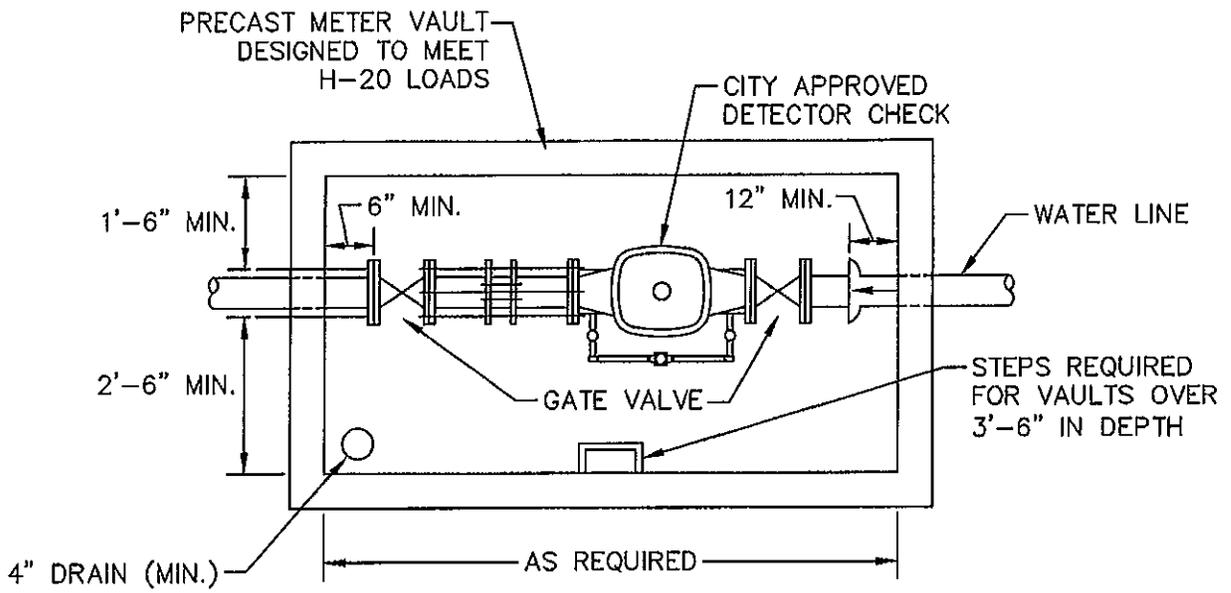


WATER SYSTEMS
 5 1/4" LOCKING
 DROP LID

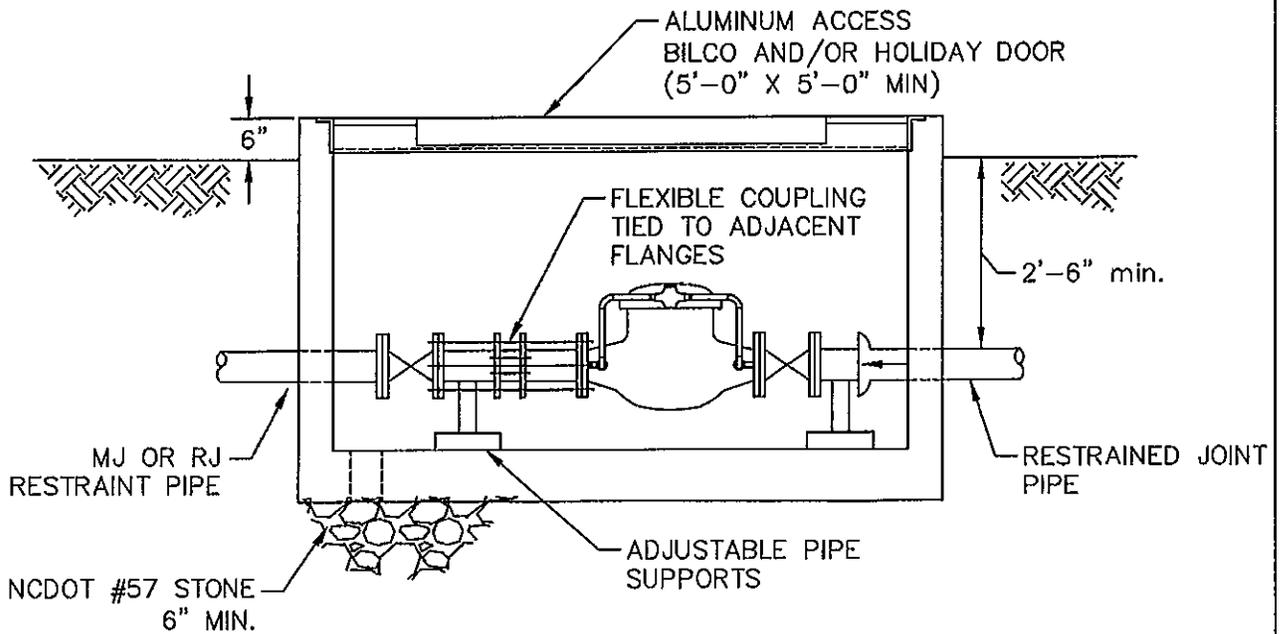
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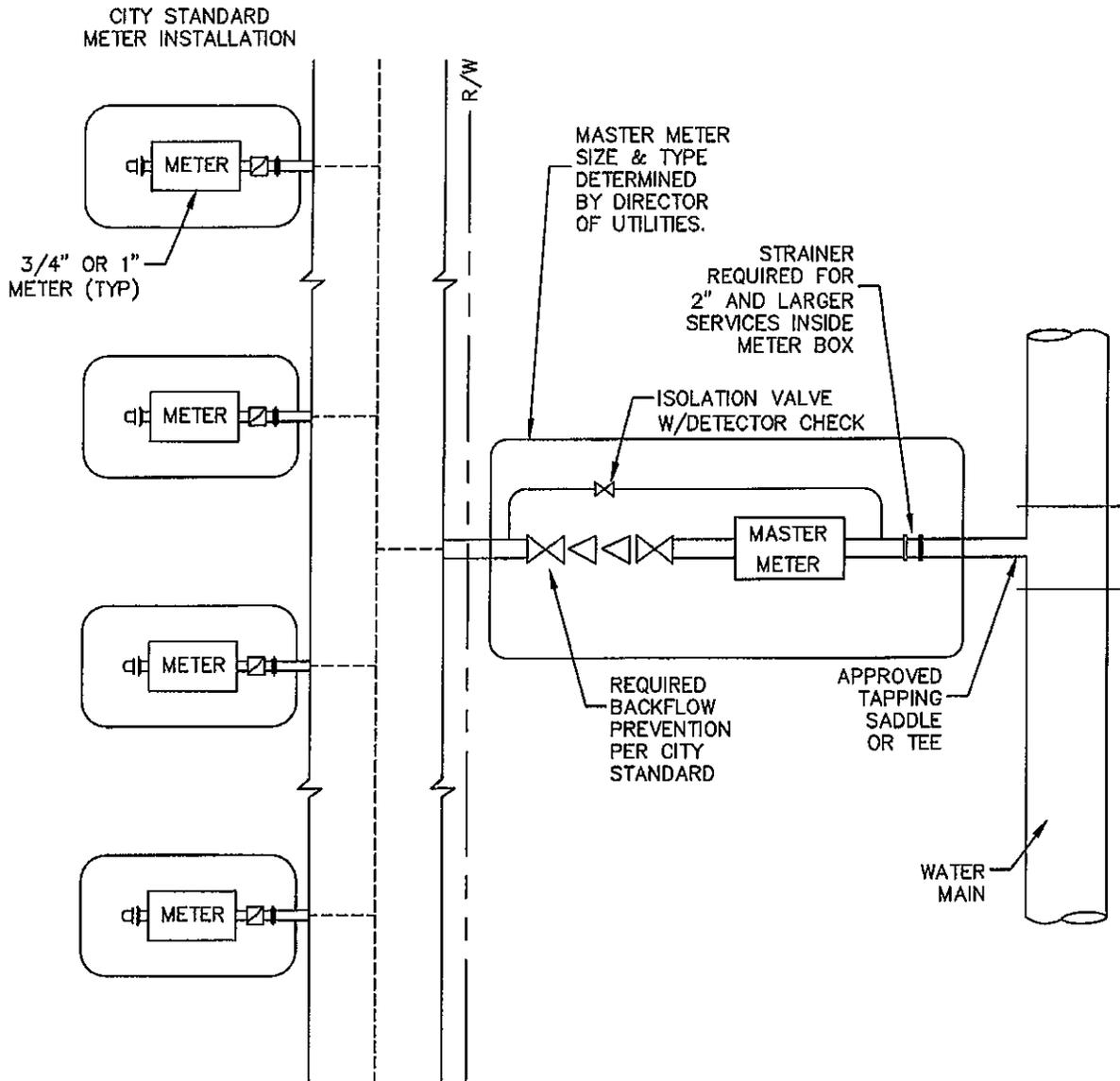
W - 15.0



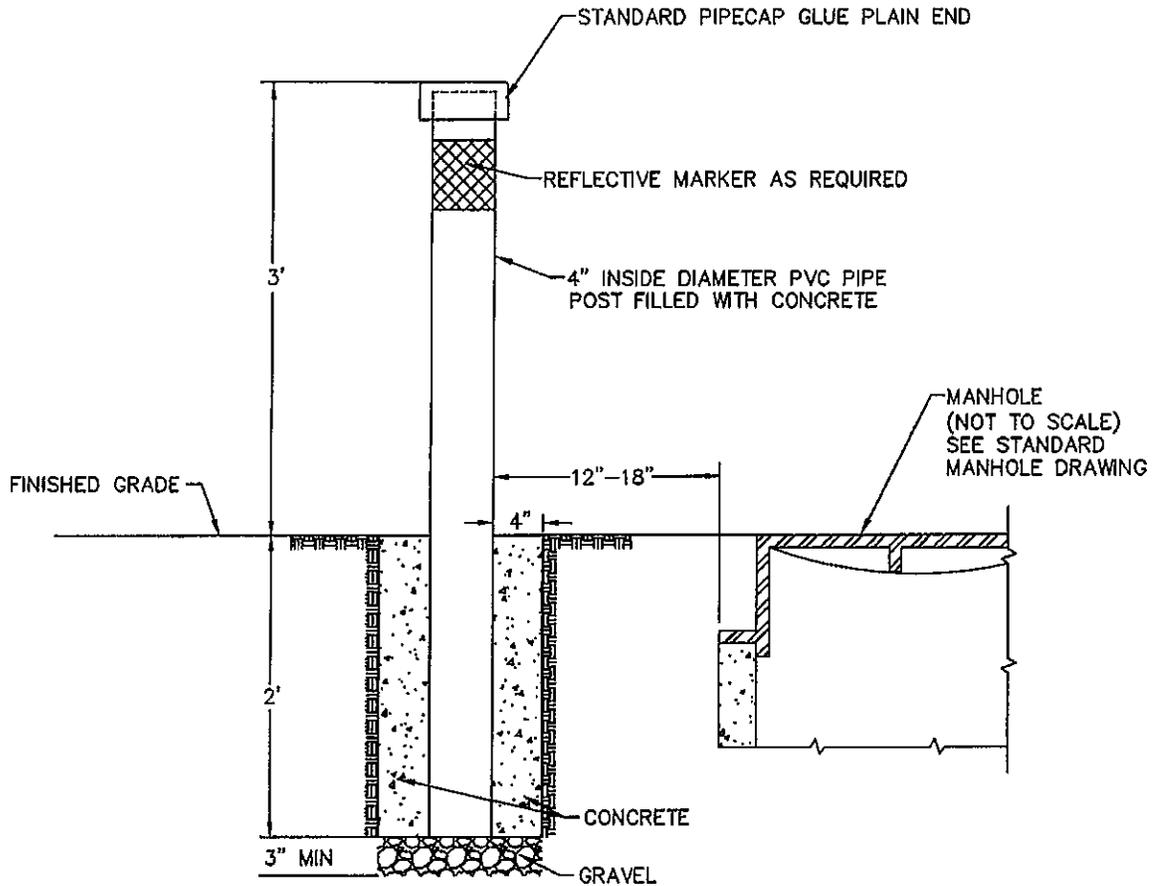
PLAN



SECTION



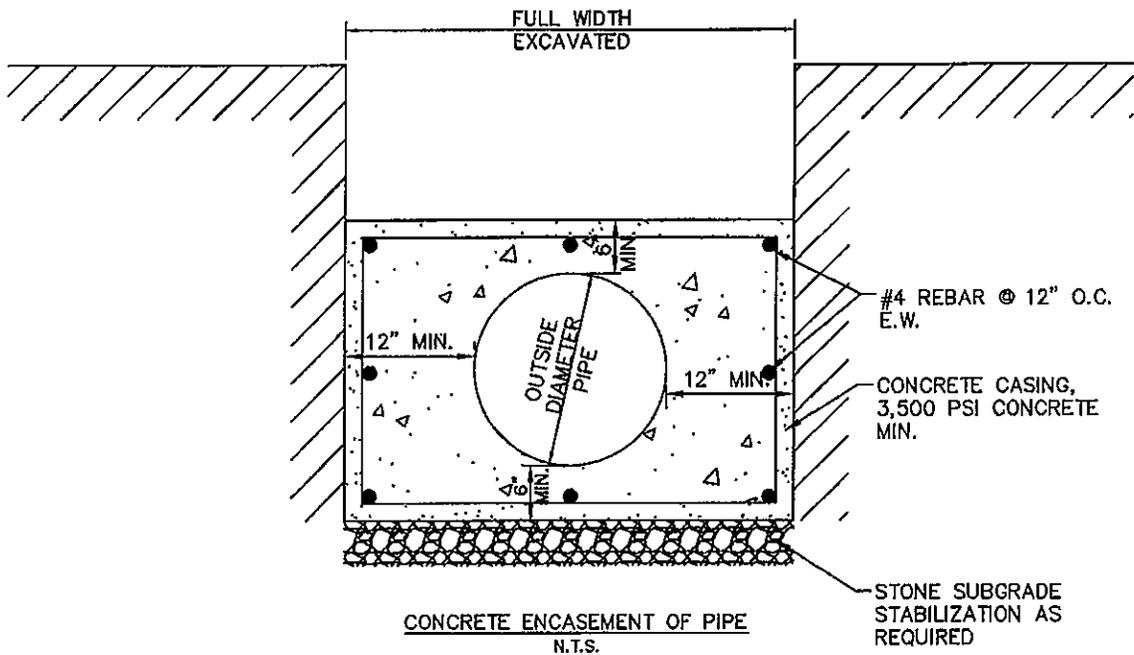
1. USE OF MULTIPLE METER ASSEMBLY SHALL BE APPROVED BY DIRECTOR OF UTILITIES.
2. BACKFLOW PREVENTION DEVICE AND VAULT SHALL BE PER CITY BACKFLOW PREVENTION ORDINANCE.
3. OWNER SHALL BE RESPONSIBLE FOR THE CHOICE OF MATERIAL AND MAINTENANCE OF ALL PIPING BETWEEN INDIVIDUAL METERS AND THE MASTER METER. THE CITY SHALL NOT BE RESPONSIBLE FOR REPAIR OR MAINTENANCE OF THESE LINES.



MARKER POST
NTS

NOTES:

1. AS DIRECTED THE POST SHALL BE LOCATED ON THE STRAIGHT SIDE OF MANHOLE CONE.
2. POSTS SHALL BE SET IN CONCRETE.
3. AS AN ALTERNATIVE, A TREATED 4 X 4 POST MAY BE USED, IF APPROVED.
4. POSTS SHALL BE PAINTED WHITE.



NOTE:

1. PIPE SHALL BE DIP WITHIN ENCASEMENT UNLESS APPROVED BY DIRECTOR OF UTILITIES.
2. USE SOLID PRE-CAST CONCRETE BLOCKS (3,500 PSI CONCRETE MIN.) TO SUPPORT PIPE IN TRENCH.

BACKFLOW PREVENTION DETAILS:

- BF-1.0 REDUCED PRESSURE PRINCIPLE ASSEMBLY
3/4"-2" ABOVE GROUND
- BF-2.0 REDUCED PRESSURE PRINCIPLE ASSEMBLY
3" AND LARGER ABOVE GROUND
- BF-3.0 FIRE SERVICE CONNECTION
ABOVE GROUND
- BF-4.0 FIRE SERVICE CONNECTION
BELOW GROUND
- BF-5.0 TEST COCK LOCATION
- BF-6.0 VAULT COUPLING
- BF-7.0 RESIDENTIAL IRRIGATION BACKFLOW PREVENTER
- BF-8.0 DCV .75"- 2" ABOVE GROUND
- BF-9.0 DCV 2.5"- 12" INDOOR
- BF-10.0 DCV .75"- 2" INDOOR
- BF-11.0 RPP 2.5"- 12" INDOOR
- BF-12.0 RPP .75"- 2" INDOOR
- BF-13.0 DCV 2.5"- 10" ABOVE GROUND
- BF-14.0 DCV .75- 1" BELOW GROUND VAULT
- BF-15.0 DCV 1.5"- 2" BELOW GROUND VAULT
- BF-16.0 DCV 2.5"- 12" BELOW GROUND VAULT

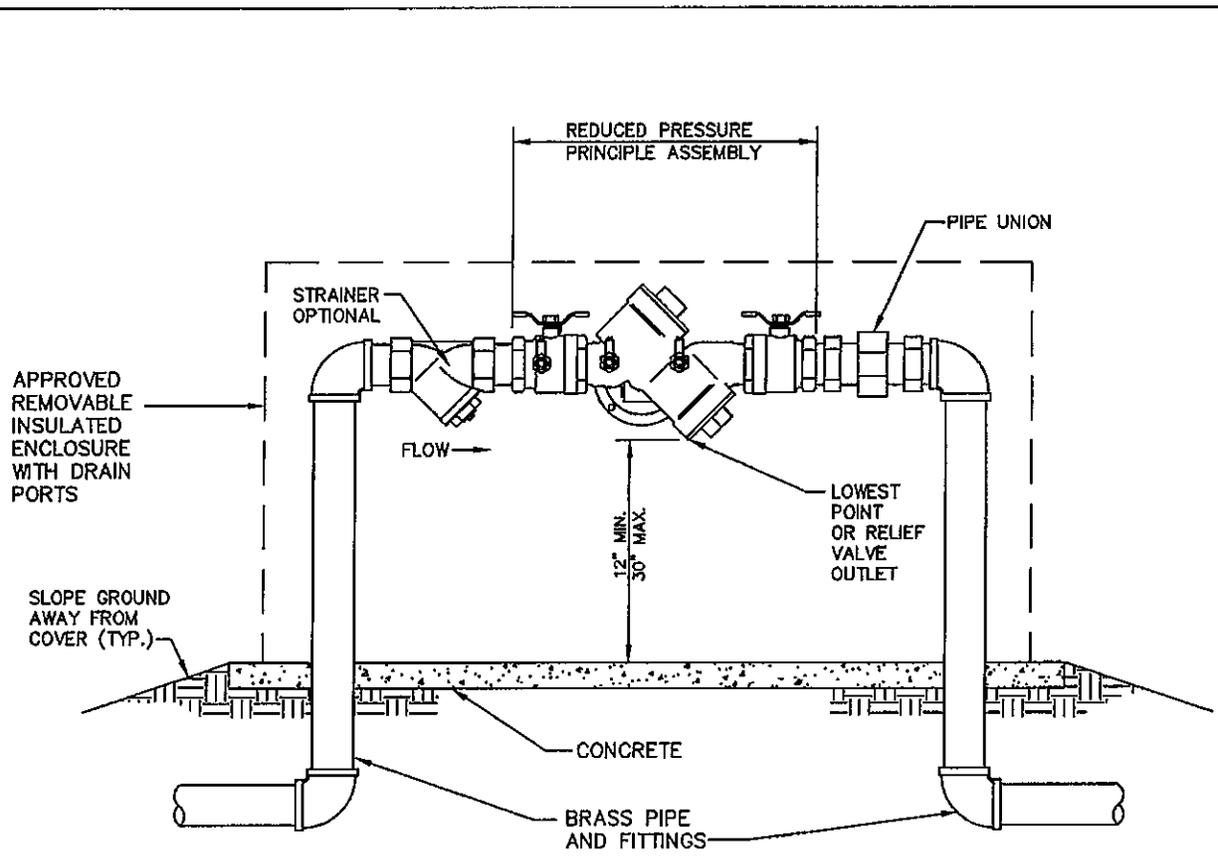


**WATER SYSTEMS
BACKFLOW PREVENTION
INDEX**

JANUARY 2009

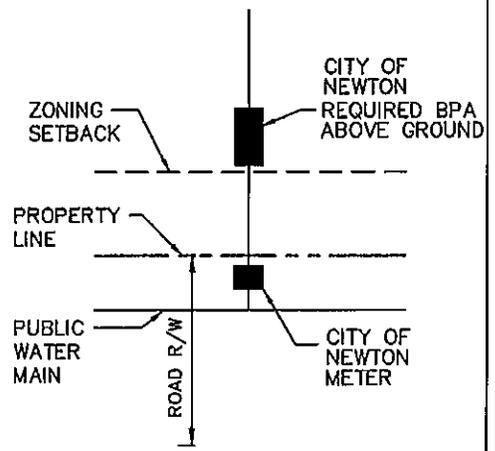
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BF



NOTES:

1. RESIDENTIAL IRRIGATION CONNECTIONS AND ALL COMMERCIAL CONNECTIONS MUST HAVE BACKFLOW PROTECTION. SEE BACKFLOW PREVENTION ORDINANCE FOR DETAILS.
2. REDUCED PRESSURE ZONE ASSEMBLIES (RP) MUST CONFORM TO CITY OF NEWTON ORDINANCE. REFER TO CITY OF NEWTON APPROVED LIST OF BPA'S.
3. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL OF THE DIRECTOR OF UTILITIES AND MUST BE ON THE PROPERTY OWNER'S SIDE OF THE METER AND OUTSIDE OF THE RIGHT-OF-WAY.
4. EACH BPA IS REQUIRED TO BE TESTED BY AN APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.
5. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN CITY OF NEWTON LAND DEVELOPMENT DESIGN STANDARDS MANUAL.

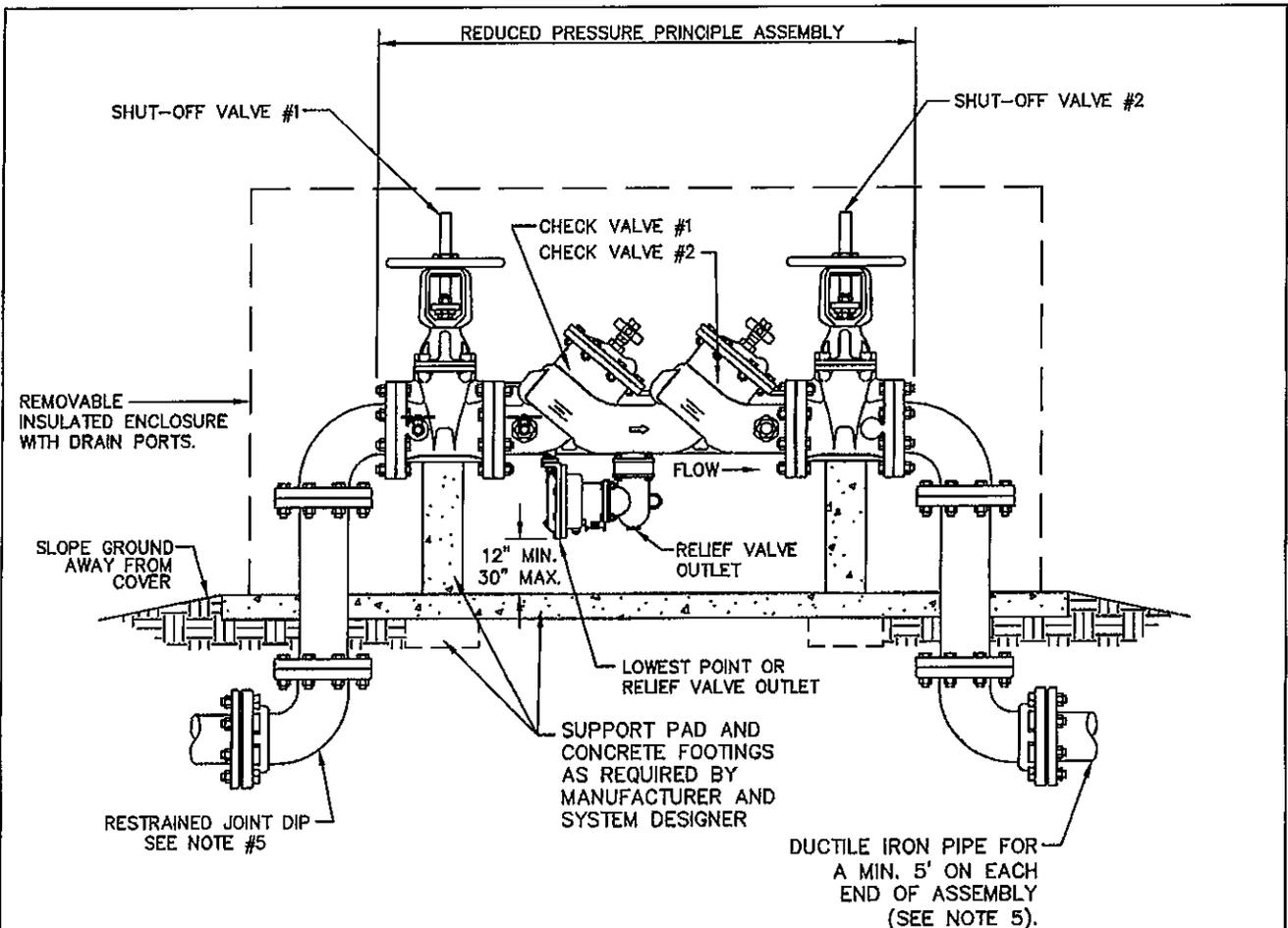


TYPICAL LOCATION REQUIREMENT FOR ABOVE GROUND INSTALLATION
N.T.S.



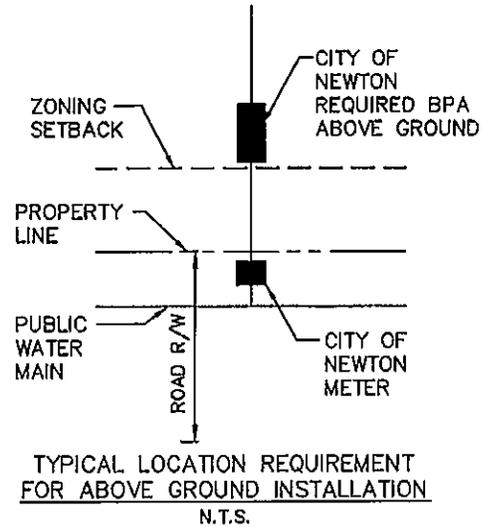
WATER SYSTEMS
BACKFLOW PREVENTION
REDUCED PRESSURE PRINCIPLE
ASSEMBLY (RP) 3/4"-2"
ABOVE GROUND

JANUARY 2009
NTS BF-1.0



NOTES:

1. RESIDENTIAL IRRIGATION CONNECTIONS AND ALL COMMERCIAL CONNECTIONS MUST HAVE BACKFLOW PROTECTION. SEE BACKFLOW PREVENTION ORDINANCE FOR DETAILS.
2. REDUCED PRESSURE ZONE ASSEMBLIES (RP) MUST CONFORM TO CITY OF NEWTON ORDINANCE. REFER TO CITY OF NEWTON APPROVED LIST OF BPA'S.
3. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL OF THE DIRECTOR OF UTILITIES AND MUST BE ON THE PROPERTY OWNER'S SIDE OF THE METER AND OUTSIDE OF THE RIGHT-OF-WAY.
4. EACH BPA IS REQUIRED TO BE TESTED BY AN APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.
5. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN CITY OF NEWTON LAND DEVELOPMENT DESIGN STANDARDS MANUAL. DUCTILE IRON PIPE CONNECTIONS ARE TO BE RESTRAINED MECHANICAL JOINT BELOW GRADE, AND FLANGE CONNECTIONS ABOVE GRADE.

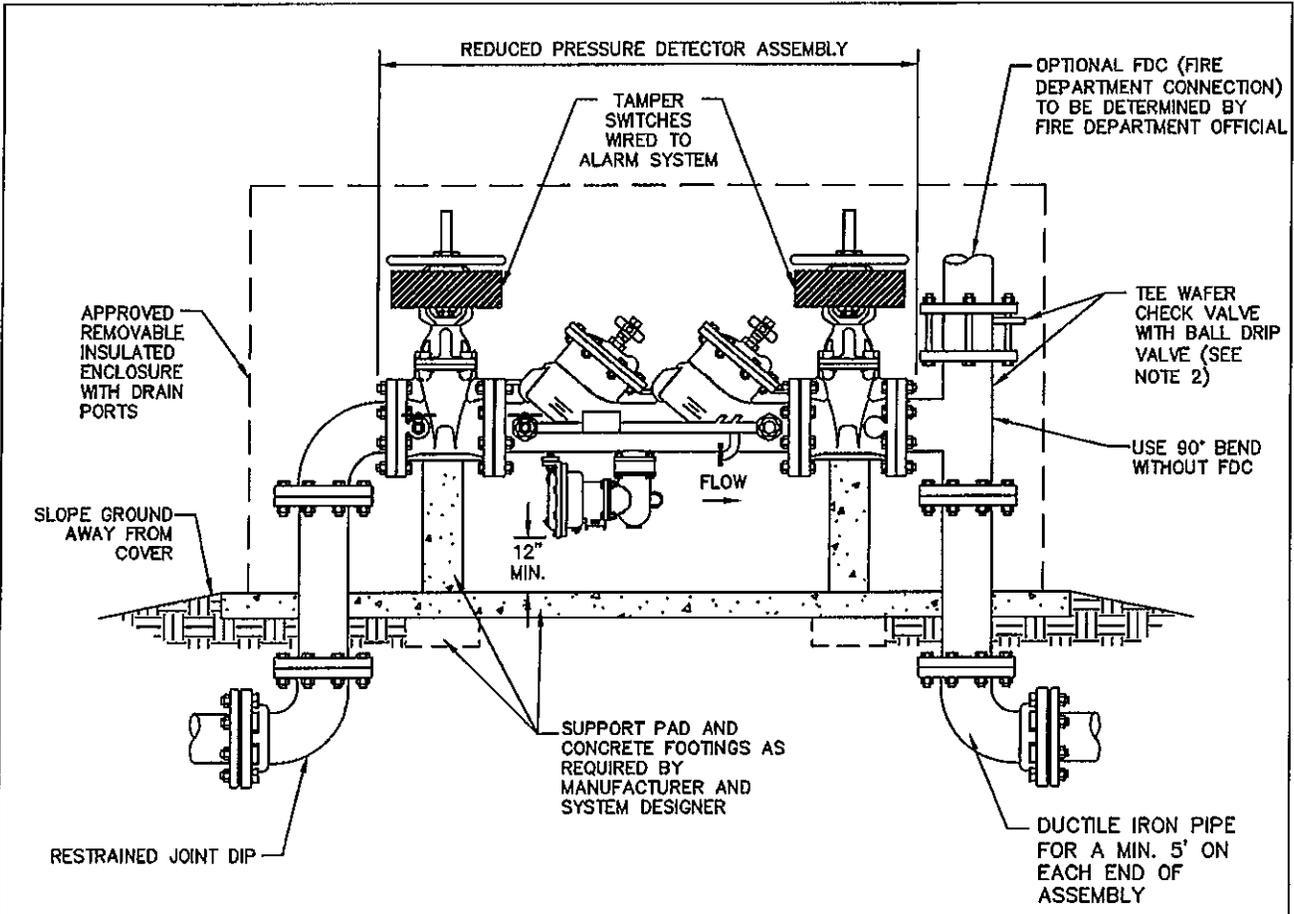


WATER SYSTEMS
BACKFLOW PREVENTION
REDUCED PRESSURE PRINCIPLE
ASSEMBLY (RP) 3" AND LARGER
ABOVE GROUND

JANUARY 2009

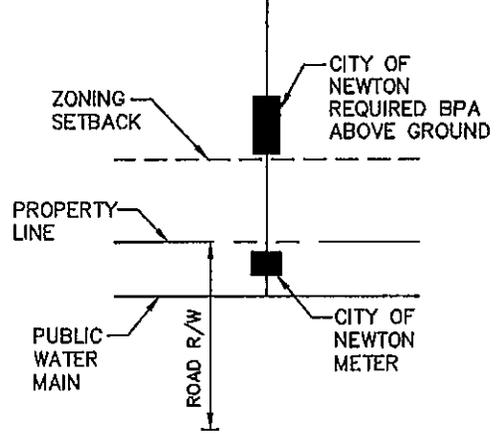
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BF-2.0



NOTES:

1. FIRE DEPARTMENT CONNECTION DETAILS ARE TO BE DETERMINED BY FIRE DEPARTMENT OFFICIALS. OPTIONAL FDC SHOWN ABOVE.
2. WAFER CHECK VALVE MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS FOR HORIZONTAL OR VERTICAL INSTALLATION.
3. REDUCED PRESSURE ZONE ASSEMBLIES (RP) MUST CONFORM TO CITY OF NEWTON ORDINANCE. REFER TO CITY OF NEWTON APPROVED LIST OF BPA's.
4. ALL LOCATIONS FOR BPA's REQUIRE APPROVAL OF THE DIRECTOR OF UTILITIES AND MUST BE ON THE PROPERTY OWNER'S SIDE OF THE METER AND OUTSIDE OF THE RIGHT-OF-WAY.
5. EACH BPA IS REQUIRED TO BE TESTED BY AN APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.
6. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN CITY OF NEWTON LAND DEVELOPMENT DESIGN STANDARDS MANUAL.



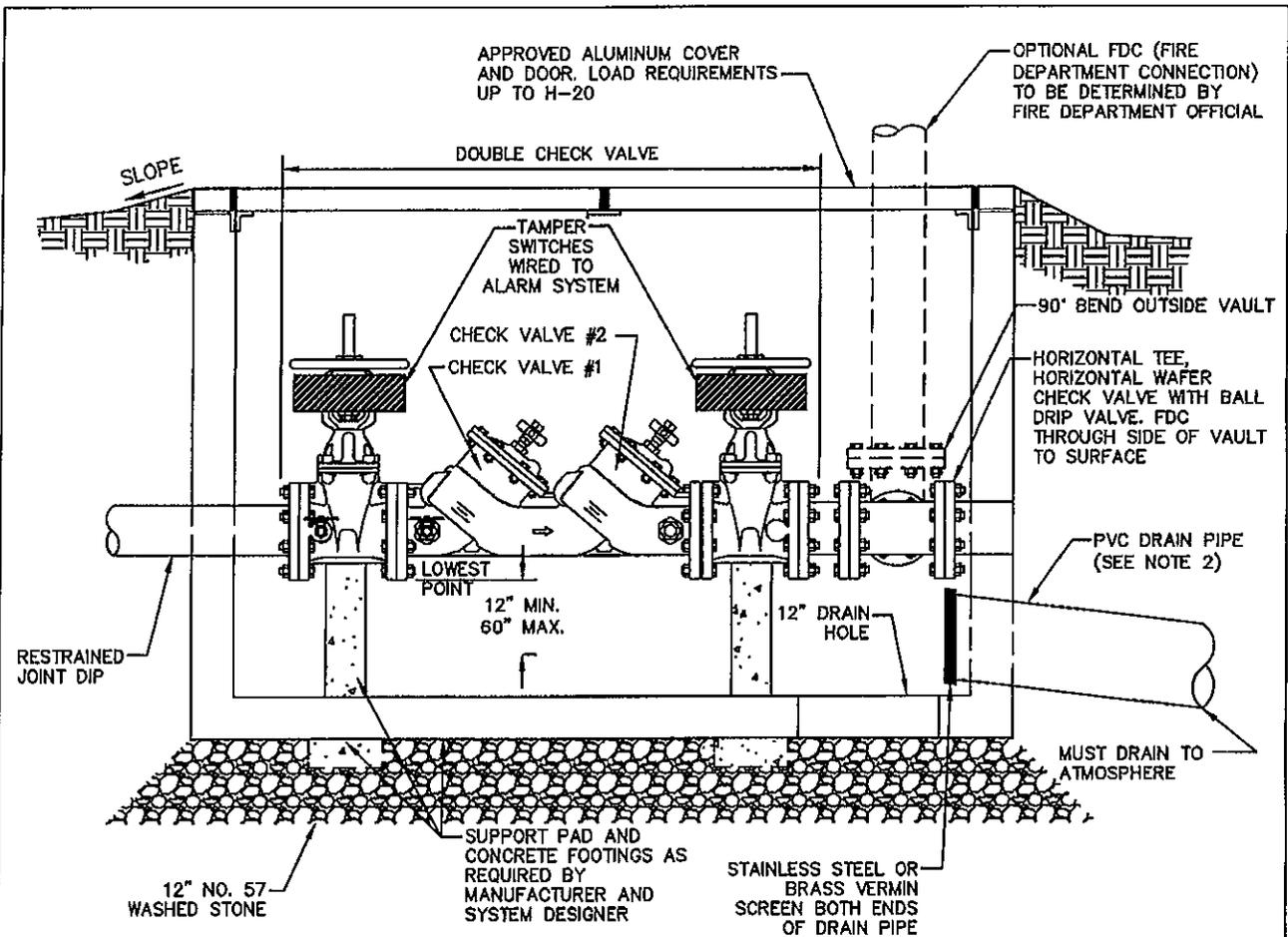
TYPICAL LOCATION REQUIREMENT FOR ABOVE GROUND INSTALLATION
N.T.S.



WATER SYSTEMS
BACKFLOW PREVENTION
FIRE SERVICE CONNECTION
ABOVE GROUND

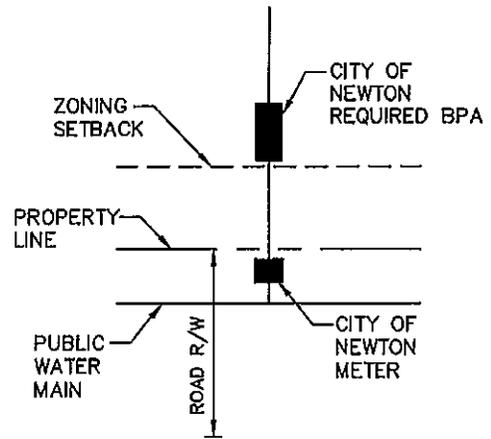
JANUARY 2009

NTS BF-3.0



NOTES:

1. FIRE DEPARTMENT CONNECTOR DETAILS ARE TO BE DETERMINED BY FIRE DEPARTMENT OFFICIALS. OPTIONAL FDC SHOWN ABOVE.
2. DRAIN PIPE DIAMETER MUST BE AT LEAST TWICE WATER PIPE DIAMETER. DRAIN PIPE SHALL DISCHARGE TO ATMOSPHERE AND MUST HAVE VERMIN SCREEN ATTACHED TO BOTH ENDS OF PIPE. VAULTS MUST REMAIN FREE OF LIQUID AT ALL TIMES.
3. PRE-CAST CONCRETE VAULT H-20 LOAD RATED.
4. DOUBLE CHECK VALVE MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS FOR HORIZONTAL OR VERTICAL INSTALLATION.
5. DOUBLE CHECK VALVE ASSEMBLIES MUST CONFORM TO CITY OF NEWTON ORDINANCE. REFER TO CITY OF NEWTON APPROVED LIST OF BPA's.
6. ALL LOCATIONS FOR BPA's REQUIRE APPROVAL OF THE DIRECTOR OF UTILITIES AND MUST BE ON THE PROPERTY OWNER'S SIDE OF THE METER AND OUTSIDE OF THE RIGHT-OF-WAY
7. EACH BPA IS REQUIRED TO BE TESTED BY AN APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE



TYPICAL LOCATION REQUIREMENT
N.T.S.

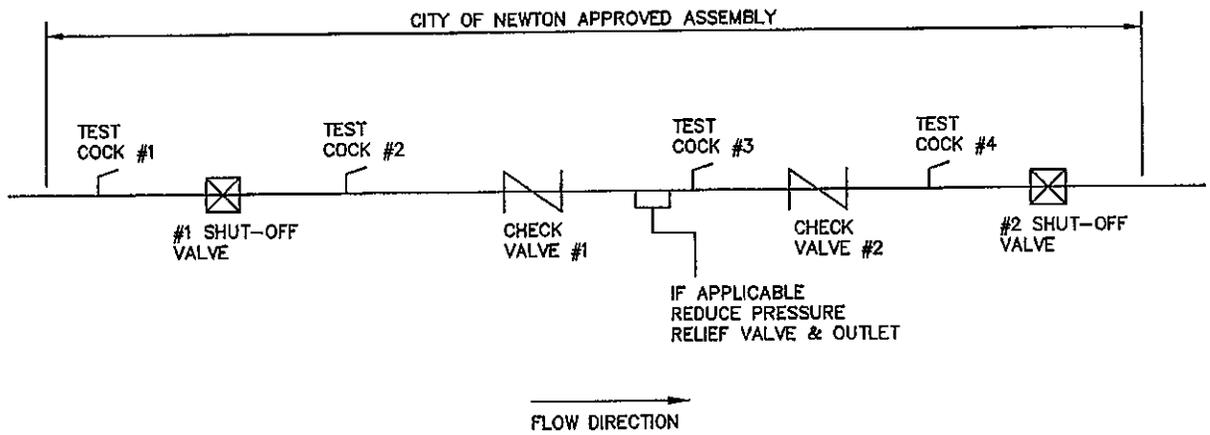


WATER SYSTEMS
BACKFLOW PREVENTION
FIRE SERVICE CONNECTION
BELOW GROUND

JANUARY 2009

NTS

BF-4.0



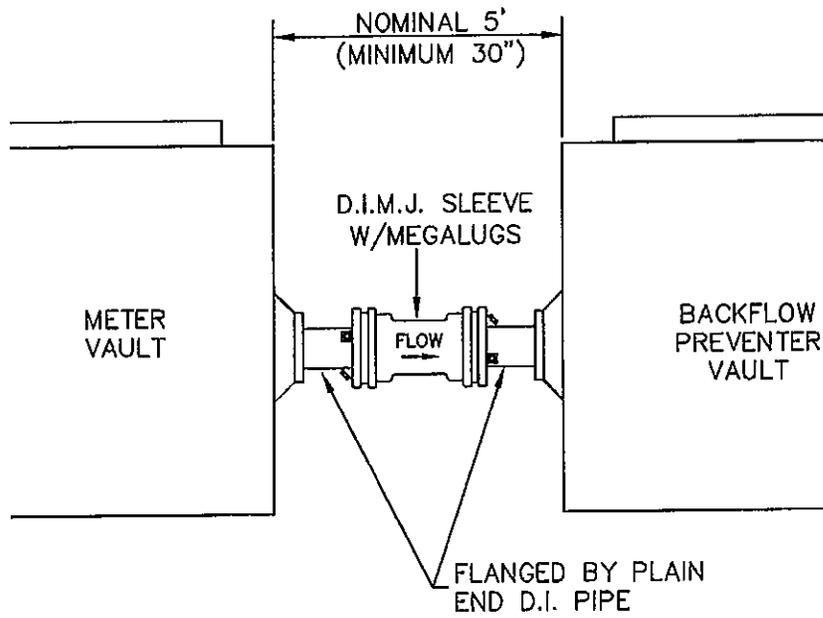
WATER SYSTEMS
BACKFLOW PREVENTION

TEST COCK LOCATIONS

JANUARY 2009

NTS

BF-5.0



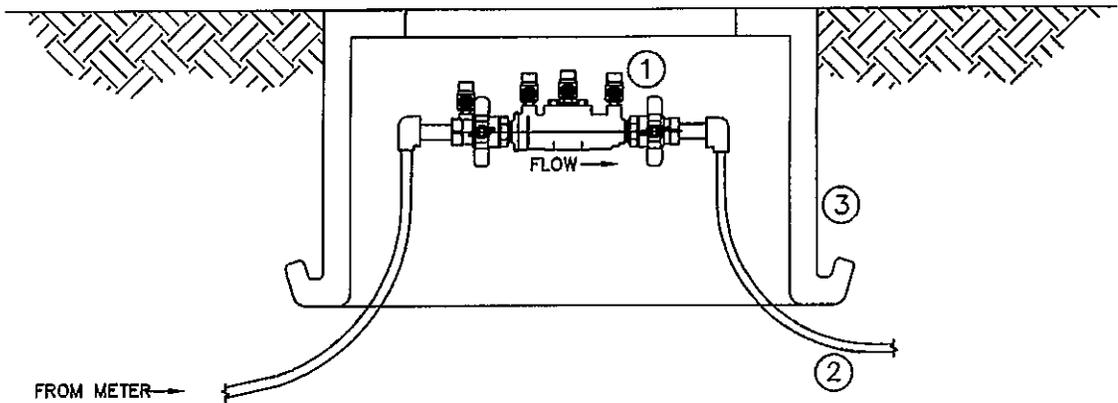
WATER SYSTEMS
BACKFLOW PREVENTION

VAULT COUPLING

JANUARY 2009

NTS

BF-6.0

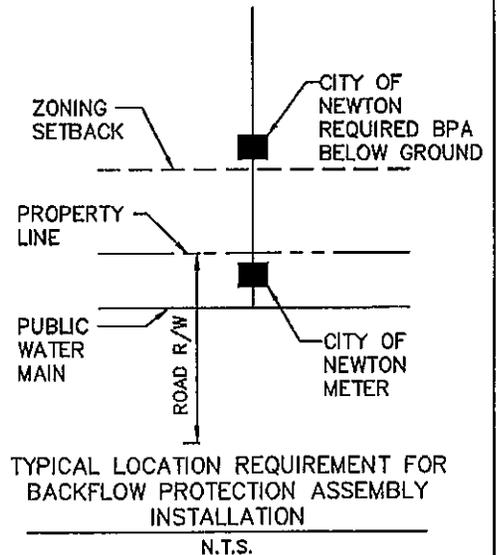


LEGEND:

- ① DOUBLE CHECK VALVE ASSEMBLY
- ② COPPER TUBING, TYPE K, WITH COMPRESSION JOINTS.
- ③ WHITE OR BLACK POLYETHYLENE OR CAST IRON METER BOX PER THE MATERIALS SECTION.

NOTES:

1. ONLY RESIDENTIAL IRRIGATION CONNECTIONS SHALL USE DOUBLE CHECK VALVE ASSEMBLIES. ALL OTHER APPLICATIONS MUST BE REDUCED PRESSURE ZONE (RPZ) ASSEMBLIES. SEE BACKFLOW PREVENTION ORDINANCE FOR ADDITIONAL INFORMATION.
2. DOUBLE CHECK VALVE ASSEMBLIES MUST CONFORM TO CITY OF NEWTON ORDINANCE. REFER TO CITY OF NEWTON APPROVED LIST OF BPA'S.
3. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL OF THE DIRECTOR OF UTILITIES AND MUST BE ON THE PROPERTY OWNER'S SIDE OF THE METER AND OUTSIDE OF THE RIGHT-OF-WAY.
4. EACH BPA IS REQUIRED TO BE TESTED BY AN APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.
5. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN CITY OF NEWTON LAND DEVELOPMENT DESIGN STANDARDS MANUAL.

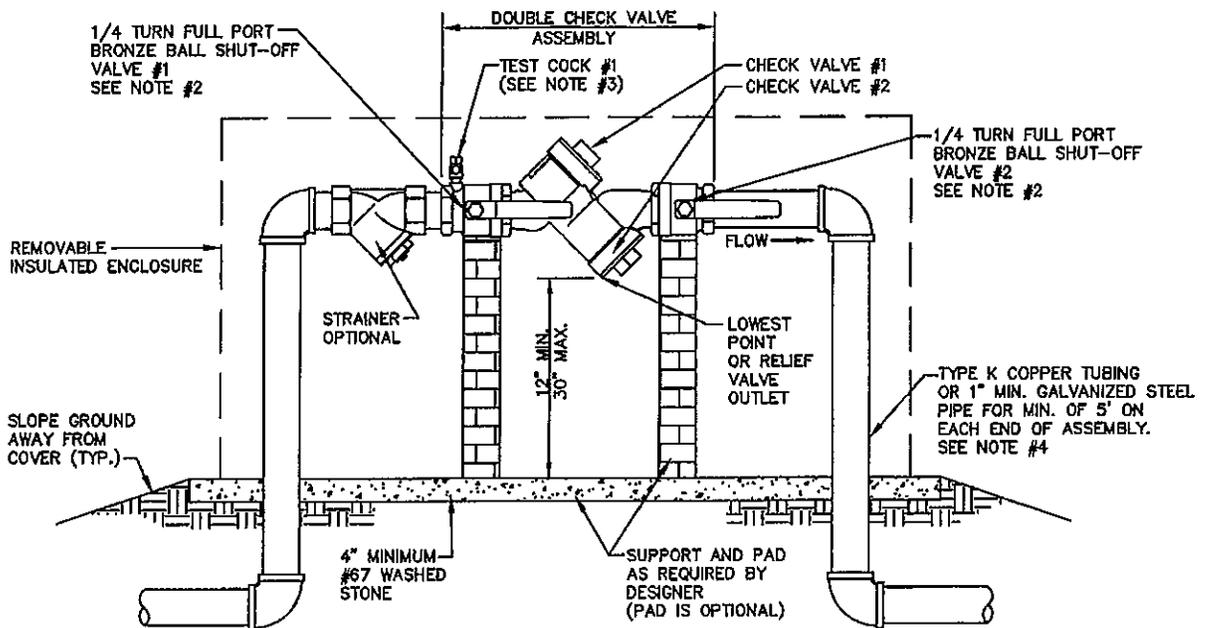


WATER SYSTEMS
BACKFLOW PREVENTION
RESIDENTIAL IRRIGATION
BACKFLOW PREVENTER

JANUARY 2009

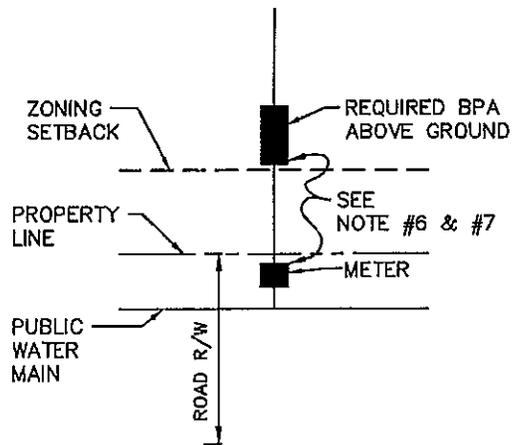
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NOTES:

1. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO SPECIFICATIONS. REFER TO APPROVED LIST OF BPA'S.
2. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
4. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
5. INSULATED ENCLOSURE SHALL BE AS SPECIFIED IN ENCLOSURE INFORMATION.
6. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
7. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
8. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.



TYPICAL LOCATION REQUIREMENT FOR ABOVE GROUND INSTALLATION

N.T.S.



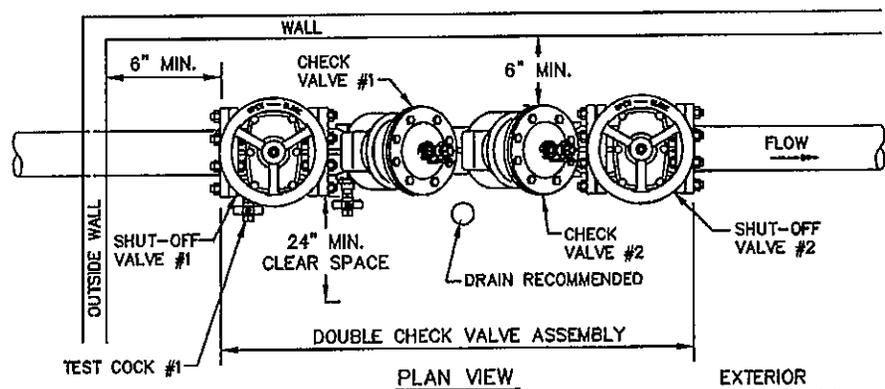
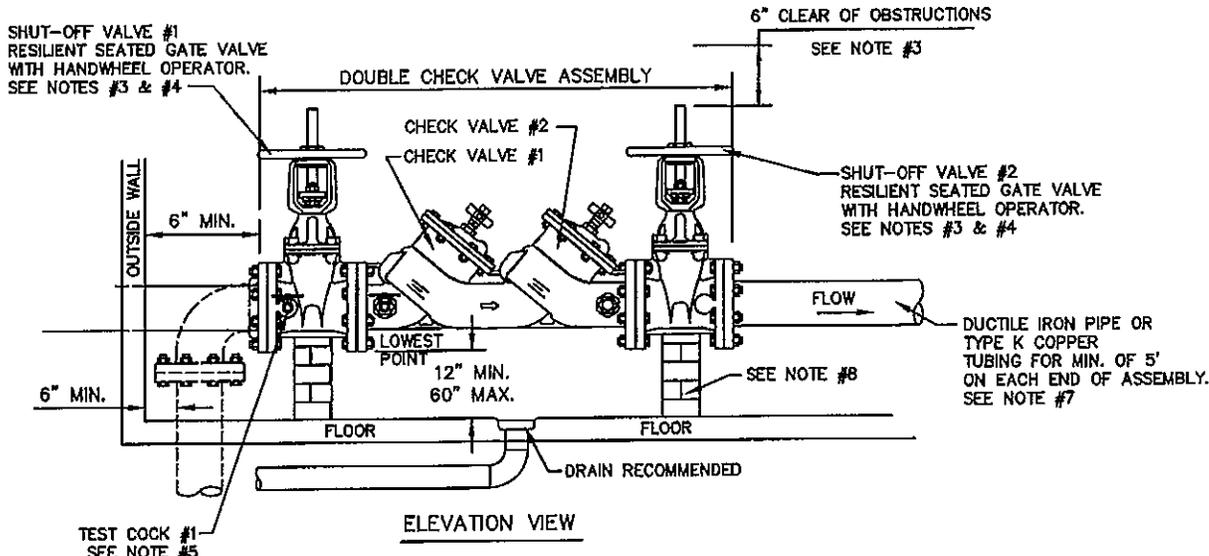
**WATER SYSTEMS
BACKFLOW PREVENTION**

**DOUBLE CHECK VALVE ASSEMBLY
(DC) 3/4"-2" ABOVE GROUND**

JANUARY 2009

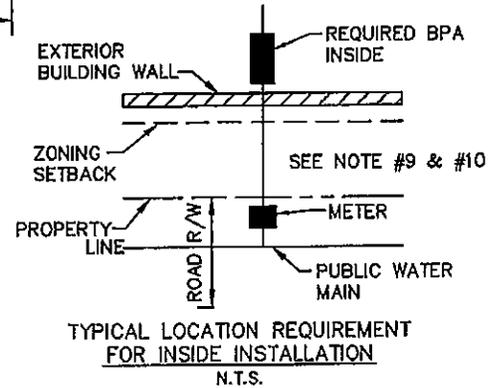
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NOTES:

1. INDOOR INSTALLATION SHALL ONLY BE PERMITTED IN CASES WHERE ADEQUATE SPACE FOR THE BACKFLOW PREVENTION ASSEMBLY IS NOT AVAILABLE OUTSIDE. WILL REVIEW ON A CASE BY CASE BASIS.
2. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO SPECIFICATIONS. REFER TO APPROVED LIST OF BPA'S.
3. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED. 6" CLEARANCE SHALL BE WITH VALVE FULLY OPEN.
4. FIRE LINE INSTALLATIONS SHALL HAVE OUTSIDE STEM AND YOKE (OS&Y) HANDWHEEL OPERATORS. IF SERVING FIRE SPRINKLERS, TAMPER SWITCHES ARE REQUIRED.
5. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
6. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION, UNLESS OTHERWISE APPROVED.
7. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
8. SUPPORT FOR ASSEMBLY SHALL BE DESIGNED BY OWNER. IT IS RECOMMENDED 8"-10" RP BE SUPPORTED AT CENTER.
9. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
10. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS --REQUIRED BACKFLOW PREVENTER.
11. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.

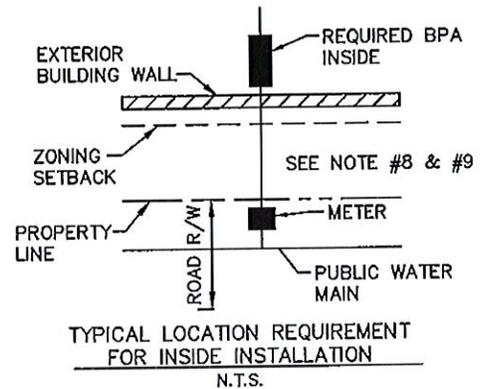
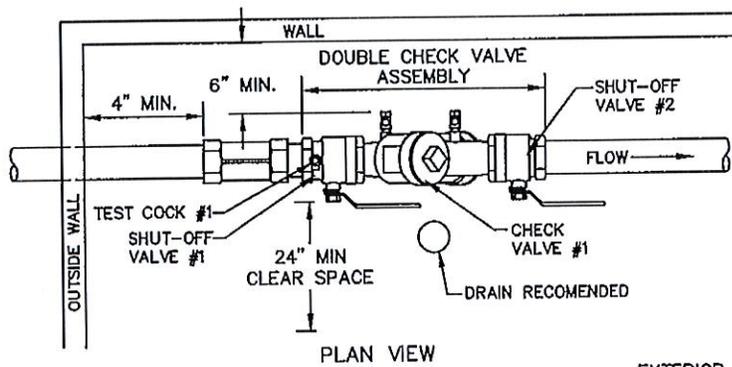
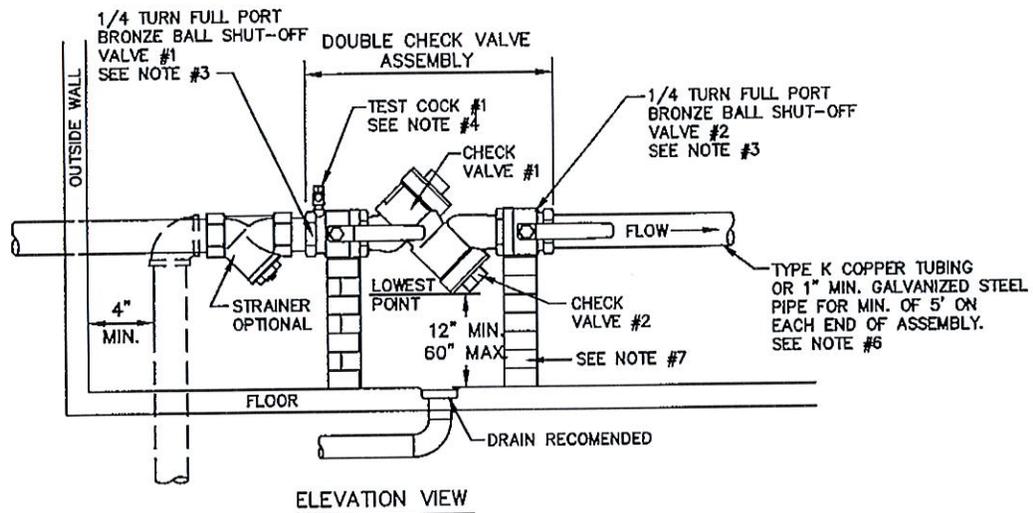


WATER SYSTEMS
BACKFLOW PREVENTION

DOUBLE CHECK VALVE
ASSEMBLY (DC) 2-1/2"-12"
INDOOR

JANUARY 2009

NTS BF - 9.0



NOTES:

1. INDOOR INSTALLATION SHALL ONLY BE PERMITTED IN CASES WHERE ADEQUATE SPACE FOR THE BACKFLOW PREVENTION ASSEMBLY IS NOT AVAILABLE OUTSIDE. WILL REVIEW ON A CASE BY CASE BASIS.
2. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO SPECIFICATIONS. REFER TO APPROVED LIST OF BPA'S.
3. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
4. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
5. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION, UNLESS OTHERWISE APPROVED.
6. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
7. SUPPORT FOR ASSEMBLY SHALL BE DESIGNED BY OWNER AS REQUIRED.
8. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
9. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY WATER BETWEEN ANY WATER METER AND ITS -REQUIRED BACKFLOW PREVENTER.
10. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.

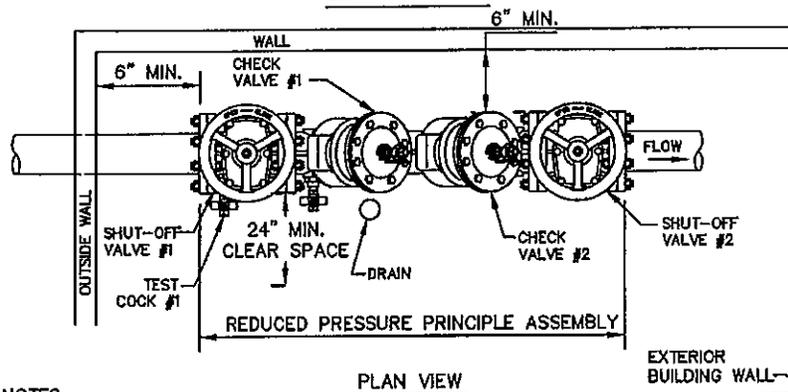
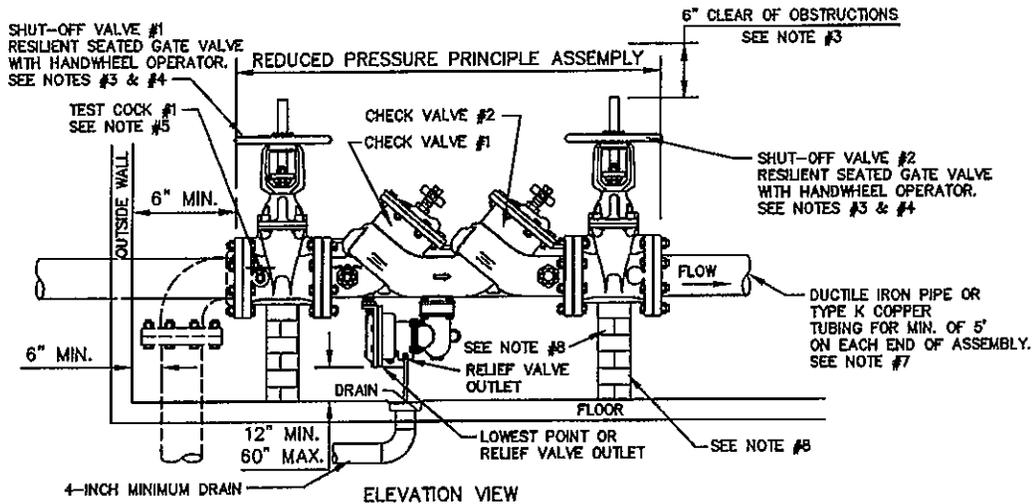


WATER SYSTEMS
BACKFLOW PREVENTION
DOUBLE CHECK VALVE
ASSEMBLY (DC) 3/4"-2"
INDOOR

JANUARY 2009

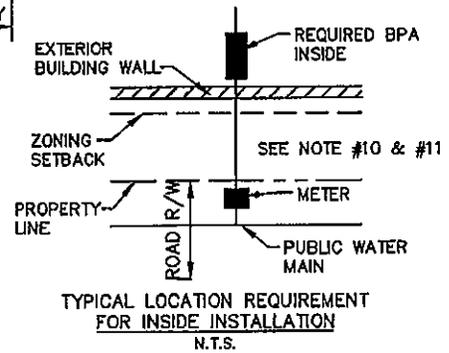
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BF - 10.0



NOTES:

1. INDOOR INSTALLATION SHALL ONLY BE PERMITTED IN CASES WHERE ADEQUATE SPACE FOR THE BACKFLOW PREVENTION ASSEMBLY IS NOT AVAILABLE OUTSIDE. WILL REVIEW ON A CASE BY CASE BASIS.
2. REDUCED PRESSURE ASSEMBLIES (RP) MUST CONFORM TO SPECIFICATIONS. REFER TO APPROVED LIST OF BPA'S.
3. APPROVED RP INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED. 6" CLEARANCE SHALL BE WITH VALVES FULLY OPEN.
4. FIRE LINE INSTALLATIONS SHALL HAVE OUTSIDE STEM AND YOKE (OS&Y) HANDWHEEL OPERATORS. IF SERVING FIRE SPRINKLERS, TAMPER SWITCHES ARE REQUIRED.
5. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
6. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION, UNLESS OTHERWISE APPROVED.
7. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
8. SUPPORT FOR ASSEMBLY SHALL BE DESIGNED BY OWNER. IT IS RECOMMENDED 8"-10" RP BE SUPPORTED AT CENTER. THE SUPPORT SHALL NOT BLOCK RELIEF VALVE OR DRAIN PORT.
9. AN AIR GAP DRAIN IS RECOMMENDED TO REDUCE SPLASHING OF MINOR DISCHARGES FROM THE RELIEF VALVE DRAIN PORT.
10. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
11. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
12. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.



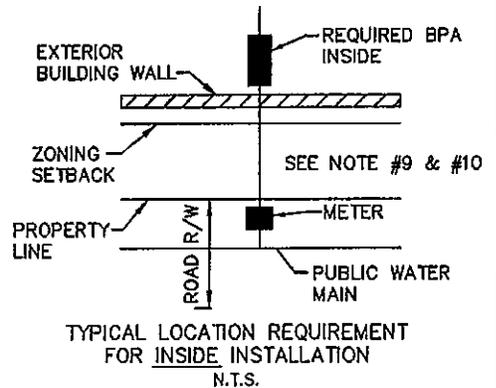
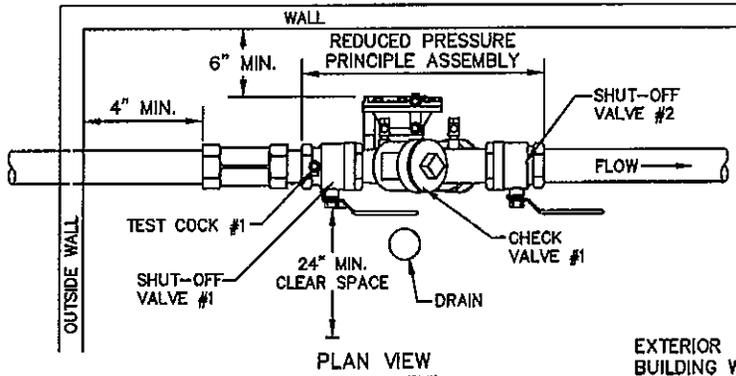
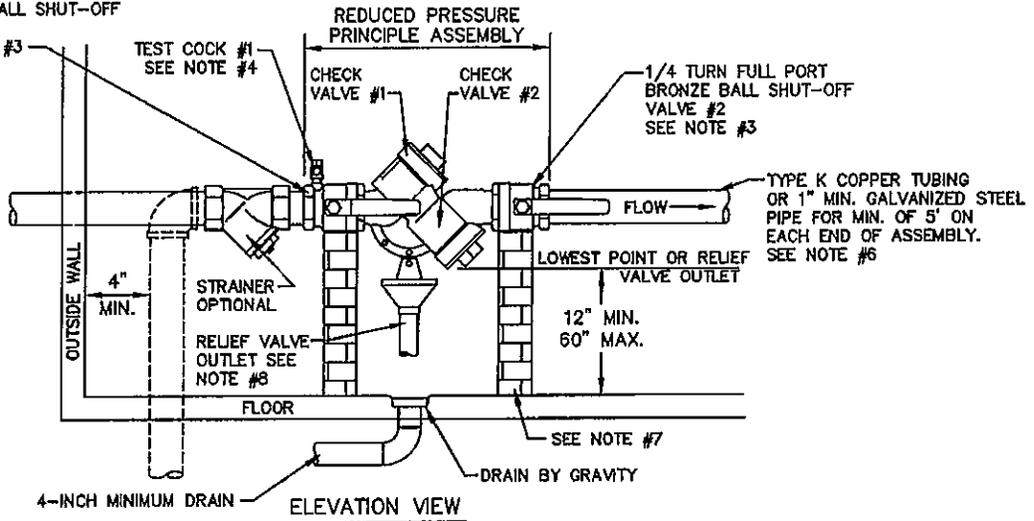
WATER SYSTEMS
 BACKFLOW PREVENTION
 REDUCE PRESSURE PRINCIPLE
 ASSEMBLY (RP) 2-1/2"-12"
 INDOOR

JANUARY 2009

NTS

BF - 11.0

1/4 TURN FULL PORT
BRONZE BALL SHUT-OFF
VALVE #1
SEE NOTE #3



NOTES:

1. INDOOR INSTALLATION SHALL ONLY BE PERMITTED IN CASES WHERE ADEQUATE SPACE FOR THE BACKFLOW PREVENTION ASSEMBLY IS NOT AVAILABLE OUTSIDE. WILL REVIEW ON A CASE BY CASE BASIS.
2. REDUCED PRESSURE ASSEMBLIES (RP) MUST CONFORM TO SPECIFICATIONS. REFER TO APPROVED LIST OF BPA'S.
3. APPROVED RP INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
4. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
5. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION, UNLESS OTHERWISE APPROVED.
6. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
7. SUPPORT FOR ASSEMBLY SHALL BE DESIGNED BY OWNER AS REQUIRED.
8. AN AIR GAP DRAIN IS RECOMMENDED TO REDUCE SPLASHING OF MINOR DISCHARGES FROM THE RELIEF VALVE DRAIN PORT.
9. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
10. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
11. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.

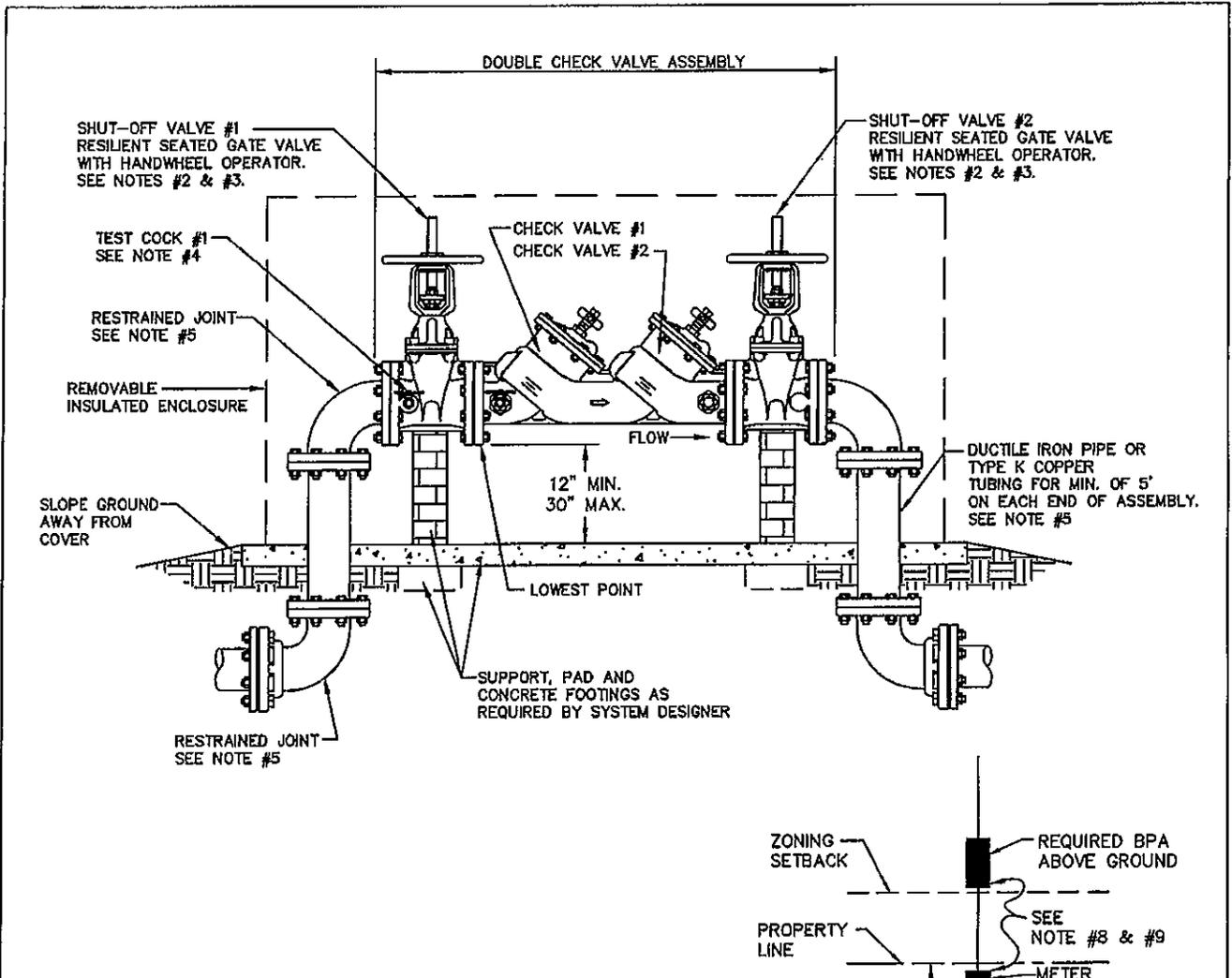


WATER SYSTEMS
BACKFLOW PREVENTION
REDUCED PRESSURE PRINCIPLE
ASSEMBLY (RP) 3/4"-2"
INDOOR

JANUARY 2009

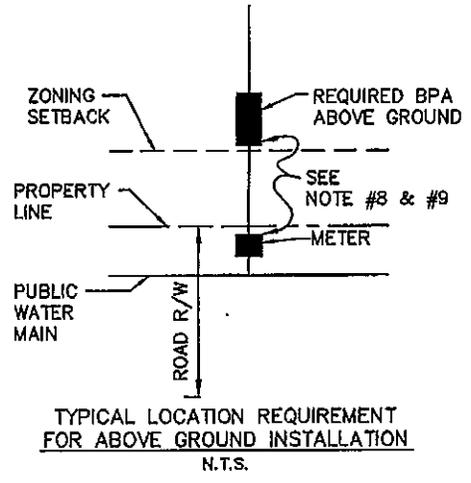
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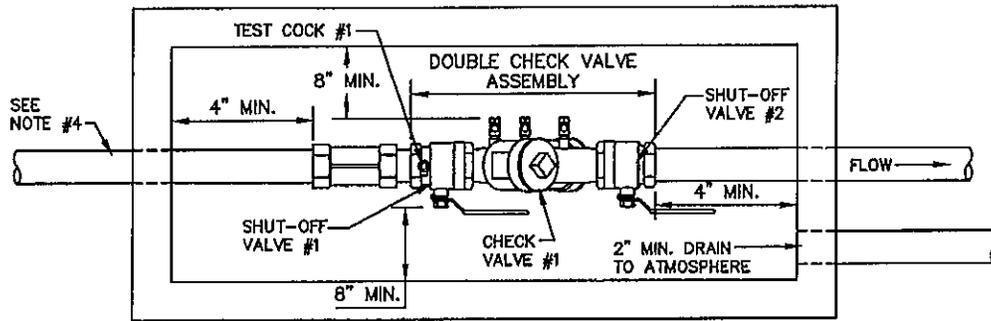
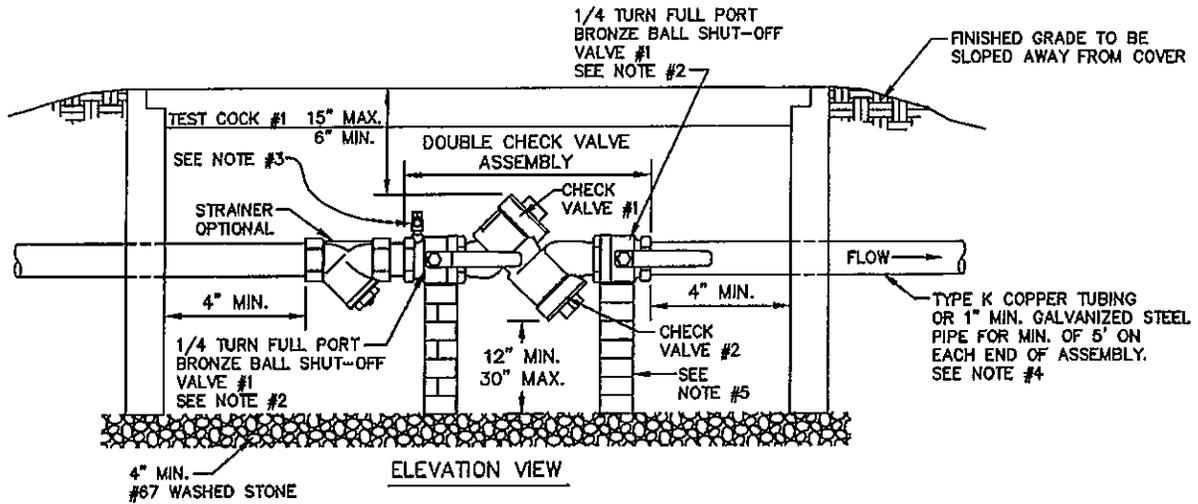
NOTES:

1. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO NEWTON BACKFLOW ORDINANCE. REFER TO APPROVED LIST OF BPA'S.
2. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. FIRE LINE SERVICES SHALL HAVE OUTSIDE STEM AND YOKE (OS & Y) HANDWHEEL OPERATORS. IF SERVING FIRE SPRINKLERS, TAMPER SWITCHES ARE REQUIRED.
4. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
5. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS SPECIFICATION. ALL JOINTS SHALL BE RESTRAINED WITH MEGALUG RESTRAINTS OR APPROVED EQUAL.
6. 8" - 10" DC SHALL BE SUPPORTED AT CENTER WITH BRICK PEDESTAL.
7. INSULATED ENCLOSURE SHALL BE AS SPECIFIED IN ENCLOSURE INFORMATION.
8. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
9. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
10. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.



WATER SYSTEMS
BACKFLOW PREVENTION
DOUBLE CHECK VALVE
ASSEMBLY (DC) 2-1/2"-10"
ABOVE GROUND

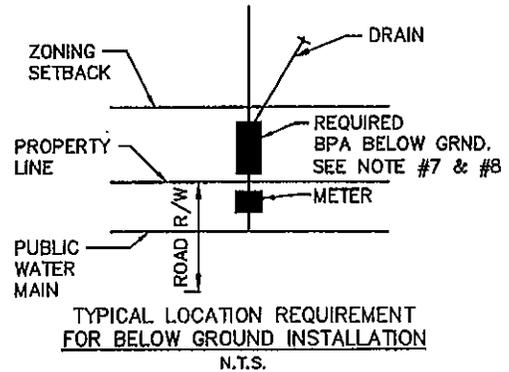
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NTS	BF - 13.0



PLAN VIEW

NOTES:

1. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO SPECIFICATIONS. REFER TO APPROVED LIST OF BPA'S.
2. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY. ALL TEST COCKS MUST BE ON ONE SIDE OR TOP. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION.
4. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
5. VAULT, DOORS OR COVERS AND SUPPORT OF ASSEMBLY SHALL BE DESIGNED BY OWNER AND AS REQUIRED.
6. DRAIN INLET MAY BE PROVIDED AS SHOWN OR AS FLOOR DRAIN.
7. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
8. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
9. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.

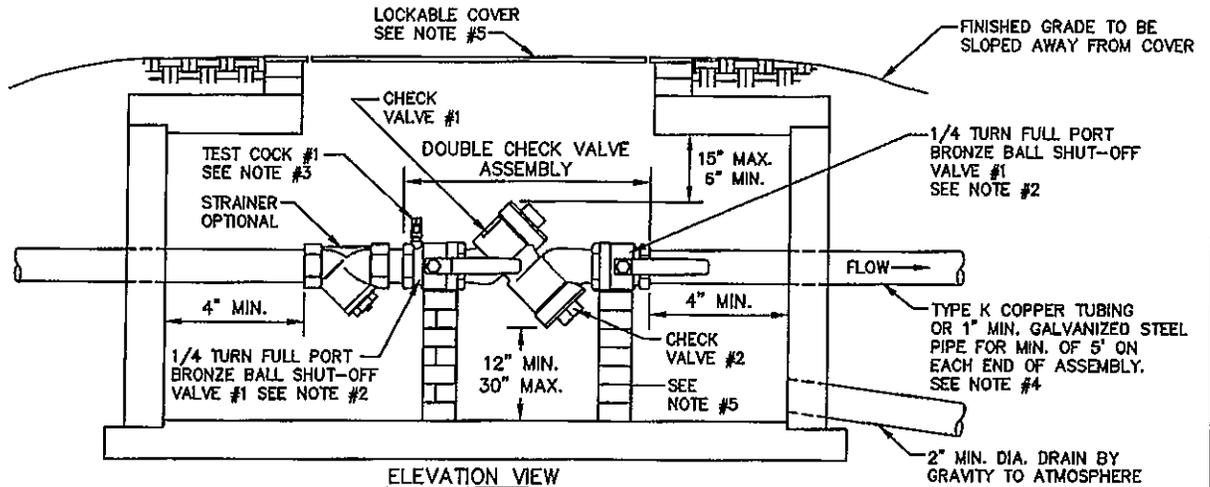


WATER SYSTEMS
BACKFLOW PREVENTION
DOUBLE CHECK VALVE
ASSEMBLY (DC) 3/4"-1"
BELOW GROUND VAULT

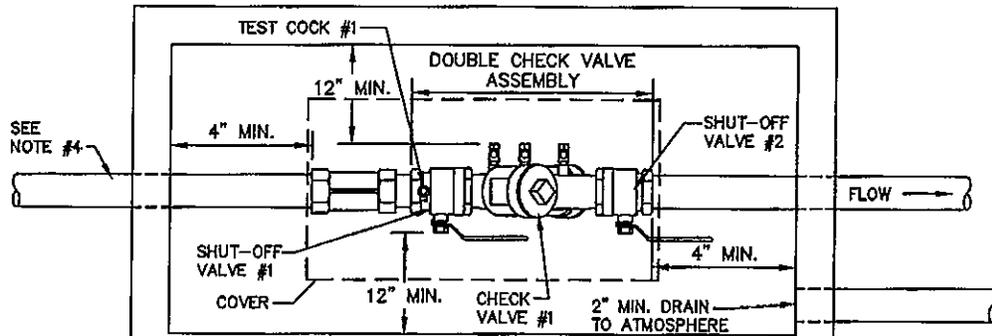
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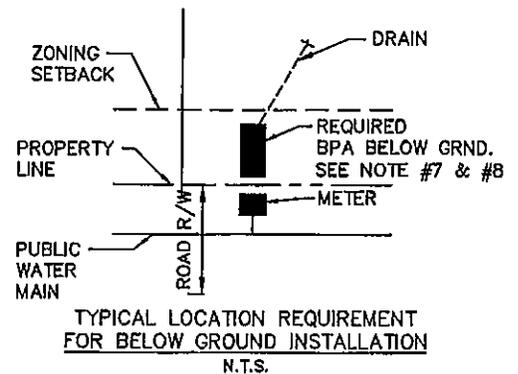
ELEVATION VIEW



PLAN VIEW

NOTES:

1. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO CITY OF NEWTON BACKFLOW ORDINANCE. REFER TO APPROVED LIST OF BPA'S.
2. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY. ALL TEST COCKS MUST BE ON ONE SIDE OR TOP. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION.
4. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
5. VAULT, DOORS OR COVERS AND SUPPORT OF ASSEMBLY SHALL BE DESIGNED BY OWNER AND AS REQUIRED.
6. DRAIN INLET MAY BE PROVIDED AS SHOWN OR AS FLOOR DRAIN.
7. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
8. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
9. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.



TYPICAL LOCATION REQUIREMENT FOR BELOW GROUND INSTALLATION
N.T.S.



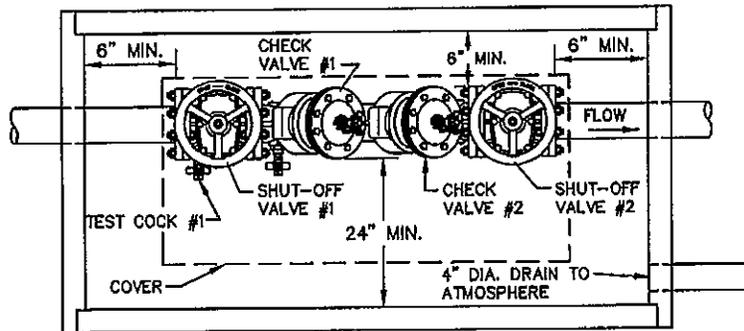
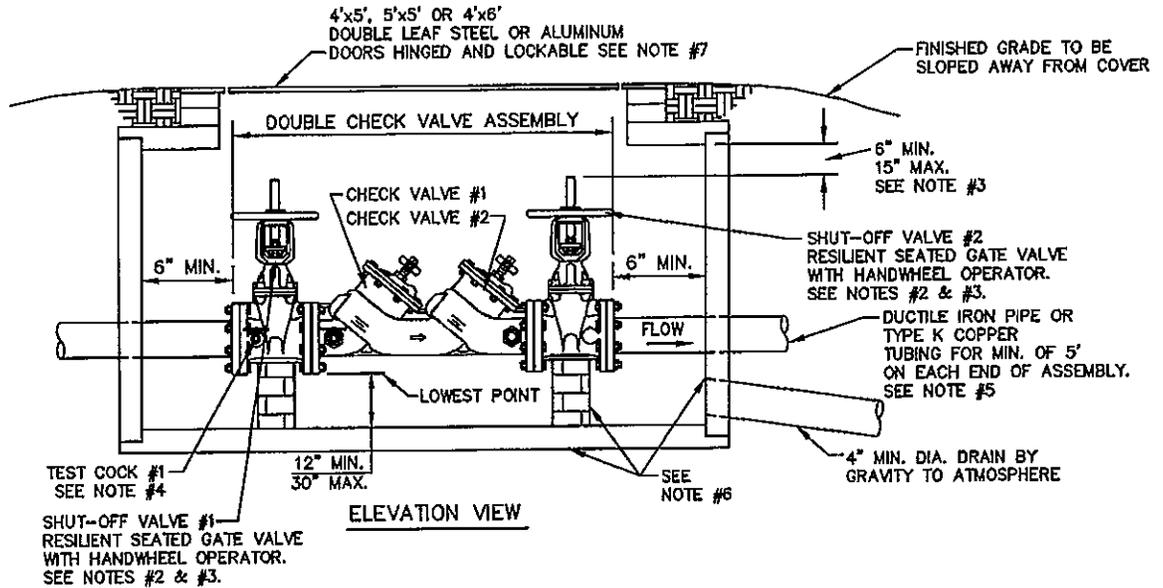
WATER SYSTEMS
BACKFLOW PREVENTION

DOUBLE CHECK VALVE
ASSEMBLY (DC) 1-1/2"-2"
BELOW GROUND VAULT

JANUARY 2009

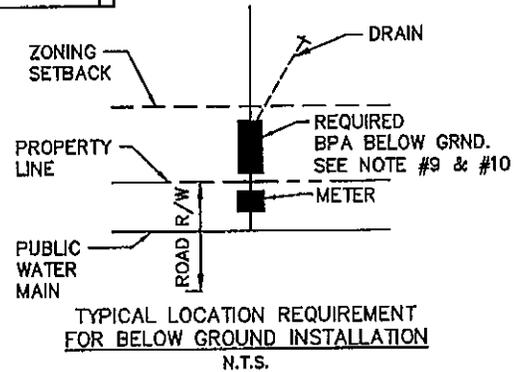
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BF - 15.0



NOTES:

1. DOUBLE CHECK VALVE ASSEMBLIES (DC) MUST CONFORM TO CITY OF NEWTON BACKFLOW ORDINANCE. REFER TO APPROVED LIST OF BPA'S.
2. APPROVED DC INCLUDES SHUT-OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED. 15" MAX. & 6" MIN. CLEARANCE SHALL BE WITH VALVES FULLY OPEN.
3. FIRE LINE INSTALLATIONS SHALL HAVE OUTSIDE STEM AND YOKE (OS&Y) HANDWHEEL OPERATORS. IF SERVING FIRE SPRINKLERS, TAMPER SWITCHES ARE REQUIRED.
4. TEST COCK #1 SHALL BE UPSTREAM OF SHUT-OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY. ALL TEST COCKS MUST BE ON ONE SIDE OR TOP. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION.
5. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN STANDARDS & SPECIFICATIONS.
6. VAULT AND SUPPORT OF ASSEMBLY SHALL BE DESIGNED BY OWNER AND AS REQUIRED.
7. ACCESS DOORS SHALL BE AS SPECIFIED IN WATER DETAIL #5 OR APPROVED EQUAL.
8. ALL LOCATIONS FOR BPA'S REQUIRE APPROVAL.
9. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND ITS REQUIRED BACKFLOW PREVENTER.
10. EACH REQUIRED BPA IS REQUIRED TO BE TESTED BY A APPROVED CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE.



WATER SYSTEMS
BACKFLOW PREVENTION

DOUBLE CHECK VALVE
ASSEMBLY (DC) 2-1/2"-12"
BELOW GROUND VAULT

JANUARY 2009

NTS

BF - 16.0