STANDARD SPECIFICATIONS AND DETAILS

For The

Dare County Water System

Dare County, North Carolina

June 26, 2018

6/26/18

The Standard Specifications and Details for the Dare County Water System dated June 26, 2018 were prepared by me or under my direct supervision.

DISCLAIMER:

To the best of their ability, the authors of this document have insured that the material presented herein is accurate and reliable. The design of engineered facilities, however, requires considerable judgement on the part of the designer. It is the responsibility of the design professional to insure that techniques utilized are appropriate for any given situation. Therefore, neither Dare County Water System, nor any other individual, group, etc. associated with the production of this document accepts any responsibility for improper design, any loss, damage, or injury as a result of the use of the information in this document. Please see "1.0 Instructions for the Design Professional" for further information.

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1.0 INSTRUCTIONS FOR THE DESIGN PROFESSIONAL

The design of all infrastructure to be served by the Dare County Water System shall be signed and sealed by a licensed Design Professional in accordance with N.C. General Statute 89. It is the responsibility of the Design Professional to ensure that the design and construction meets all Town, County, State, and Federal requirements. Design Professionals shall only design and seal those portions of a project within their area of expertise.

All infrastructure and development to be served by the Dare County Water System shall be constructed in accordance with these Standard Specifications and Details. In the case where any requirement in the County Code conflicts with any regulation or standard presented in this document, the County Code shall take precedence. It is recognized that certain improvements financed wholly or in part with State and/or Federal funds are subject to the regulations and standards prescribed by those agencies. Such regulations and standards may be different than those of the County and may take priority over County standards presented in this document.

The County recognizes that there will be instances where modifications and/or exceptions from the Standard Specifications and Details may be necessary due to particular site situations and circumstances. Requests for modifications and/or exceptions from the Standard Specifications and Details must be submitted in writing describing the request and reason(s) for request. Modifications and/or exceptions from the Standard Specifications and Details may be allowed, in writing, after investigation by the County, which may require studies or other pertinent information to be provided by the Design Professional to help support or validate the modification request. In general, the request will need to satisfy the following criteria:

- The modification to the design criteria is based on sound engineering principles and practices.

- The modification to the design criteria will not create an unsafe or hazardous situation to occur.
- The modification to the design criteria will be equivalent to the minimum criteria set forth herein in terms of efficiency, functionality, durability, structural integrity and long term maintenance.
- The modification to the design criteria will not adversely impact adjacent properties or individual property owners, provided that safety is not compromised.

In order to ensure good engineering design, the County may occasionally require more stringent standards than those presented herein. Justification for the more stringent requirements shall be provided in writing to the Design Professional.

Any deviations from these Standard Specifications and Details must be clearly shown on the submittal drawings, in one location, with the heading "Exceptions to the Dare County Adopted Standard Specifications and Details". Additionally, on every set of plans submitted to the County for review, the cover sheet or first sheet in the set shall have the following certification with the Design Professional's seal and signature affixed: "These improvements shall be constructed in accordance with the following plans, and the Standard Specifications and Details of the Dare County Water System. The Design Professional whose seal and signature appear below certifies that the Standard Specifications and Details of the Dare County Water System have been thoroughly checked and are applicable to this particular project. Any exceptions to the Standard Specifications and Details are shown on sheet ____ of these drawings."
Projects will be constructed according to the Standard Specifications and Details in effect at the time the project receives County approval for construction. The Contractor must have a complete set of plans and specifications on the jobsite any time work is being performed. All construction methods and material not specified within this document shall conform to any applicable Town, County, State, or Federal design requirements or regulations.

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

1.2 SUMMARY

A. Section Includes:
1. Preparing and grading sub-grades for slabs on grade, walks, pavements, and landscaping.
2. Base course for pavements.
3. Excavating and backfilling for utility trenches.
4. Erosion and sediment control measures.

1.3 DEFINITIONS

A. Off-Site Select Borrow: Approved soil material obtained off-site when specified or when sufficient approved soil material is not available from excavations.

B. Unsuitable Soil: Soil produced from excavation of drainage features, cut to sub-grade, or required stripping that does not meet the definition and requirements of suitable soil.

C. Suitable Soil: Soil produced from excavation of drainage features, cut to sub-grade, or required stripping that meets the definition and requirements of suitable soil.

D. Topsoil: Soil produced from stripping the top or upper 4-8” soil layer from areas to be further excavated, re-landscaped, or re-graded without contamination from the subsoil. Stripping of topsoil is not required where excavation width is less than 10’ or for the installation of pipe utilities. Topsoil shall be stockpiled on site at designation location for further use. Topsoil shall not be removed from site.

E. Backfill: Soil material or controlled low-strength material used for fill and excavation.

F. Base Course: The layer placed between the sub-grade and surface pavement in a paving system.

G. Excavation: Removal of material encountered above sub-grade elevations and to the lines and dimensions indicated.

H. Fill: Soil materials used to raise existing grades.

I. Porous Fill: Fill material supporting the slab on grade that also minimizes upward capillary flow of water.

J. Structures: Buildings, slabs, curbs, utility appurtenances, tanks, retaining walls or other man-made stationary features constructed above or below ground surface.

K. Sub-grade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below topsoil materials.

L. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or dimensions without direction by the County. Unauthorized excavation, as well as remedial work directed by the County, shall be at the Contractor's expense.

M. Undercut excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by County. Authorized undercut excavation and replacement material will be paid for according to Contract unit price for UNDERCUT and BACKFILL.

N. Utilities: On-site underground pipes, conduits, ducts and cables.

1.4 SUBMITTALS

A. Material Test Reports: Interpreted test results from a qualified testing agency shall be submitted indicating compliance of test results with the following indicated requirements:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.

B. Manufacturer’s data on detectable warning tape.

1.5 QUALITY ASSURANCE

A. Perform work and provide materials in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

B. North Carolina Erosion and Sediment Control Planning and Design Manual.

C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient suitable soil materials are not available from excavations.

B. Suitable Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, GC, SW, SP, and SM or a combination of these groups; free of: rock or gravel larger than 1-1/2 inches in any dimension, debris, waste, frozen materials, vegetation, and other matter.

C. Unsuitable Soils: ASTM D 2487 Soil Classification Groups SC, ML, CL, OL, MH, CH, OH, and PT or a combination of these groups.
   1. Unsuitable soils also include suitable soils not maintained within 2 percent of optimum moisture content at time of compaction and all soils not meeting the requirements for suitable soils.

D. Porous Fill: ASTM D 2487 soil classification groups GW, GP, SW, or SP with a maximum aggregate size of 1.0 inch and no more than 5 percent passing the No. 200 sieve.

E. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

F. Utility/Stone Bedding Material: NCDOT #67 or #57.

G. Aggregate Base Course Material: NCDOT ABC.

2.2 ACCESSORIES

A. Detectable Warning Tape for Metallic and Nonmetallic Pipe Materials: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2' 6" deep.

B. Tape Colors: Provide tape colors to utilities as follows:
   1. Red: Electric.
   2. Yellow: Gas.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sanitary Sewer and Storm Sewer systems.
   6. Brown: Sewer Force Mains.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Call NC One Call service at 811 not less than three working days before performing work.

B. Identify required lines, levels, contours, and datum locations.

C. Notify County of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

D. Maintain and protect existing utilities indicated to remain.

E. Preparation of sub-grade for earthwork operations, including removal of vegetation, topsoil, debris, obstructions, and materials from ground surface, is specified in Section 31 10 00 Site Clearing.

3.2 PROTECTION

A. Barricade open holes and depressions occurring as part of the work, and post warning lights on barricades adjacent to the excavation. Operate warning lights from dusk to dawn and as otherwise required.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washouts, and other hazards created by earthwork operations.

C. Protect and maintain erosion and sedimentation controls.

D. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

3.3 DEWATERING

A. Prevent surface water and groundwater from entering excavations, from ponding on prepared sub-grades, and from flooding project site and surrounding area.

B. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

C. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
   2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavation as temporary drainage ditches.

3. Do not use excavated trenches as temporary drainage ditches.

D. Maintain the water level below the excavation sub-grade during excavation and construction.
   1. Material disturbed below the foundation sub-grade due to improper dewatering shall be removed and replaced with stone bedding material at no expense to the Owner.
   2. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls, or bedding material will occur.

E. Dispose of water pumped from excavations into ditches or storm drains having the capacity to handle the volume of pumped water.
   1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
   2. Prevent flooding of streets, roadways, or private property.
   3. Provide noise attenuated engines when pumps will operate within 500 feet of a residence or commercial establishment.

3.4 TOPSOIL EXCAVATING

A. Do not excavate wet topsoil.

B. Excavate topsoil and stockpile in area designated on site.

3.5 SUBSOIL EXCAVATING

A. Remove groundwater by pumping to keep excavations dry.

B. Excavate subsoil to sub-grade elevations regardless of the conditions encountered.

C. Slope banks to angle of repose or less, until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Proof roll bearing surfaces.

F. Correct unauthorized excavation at no cost to Owner.

G. Fill over-excavated areas under structure bearing surfaces in accordance with direction by County.

H. Deposit soil in on-site stockpile locations as designated on the Drawings unless otherwise directed by the County.

I. Refer to Section 31 23 17 Trenching and Backfilling for trenching specifications. Project-specific trenching specifications are also located in that section.

3.6 EXCAVATION AND TRENCH SAFETY

A. During excavations, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading, to prevent slides or cave-ins, and to provide adequate access to the work. The Contractor shall comply with the "Rules and Regulations Governing the Construction Industry" as promulgated for the Health, Safety & General Welfare of Employees by the Commission of Labor. Particular attention shall be paid to the following sections:

1. Where unstable material is encountered in excavations over 5' in depth, the sides of the excavations shall be shored or sheet piled unless the sides are sufficiently sloped to eliminate all possibility of a cave-in.
2. Where stable material is encountered in excavations over 5' in depth, the sides of the excavations shall be shored or braced unless the sides are sufficiently sloped to eliminate all possibility of a cave-in.
3. Where workmen are engaged near the edge of the excavation, undercutting of bank or walls is prohibited unless adequately protected.
4. Proper and adequate means of ingress and egress shall be provided at all times from all excavations and trenches; either by ramps, stairways, or ladders located so as to be accessible to workmen at all times.

B. In addition to the Safety Provisions specified herein, the Contractor shall comply with the Department of Labor, Safety & Health Regulations for Construction promulgated under the Occupational & Health Act of 1970 (PL-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54). Where the requirements of these acts are in excess of those requirements specified, the requirements of these acts shall govern.

3.7 STORAGE OF MATERIALS

A. Stockpile off-site select borrow and excavated suitable soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Stockpile height should not exceed 15' and slope should be 2:1 or flatter. Cover to prevent windblown dust.

B. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

C. Materials which are excavated shall be placed so that the base of the pile is not less than 2' from the edge of the excavation.

3.8 BACKFILLING TRENCHES

A. Prior to backfilling, remove all debris, trash, organic material, formwork, temporary shoring and bracing from excavation. Perform all testing and inspection of underground utilities.

B. Place and compact initial backfill of suitable soil material or sub-base material, free of particles larger than 1 inch, to a height of 12 inches over the utility.

C. Carefully compact material under pipe haunches. Bring backfill up evenly on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Install warning tape directly above utilities at 12” below final grade, except 6” below sub-grade under paved areas and slabs.

E. Final backfill areas to contours and elevations. Use unfrozen and unsaturated materials.

F. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy sub-grade surfaces.

G. Place material in continuous layers as follows:
1. Borrow Materials: Maximum 8 inches compacted depth.
2. Fill Materials: Maximum 8 inches compacted depth.

H. Maintain optimum moisture content of backfill materials to attain required compaction density.
1. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer to within 2 percent of optimum moisture content before compaction.
2. Remove and replace, or scarify and air dry otherwise suitable soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 PLACING FILL

A. Preparation: Remove vegetation, topsoil, debris, wet and unsuitable soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

B. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

C. When sub-grade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisten, or aerate soil, and re-compact to required density.

D. Place fill material in layers to required elevations for each location listed below.
1. Under grass, use excavated suitable soil or off-site select borrow to 4” below finished grade, and then fill with topsoil to grade.
2. Under pavements, use base material, and excavated suitable soil or off-site select borrow.
3. Under walks and ramps, use excavated suitable soil or off-site select borrow.

E. Maintain moisture content of fill material by moistening or aerating to within 2% of optimum.

3.10 BASE COURSE

A. Under pavements, place base course material on prepared sub-grades as soon as possible after proof-rolling.

B. Compact base course at optimum moisture content to required grades, lines, cross-sections and thicknesses to not less than 95% maximum density.

C. Shape base to required crown elevations and cross-slope grades.

D. When thickness of compacted base course is 6 inches or less, place materials in a single layer.

E. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.11 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, or planting is scheduled.

B. Fine grade topsoil to eliminate rough or low areas. Maintain levels, profiles, and contours of sub-grade.

C. Remove large stones, roots, grass, weeds, debris, and foreign materials while spreading.

D. Lightly compact placed topsoil.

E. Leave stockpile area and site clean, raked, and ready to receive landscaping.

3.12 COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations.

C. Place backfill and fill uniformly along the full length of each structure.

D. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 698:
   1. Under structures and pavements, compact the top 12 inches below sub-grade and each layer of backfill or fill material at 95 percent maximum dry density.
   2. Under walkways, compact the top 6 inches below sub-grade and each layer of backfill or fill material at 95 percent maximum dry density.
   3. Under lawn or unpaved areas, compact the top 6 inches below sub-grade and each layer of backfill or fill material at 90 percent maximum dry density.

3.13 TESTS

A. Testing Agency Services: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports. Allow testing agency to inspect and test each sub-grade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

B. Perform laboratory material tests in accordance with ASTM D698 (Standard Proctor).

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556 (sand cone) or ASTM D2922 (nuclear) as applicable.

D. Frequency of Tests:
   1. Building slab areas: At sub-grade and at each compacted fill and backfill layer, at least 1 test every 2000 sq. ft., but in no case less than 3 tests.
   2. Parking areas and roadways: At sub-grade and at each compacted fill and backfill layer, perform at least one field in place density test every 5000 sq. ft. or less of paved area, but in no case less than 3 tests.
   3. Trench backfill: In paved areas, test as above. In lawns and unpaved areas, test final backfill layer with one field in-place density test for each 250 feet of trench. In wooded, undeveloped areas, testing is not required.

E. When testing agency reports that sub-grades, fills, or backfills are below specified density, scarify, moisten, aerate or replace soils and re-compact and re-test as necessary to achieve required density.

3.14 TOLERANCES

A. Top Surface of Exposed Subgrade: Plus or minus one (1) inch.

B. Top of Topsoil: Plus or minus one-half (1/2) inch.

C. Where settling occurs during the project time, remove the finished surface, backfill with approved material, compact and re-install the finish surface. Restored surface shall match adjacent work to greatest extent possible.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

B. North Carolina Erosions and Sediment Control Planning and Design Manual.

1.2 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated paving, curbs, and concrete flatwork.
3. Removing designated trees, shrubs, and other plant life.
4. Capping and/or removing abandoned utilities.

1.3 PAYMENT

A. Basis of Measurement: By the Lump Sum

B. Basis of Payment: By the unit price bid per Lump Sum for site clearing.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

B. A minimum of two persons shall be present at all times during tree clearing and grubbing operations. One shall be completely knowledgeable of the tree types involved, and shall direct the trimming of roots and limbs where required.

1.5 JOB CONDITIONS

A. Dust Control: During execution of the work included in this Section, use all means necessary to prevent the dissipation of dust; to prevent dust from becoming a nuisance to the public, neighbors, and performance of additional work on the site, thoroughly moisten all surfaces.

B. Burning: Burning of combustible materials from demolished structures or vegetation will not be permitted on-site.

C. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks and other adjacent facilities. Do not close or obstruct roads, streets, walks

or other adjacent facilities without permission from authorities and notification of the County and Owner.

D. Existing Conditions: It is recommended, but not required, that the Contractor video-tapes existing conditions of the right-of-way and adjacent properties prior to commencement of work.

PART 2 PRODUCTS

A. Temporary Barricades: Use only unused and solid lumber of utility grade or better to build temporary barricades surrounding the objects selected for protection, unless otherwise directed by the County.

B. Pruning Paint: To treat cut or damaged plant tissue, apply only a pruning paint known to be formulated for horticultural applications and accepted by the County.

C. Other Materials: Any other materials required for completion of the work this Section shall be selected by the Contractor and subject to approval by the County.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Notification: The County should be notified at least forty-eight (48) hours prior to beginning the work of this Section.

B. Call NC One Call service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Verify the existing plant life designated to remain is tagged or identified.

D. Identify stockpile locations for placing removed materials.

3.2 PROTECTION

A. Ensure that utilities indicated to remain are located, identified, and protected from damage.

B. Protect benchmarks, survey control points, and existing structures from damage or displacement.

C. Heavy equipment and traffic shall be restricted from traveling over any infiltration areas except as necessary to perform clearing operations.

3.3 CLEARING

A. Clearing and grubbing operations of construction sites, pipeline easements, and roadway areas, involve the removal of all vegetation and debris, including trees, logs, stumps, abandoned vehicles, obstacles, lumber, sawdust piles, fences, leaf piles, brick, tile, rubble, and masonry in the area of excavation, grade change, embankment construction, structure construction, or alteration and building construction, and all other such items as required for removal by the County.

B. The Contractor shall pursue his operations in order to prevent damage to adjacent property and likewise to prevent bark, limb, or root injuries to trees, shrubs, or other types of vegetation which are to continue growing. When such injuries inevitably occur, all jagged edges of scarred areas shall be smoothed in compliance with standard horticultural practice, and the scars shall be concealed entirely with an asphaltum-based tree paint. All plants damaged by construction procedures to a degree which decimates their worth for shade or further landscape purposes, shall be cut and removed by the Contractor, with no additional compensation, if directed by the County.

C. Timber shall not be cut by the Contractor beyond the clearing limits established by the County. Any timber to remain for landscape or erosion control purposes shall not be cut by the Contractor except when so directed by the County.

D. The entire site for construction projects shall be enclosed in the clearing limits, excluding any specific locations on the drawings, unless otherwise directed by the County.

E. Both permanent and construction easements shall be cleared for the pipeline and drainage easements as shown on the drawings, unless otherwise directed by the County.

F. Healthy trees shall be cut at a height not exceeding six (6) inches above natural ground during the clearing of roadway areas where the depth of embankment surpasses six (6) feet in height, unless otherwise directed by the County.

G. Trees shall be cut at or below the natural ground surface when trees are to be cut in areas not selected for grubbing.

H. The process of grubbing shall be performed on all cleared areas excluding the following:
   1. Stumps within the area between permanent easements and construction easements may remain provided they are cut at or below the natural ground.
   2. Stumps shall not be grubbed nor be cut more than six (6) inches above the ground level, when the roadway embankment surpasses six (6) feet in height. Unsound or decayed stumps shall be removed to a minimum depth of two (2) feet below the natural ground surface.
   3. In designated clearing and/or grubbing areas, all holes and additional ruts shall be filled and the area brought to a satisfactory form allowing the Owner to mow the area without difficulty. Execution of this work shall be a part of the clearing and grubbing operation despite whether the conditions were the results of the Contractor's actions or were present before construction.

4. Additional items which shall be removed from construction sites and permanent easement surfaces include the following: cans, rocks over two (2) inches in diameter, loose debris, bottles, bricks, etc.

I. All stumps and roots larger than 2” in diameter shall be completely removed by grubbing except in areas of the building site, parking areas and drives; they must be cut off no less than 18” below any sub-grade. The area of operation shall then be cleared of resulting debris and matted roots, weeds, and other organic material shall be hauled away from the site. Generally, all material that cannot be compacted to 90% density in lawn areas and 95% density elsewhere must be removed.

3.4 REMOVAL

A. All timber of value, including pulp wood, that is required to be cut during the process of construction shall become property of the Contractor and shall be removed from the project site as described in these specifications.

B. All non-value clearing and grubbing debris shall be removed from the property by the Contractor to an acceptable location as permitted by federal, state and local regulations.

C. Partially remove paving, curbs, and concrete flatwork as indicated on Drawings. Neatly saw cut edges at right angle to surface.

D. Remove abandoned utilities. Indicate removal termination point for underground utilities on Record Documents.

E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

F. Do not burn or bury materials on site. Leave site in clean condition.

END OF SECTION

5SECTION 31 23 17

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

1.2 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities.
2. Compacted fill from top of utility bedding sub-grades or finish grades.
3. Backfilling and compaction.

1.3 MEASUREMENT AND PAYMENT

A. Unclassified excavation:
1. No measurement or direct payment will be made for the Work under this Section and all costs for same shall be included in the price bid for the utility or structure to which it pertains.

1.4 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

4. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

5. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

6. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.5 DEFINITIONS

A. Off-Site Select Borrow: Approved soil material obtained off-site when specified or when sufficient approved soil material is not available from excavations.

B. Unsuitable Soil: Soil produced from excavation of drainage features, cut to sub-grade, or required stripping that does not meet the definition and requirements of suitable soil.

C. Suitable Soil: Soil produced from excavation of drainage features, cut to sub-grade, or required stripping that meets the definition and requirements of suitable soil.

D. Topsoil: Soil produced from stripping the top or upper soil layer from areas to be further excavated, re-landscaped, or re-graded without contamination from the subsoil. Stripping of topsoil is not required where excavation width is less than 10’ or for the installation of pipe utilities. Topsoil shall be stockpiled on site at designation location for further use. Topsoil shall not be removed from site.

E. Backfill: Soil material or controlled low-strength material used for fill and excavation.

F. Base Course: The layer placed between the sub-grade and surface pavement in a paving system.

G. Excavation: Removal of material encountered above sub-grade elevations and to the lines and dimensions indicated.

H. Fill: Soil materials used to raise existing grades.

I. Porous Fill: Fill material supporting the slab on grade that also minimizes upward capillary flow of water.

J. Structures: Buildings, slabs, curbs, utility appurtenances, tanks, retaining walls or other man-made stationary features constructed above or below ground surface.

K. Sub-grade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below topsoil materials.

L. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or dimensions without direction by the County. Unauthorized excavation, as well as remedial work directed by the County, shall be at the Contractor's expense.

M. Undercut excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by the County. Authorized undercut excavation and replacement material will be paid for according to Contract unit price for UNDERCUT and BACKFILL.

N. Utilities: On-site underground pipes, conduits, ducts and cables.

1.6 SUBMITTALS

A. Material Test Reports: Interpreted test results from a qualified testing agency shall be submitted indicating compliance of test results with the following indicated requirements:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Manufacturer's data on detectable warning tape.

1.7 QUALITY ASSURANCE

A. Perform work and provide materials in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

B. North Carolina Erosion and Sediment Control Planning and Design Manual.

C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.8 QUALIFICATIONS

A. Use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section

B. Use a sufficient number of equipment of adequate size and capacity to accomplish the work in a timely manner.

1.9 JOB CONDITIONS

A. Existing Utilities:
   1. The existence and locations of underground utilities indicated on the Contract Drawings are not guaranteed and shall be investigated and verified in the field by the Contractor before starting work. Excavations in the vicinity of existing structures and utilities shall be done carefully by hand.
   2. Locate existing utilities lines using an electronic pipe finder or other approved means. Uncover these utilities by hand excavation and provide protection from damage. Cooperate with Owner and utility companies for maintaining services. Do not break connections without providing temporary services, as acceptable to the County.
   3. Locate, excavate, and expose all existing underground lines before beginning trenching operations.

4. The Contractor will be held responsible for the workmanlike repair of any damage done to any of these utilities in the execution of his work under this Section.
5. The Contractor shall familiarize himself with the existing conditions of these utilities. He shall be prepared to adequately safeguard himself, the utilities, and the Owner from damage.
6. Necessary arrangements shall be made by the Contractor with all persons, firms, corporations owning or using any poles, pipes, tracks or conduits, etc., affected by the construction included under this Section to maintain and protect such facilities during construction. The cost of any such protection shall be paid by the Contractor and included in the Contract price.
7. In the event that any existing gas pipes, water pipes, conduits, sewers, tile drains, poles or other utilities are blocked or interfered with by construction operations, the Contractor shall maintain them in continuous operation and restore them to the same condition as they were prior to the start of construction on this project, all at no additional compensation.

B. Utility Notification:
1. Call NC One Call service at 811 not less than three working days before performing work.

C. Protecting Trees, Shrubbery, and Lawns:
1. Trees and shrubbery in developed areas and along the trench line shall not be disturbed unless absolutely necessary and subject to the approval of the County.
2. Any trees and shrubbery for which removal is necessary shall be heeled in and replanted.
3. Where trenches cross private property through established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replacement is approved by the County.
4. Topsoil underlying lawn areas shall be removed and kept separate from general excavated materials.

D. Clearing:
1. Perform all clearing necessary for installation of the complete work.
2. Clearing shall be performed in accordance with Section 31 10 00 Site Clearing.

E. Removing and Resetting Fences:
1. Where existing fences must be removed to permit construction of utilities:
a. Remove such fences and, as the Work progresses, reset the fences in their original location and condition.
b. Fencing must be replaced at the end of each working day.

F. Restoration of Disturbed Areas:
1. Restore all areas disturbed by, during, or as a result of construction activities to their previous or better condition.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Suitable Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, GC, SW, SP, and SM or a combination of these groups; free of: rock or gravel larger than 1-1/2 inches in any dimension, debris, waste, frozen materials, vegetation, and other matter.

B. Unsuitable Soils: ASTM D 2487 Soil Classification Groups SC, ML, CL, OL, MH, CH, OH, and PT or a combination of these groups.
   1. Unsuitable soils also include suitable soils not maintained within 2 percent of optimum moisture content at time of compaction and all soils not meeting the requirements for suitable soils.

C. Native material: Soils as excavated from the trench excavation. Where specifically directed by the County, native material may be used for trench backfill.

D. Porous Fill: ASTM D 2487 soil classification groups GW, GP, SW, or SP with a maximum aggregate size of 1.0 inch and no more than 5 percent passing the No. 200 sieve.

E. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

F. Utility/stone bedding material: NCDOT #67 or #57.

G. Aggregate Base Course Material: NCDOT ABC.

2.2 EXCAVATED MATERIALS

A. Perform all excavation of every description and of whatever substances encountered to depths indicated or specified.

B. Pile material suitable for backfilling in an orderly manner at a safe distance from banks or trenches to avoid overloading and to prevent slides or cave-ins.

C. Remove and deposit unsuitable or excess material as directed by the County.

2.3 ACCESSORIES

A. Detectable Warning Tape for Metallic and Nonmetallic Pipe Materials:
   1. Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic

core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep.

2. Color: Blue
3. Text: “CAUTION – WATER LINE BURIED BELOW”

B. Detectable Tracer Wire: At all locations where pressure piping is installed and at lateral locations, non-ferrous or ferrous materials, the contractor shall install a continuous length of solid copper wire, on top and parallel to the pipe.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. County reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instruments with qualified operator to establish lines and grades.

3.2 EXAMINATION AND PREPARATION

A. Call NC One Call service at 811 not less than three working days before performing work.

B. Identify required lines, levels, contours, and datum locations.

C. Notify County of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

3.3 PROTECTION OF UTILITIES

A. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise make them known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.

B. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

C. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

D. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the County and secure his instructions.

E. Do not proceed with permanent relocation of utilities until written instructions are received from the County.

F. Locations within streets or highways:
   1. Take all precautions and comply with all requirements as may be necessary to protect the improvements, including barricades for protection of traffic.
   2. Keep a minimum of one lane open to traffic at all times where utility crosses street or highway.

3.4 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.

B. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

D. Protect plant life, lawns, and other features remaining as portion of final landscaping.

E. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Establish temporary traffic control and detours, when necessary, when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.5 DEWATERING

A. Prevent surface water and groundwater from entering excavations, from ponding on prepared sub-grades, and from flooding project site and surrounding area.

B. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
   2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavation as temporary drainage ditches.
   3. Do not use excavated trenches as temporary drainage ditches.

C. Maintain the water level below the excavation sub-grade during excavation and construction.
   1. Material disturbed below the foundation sub-grade due to improper dewatering shall be removed and replaced with stone bedding material at no expense to the Owner.
   2. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls, or bedding material will occur.

D. Dispose of water pumped from excavations into ditches or storm drains having the capacity to handle the volume of pumped water.
   1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
   2. Prevent flooding of streets, roadways, or private property.
   3. Provide noise attenuated engines when pumps will operate within 500 feet of a residence or commercial establishment.

3.6 TRENCHING

A. Excavate for utilities to the lines and grades per the drawings.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Do not advance open trench more than 400 feet ahead of installed pipe.

D. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and utility.

E. Do not interfere with 45 degree bearing splay of foundations.

F. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

G. When subsurface materials at bottom of trench are loose or soft notify County, and request instructions.

H. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.

I. Stockpile excavated material that is suitable for re-use as directed in 31 00 00 Earthwork, 3.7 Storage of Materials.

J. Remove from site any excavated material that is unsuitable for re-use.

K. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

L. Open cut:
   1. Excavate for utilities by open cut.
   2. If conditions at the site prevent such open cut, and if approved by the County, tunneling may be used.
   3. Short sections of a trench may be tunneled if, in the opinion of the County, the conductor can be installed safely and backfill can be compacted properly into such tunnel.

M. Special requirements relating to excavation for water distribution lines:

1. Do not excavate trench more than 400’ ahead of pipe laying, unless permitted by County.
2. Provide depth of cover shown or minimum cover of 36”, whichever is greater.
3. Where minimum cover only is required, carry excavations to depths necessary to properly grade the pipe on tangents and vertical curves as directed by the County.
4. Provide minimum clearance of 6” between pipe walls and trench walls or sheeting and bracing lines.
5. If minimum cover of 36” cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other County -approved material.
6. If an unacceptable bearing surface is encountered during excavation, notify the County immediately. County may authorize excavation below invert elevation for the introduction of bedding material. Authorized undercut excavation and replacement material will be paid for according to Contract unit price for Undercut and Backfill.
7. If authorized bedding material is off-site select borrow or stone bedding material, they shall be paid for according to the respective unit price.
8. If bedding material is required, pipe must be supported during placement and compaction of such material.

N. Correct over-excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by County.

3.7 EXCAVATION AND TRENCH SAFETY

A. During excavations, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading, to prevent slides or cave-ins, and to provide adequate access to the work. The Contractor shall comply with the “Rules and Regulations Governing the Construction Industry” as promulgated for the Health, Safety & General Welfare of Employees by the Commission of Labor. Particular attention shall be paid to the following sections:
   1. Where unstable material is encountered in excavations over 5’ in depth, the sides of the excavations shall be shored or sheet piled unless the sides are sufficiently sloped to eliminate all possibility of a cave-in.
   2. Where stable material is encountered in excavations over 5’ in depth, the sides of the excavations shall be shored or braced unless the sides are sufficiently sloped to eliminate all possibility of a cave-in.
   3. Where workmen are engaged near the edge of the excavation, undercutting of bank or walls is prohibited unless adequately protected.
   4. Materials which are excavated shall be placed so that the base of the pile is not less than 2’ from the edge of the excavation.
   5. Proper and adequate means of ingress and egress shall be provided at all times from all excavations and trenches; either by ramps, stairways, or ladders located so as to be accessible to workmen at all times.

B. In addition to the Safety Provisions specified herein, the Contractor shall comply with the Department of Labor, Safety & Health Regulations for Construction promulgated under the Occupational & Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54). Where the requirements of

these acts are in excess of those requirements specified, the requirements of these acts shall govern.

3.8 BACKFILLING

A. Prior to backfilling, remove all debris, trash, organic material, formwork, temporary shoring and bracing from excavation. Perform all testing and inspection of underground utilities.

B. Place and compact initial backfill of suitable soil material or sub-base material, free of particles larger than 1 inch, to a height of 12 inches over the utility.

C. Carefully compact material under pipe haunches. Bring backfill up evenly on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Install warning tape directly above utilities at 12” below final grade, except 6” below sub-grade under paved areas and slabs.

E. Final backfill areas to contours and elevations. Use unfrozen and unsaturated materials.

F. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over-porous, wet, frozen, or spongy sub-grade surfaces.

G. Initial Backfill:
   1. Place approved backfill and bedding material in layers of 8 inches maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is cover of not less than 24” over sewers and 12” over other utilities.

H. Remainder of backfill:
   1. Wooded, undeveloped areas and swamps:
      a. Place approved backfill and bedding material in layers of 12-18” maximum thickness, and compact with suitable tampers.
      b. Tamping may be ceased when backfill exceeds 30” over the pipe.
      c. Mound excess material 6” above grade to provide for settlement.
   2. Lawns and unpaved areas:
      a. Place approved backfill and bedding material in layers of 12-18” maximum thickness, and compact with suitable tampers.
      b. Obtain a compaction of 90% of maximum dry density.
   3. Paved areas, slabs on grade, site concrete flatwork and other similar areas:
      a. Place approved backfill and bedding material in layers of 8 inches maximum thickness, and thoroughly compact with heavy duty mechanical tampers.
      b. Obtain a compaction of 98% of an ASTM D698 Standard Proctor.

I. Maintain optimum moisture content of backfill materials to attain required compaction density.
   1. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer to within 2 percent of optimum moisture content before compaction.

2. Remove and replace, or scarify and air dry otherwise suitable soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

J. Do not leave more than 20 feet of trench open at end of working day.

K. Protect open trench to prevent danger to the public.

3.9 TOLERANCES

A. Top Surface of Backfilling under Paved Areas: Plus or minus one (1) inch required elevations.

B. Top Surface of General Backfilling: Plus or minus one (1) inch from required elevations.

3.10 FIELD QUALITY CONTROL

A. Testing Agency Services: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports. Allow testing agency to inspect and test each sub-grade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

B. Perform laboratory material tests in accordance with ASTM D698 (Standard Proctor).

C. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1556 (sand cone) or ASTM D2922 (nuclear) as applicable.

D. Frequency of Tests:
1. Building slab areas: At sub-grade and at each compacted fill and backfill layer, at least 1 test every 2000 sq. ft., but in no case less than 3 tests.
2. Parking areas and roadways: At sub-grade and at each compacted fill and backfill layer, perform at least one field in place density test every 5000 sq. ft. or less of paved area, but in no case less than 3 tests.
3. Trench backfill: In paved areas, test as above. In lawns and unpaved areas, test final backfill layer with one field in-place density test for each 250 feet of trench. In wooded, undeveloped areas, testing is not required.

E. When testing agency reports that sub-grades, fills, or backfills are below specified density, then scarify, moisten, aerate, or replace soils. Re-compact and re-test as necessary to achieve required density.

3.11 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

B. North Carolina Erosions and Sediment Control Planning and Design Manual.

1.2 SUMMARY

A. Section Includes:
1. Stone Check Dam
2. Temporary Gravel Construction Entrance
3. Silt Fence
4. Rock Energy Dissipater
5. Block and Gravel Inlet Protection

1.3 MEASUREMENT AND PAYMENT

A. Stone Check Dam
1. Basis of Measurement: Per each installed.
2. Basis of Payment: Includes necessary excavation, riprap, filter stone and required maintenance throughout the Contract time.

B. Temporary Gravel Construction Entrance
1. Basis of Measurement: Per each installed.
2. Basis of Payment: Includes site clearing, stripping, excavating, backfilling, placing rock, and required maintenance throughout the Contract time.

C. Silt Fence
1. Basis of Measurement: By Linear Foot of silt fence installed.
2. Basis of Payment: Includes excavating, vegetation removal, installation and continued maintenance throughout the Contract time.

D. Rock Energy Dissipater
1. Basis of Measurement: Per SY of riprap installed to depth as indicated on drawings and details.
2. Basis of Payment: Includes excavating, removing unsuitable material, backfilling, placing geotextile fabric, placing riprap, backfilling edges and continued maintenance throughout the Contract time.

E. Block and Gravel Inlet Protection
   1. Basis of Measurement: Block and gravel inlet protection is to be included in the unit price paid for the corresponding drainage structure.
   2. Basis of Payment: Block and gravel inlet protection is to be included in the unit price paid for the corresponding drainage structure. No separate payment will be made.

F. Rock Pipe Inlet Protection
   1. Basis of Measurement: Per each installed.
   2. Basis of Payment: Includes necessary excavation, riprap, filter stone and required maintenance throughout the Contract time.

G. Riprap Channel Lining
   1. Basis of Measurement: Per SY of riprap installed to the depth as indicated on drawings and details.
   2. Basis of Payment: Includes excavating, removing unsuitable material, backfilling, placing geotextile fabric, placing riprap, backfilling edges, and continued maintenance throughout the Contract time.

1.4 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:
   1. ASTM C127 - Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. Precast/Prestressed Concrete Institute:
   1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

1.5 SUBMITTALS

A. Geotextile fabric

B. Filter fabric

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with requirements of Section 31 00 00 – Earthwork, Section 31 10 00 – Site Clearing, and Section 31 37 00 – Riprap.

B. Perform work and provide materials in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, July 2006 edition.

C. North Carolina Erosion and Sediment Control Planning and Design Manual.

D. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

PART 2 PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials and rock in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, July 2006 edition.

B. Geotextile Fabric: Manufacturer's standard non-woven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
   1. Provide geotextile fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
      a. Grab Tensile Strength (ASTM D 4632): 200 lb.
      b. Apparent Opening Size (ASTM D 4751): #60 U.S. Standard sieve.
   2. Acceptable geotextile fabrics include: Propex Geotex® 801 or approved equal.

C. Filter Fabric: Manufacturer's standard woven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
   1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
      a. Standard-strength filter fabric:
         1) Grab Tensile Strength (ASTM D 4632): 50 lb.
         2) Elongation (ASTM D 4632): 30% maximum.
         3) Apparent Opening Size (ASTM D 4751): #30 U.S. Standard sieve.
         4) Permeability (ASTM D 4491): 0.15/sec.

      b. Extra-strength filter fabric:
         1) Grab Tensile Strength (ASTM D 4632): 100 lb.
         2) Elongation (ASTM D 4632): 25% maximum.

3) Apparent Opening Size (ASTM D 4751): #30 U.S. Standard sieve.
4) Permeability (ASTM D 4491): 0.15/sec.

c. Propex Geotex® 102F satisfies both sets of requirements and may be used for silt fence construction; however, an approved equal may also be substituted.

2.2 CONCRETE MASONRY UNITS

A. Concrete masonry units shall conform to ATSM C90.

B. Unit compressive strength: Provide units with a minimum average net-area compressive strength of 1900 psi.

C. Weight Classification: Lightweight.

D. Size: 8”x8”x16” nominal. Manufactured to dimensions 3/8” less than nominal.

2.3 ACCESSORIES

A. Mortar and Grout: (Per NCDOT 1040-8)
1. Portland cement: ASTM C 150, Type I or II.
2. Hydrated lime: ASTM C 207, Type S.
3. Masonry cement not permitted.
4. Mortar Cement: ASTM C 1329.
5. Aggregate for mortar: ASTM C 144.
6. Aggregate for grout: ASTM C 404.
7. Mortar: 1 part Portland cement, 1/4 part hydrated lime, 3-3/4 parts mortar sand (max), water.
8. Grout: 1 part Portland cement, 3 parts mortar sand, water.

B. Steel Plate and Bar, Channels, Angles, M and S shapes: ASTM A 36.

C. Welding Electrodes: Comply with AWS requirements.

PART 3 EXECUTION

3.1 STONE CHECK DAM

A. Construction
1. Immediately following ditch excavation, install stone check dams where indicated on the drawings.
2. Ditch bottom shall be firm, unyielding, and free of loose sediment.
3. Place NCDOT Class B riprap in ditch from top of bank to top of bank, sloping at 2:1 upstream and downstream. Provide a 6” depression in the riprap at the center point of the ditch.
4. Line the upstream edge of the stone check dam with a 12” thick layer of NCDOT #5 or #57 stone from the bottom of the ditch to the top of the riprap.

B. Maintenance
1. Inspect stone check dams immediately following all rainfall events.
2. Remove sediment buildup from front of check dam when sediment height reaches one third (1/3) the height of the dam.
3. If the stone becomes matted with soil material to the extent that the drainage through the stone deteriorates, the contaminated stone shall be removed from the site to an approved location and replaced with new stone at no cost to the Owner.
4. Maintain stone check dams until County approves the surrounding vegetation establishment.

3.2 TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

A. Purpose
1. The purpose of the temporary gravel construction entrance pad is to clean the tires of vehicles exiting the site and prevent or limit the amount of soils tracked off-site on the paved roads.

B. Construction
1. Verify location of temporary gravel construction entrance as shown on the drawings and determine if location will serve planned operations.
2. Size: 50’ length minimum x 20’ wide minimum. Contractor may need to increase size based upon volume of construction traffic and size of construction vehicles.
3. Provide turnout radii of 5’ minimum, 20’ preferred.
4. Strip topsoil and all vegetation. Excavate a minimum of 8” below existing paved roadway.
5. Proof roll subgrade. If subgrade is yielding, notify County prior to additional excavation.
6. Place 6” minimum thickness of NCDOT #5 or #57 washed stone in excavated area.

C. Maintenance:
1. Maintain entrance pad for the remainder of the Contract time. If the stone becomes matted with soil material to the extent that the performance of the gravel construction entrance deteriorates, the contaminated stone shall be excavated, removed from the site to an approved location, and replaced with new stone at no cost to the Owner.
2. Any material that is tracked onto the roadway shall be removed immediately. Sweeping the tracked material into the road shoulder or ditch is not acceptable.

3.3 SILT FENCE

A. Construction
1. Steel posts shall be used. Wooden stakes are not acceptable.
2. Posts shall be 5’ in height and be of the self-fastener angle type.
3. Post spacing shall be 8’ on center when used with a wire mesh fencing and standard strength filter fabric.

4. Post spacing of 6’ on center may be used without wire mesh fencing provided extra strength fabric is used.
5. Maximum fabric height is 24” above existing grade.
6. Wire mesh fence and fabric shall be installed on the upslope side of the fence.
7. Filter fabric and wire fence mesh shall be secured to the steel post utilizing plastic or wire ties no more than 12” apart. Plastic or wire ties shall have a minimum 50 pound tensile strength.
8. Lap all fabric joints 4’ minimum.
9. Excavate a trench 4” wide x 8” deep along the upslope side of the fence and place 12” of fabric in the excavated area. Backfill the excavation with the soil placed over the filter fabric. Compact the soil.

B. Maintenance
1. Inspect silt fence immediately following all rainfall events.
2. Remove sediment build up along fence.
3. Repair and replace silt fence as necessary.
4. Maintain silt fence throughout the Contract time.

3.4 ROCK ENERGY DISSIPATER

A. Excavate to the indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 1 week.

C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, minimize the number of voids, and prevent tearing of the fabric.

D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.5 BLOCK AND GRAVEL DROP INLET PROTECTION

A. Construction:
1. Construct block and gravel drop inlet protection in accordance with drawings and details.
2. Lay 2 rows of 8” hollow CMU’s in a running bond around the drop inlet.
3. Lower edge of CMU shall be 1-2” below the top of the grate frame to prevent lateral slippage of the blocks towards the center of the drop inlet.
4. Two 8” CMUs on the first course shall be laid on their side to allow the passage of water.

5. Fit hardware cloth with 1/2” opening over the sideways laid CMUs to retain stone. Edges of hardware cloth shall extend 6” past edges of sideways laid CMUs in all directions.
6. Place clean NCDOT #5 or #57 stone around the outside of the CMUs to a height of 12-14” and slope away from the drop inlet at a 2:1 slope on all sides.

B. Maintenance:
1. Inspect drop inlets immediately following all rainfall events.
2. Remove sediment buildup around the stone.
3. If the stone becomes matted with soil material to the extent that the drainage through the stone deteriorates, the contaminated stone shall be removed from the site to an approved location and replaced with new stone at no cost to the Owner.
4. Maintain drop inlet protection until final paving or until County approves the surrounding vegetation establishment.

3.6 ROCK PIPE INLET PROTECTION

A. Construction:
1. Clear the area of all debris that might hinder excavation and disposal of spoil.
2. Install the Class B or Class I riprap in a semi-circle around the pipe inlet. The stone should be built up higher on each end where it ties into the embankment. The minimum crest width of the riprap should be 3 feet, with a minimum bottom width of 11 feet. The minimum height should be 2 feet, but also 1 foot lower than the shoulder of the embankment or diversions.
3. A 1 foot thick layer of NC DOT #5 or #57 stone should be placed on the outside slope of the riprap.
4. The sediment storage area should be excavated around the outside of the stone horseshoe 18 inches below natural grate.
5. When the contributing drainage area has been stabilized, fill depression and establish final grading elevations, compact area properly, and stabilize with ground cover.

B. Maintenance
1. Inspect rock pipe inlet protection at least weekly and after each significant (1/2 inch or greater) rainfall.
2. Remove sediment and restore the sediment storage area to its original dimensions when the sediment has accumulated to ½ the design depth of the trap.
3. Place the sediment that is removed in the designated disposal area do not replace the contaminated part or the gravel facing.
4. Check the structured for damage. Any riprap displaced from the stone horseshoe must be replaced immediately.
5. After all the sediment-producing areas have been permanently stabilized, remove the structure and all the unstable sediment. Smooth the area to blend with the adjoining areas and provide permanent ground cover.

3.7 RIPRAP CHANNEL LINING

A. Excavate ditches in accordance with Section 31 00 00 Earthwork and to the lines and grade on the drawings and details.

B. Where ditch bottoms and side slopes are to be lined with riprap, over-excavate the ditch bottom and sides to receive the geotextile fabric and the riprap. Over-excavation shall be done such that the finished grade of the top of the riprap is 2 inches below the proposed invert of the ditch.

C. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 1 week.

D. Carefully place rock on geotextile fabric to produce an even distribution of pieces, minimize the number of voids, and prevent tearing of the fabric.

E. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.8 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 15 feet. Slope stockpile sides at 2:1 or flatter. Cover to prevent windblown dust.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 Seeding.

E. Stabilize ditch excavations and stockpiles immediately.

3.9 FIELD QUALITY CONTROL

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.10 CLEANING

A. When sediment accumulation in sedimentation structures has reached one-third depth of sediment structure or device, remove and dispose of sediment.

B. Final inspection of the storm water detention pond will require removal of all accumulated sediment from the forebay and main basin prior to final acceptance. Depth of both shall be returned to design inverts.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction areas, site areas, or natural waterways.

END OF SECTION

SECTION 31 37 00

RIPRAP

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

B. North Carolina Erosion and Sediment Control Planning and Design Manual.

1.2 SUMMARY

A. Section Includes:
   1. Riprap placed loosely.

1.3 MEASUREMENT AND PAYMENT

A. Riprap:
   1. Basis of Measurement: By the Ton of riprap installed. If riprap is part of Rock Energy Dissipater or Riprap Channel Lining, refer to Measurement and Payment Section of 31 25 13 – Erosion Controls.
   2. Basis of Payment: Includes supplying and placing riprap to the lines, thicknesses and elevations as shown on the drawings.

1.4 SUBMITTALS

A. Data from material supplier indicating compliance of material to NCDOT standards for the Types and Classes of riprap to be provided.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform work in accordance with and provide materials in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish materials in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

B. Riprap: Granite type; irregular shaped rock; solid and non-friable. Class of stone needed is specified on drawings and in detail drawings.

C. Binder: Portland cement.

D. Geotextile Fabric: Specified on drawings and in detail drawings.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place geotextile fabric over substrate; lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes, and channel linings as indicated on the Drawings.

C. Installed Thickness: As indicated on the Drawings.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

B. North Carolina Erosions and Sediment Control Planning and Design Manual.

1.2 SUMMARY

A. Section Includes:
1. Fertilizing
2. Seeding
3. Hydro seeding
4. Mulching
5. Maintenance

1.3 MEASUREMENT AND PAYMENT

A. Grassed Areas:
1. Basis of Measurement: Per Acre of disturbed area to be seeded, measured to the nearest one-quarter acre.
2. Basis of Payment: Includes seeding, watering, mowing and maintenance until the end of Contract time.

1.4 REFERENCES

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.5 DEFINITIONS

A. Finished Grade: Elevation of finished surface of planting soil.

B. Subgrade: Surface or elevation of subsoil remaining after excavation is complete or top surface of a fill or backfill before planting soil is placed.

C. Subsoil: All soil beneath the topsoil layer of the soil profile, typified by the lack of organic matter and soil organisms.

D. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, and in disturbed areas the surface soil is typically subsoil.

E. Weeds: Vegetative species other than specified species to be established in given area.

1.6 SUBMITTALS

A. Product Data: For all pesticides and herbicides used on this project, submit product label and manufacturer's application instructions.

B. Certification of Grass Seed: Submit data from seed vendor for each seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination and weed seed. Include the year of production and date of packaging.

C. Product Certificates: From Manufacturer, for all fertilizers, limes, and other soil amendments.

1.7 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform work in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

C. Submit the following test reports to the Owner for each soil type to be amended:
   1. Soil Analysis including:
      a. pH factor.
      b. Composition of soil.
      c. Percentage of organic content.
      d. Recommendation of type and quantity of additives required to establish satisfactory pH and bring the supply of nutrients to a satisfactory level for planting.
   2. Testing shall be conducted by a soil testing laboratory in compliance with USDA Handbook No. 60.
   3. Recommendations shall be reported in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Store seed, fertilizer, lime, and mulch in a manner which prevents wetting and deterioration.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed with beneficial and optimum results. Apply products during favorable weather conditions according to manufacturer's instructions.

B. The contractor shall field check the location of utilities before any ground disturbance associated with seeding, fertilizing, liming or mulching. The contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement.

C. Work shall only take place on-site under the direct supervision of a competent, experienced landscape foreman.

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas for 30 days from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Grass Seed: Provide seed conforming to all statutory requirements and all rules and regulations adopted by the North Carolina Board of Agriculture. Deliver to site in original containers, labeled to show that the requirements of the N.C. Seed Law are met.

B. No seed will be accepted with a date of test more than 8 months prior to the date of sowing, excluding the month in which the test was completed.

C. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the contractor may elect to increase the rate of application sufficiently to obtain the minimum pure live seed content specified, provided that such an increase in the rate of application does not cause the quantity of noxious weed seed per area to exceed the quantity that would be allowable at the regular rate of application.

D. Seed: Seed of grass species as follows, with not less than 95 percent germination. Not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. Permanent Seeding:

Seed	Quantity	Planting Season
Tall Fescue Blend	6 lbs /1000 SF	Sept 1 – Mar 31
Common Bermuda 'Sahara' (Cynodon dactylon 'Sahara')	3 lbs / 1000 SF	Apr 1 – Aug 31

a. If lawn areas are initially seeded with a fescue blend, the contractor shall be required to overseed with Bermuda seed after April 1.

b. Mix temporary seed with Bermuda seed to establish cover before Bermuda seed germinates.

2. Temporary Seeding:

Seed	Quantity	Planting Season
Perennial Rye Grass	5 lbs /1000 SF	Sept 1 – Mar 15
Brown Top Millet	2 lbs / 1000 SF	Mar 15 – Aug 31

2.2 ACCESSORIES

A. Mulching Material: Dry oat, hay, or wheat straw that is free from weeds and foreign matter detrimental to plant life.

B. Fertilizer: Commercial grade fertilizer recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis.

C. Lime: Ground dolomitic limestone, ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent. Minimum 99 percent passing through a No. 8 sieve and a minimum 75 percent passing through a No. 60 sieve.

D. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: Jute matting, open weave.

F. Herbicide: Round-Up by Monsanto or approved equal.

G. Stakes: Softwood lumber, chisel pointed.

H. String: Inorganic fiber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared soil base is ready to receive the work of this Section.

B. Do not place or mix soils or soil amendments in frozen, wet, or muddy conditions.

C. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture.

D. Uniformly moisten any soil which is excessively dry or dusty to the extent of being unworkable.

3.2 FERTILIZING

A. Apply lime at application rate as recommended by soil analysis or at 40 lbs per 1000 sq. ft.

B. Apply fertilizer at application rate as recommended by soil analysis.

C. Do not apply fertilizer at same time or with same machine used to apply seed.

D. Mix fertilizer thoroughly into upper 3 inches of topsoil.

E. Lightly water soil to aid in dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Seed at the rates in accordance with 32 92 19 Seeding Part 2.1 D.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

D. Immediately following seeding, apply mulch to thickness of 1/8 – 1/4 inches. Maintain clear of shrubs and trees.

E. Apply water with fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.

3.4 HYDRO SEEDING

A. Hydroseeding: Mix specified seed, fertilizer and fiber mulch in water, utilizing equipment specifically designed for hydroseeding operations. Continue mixing until uniformly blended into a homogeneous slurry suitable for hydraulic application.

B. Paper mulch material is not allowed.

C. Mix slurry with a nonasphaltic tackifier.

D. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch is deposited at not less than 500 lbs per acre dry weight and the seed component is deposited at not less than the specified seed sowing rate.

E. Apply slurry coat of fiber mulch at a rate of 1000 lbs per acre.

F. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 2 inches of soil and maintain moisture levels 2 – 4 inches.

3.5 MAINTENANCE

A. General Care
   1. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf.
   2. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation identical to those used in the original installation.
   3. As necessary, fill in any soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
   4. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   5. Apply treatments as required to keep turf and soil free of pests, pathogens, and disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering
   1. Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
   2. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   3. Water turf with fine spray at a minimum rate of one inch per week unless rainfall precipitation is adequate.

C. Mowing
   1. Mow grass as soon as top growth is tall enough to cut. Continue mowing without cutting more than 1/3 of grass height. Do not cut more than 1/3 of grass blade at each mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Maintain the following heights:
      a. Bermuda: 1”
      b. All other grasses: 2-1/2”

D. Apply herbicides to control growth of weeds. Remedy damage resulting from improper use of herbicides.

E. Immediately reseed areas showing bare spots.

F. Repair washouts or gullies.

3.6 ACCEPTABLE TURF CONDITIONS

A. Satisfactorily Seeded Turf: At end of maintenance period a healthy, uniform, close stand of grass should be established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

3.7 CLEANUP

A. Perform cleanup during the installation and upon completion of the work. Remove soil and debris created during seeding operation from paved areas.

B. Remove from site all excess material, debris, and equipment.

END OF SECTION

SECTION 33 05 23

TRENCHLESS UTILITY INSTALLATION – JACK AND BORE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

1.2 SUMMARY

A. Section Includes:
1. Excavation for approach trenches and pits.
2. Casing pipe.
3. Carrier pipe.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Jacked Pipe:
1. Basis of Measurement: By linear foot measured on invert of jacked pipe from face to face of jacked pipe.
2. Basis of Payment: Includes excavation, jacked pipe, grout, accessories, tests, and backfill.

1.4 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Railway Engineering and Maintenance-of-Way Association:
1. AREMA - Manual for Railway Engineering.

C. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
4. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
5. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
6. ASTM C33 - Standard Specification for Concrete Aggregates.
7. ASTM C150 - Standard Specification for Portland Cement.

8. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
9. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
10. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
11. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
12. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
13. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

E. National Utility Contractors Association:
1. NUCA - Pipe Jacking & Micro Tunneling Design Guide.
2. NUCA - Trenchless Excavation Construction Equipment & Methods Manual.

1.5 SUBMITTALS

A. Product data for steel casing pipe and pipe supports.

B. Project Record Documents: Record actual locations of casing, carrier pipe, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NUCA Trenchless Excavation Construction Equipment & Methods Manual and NUCA Pipe Jacking & Micro Tunneling Design Guide.

B. Perform work and provide materials in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

1.7 QUALIFICATIONS

A. Use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use a sufficient number of equipment of adequate size and capacity to accomplish the work in a timely manner.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.

C. Accept system components on site in manufacturer's original containers or configuration. Inspect for damage.

D. Use wooden shipping braces between layers of stacked pipe. Stack piping lengths no more than 3 layers high.

E. Store field joint materials indoors in dry area in original shipping containers.

F. Support casing and carrier pipes with nylon slings during handling.

1.9 FIELD MEASUREMENTS

A. Verify invert elevations of existing work prior to excavation and installation of casing pipe.

PART 2 PRODUCTS

2.1 CASING AND JACKING PIPE MATERIALS

A. Steel Casing Pipe: All encasement pipe shall be smooth wall welded steel conforming to ASTM Designation A139, Grade B. The outside of the pipe shall be coated in accordance with AWWA Standard C203.

2.2 CARRIER PIPE MATERIALS

A. Water Distribution: As specified in Section 33 11 00 Water Distribution.

2.3 ACCESSORIES

A. Supports and Insulators:
   1. Spiders: Bituminous coated steel spiders.

B. Steel Strapping: ASTM A36/A36M.

C. Grout: 1 part Portland cement, 3 parts mortar sand, and water.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect from damage any utilities indicated to remain.

C. Notify utility company to remove and relocate utilities.

D. Protect plant life, lawns and other features remaining as portion of final landscaping.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Establish elevations of casing with not less than three feet of cover.

3.2 DEWATERING

A. Intercept and divert surface drainage precipitation and groundwater away from excavation through use of dikes, curb walls, ditches, pipes, sumps, or other means.

B. Develop substantially dry subgrade for prosecution of subsequent operations.

3.3 PITS OR APPROACH TRENCHES

A. Excavate approach trenches or pits as site conditions require.

B. Ensure casing entrance face as near perpendicular to alignment as conditions permit.

C. Establish vertical entrance face at least 1 foot above top of casing.

D. Install dewatering measures and excavation supports as specified in Section 31 23 17 Trenching and Backfilling.

3.4 CASING PIPE INSTALLATION

A. Boring:

1. Push pipe into ground with boring auger rotating within pipe to remove spoil. Do not advance cutting head ahead of casing pipe except for distance necessary to permit cutting teeth to cut clearance for pipe. Arrange machine bore and cutting head to be removable from within pipe. Arrange face of cutting head to provide barrier to free flow of soft material.
2. When unstable soil is encountered during boring, retract cutting head into casing to permit balance between pushing pressure and ratio of pipe advancement to quantity of soil.
3. When voids develop greater than outside diameter of pipe by approximately one inch, grout to fill voids.

4. When boring is obstructed, relocate, jack, or tunnel as directed by County Engineering Department.

B. Jacking
1. Construct adequate thrust wall normal to proposed line of thrust.
2. Impart thrust load to pipe through suitable thrust ring sufficiently rigid to ensure uniform distribution of thrust load on full pipe circumference.

3.5 PRESSURE GROUTING

A. Pressure grout annular space between casing pipe and surrounding earth.

3.6 CARRIER PIPE INSTALLATION

A. Clean, inspect, and handle pipe in accordance with Sections 33 11 00 Water Distribution.

B. Pipeline Installation: After completion of the boring and encasement, insert the pipeline in pre-jointed segments. A galvanized steel spider shall be installed behind each carrier pipe bell in the encasement pipe, as shown on the drawings and details.

C. Place carrier pipe in accordance with Sections 33 11 00 Water. Exercise care to prevent damage to pipe joints when carrier pipe is placed in casing.

D. Support pipeline within casing so no external loads are transmitted to carrier pipe. Attach supports to barrel of carrier pipe; do not rest carrier pipe on bells.

E. Pressure test line prior to grouting ends of casing pipe.

F. Grout ends of casing to seal.

3.7 TOLERANCES

A. Do not over-cut excavation by more than 1 inch greater than outside diameter of casing pipe.

B. Install casing pipe to vertical and horizontal alignment on drawings within plus or minus 3 inches prior to installation of carrier pipe.

C. Install pipe bells with minimum 1/2 inch clearance to casing.

END OF SECTION

SECTION 33 05 24

HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

1.2 SUMMARY

A. Section Includes:
   1. Excavation for approach trenches and pits.
   2. Horizontal directional drilling.
   3. Pipe.

1.3 MEASUREMENT AND PAYMENT

A. Horizontal Directional Drilling:
   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes:
      a. Excavation
      b. Fusing
      c. Drilling
      d. Pipe
      e. Accessories
      f. HDPE Mechanical Joint Adapter
      g. Backfilling
      h. Testing.

1.4 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
   2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

5. ASTM F1962 - Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings.

C. National Utility Contractors Association:
   1. NUCA - HDD Installation Guidelines.

D. The Plastic Pipe Institute, Inc.:
   1. PPI Generic Butt Fusion Joining Procedure TR-33.

1.5 DESIGN REQUIREMENTS

A. Design Criteria:
   1. Drilling Steering System: Remote with continuous electronic monitoring of boring depth and location.
   2. Directional Change Capability: 90 degree with 35 foot radius curve.
   3. Minimum distance for single bores and between boring pits:

Pipe Size	Boring Distance
1 to 1-1/2 inches	400 feet
2 to 2-1/2 inches	350 feet
3 to 6 inches	300 feet

   4. Ratio of Reaming Diameter to Pipe Outside Diameter:
      a. Nominal pipe diameter of 6 inches and smaller: 1.5 maximum.
      b. Nominal pipe diameter larger than 6 inches: Submit recommended ratio and reaming procedures for review.

1.6 SUBMITTALS

A. Shop Drawings:
   1. Submit technical data for equipment, method of installation, and proposed sequence of construction.
   2. Include information pertaining to pits, dewatering, method of spoils removal, equipment size and capacity, equipment capabilities including installing pipe on radius, type of drill bit, drilling fluid, method of monitoring line and grade and detection of surface movement, name plate data for drilling equipment and mobile spoils removal unit.

B. Product Data:
   1. Identify source of water used for drilling.
   2. Submit copy of approvals and permits for use of water source.

C. Project Record Documents: Record actual locations of pipe and invert elevations.

D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

E. Record actual depth of pipe at 25-foot intervals.

F. Record actual horizontal location of installed pipe.

G. Show depth and location of abandoned bores.

H. Record depth and location of drill bits and drill stems not removed from bore.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with the following:
1. NUCA HDD Installation Guidelines.
2. ASTM F1962.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings until pipe is installed.

B. Protect pipe from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.

C. Accept products on site in manufacturer’s original containers or configuration. Inspect for damage.

D. Use shipping braces between layers of stacked pipe. Stack piping lengths no more than 3 layers high.

E. Support pipes with nylon slings during handling.

PART 2 PRODUCTS

2.1 DRILLING FLUID

A. Drilling Fluid: Liquid bentonite clay slurry; totally inert with no environmental risk.

2.2 PIPE

A. Water Distribution System Pipe: HDPE DR-9.

2.3 FILL MATERIALS

A. On-site suitable material.

2.4 WATER SOURCE

A. Water: Potable.

2.5 ACCESSORIES

A. HDPE mechanical joint adapter meeting the requirements of AWWA C111/ANSI A21.11.

B. Mechanical joint accessory kits

C. Grout: 1 part Portland cement, 3 parts mortar sand, and water.

PART 3 EXECUTION

3.1 PREPARATION

A. Notification: The County should be notified at least forty-eight (48) hours prior to beginning the work of this Section.

B. Call NC One Call service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Locate, identify, and protect from damage any utilities indicated to remain.

D. Identify required lines, levels, contours, and datum locations.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 DEWATERING

A. Intercept and divert surface drainage, precipitation, and groundwater away from excavation through use of dikes, curb walls, ditches, pipes, sumps or other means.

B. Develop and maintain substantially dry subgrade during drilling and pipe installation.

3.3 EXCAVATION

A. Excavate subsoil as specified in Section 31 23 17 Trenching and Backfilling.

B. Excavate approach trenches and pits as site conditions require. Minimize number of access pits.

C. Provide sump areas to contain drilling fluids.

D. Restore areas after completion of drilling and carrier pipe installation.

3.4 DRILLING

A. Drill pilot bore with vertical and horizontal alignment as indicated on drawings and details.

B. Guide drill remotely from ground surface to maintain alignment by monitoring signals transmitted from drill bit.
   1. Monitor depth, pitch, and position.
   2. Adjust drill head orientation to maintain correct alignment.

C. Inject drilling fluid into bore to stabilize hole, remove cuttings, and lubricate drill bit and pipe.

D. Continuously monitor drilling fluid pumping rate, pressure, viscosity, and density while drilling pilot bore, back reaming, and installing pipe to ensure adequate removal of soil cuttings and stabilization of bore.
   1. Provide relief holes when required to relieve excess pressure.
   2. Minimize heaving during pullback.

E. Calibrate and verify electronic monitor accuracy during first 50 feet of bore in presence of County before proceeding with other drilling. Excavate minimum of four test pits spaced along first 50 feet bore to verify required accuracy. When required accuracy is not met, adjust equipment or provide new equipment capable of meeting required accuracy.

F. After completing pilot bore, remove drill bit.

3.5 DRILLING OBSTRUCTIONS

A. When obstructions are encountered during drilling, notify County immediately. Do not proceed around obstruction without County approval.

B. For conditions requiring more than 3 feet deviation in horizontal alignment, submit new shop drawings to County for approval before resuming work.

C. Maintain adjusted bore alignment within easement or right-of-way.

3.6 PIPE INSTALLATION

A. After completing pilot bore, remove drill bit. Install reamer and pipe pulling head. Select reamer with minimum bore diameter required for pipe installation.

B. Attach pipe to pipe pulling head. Pull reamer and pipe to entry pit along pilot bore.

C. Inject drilling fluid through reamer to stabilize bore and lubricate pipe.

D. Install piping with horizontal and vertical alignment as shown on drawings and details.

E. Protect and support pipe being pulled into bore so pipe moves freely and is not damaged during installation.

F. Do not exceed pipe manufacturer's recommended pullback forces.

G. Install trace wire continuous with each bore. Splice trace wire only at intermediate bore pits. Tape or insulate trace wire to prevent corrosion and maintain integrity of pipe detection.
   1. Terminate trace wire for each pipe run at structures along pipe system.
   2. Provide extra length of trace wire at each structure, so trace wire can be pulled 3 feet out top of structure for connection to detection equipment.
   3. Test trace wire for continuity for each bore before acceptance.

H. Provide sufficient length of pipe to extend past termination point to allow connection to other pipe sections.

I. Slip the gland ring over the pipe end and then butt fuse the HDPE MJ adapter to the end of the pipe using the PPI generic Butt Fusion Joining Procedure TR-33.

J. Mark location and depth of bore with spray paint on paved surfaces, and wooden stakes on non-paved surfaces at 25-foot intervals.

3.7 SLURRY REMOVAL AND DISPOSAL

A. Contain excess drilling fluids at entry and exit points until recycled or removed from site. Provide recovery system to remove drilling spoils from access pits.

B. Remove, transport and legally dispose of drilling spoils.

   1. Do not discharge drilling spoils in sanitary sewers, storm sewers, or other drainage systems.

   2. When drilling in suspected contaminated soil, test drilling fluid for contamination before disposal.

C. When drilling fluid leaks to surface, immediately contain leak and barricade area from vehicular and pedestrian travel before resuming drilling operations.

D. Complete cleanup of drilling fluid at end of each work day.

3.8 ERECTION TOLERANCES

A. Maximum Variation From Horizontal Position: 12 inches.

B. Maximum Variation From Vertical Elevation: 2 inches.

C. Minimum Horizontal and Vertical Clearance from Other Utilities: 12 inches.

D. When pipe installation deviates beyond specified tolerances, abandon bore, remove installed pipe, re-bore, and reinstall pipe in correct alignment.

E. Fill abandoned bores greater than 3" in diameter with grout or flowable fill material.

3.9 FIELD QUALITY CONTROL

A. Upon completion of pipe installation, test pipe in accordance with the following:

1. Water Distribution Pipe Testing: Section 33 11 00 Water Distribution.

3.10 CLEANING

A. Upon completion of drilling and pipe installation, remove drilling spoils, debris, and unacceptable material from approach trenches and pits. Clean up excess slurry from ground.

B. Restore approach trenches and pits to original condition.

END OF SECTION

SECTION 33 11 00

WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe and fittings for public line, including potable water line and fire water line.
   2. Tapping sleeves and valves.
   3. Valves and fire hydrants.
   4. Underground pipe markers.

1.3 DEFINITIONS

A. Off-Site Select Borrow: Approved soil material obtained off-site when specified or when sufficient approved soil material is not available from excavations.

B. Unsuitable Soil: Soil produced from excavation of drainage features, cut to sub-grade, or required stripping that does not meet the definition and requirements of suitable soil.

C. Suitable Soil: Soil produced from excavation of drainage features, cut to sub-grade, or required stripping that meets the definition and requirements of suitable soil.

D. Topsoil: Soil produced from stripping the top or upper 4-8” soil layer from areas to be further excavated, re-landscaped, or re-graded without contamination from the subsoil. Stripping of topsoil is not required where excavation width is less than 10’ or for the installation of pipe utilities. Topsoil shall be stockpiled on site at designation location for further use. Topsoil shall not be removed from site.

E. Base Course: The layer placed between the sub-grade and surface pavement in a paving system.

F. Excavation: Removal of material encountered above sub-grade elevations and to the lines and dimensions indicated.

G. Porous Fill: Fill material supporting the slab on grade that also minimizes upward capillary flow of water.

H. Structures: Buildings, slabs, curbs, utility appurtenances, tanks, retaining walls or other man-made stationary features constructed above or below ground surface.

I. Sub-grade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below topsoil materials.

J. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or dimensions without direction by the County Engineering Department. Unauthorized excavation, as well as remedial work directed by the County Engineering Department, shall be at the Contractor's expense.

K. Undercut excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by County Engineering Department. Authorized undercut excavation and replacement material will be paid for according to Contract unit price for UNDERCUT and BACKFILL.

L. Utilities: On-site underground pipes, conduits, ducts and cables.

1.4 MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
1. Basis of Measurement: By the Linear Foot. The length of water lines to be paid for will be determined by measuring along the centerlines of the various sizes of pipe furnished and installed. Pipe will be measured from center of fitting to center of fitting, from the center of the water distribution line to end of service connection and from center of water distribution line to center of hydrant.
2. Basis of Payment includes:
   a. Excavation for piping and all fittings, including all valves, sleeves, hydrants and blow-offs.
   b. Removal of unsuitable soil material.
   c. Piping and fittings, with the exception of valves, tapping sleeves and tapping valves, and fire hydrants.
   d. Concrete thrust restraints.
   e. Connection to public utility water source.
   f. Backfilling with suitable trench excavation or on-site suitable soil.
   g. Testing.

B. Valves:
1. Basis of Measurement: Per Each unit installed.
2. Basis of Payment includes:
   a. Valve
   b. Accessories and kits
   c. Valve Box
   d. Concrete Collar as required
   e. Blocking
   f. Backfilling

C. Tapping Sleeve and Tapping Valve
1. Basis of Measurement: Per Each unit installed.
2. Basis of Payment includes:
   a. Tapping sleeve and tap valve
   b. Testing of assembly before wet tap

c. Cutting the wet tap
d. Blocking
e. Backfilling

D. Fire Hydrant
1. Basis of Measurement: Per Each unit installed.
2. Basis of Payment includes:
a. Fire hydrant
b. Blocking and rodding
c. Drainage aggregate
d. Backfilling
e. Painting

E. Blow Off
1. Basis of Measurement: Per Each unit installed.
2. Basis of Payment includes:
a. Complete blow off assembly per drawings and details
b. Blocking
c. Backfilling

F. Backflow Preventer
1. Basis of Measurement: Per Each unit installed.
2. Basis of Payment includes:
a. Complete backflow preventer assembly
b. Accessories
c. Enclosure
d. Blocking backfilling
e. Testing

1.5 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

C. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

5. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
6. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
7. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association:
1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm), for Water.
3. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
5. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
6. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
7. AWWA C200 - Steel Water Pipe 6 In. (150 mm) and Larger.
8. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
9. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied.
10. AWWA C206 - Field Welding of Steel Water Pipe.
11. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
12. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
13. AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
14. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
15. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
16. AWWA C509 - Gate Valves for Water and Sewage Systems.
17. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
18. AWWA C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.
19. AWWA C606 - Grooved and Shouldered Joints.

20. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
21. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
22. AWWA C702 - Cold-Water Meters - Compound Type.
23. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
24. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 12 In. (100 mm Through 300 mm), for Water Distribution.
25. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 36 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
26. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

E. Manufacturer's Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 - Connecting Flange Joint between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Agency:
1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.6 SUBMITTALS

A. Product Data: Submit data on all pipe materials, pipe fittings, valves and accessories.

B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed specifications.

D. Record Documents (As-Built Drawings): Record location and depth of cover for pipe runs, valves, tees, and other fittings. Identify and describe variations to drawings and discovery of unidentified buried objects. Provide color photographs for all tee and valve connections and fire hydrant assemblies taken prior to placing any backfill. Photographs shall be numbered and keyed to the appropriate location on the as-built drawings.

1.7 QUALITY ASSURANCE

A. All work shall conform to applicable AWWA and ASTM standards as the manufacturer's recommendations and instructions.

1.8 INSTALLER QUALIFICATIONS

A. Installer shall be a licensed underground utility contractor licensed for such work in the State of North Carolina. Installing contractor's license status shall be current.

1.9 DELIVERY, STORAGE, AND HANDLING

A. All pipe, of whatever material, shall be transported, handled, stored, and installed in strict compliance with applicable AWWA and ASTM standards as well as the manufacturer's instructions and recommendations.

B. Deliver and store valves in shipping containers with labeling in place.

C. Block individual and stockpiled pipe lengths to prevent moving.

D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

E. Store polyethylene materials out of sunlight.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe: AWWA C151. Bituminous outside coating: AWWA C151. Pipe Mortar Lining: AWWA C104, double thickness. Polyethylene Encasement: AWWA C105.

1. Ductile cast iron pipe shall be Grade 60-42-10 centrifugally cast in accordance with ANSI Standard A21.51 (AWWA C151), latest revision for 200 psi operating pressures plus surge allowance of 100 psi. Wall thickness and strength shall conform to ANSI Standard A21.50 for cover as shown on the drawings and details. Each pipe shall be hydrostatically tested, before shipment, to a minimum of 500 psi. Factory tests and basis for acceptance shall be as specified in ANSI Standard A21.51. Unless otherwise specified, thickness class shall conform to ANSI A21.51 (AWWA C151).
   a. Bells for push-on joints shall conform to the requirements of ANSI Standard A21.51, such as "Fastite," "Tyton", "Bell-Tite", or equal. Pipe shall be nominal 18' lengths. Joint detail, including rubber gaskets, shall conform to ANSI Standard Specification A21.11., AWWA C111, latest revision.
   b. The pipe shall have an outside pipe coating of bituminous material in accordance with AWWA C151, latest revision. The final coat shall be continuous and smooth, being neither brittle when subjected to low temperatures nor sticky when exposed to hot sun. The coating shall be strongly adherent to the pipe at all temperatures.
   c. Pipe 6" and larger shall be Class 50. 4" diameter pipe shall be Class 51 or 52.
2. Fittings for ductile iron pipe sizes 4"-12" shall be cast from ductile iron in accordance with ANSI/AWWA C153/A21.53.

a. All fittings shall be Class 350 ductile iron fittings, mechanical joint. Mechanical joints shall conform to ANSI/AWWA A21.11/C111. Wall and socket thicknesses shall be equal to Class 54 ductile iron pipe as specified in ANSI/AWWA A21.51/C151. Ductile iron shall be in accordance with ASTM A563 with minimum physical qualities of 70,000 psi tensile strength, 50,000 psi yield strength, and 5% elongation.
b. All ductile cast iron fittings shall have cement mortar lining conforming to ANSI Standard A21.4, latest edition. Buried fittings shall be given a full coat inside and outside of a bituminous coating which conforms to ANSI 21.4, latest revision.

3. Mechanical jointing ductile iron pipe shall be used only at the specific locations indicated on the drawings and details or as approved by the County Engineering Department. The mechanical joint shall consist of:
   a. a bell cast integrally with the pipe or fitting and provided with an exterior flange having cored or drilled bolt holes and interior annular recesses for the sealing gasket and the spigot of the pipe or fitting;
   b. a pipe or fitting spigot;
   c. a sealing gasket;
   d. a separate cast iron follower gland having cored or drilled bolt holes; and (5) tee head bolts and hexagon nuts. The joint shall be designed to permit normal expansion, contraction and deflection of the pipe or fitting while maintaining a leak proof joint connection. The mechanical joint shall conform to the requirements of ANSI Standard Specification A21.11 and AWWA Clll Specifications, latest revision.
4. Ductile iron flanged pipe shall be supplied in accordance with ANSI/AWWA C115/A21.15. Pipe barrels and flanges shall have a taper pipe thread (NPT) in accordance with B1.20.1, with thread diameters adapted to ductile iron pipe standard outside diameters. Ductile iron pipe used for flanging shall be centrifugally cast in metal molds and shall meet the requirements of ANSI/AWWA C151/A21.51. Flanges shall conform to ANSI/AWWA C110/A21.10. Flanged pipe shall be furnished in maximum length of 17'6" for sizes 4-48". The flanges shall conform to the drilling and facing requirements of ANSI B16.1 Class 125 flanges. Face to face dimensions shall conform to a tolerance of ± 0.12" for sizes 3-64". The minimum class thickness for ductile iron flanged pipe to be threaded is class 53.

B. Polyvinyl Chloride (PVC): AWWA C900 DR 18 Class 150 (pipe 4” – 12”) and AWWA C905, DR 18 Class 150 (pipe larger than 12”).
   1. Fittings for PVC pipe sizes” and larger shall be cast from ductile iron in accordance with ANSI/AWWA C153/A21.53.
   2. Ductile iron fittings shall have a working pressure rating of 350 psi for fitting sizes 12" and less. Fitting over 12" shall have a minimum rated working pressure of 250 psi. Mechanical joints shall conform to ANSI/AWWA A21.11/C111. Wall and socket thicknesses shall be equal to Class 54 ductile iron pipe as specified in ANSI/AWWA A21.51/C151. Ductile iron shall be in accordance with ASTM A563 with minimum physical qualities of 70,000 psi tensile strength, 50,000 psi yield strength, and 5% elongation.

a. All ductile cast iron fittings shall have cement mortar lining conforming to ANSI Standard A21.4, latest edition. Buried fittings shall be given a full coat inside and outside of a bituminous coating which conforms to ANSI 21.4, latest revision.
b. Appropriate transition gaskets shall be utilized for the SDR or class of PVC pipe.

3. The pipe shall be furnished in nominal lengths of 20'. Each joint shall be clearly marked as complying with National Sanitation Foundation standards.

C. Polyvinyl Chloride (PVC): PVC pipe of 3" nominal diameter and less shall conform to ASTM Specification D-2241, "Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR)", as it applies to Class 12454 (A or B) polyvinyl chloride plastic pipe, SDR 21 water pressure ratings of 200 psi at 23 C (73.4 F), with minimum physical requirements as listed in the following table. Each joint shall be clearly marked as complying with National Sanitation Foundation standards.

NOMINAL SIZE INCHES	OUTSIDE DIAMETER INCHES	MIN. WALL THICKNESS INCHES	WEIGHT/ MO FT. POUNDS	WORKING PRESSURE PSI
¾	1.0501	0.060	11.8	200
1	1.315	0.063	15.9	200
1-1/4	1.660	0.079	24.8	200
1-1/2	1.900	0.090	32.2	200
2	2.375	0.113	50.8	200
2-1/2	2.875	0.137	74.2	200
3	3.500	0.167	110.0	200

1. Fittings for PVC ¾" – 2" shall be brass compression X MIP fittings. Solvent weld (glue) fittings will not be accepted.

2.2 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves: Furnish and install tapping sleeve and valve at the location(s) shown on the Contract Drawings and as required herein. The tapping sleeve and valve shall be suitable for wet installation without interrupting water service in any manner. The tapping sleeve and valve shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings.

1. The tapping sleeve shall be fully gasketed wrap around tapping sleeve. The sleeve body shall be 18-8 stainless steel. The bolts and nuts shall be 18-8 stainless steel. The gasket shall be gridded virgin GPR compounded for water service in accordance with ASTM D2000-80M 4AA607. The outlet gasket shall be Buna-N. The flange shall be ductile iron. The tapping sleeve shall be fitted with a female ¾" NPT test port and supplied with a ¾" 18-8 stainless steel plug with square head.

B. Tapping Valves:
1. Tapping valves shall be “O” ring type with mechanical joint and conforming to AWWA C509 non-rising stem construction. Inlet flange end shall be Class l25 (ASME Bl6.l). The valves shall be as specified under section 2.3 of this specification for gate valves.

2.3 VALVES AND FIRE HYDRANTS

A. Gate Valves: All gate valves shall be resilient seated wedge type that fully comply with the requirements of the latest revision of AWWA Standard C-509. All gate valves shall open by turning in a counterclockwise direction. All operating nuts, hand wheels and chain wheels shall have the direction of opening cast on them.
1. Valves 2” and larger shall be iron body, bronze mounted, resilient seat type.
2. All valves other than flanged end valves shall be of the non-rising stem type.
3. Outside screw and yoke (OS&Y) type may be used when approved by the County for above ground and vaulted installation. These flanged gate valves for hand operation shall be of the OS&Y type with conventional packing for either wheel or chain operation, as shown on the drawings and details.
4. Unless otherwise shown on the drawings or stated in the proposal, all gate valves 2"-12" shall be designed for a working pressure of 200 psi and shall be tested to a minimum pressure of 400 psi.
5. All gate valves 14"-24" shall be designed for a working pressure of 150 psi and hydrostatically tested to a minimum pressure of 300 psi.
All buried valves shall be provided with a 2-piece screw-type valve box.
6. Gate valves shall be of the mechanical joint type unless otherwise indicated on the drawings and details.
7. All gate valves shall be manufactured by the American-Darling Co., Mueller Co., M&H Valve, Dresser, Clow, Kennedy Valve Co., or equal.

B. Butterfly Valves: Butterfly valves shall conform to AWWA C-504, latest revision.
1. All valves for buried service shall have cast iron bodies with integrally cast mechanical joint ends conforming to AWWA C-111, latest revision.
2. Valves for above ground use shall be short bodied with flanges conforming to ANSI B16.1, latest revision.
3. The valve discs shall be designed to rotate 90 degrees from full open to tight shut position and shall have adjustable mechanical stops to govern the rotation of the disc.
4. The valve shall have a Buna-N or a Buna-S valve seats with bronze or stainless steel seating rings.
5. The stuffing boxes shall be integrally cast with the valve body.
6. The shaft bearings shall be of the self-lubricating sleeve type with thrust bearings to keep the valve disc centered.
7. Valves shall be AWWA 150B unless otherwise specified on the drawings.

C. Swing Check Valves:
1. Valves 2" to 12": Swing check valves shall conform to AWWA C 508, latest revision.
2. Small swing check valves shall have iron bodies with NPT ends.

3. The swing disc shall be internally weighted or spring loaded and constructed of composition or bronze with rubber seats.
4. Valves shall be rated at 175 lb. service water pressure or 200 lb. WOG.
5. Valves shall be installed in a horizontal position. Some operating conditions may dictate the need for an assisted closure feature, such as outside weight and lever or outside spring and lever, to reduce or eliminate check valve slam. Above ground or vaulted installations may use flanged valves.

D. Fire Hydrants: Fire hydrants shall be of the compression or gate type conforming to AWWA C-502, latest revision and shall be the Owner's standard which consists of Waterous WB67 5-1/4" VO Pacer with ALPHA connection, or County approved alternate.
1. All hydrants shall have a bronze to bronze main valve assembly.
2. The hydrant shall have two 2-1/2" hose nozzles with caps and one 4-1/2" steamer connection conforming to the Dare County Water System Standards.
3. Threads on nozzles and caps and operating nuts shall conform to National Standard Threads.
4. Hydrants shall open by turning counterclockwise and shall be so marked.
5. The hydrant main valve shall meet or exceed the flow requirements of AWWA C-502 and shall be at least 5-1/4" in diameter and the hydrant elbow shall be a 6" ALPHA connection end.
6. Elbow shall have interior coated with minimum 4 mils thickness epoxy in accordance with AWWA C550.
7. The hydrant barrel shall be of such length to provide a minimum of 3'6" of bury.
8. All hydrants shall be traffic models with breakable safety sleeve stem coupling with SS stem coupling pins.
9. The Contractor shall include in the base bid price for fire hydrants and accessories all hydrant barrel extensions necessary to set the pumper nozzle at the specified height at the location shown on the drawings and details.
10. Hydrants shall be designed for a 300 psi test pressure and a 150 psi working pressure.
11. All hydrants shall be factory primed and finish painted.
12. Final color of the hydrant body and bonnet shall be Rustoleum enamel or equal "Safety Red".
13. All hydrants shall be repainted by the contractor.
14.

2.4 BACKFLOW PREVENTERS

A. All existing and proposed water services (if listed as a hazard); dedicated fire lines; irrigation lines; and private distribution systems must be provided with an backflow prevention in accordance with the Dare County Cross Connection Control Plan and the Rules Governing Public Water Systems as found in Title 15A, Subchapter 18C of the North Carolina Administrative Code.

B. Approved backflow prevention assemblies shall be installed above ground. Assemblies may be installed inside of buildings as long as there are no unprotected taps between the main and the building.

C. The backflow prevention assembly(s) must be readily accessible at all times. Readily accessible means that only a one piece cover must be removed for an outside installation to test or perform maintenance on the assembly.

D. All backflow prevention assemblies shall be installed in accordance with the manufacturer's specifications, University of Southern California guidelines and/or the latest edition of the North Carolina building code, whichever is most restrictive. Testing of backflow prevention assemblies shall be performed by a certified backflow prevention assembly tester. Such tests are to be conducted after installation and annually thereafter. A record of all testing and repairs is to be retained by the customer.

2.5 FIRE HYDRANT LOCATION MARKERS

A. Contractor shall install at all hydrant locations a reflective hydrant marker, Stimpsonite, Model 88AB, two-way blue reflector in centerline of pavement perpendicular to hydrant location using e-bond epoxy adhesive 1240/1241 per manufacturer's specifications.

2.6 VALVE LOCATION MARKERS

A. All valve locations and blow offs shall be marked with a concrete valve marker with a metal coin on top showing valve size, distance, and direction.

2.7 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 3 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep. Tape shall be Alarmtape by Paul Potter Associates, Detectatape by Allen Systems, Inc., Terra Tape by Griffolyn Co., Inc., or approved equal.

B. Color: Blue

C. Text: "CAUTION – WATER LINE BURIED BELOW".

D. Detectable Tracer Wire: At all locations where pressure piping is installed and at lateral locations, non-ferrous or ferrous materials, the contractor shall install a continuous length of #10, 12 or 14 solid copper wire, on top and parallel to the pipe. Tracer wire shall be Pro-Line Safety Products or County approved equal.

2.8 BEDDING AND COVER MATERIALS

A. Bedding: NCDOT #57 or #67 stone.
   1. Install stone bedding only at the direction of the County Engineering Department.

B. Soil Backfill from Above Pipe to Finish Grade:
   1. For any trenches with water, sanitary, or storm sewer utilities that are not located under curb or paved areas, backfill using on-site suitable soil when available.
   2. For any trenches with water, sanitary, or storm sewer utilities that are located under curb or paved areas, backfill using only approved off-site select borrow.

2.9 ACCESSORIES

A. Anchorages:
   1. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.
      a. Cement: ASTM C 150, Type I.
      b. Fine Aggregate: ASTM C33, sand.
      c. Coarse Aggregate: ASTM C33, crushed gravel.
      d. Water: Potable.

B. Steel rods, bolt, lugs and brackets: ASTM A36/A36M or ASTM A307 carbon steel.

C. Protective Coating: Bituminous coating.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify existing utility water main size, location, and inverts are as indicated on drawings.

B. Pre-Construction Site Photos: (Recommended Only – NOT required).
   1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
   2. Show mail boxes, curbing, lawns, driveways, signs, culverts, and other existing site features.
   3. Include project description, date taken and sequential number on back of each photograph.

C. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

3.2 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

B. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

C. Provide sheeting and shoring in accordance with Section 31 23 17.

3.3 INSTALLATION - PIPE

A. Install pipe in accordance with AWWA C600.

B. Handle and assemble pipe in accordance with manufacturer's instructions and as indicated on drawings.

C. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.

D. Lateral Separation of Sewers and Water Mains. 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:
   1. The water main is 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
   2. The water main is 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.
   3. 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 24 inches above the top of the sewer, unless local conditions or barriers prevent an 24 inch vertical separation in which case both the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.
   4. 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."

E. Separation of Water Mains and Storm Drains:
   1. There shall be a minimum of 12" vertical separation between water mains and storm drain lines. The water main shall be covered with unopened bags of concrete mix. One bag shall be placed on the water main centered under the storm drain and one bag shall be placed on each side of the centered bag.
   2. There shall be a minimum of 24" horizontal separation between water mains and storm drain lines.

F. Install ductile iron piping and fittings to AWWA C600.

G. Torque applied to mechanical joint bolts shall be 75-90 ft/lb for joint sizes 4" to 24" in accordance with AWWA C600.

H. Weld pipe in accordance with AWWA C206. Weld joints in accordance with AWWA C205.

I. Flanged Joints: Not to be used in underground installations except within structures.

J. Route pipe in straight line. Relay pipe that is out of alignment or grade.

K. Install pipe with no high points. If unforeseen field conditions arise which necessitate high points, install air release valves as directed by County Engineering Department.

L. Install pipe to have bearing along entire length of pipe. Excavate bell holes to permit proper joint installation. Do not lay pipe in wet or frozen trench.

M. Prevent foreign material from entering pipe during placement.

N. Install pipe to allow for expansion and contraction without stressing pipe or joints.

O. Install pipe using a pipe joint lubricant (soap) that meets the requirements of NSF 61.

P. Close pipe openings with watertight plugs during work stoppages.

Q. Establish elevations of buried piping with not less than 36 inches of cover. Measure depth of cover from final surface grade to top of pipe barrel.

R. Install copper tracer wire on top of all lines and lateral lines terminating to each valve box and meter box.

S. Install plastic ribbon tape continuous buried 12 inches below finish grade.

3.4 INSTALLATION - VALVES AND HYDRANTS

A. Install valves in conjunction with pipe laying; set valves plumb.

B. Install hydrants; provide support blocking and drainage gravel; do not block drain hole.
1. Set hydrants plumb with pumper nozzle facing roadway; set hydrants with centerline of pumper nozzle 18 inches above finished grade and safety flange not more than 6 inches nor less than 2 inches above grade.
2. Paint hydrants in accordance with local color scheme.
3. After hydrostatic testing, flush hydrants and check for proper drainage.

3.5 INSTALLATION - TAPPING SLEEVES AND VALVES

A. Install tapping sleeves and valves in accordance with drawings and in accordance with manufacturer's instructions.

3.6 INSTALLATION – BACKFLOW PREVENTERS

A. All backflow prevention shall be installed in accordance with the manufacturer's specifications.

B. Backflow prevention assemblies shall be installed at a minimum height of 12 inches and a maximum height of 60 inches above the floor or ground. Assemblies shall also have a clear horizontal distance of 18 inches around the entire diameter of the device.

C. All backflow prevention assemblies installed outside of buildings must be installed in an approved enclosure with the exception of residential lawn irrigation backflow prevention assemblies. All enclosures shall be insulated and shall meet the requirements of ASSE standard 1060.

D. Double check valves and double detector check valves may be installed vertically with approval from the water department.

E. Reduced pressure backflow prevention assemblies shall be installed only horizontally.

F. All backflow preventers are required to be tested by a certified backflow prevention assembly tester within ten days of installation.

3.7 THRUST RESTRAINT

A. Provide valves, tees, bends, caps, and plugs with concrete thrust blocks. Pour concrete thrust blocks against undisturbed earth. Poured concrete shall be ready mixed. Bagged concrete mixed on site will not be accepted. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair.

B. Install tie rods, clamps, set screw retainer glands, or restrained joints. Protect metal restrained joint components against corrosion by applying a bituminous coating, or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.

C. Install thrust blocks, tie rods, and joint restraint at dead ends of water main.

D. All concrete thrust blocks shall set for a minimum of 36 hours before any load is applied.

3.8 LATERAL CONNECTIONS

A. Install lateral connections in accordance with plans.

3.9 BACKFILLING

A. Backfill in accordance with Section 31 23 17 – Trenching and Backfilling.

3.10 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.11 FIELD QUALITY CONTROL

A. Pressure test system to 150 psi. Repair leaks and re-test.

1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of County Engineering Department, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
2. Prior to pressure testing of buried piping, backfill shall have been placed and tamped to provide adequate support for all pipe and fittings, and reaction backing shall have been in place at least 5 days.
3. Provide equipment required to perform leakage and hydrostatic pressure tests.
4. Test Pressure: Not less than 150 psi or 50 psi in excess of maximum static pressure, whichever is greater.
5. Conduct hydrostatic test for at least two-hour duration.
6. No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
7. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks and plug the resulting piping openings.
8. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
9. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
10. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

$L = (SD\sqrt{P})/148{,}000$
L = allowable, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during leakage test, in pounds per square inch (gauge)

11. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION

SECTION 33 13 00

DISINFECTING OF WATER DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Proposal-Agreement Section of the Contract and other sections of this Division apply to the work in this Section.

1.2 SUMMARY

A. Section Includes:
   1. Disinfection of potable water distribution system
   2. Testing and reporting results.

1.3 MEASUREMENT AND PAYMENT

A. Disinfection: No payment will be made for disinfection of water distribution piping. Cost of disinfection shall be included in the unit price bid for size and type of pipe material.

1.4 REFERENCES

A. American Water Works Association:
   1. AWWA B303 - Sodium Chlorite.
   2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   3. AWWA C651 - Disinfecting Water Mains.

1.5 SUBMITTALS

A. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

B. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
   6. Date and time of flushing start and completion.
   7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.

3. Name of person collecting samples.
4. Test locations.
5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

1.7 QUALIFICATIONS

A. Testing Firm: The Contractor shall have all bacteriological testing done by a testing laboratory approved by the Dare County Water Department.

B. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify piping system has been cleaned, inspected, and pressure tested.

B. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Before being placed into service, and before certification of completion by the County Engineering Department, all new water systems, or extensions to existing systems or valved section of such extensions, or any replacement in the existing water system, or any exposed section of the existing system shall be disinfected, according to the requirements of the North Carolina Administrative Code Title 15A, Subchapter 18C, Section .1000.

B. ".1001 DISINFECTION OF NEW SYSTEMS"

1. All interior surfaces of new potable water supply systems, including wells, filters, storage tanks and distribution lines shall be thoroughly disinfected by means of hypochlorite or chlorine solutions, after which bacteriological test samples shall be collected.

2. After disinfection the water supply shall not be placed into service until bacteriological test results of representative water samples analyzed in an approved laboratory are found to be satisfactory."

C. ".1003 DISINFECTION OF STORAGE TANKS AND DISTRIBUTION SYSTEMS"
1. Water distribution systems, including storage tanks and water mains, after flushing to remove sediment and other foreign matter, and after testing for leaks, shall be disinfected by the addition and thorough dispersion of a chlorine solution in concentrations sufficient to produce a chlorine residual of at least 50 milligrams per liter (or ppm) in the water throughout the distribution system, including all water mains and storage tanks.
2. The chlorine solution shall remain in contact with interior surfaces of the water system for a period of 24 hours. Then the water system shall be flushed with fresh water from an approved water source until the chlorine solution is dispelled. All piping systems shall be thoroughly flushed by providing a velocity of 2 feet per second in the line being flushed.
3. Representative samples of the water shall then be collected when residual chlorine concentration is approximately 2 ppm. If bacteriological tests of the samples indicate that the water quality is satisfactory, the water mains and storage tanks may be placed in service.
4. In unusual situations where large volume tanks are involved and where there is not sufficient water available to fill the tank or there is not available a suitable drainage area for the chlorinated water, an alternate disinfection procedure for tanks may be proposed. Such proposal must be submitted in writing completely describing the proposed disinfection procedure and substantiating the need for an alternate procedure in the particular circumstance. Such alternate procedure must be approved before being implemented. The conclusion of the department shall be final."

D. At locations where new water lines are to be tied into the existing system, the interior of all new fittings and valves required shall be bathed with a concentrated chlorine solution at the time of installation. Water shall be flushed through the new valve a sufficient time to wash out the chlorine solution before closing the valve and installing additional pipe. The new valve shall remain closed until the new section of pipe to be installed has passed all tests.

E. The Contractor shall be required to make arrangements for having tests conducted. All expenses incurred in making tests shall be borne by the Contractor and should be included in his bid per linear foot of pipe material.

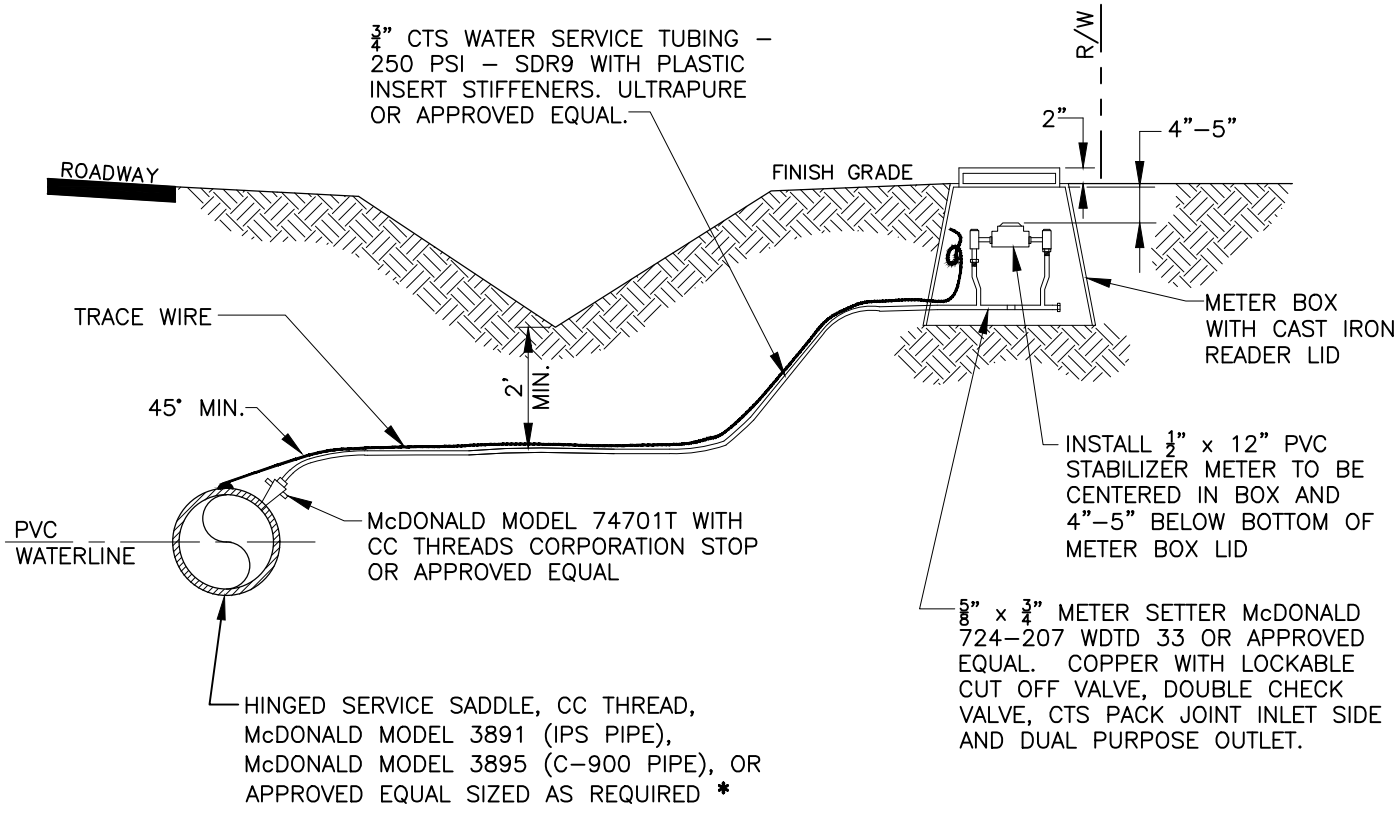
3.3 FIELD QUALITY CONTROL

A. Disinfection and Flushing:
1. Disinfect pipeline installation in accordance with AWWA C651. Use of liquid chlorine is not permitted.
2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.

3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
4. Chlorine solution shall be collected in an approved container and dechlorinated using one of the following solutions or an approved equivalent: Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite, or Sodium Thiosulfate. Dechlorinated water shall be disposed of on site.

END OF SECTION

STANDARD DETAILS



* McDONALD TWO PIECE BRASS MODEL 3805 FOR 10" & 12" C–900 PIPE

NOTES

1. CONTRACTOR TO FURNISH AND INSTALL PLASTIC METER BOX WITH CAST IRON READER LID TO MEET DARE COUNTY STANDARDS.
2. CONTRACTOR SHALL PURCHASE A METER APPROVED BY DARE COUNTY AND PROVIDE TO DARE COUNTY WATER DEPARTMENT FOR INSTALLATION.

COUNTY OF DARE NORTH CAROLINA

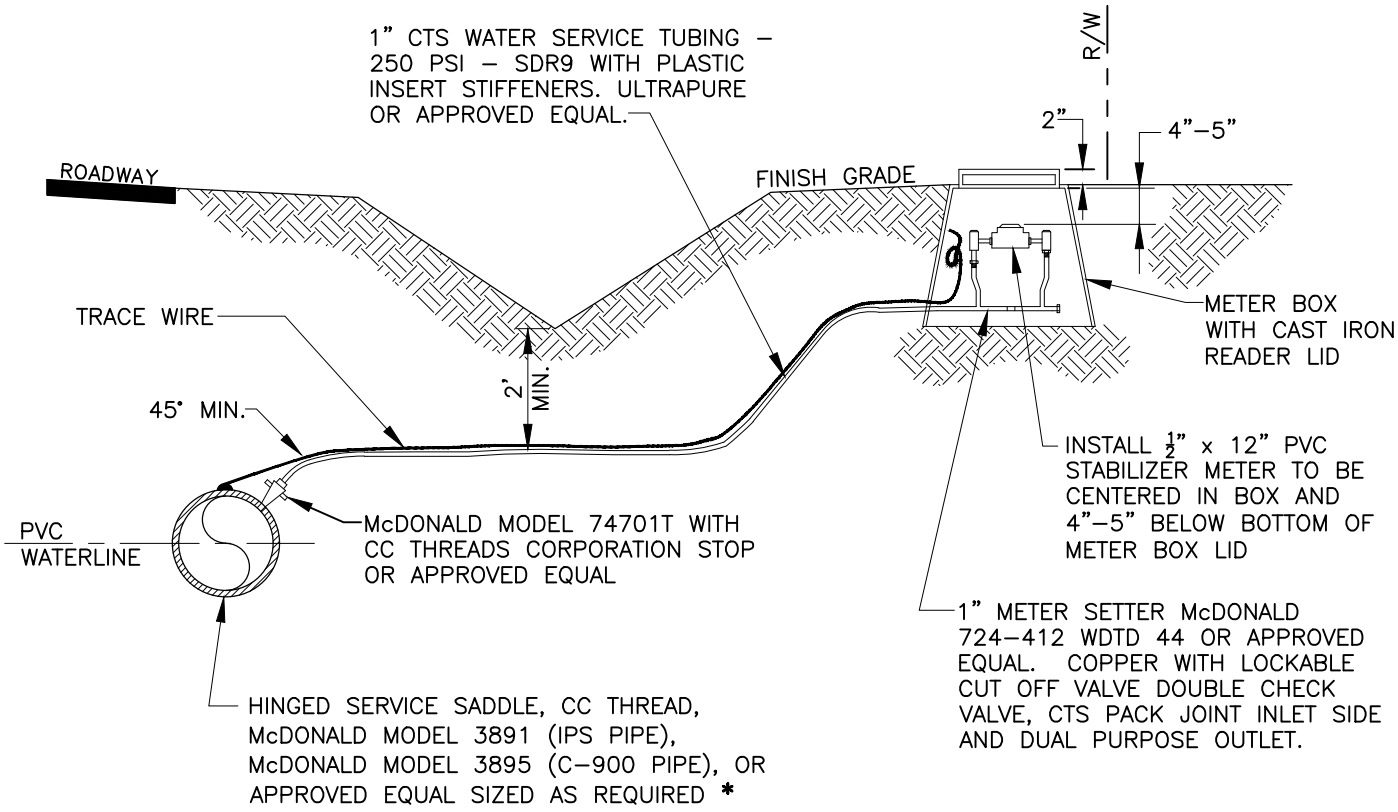
¾" WATER SERVICE LATERAL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

1



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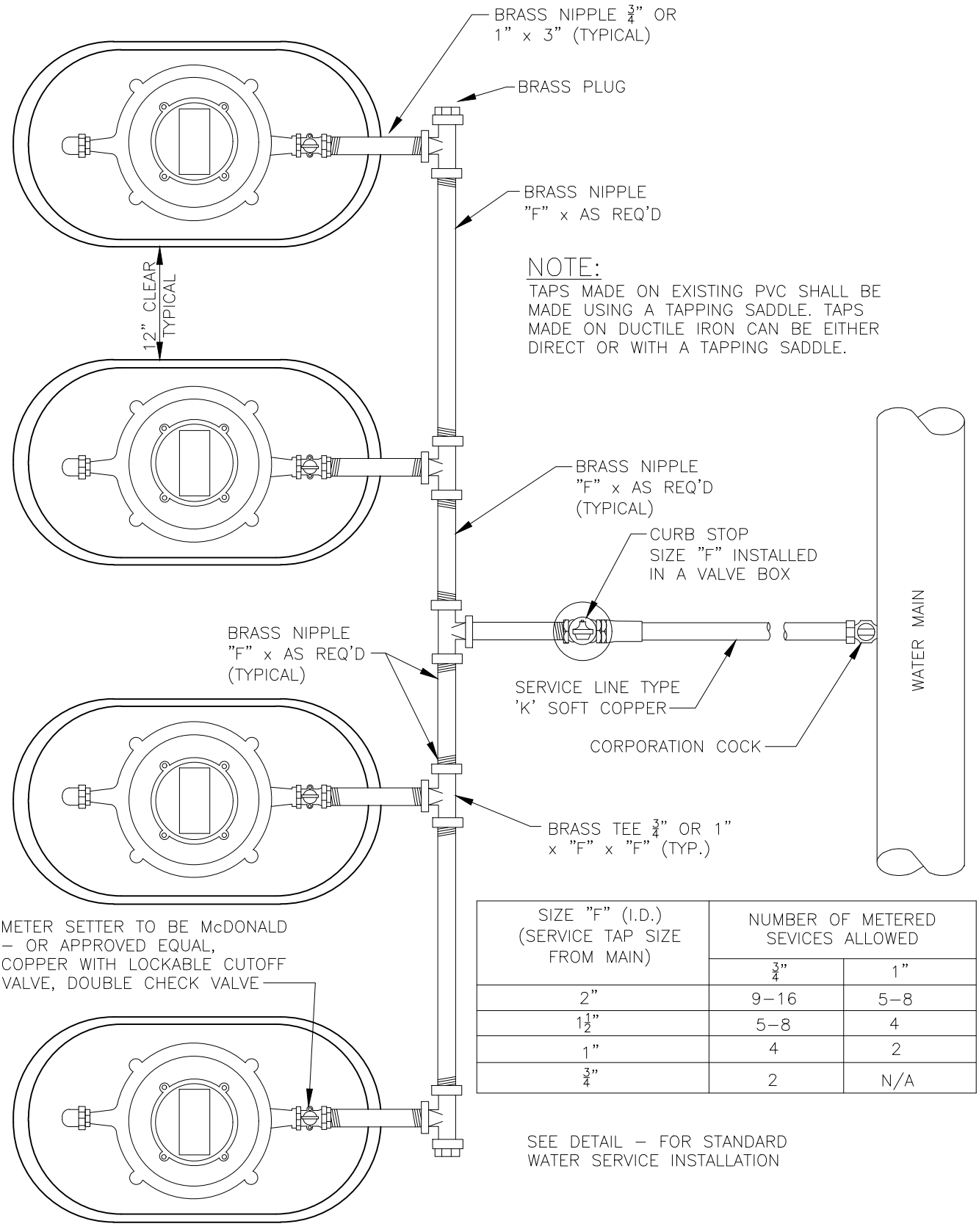
COUNTY OF DARE NORTH CAROLINA	1" WATER SERVICE LATERAL	NOT TO SCALE ISSUED: 7/31/18 DETAIL NUMBER 2



SIZE "F" (I.D.) (SERVICE TAP SIZE FROM MAIN)	NUMBER OF METERED SEVICES ALLOWED	
	¾"	1"
2"	9–16	5–8
1½"	5–8	4
1"	4	2
¾"	2	N/A

SEE DETAIL – FOR STANDARD WATER SERVICE INSTALLATION

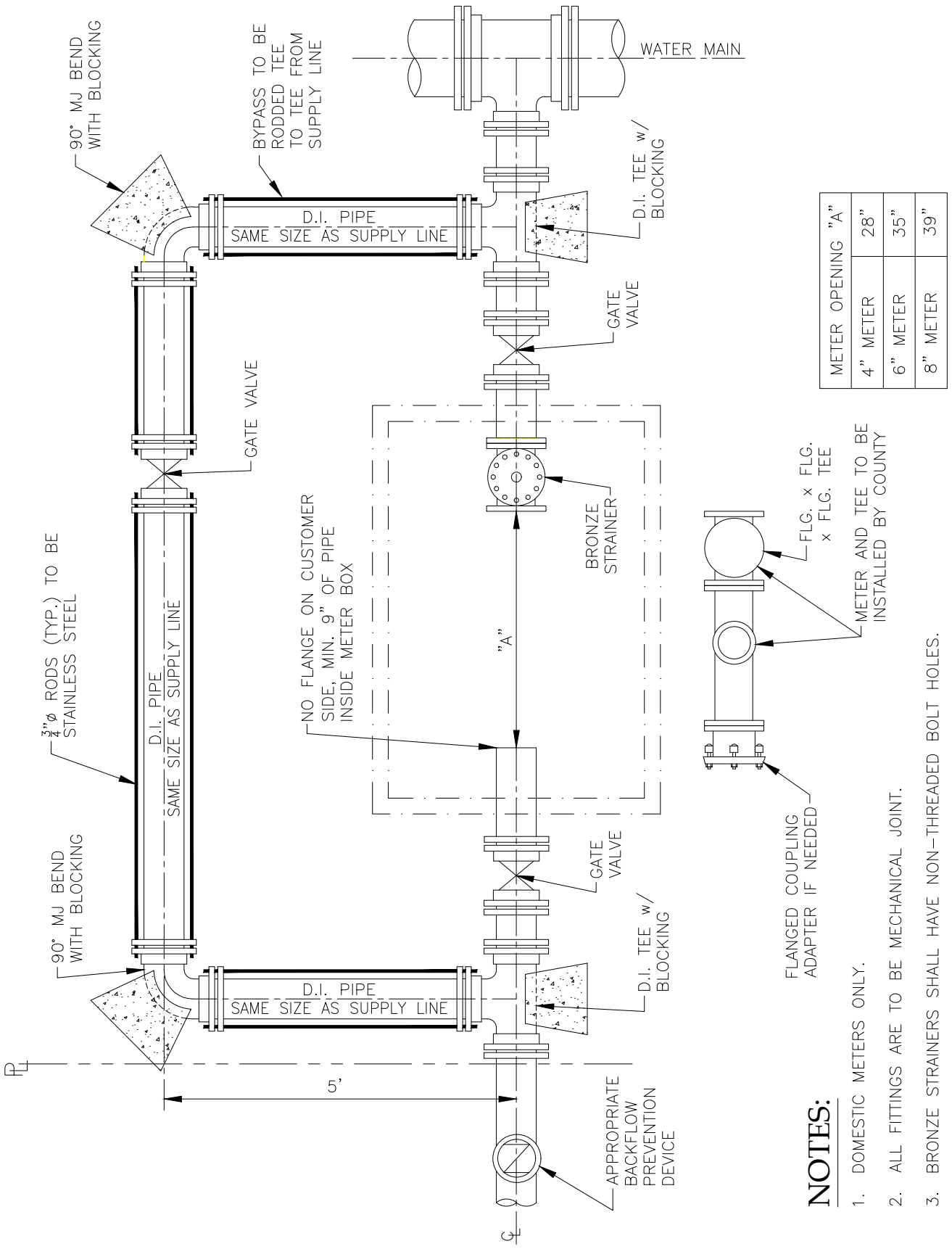
STANDARD GANG METER ASSEMBLY

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

3



METER OPENING "A"	
4" METER	28"
6" METER	35"
8" METER	39"

PLAN VIEW

NOTES:

1. DOMESTIC METERS ONLY.
2. ALL FITTINGS ARE TO BE MECHANICAL JOINT.
3. BRONZE STRAINERS SHALL HAVE NON-THREADED BOLT HOLES.

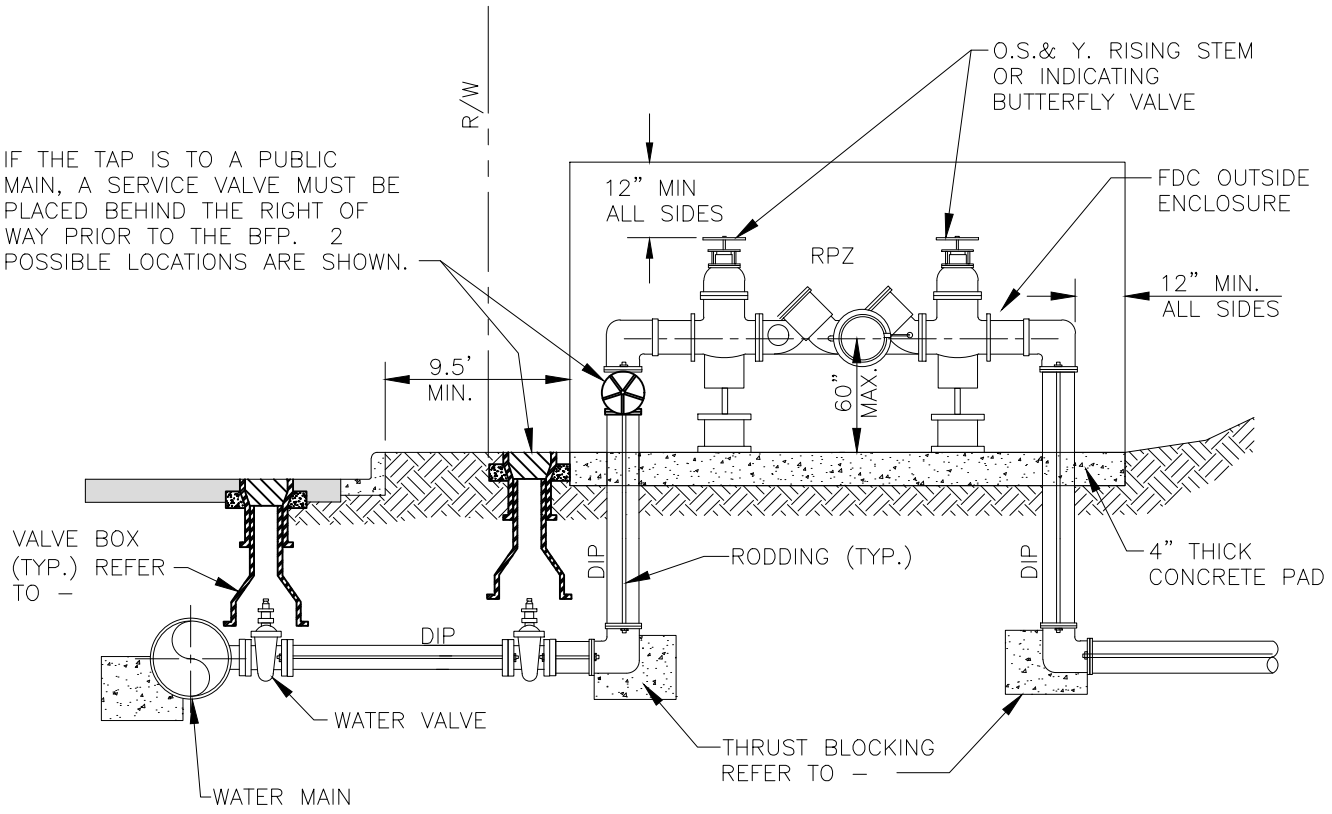
TYPICAL 4"-8" DOMESTIC WATER METER BYPASS INSTALLATION

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

4



NOTES:

1. ALL ABOVE GROUND ENCLOSURES MUST HAVE ADEQUATE DRAINAGE (TWICE THE DIAMETER OF THE SUPPLY PIPE) TO DAYLIGHT ABOVE GRADE.

2. REDUCED PRESSURE BACKFLOW PRESENTERS MAY BE LOCATED IN A BUILDING PROVIDED THERE ARE NO OTHER UNPROTECTED TAPS BETWEEN THE MAIN AND THE BUILDING. DRAINAGE IN A BUILDING MUST BE TWICE THE DIAMETER OF THE SUPPY PIPE.

3. ABOVE GROUND INSULATED VAULTS MUST BE ASSE 1060 APPROVED ABOVE GROUND ENCLOSURES. SEE CROSS CONNECTION MANUAL FOR ENCLOSURE FREEZE PROTECTION AND CERTIFICATION REQUIREMENTS.

4. RESIDENTIAL LAWN IRRIGATION R.P. ASSEMBLIES THAT ARE REMOVED TO PREVENT FREEZING IN THE WINTER MONTHS MUST BE CAPPED OFF. ALL ABOVE GROUND ASSEMBLIES, EXCEPT RESIDENTIAL LAWN IRRIGATION ASSEMBLIES, MUST BE PROTECTED FROM FROST.

5. STEEL RODS AND BOLTS SHALL BE $\frac{3}{4}$" STAINLESS STEEL.

6. ALL ASSEMBLIES MUST BE ON THE CURRENT APPROVAL LIST.

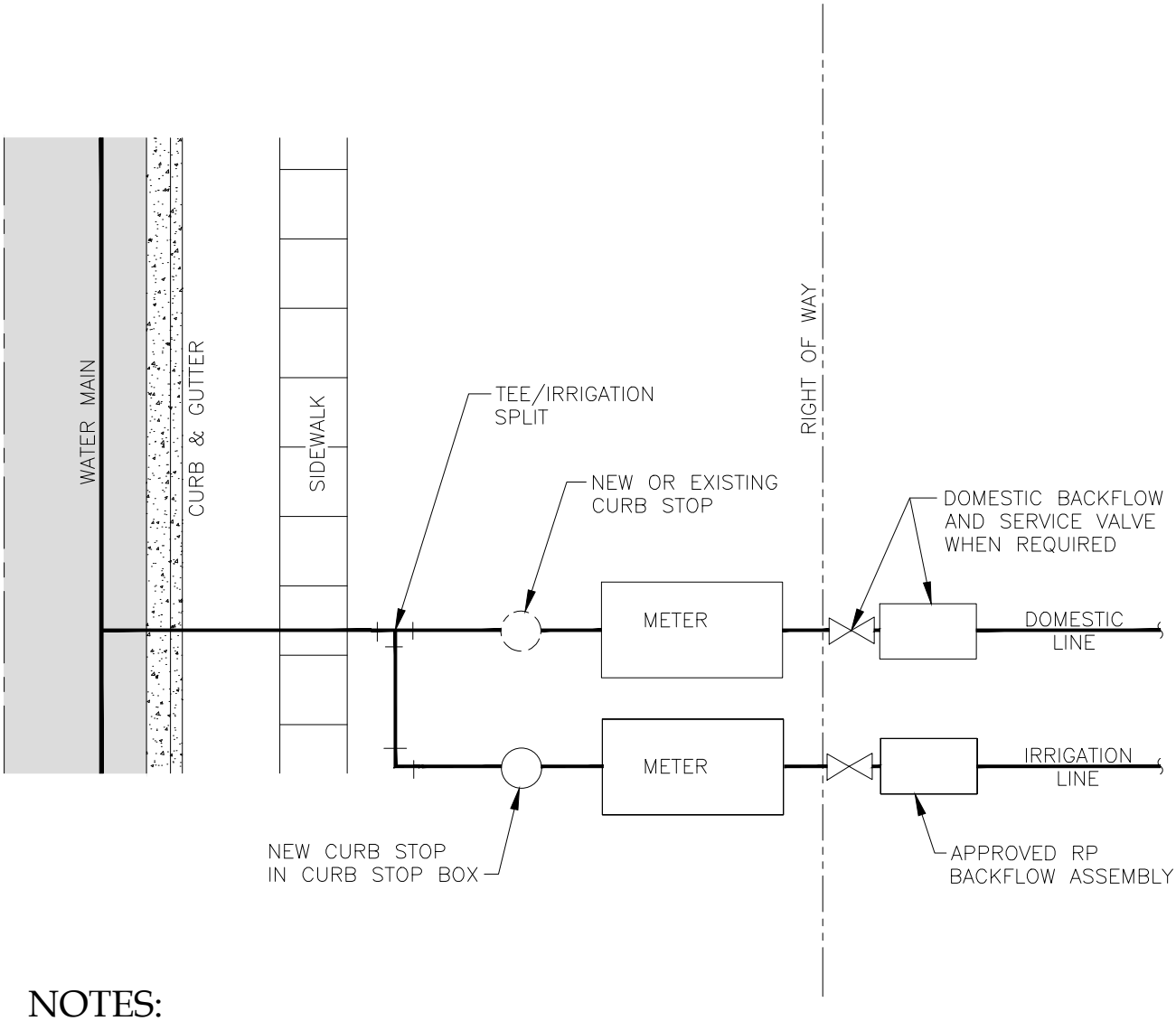
TYPICAL REDUCED PRESSURE ZONE BACKFLOW PREVENTER ASSEMBLY

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

5



NOTES:

1. IRRIGATION METER SHALL BE LOCATED ON THE SIDE OF DOMESTIC METER WITH INCREASING ADDRESSES.
2. THE BACKFLOW SHALL BE INSTALLED NO MORE THAN 4' FROM THE METER IN A VISIBLE LOCATION. IN CASE OF CONFLICTS THE COUNTY WILL CONSIDER ALTERNATIVES. ASSEMBLIES MAY BE INSTALLED INSIDE OF BUILDINGS AS LONG AS THERE ARE NO UNPROTECTED TAPS BETWEEN THE MAIN AND THE BUILDING. IN CASE OF CONFLICTS, THE COUNTY WILL CONSIDER ALTERNATIVES.
3. BACKFLOW RISER/STANDPIPE SHALL BE OF COPPER OR BRASS.
3. THE RP RELIEF VALVE SHALL BE A MINIMUM OF 12" ABOVE ANY MATERIAL (MULCH INCLUDED) OR GRADE.
4. A SERVICE VALVE IS REQUIRED AFTER THE METER BUT BEFORE THE BACKFLOW ASSEMBLY FOR MAINTENANCE AND REPLACEMENT PURPOSES.
5. THE INSTALLATION MUST ALSO MEET ALL CODE REQUIREMENTS PER THE NC PLUMBING CODE.

IRRIGATION TAP ON NEW AND EXISTING SERVICES

NOT TO SCALE

ISSUED: 7/31/18

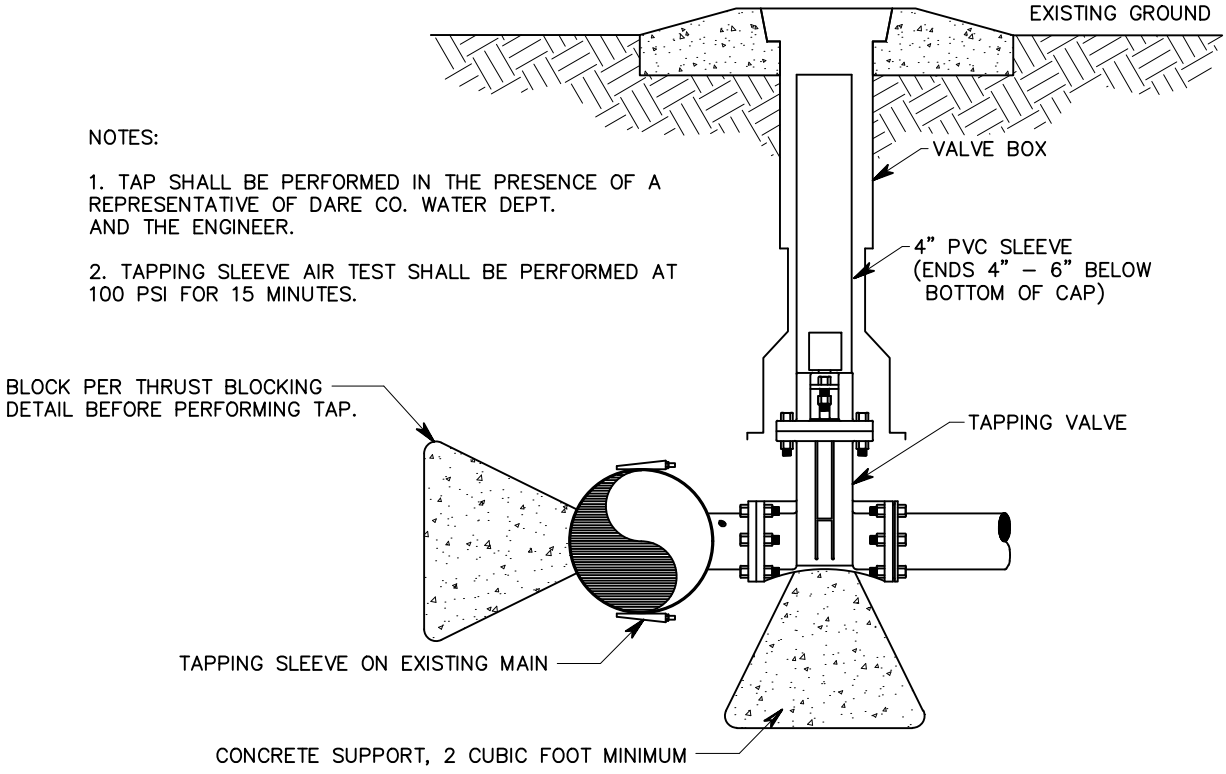
DETAIL NUMBER

6

NOTES:

1. TAP SHALL BE PERFORMED IN THE PRESENCE OF A REPRESENTATIVE OF DARE CO. WATER DEPT. AND THE ENGINEER.

2. TAPPING SLEEVE AIR TEST SHALL BE PERFORMED AT 100 PSI FOR 15 MINUTES.



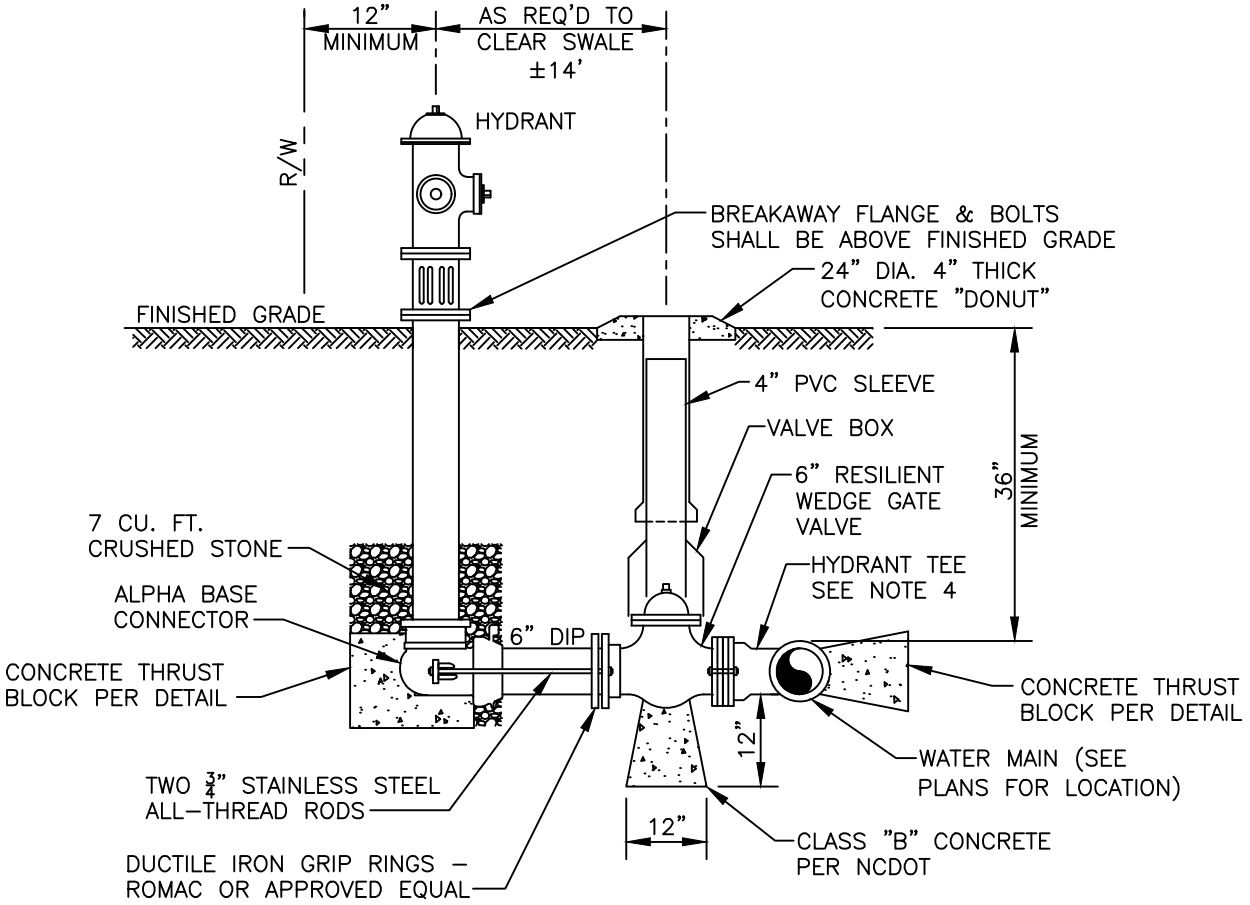
TAPPING DETAIL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

7



NOTES

1. DO NOT BLOCK HYDRANT DRAIN WITH THRUST BLOCKING.
2. DO NOT SUPPORT VALVE BOX DIRECTLY ON VALVE.
3. INSTALL REFLECTIVE HYDRANT MARKER, STIMPSONITE, MODEL 88AB, TWO-WAY BLUE REFLECTOR IN CENTERLINE OF PAVEMENT PERPENDICULAR TO HYDRANT LOCATION USING E-BOND EPOXY ADHESIVE 1240/1241 PER MANUFACTURER'S SPECIFICATIONS.
4. A HYDRANT TEE MAY BE USED UNLESS IT PLACES THE HYDRANT VALVE IN A LOCATION THAT IS DEEMED BY THE COUNTY TO BE UNDESIRABLE (IN DITCH, ETC.), IN WHICH CASE A REGULAR TEE SHALL BE USED AND THE HYDRANT VALVE SHALL BE SEPARATELY RODDED TO THE TEE WITH TO ¾" STAINLESS STEEL ALL-THREAD RODS.
5. HYDRANT TO BE WATEROUS WB67 FOR 3.5' BURY (MINIMUM) WITH 5¼" VALVE OPENING AND ALPHA BASE CONNECTOR.
6. HYDRANT MUST BE REPAINTED BY CONTRACTOR AFTER INSTALLATION. PAINT WITH RUSTOLEUM ENAMEL; "SAFETY RED".

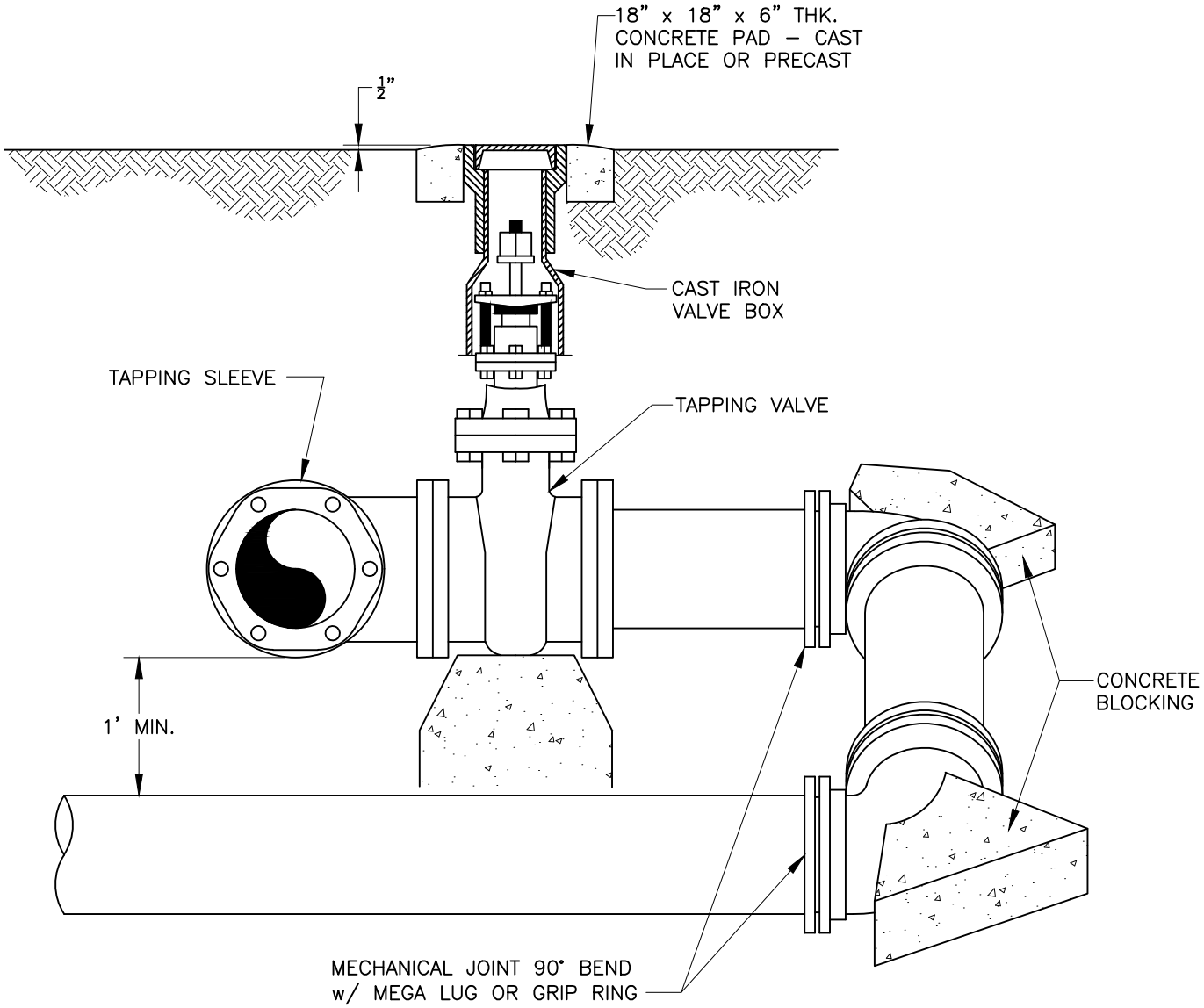
FIRE HYDRANT ASSEMBLY

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

8



WRAP AROUND TIE-IN ASSEMBLY

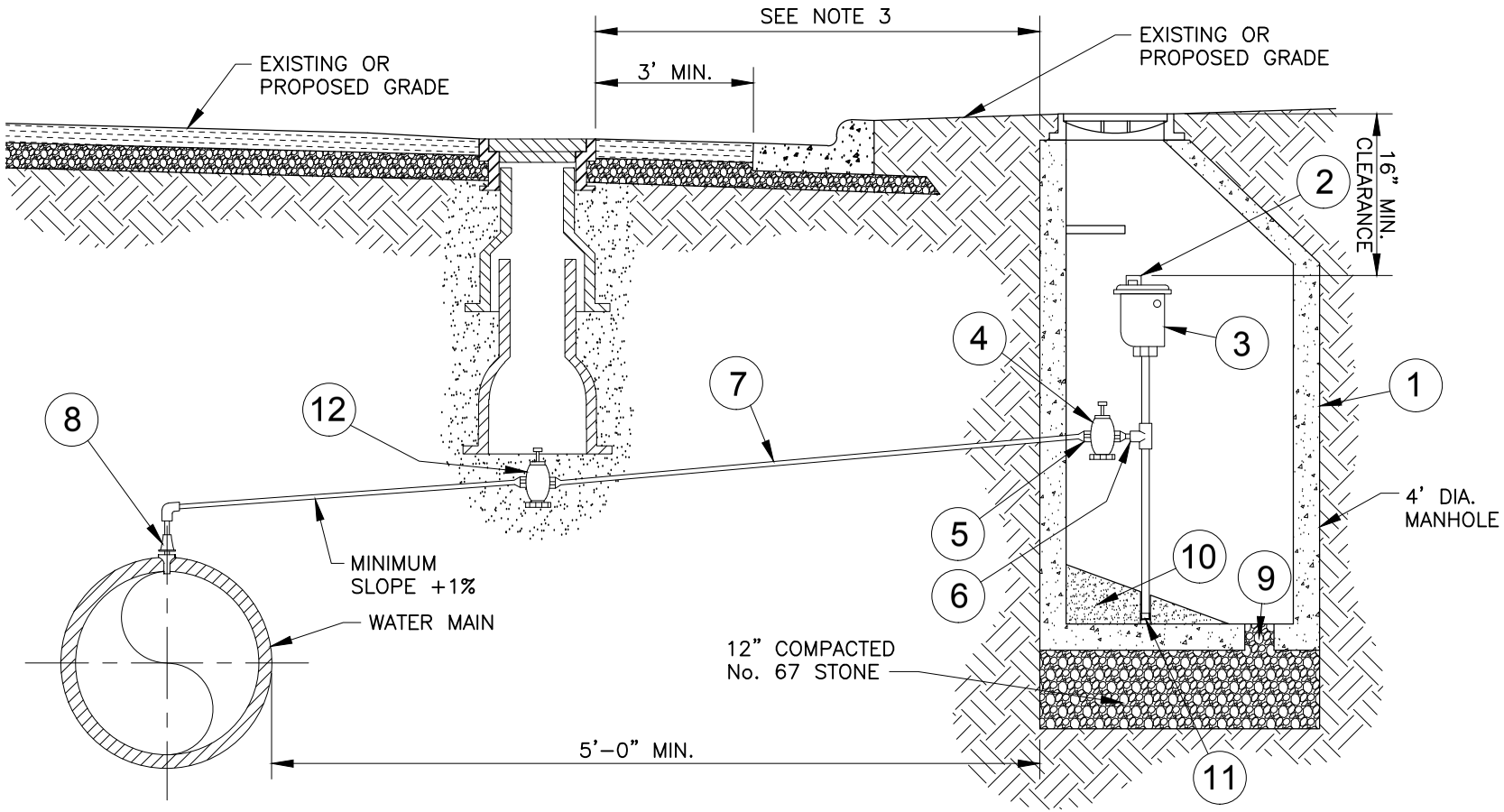
NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

9

STANDARD WATER AIR RELEASE VALVE



BILL OF MATERIALS	
1	PRECAST MANHOLE
2	TRASH HOOD
3	2" AIR RELEASE VALVE WITH VACUUM CHECK
4	2" CURB STOP BALL VALVE
5	ADAPTER
6	2" MECHANICAL JOINT BRASS PIPE AND FITTINGS
7	2" TYPE "K", SOFT COPPER WITH FLARED ELBOW
8	CORPORATION COCK
9	6" DIAMETER DRAIN
10	GROUT, 1/8" TO 1'-0" MIN. SLOPE TO DRAIN
11	PIPE CAP
12	2" GATE VALVE

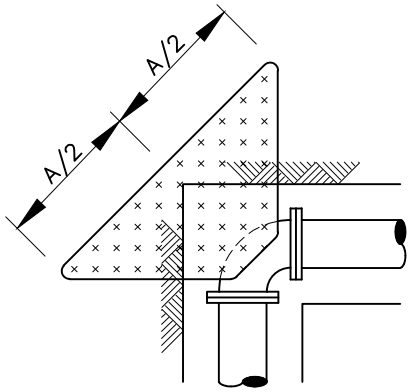
NOTES

1. AIR VALVE TO BE PL-10A WITH VACUUM CHECK BY CRISPIN OR VAL MATIC VM 45.
2. THE AIR RELEASE MANHOLE SHALL BE INSTALLED IN THE SHOULDER OR AS DIRECTED BY THE ENGINEER.
3. FOR MAINS LOCATED OUTSIDE OF STREET RIGHT-OF-WAYS THE MAXIMUM DISTANCE BETWEEN THE MANHOLE AND THE VALVE BOX SHOULD BE THREE (3) FEET.
4. MAIN SHALL BE DEEP ENOUGH TO ACCOMODATE INSTALLATION AS SHOWN

NOT TO SCALE

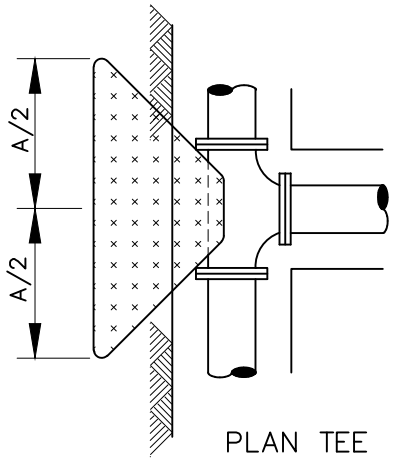
ISSUED: 7/31/18

DETAIL NUMBER 10

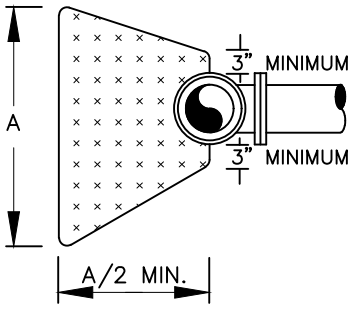


PLAN 90°

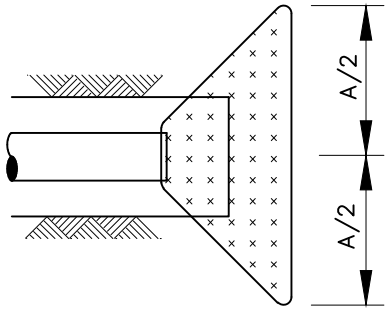
GRIP RINGS MAY BE USED ON PIPE UP TO 12" IN DIAMETER IN LIEU OF BLOCKING IN SOME LOCATIONS. USE OF GRIP RINGS SHALL BE BY PRIOR APPROVAL OF THE DARE COUNTY ENGINEER. PIPE 14" AND LARGER SHALL UTILIZE MEGA-LUG, STAR-GRIP OR EQUIVALENT RETAINER GLANDS AND SHALL INSTALL CONCRETE THRUST BLOCKING PER THIS DETAIL.



PLAN TEE



SECTION 90° & TEE



PLAN PLUG

CONCRETE THRUST BLOCK SCHEDULE

FITTING	PIPE SIZE (NOM. DIA. IN INCHES)									
	2"	4"	6"	8"	10"	12"	16"	18"	20"	24"
TEE	1.6	1.9	2.8	3.8	4.7	5.9	7.5	8.5	9.4	11.3
90° BEND	1.5	1.9	2.8	3.8	4.7	5.9	7.5	8.5	9.4	11.3
45° BEND	1.0	1.4	2.1	2.8	3.5	4.3	5.5	6.2	6.9	7.7
22 1/2° BEND	.8	1.0	1.5	2.0	2.5	3.1	4.0	4.5	4.9	5.5

TABLE "A" DIMENSIONS (IN FEET)

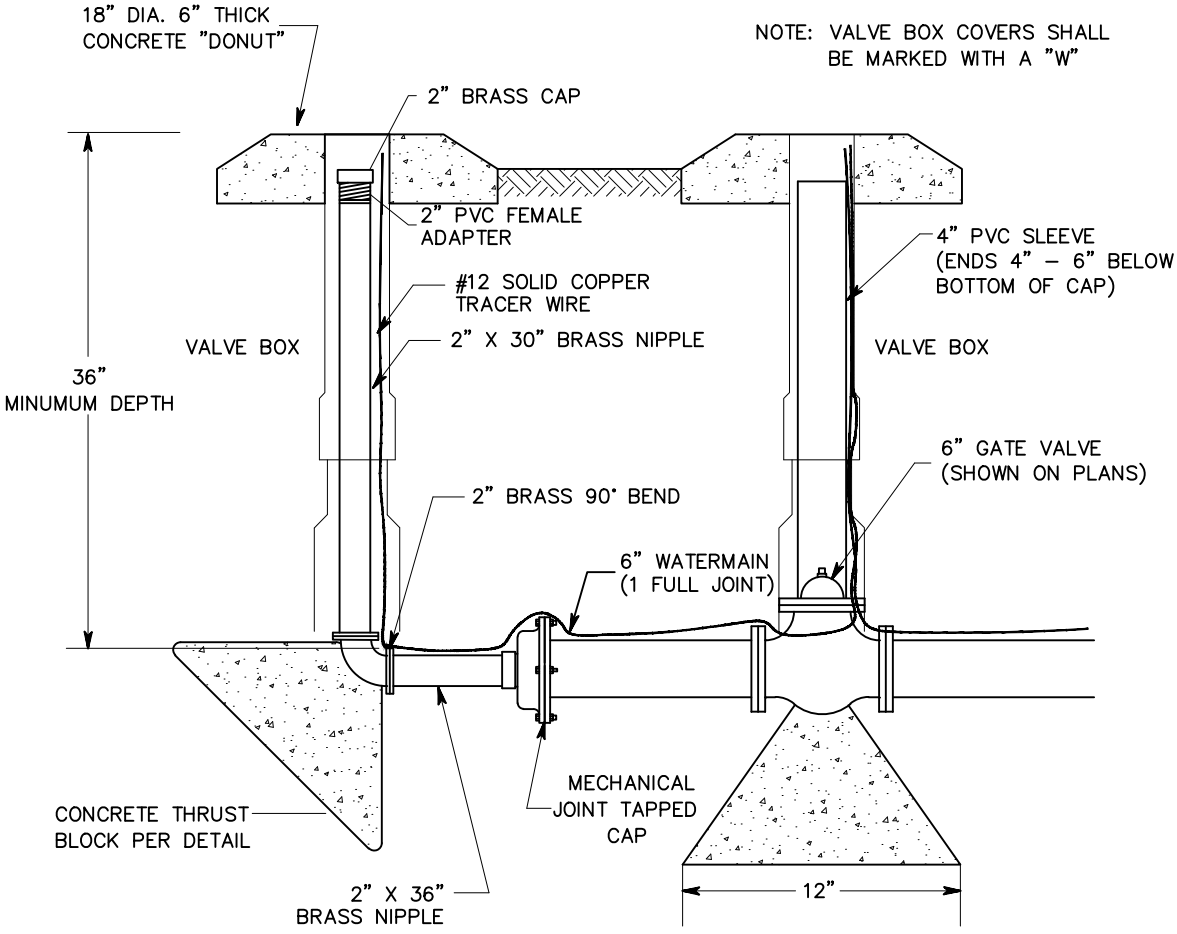
THRUST BLOCK DETAIL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

11



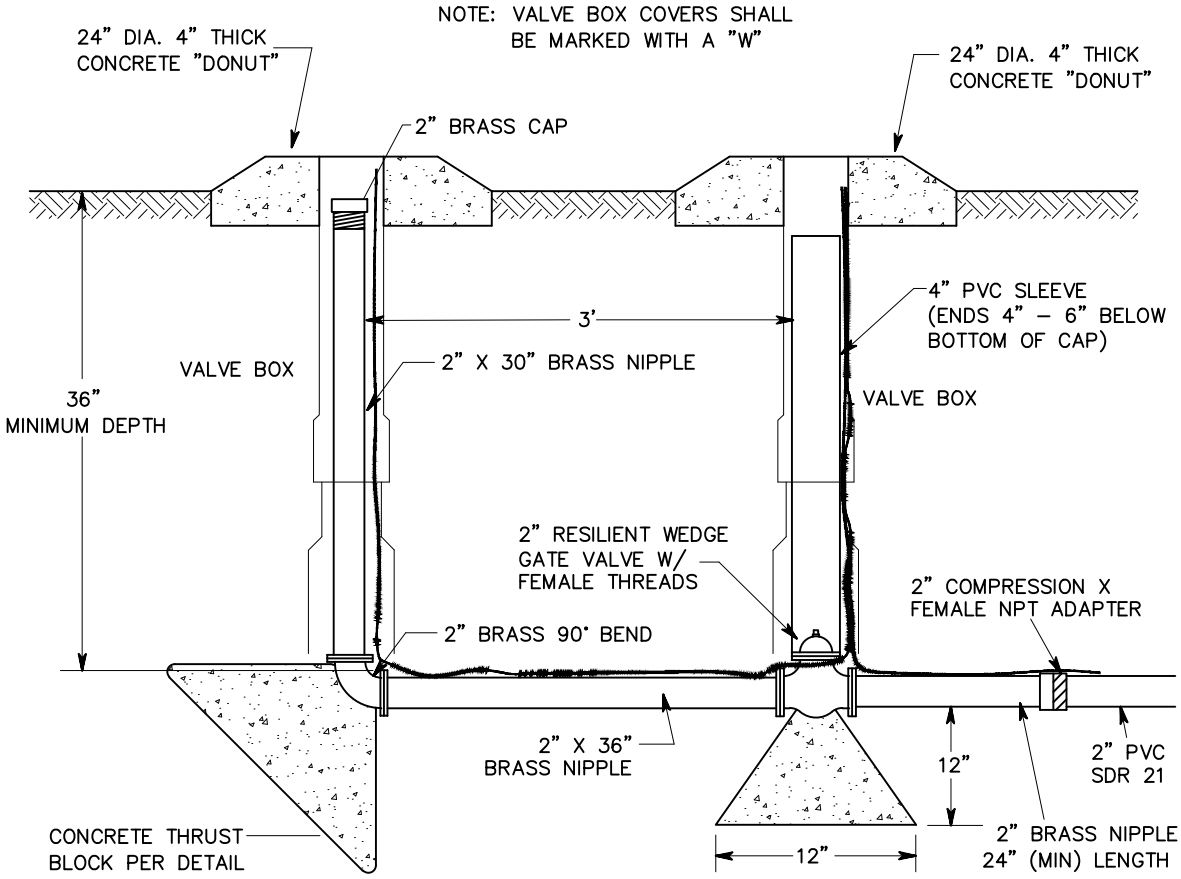
TEMPORARY BLOW-OFF DETAIL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

12



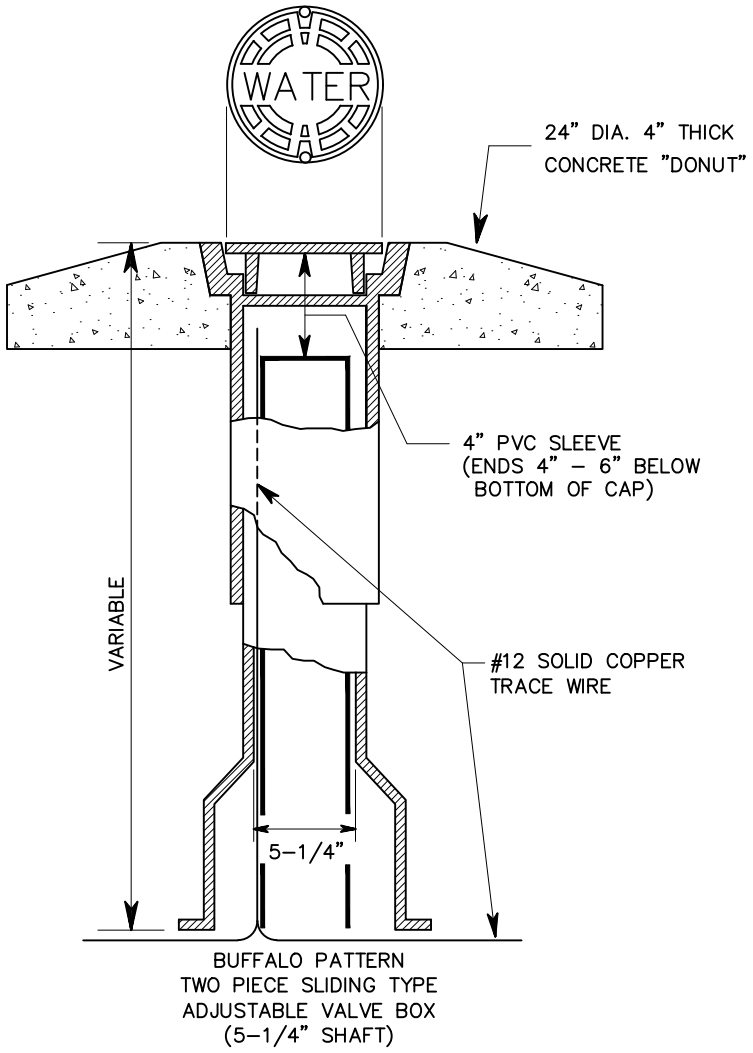
2" BLOW-OFF DETAIL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

13



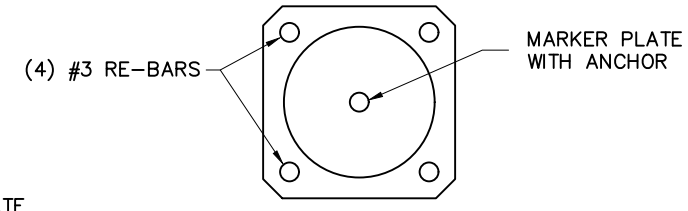
VALVE BOX DETAIL

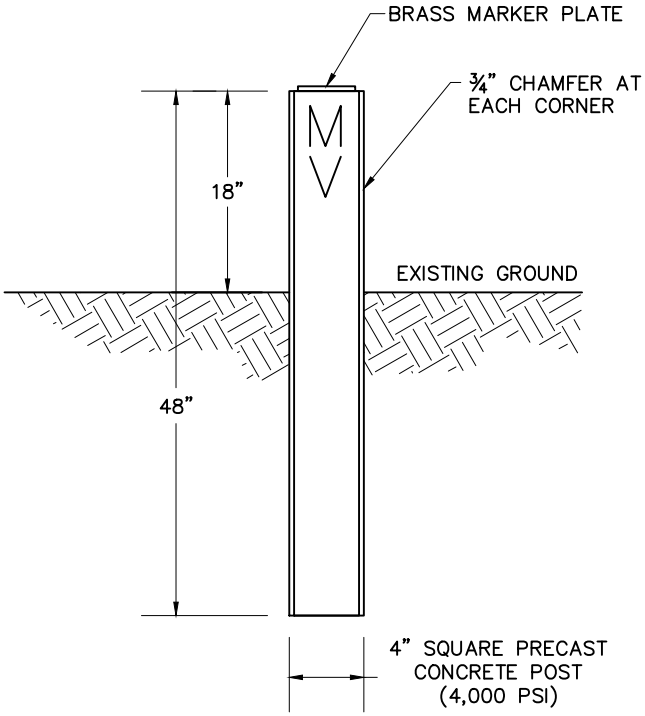
NOT TO SCALE

ISSUED: 7/31/18

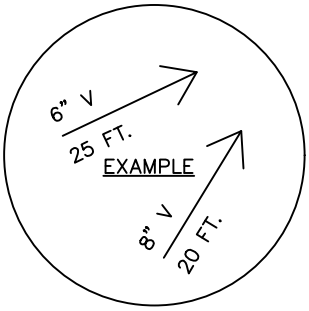
DETAIL NUMBER

14

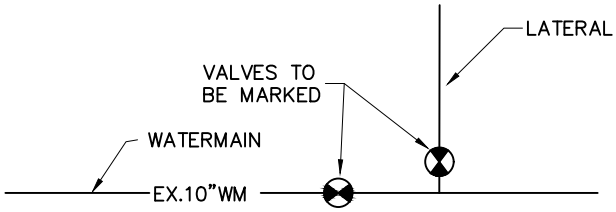


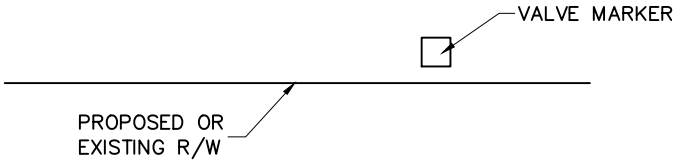


THE MARKERS TO BE LOCATED AT OR NEAR THE R/W WHERE ALL VALVES IN THE AREA CAN BE LOCATED.
FIRE HYDRANT LEG VALVES WILL NOT BE COUNTED.



BRASS MARKER PLATE WITH VALVE SIZE, DIRECTIONAL ARROW – POINTED TO MARKED VALVES AND DISTANCES TO THE NEAREST FOOT.





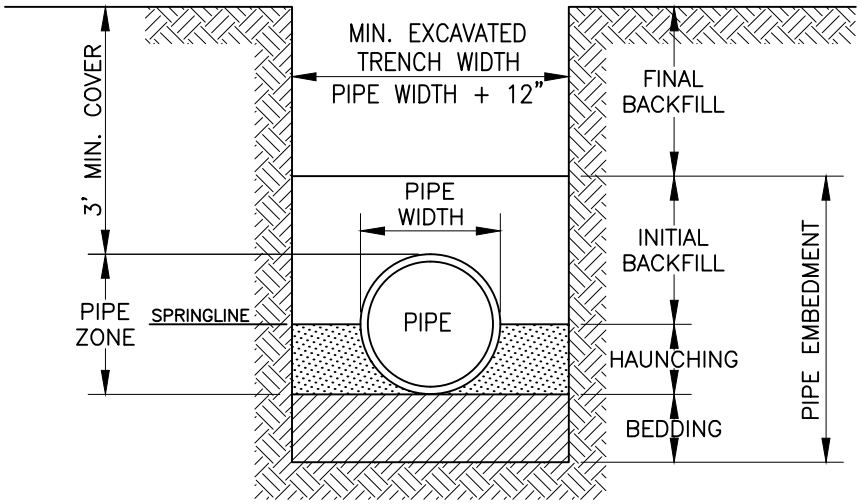
VALVE MARKER DETAIL

NOT TO SCALE

ISSUED: 7/31/18

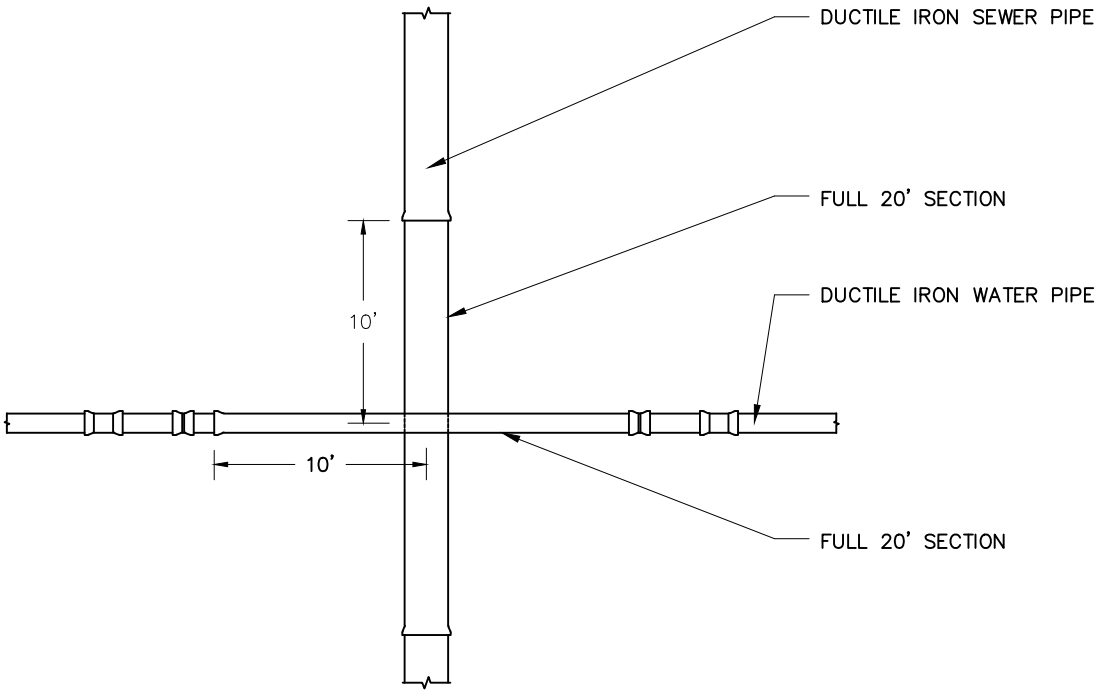
DETAIL NUMBER

15

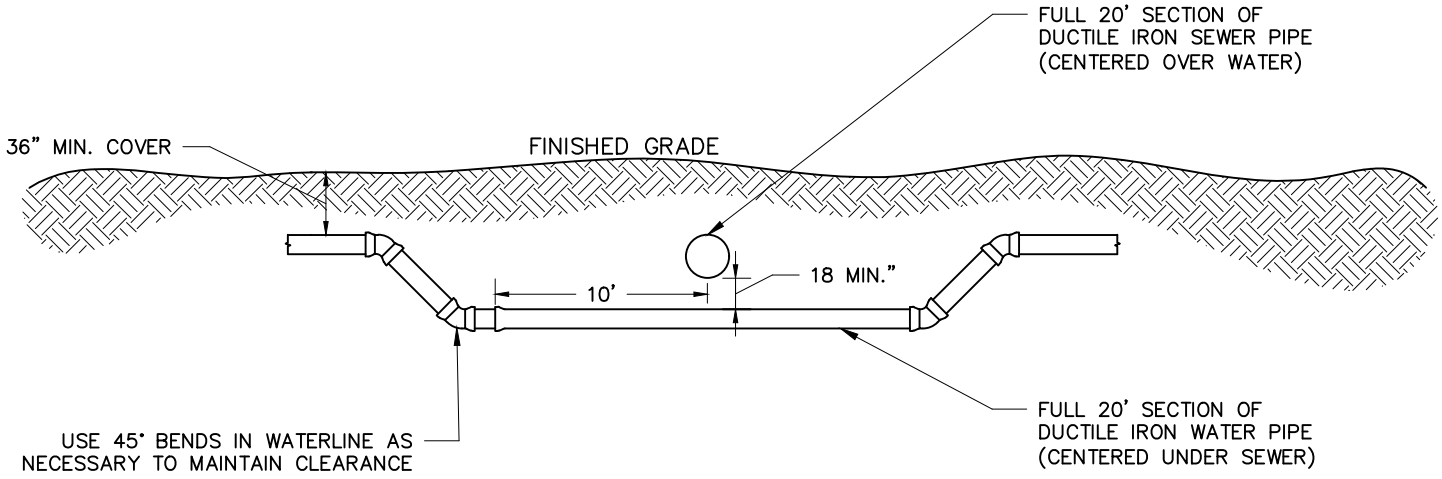


TRENCH DETAIL

NOT TO SCALE
ISSUED: 7/31/18
DETAIL NUMBER
16



PLAN VIEW



PROFILE VIEW

WATER/SEWER CROSSING DETAIL

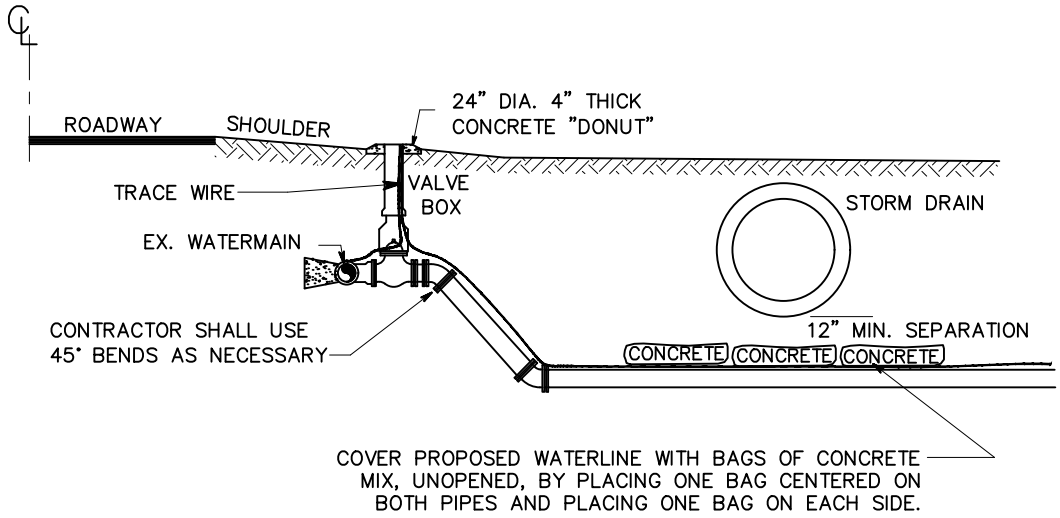
NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

17

NOTE: ALL FITTINGS ARE TO BE BLOCKED PER THE SPECIFICATIONS.



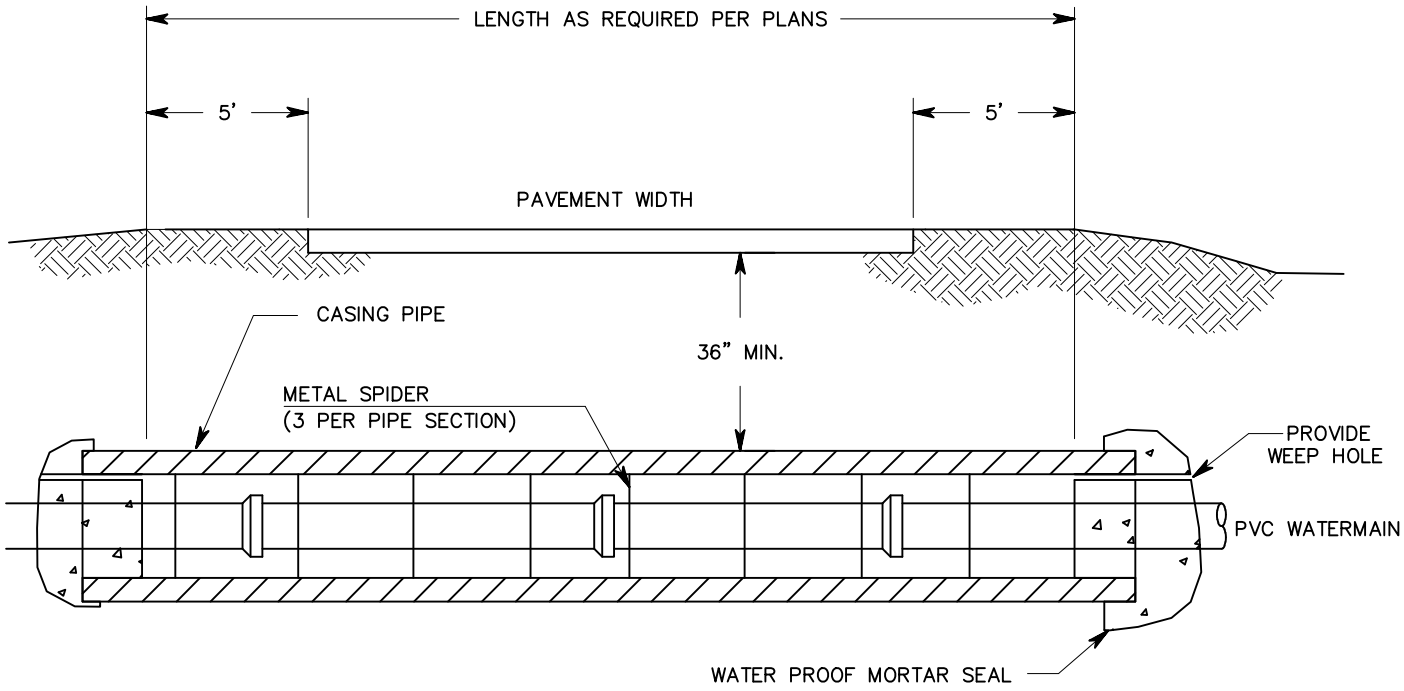
STORM SEWER CROSSING DETAIL

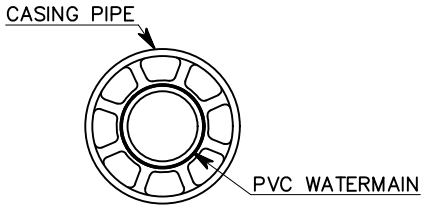
NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

18





TYPICAL SPIDER

CASING PIPE SHALL BE 2 X DIAMETER OF THE WATERMAIN OR AS SPECIFIED ON THE PLANS
CASING PIPE TO BE SCH 40 STEEL PIPE
WALL THICKNESS TO MEET NCDOT SPECS

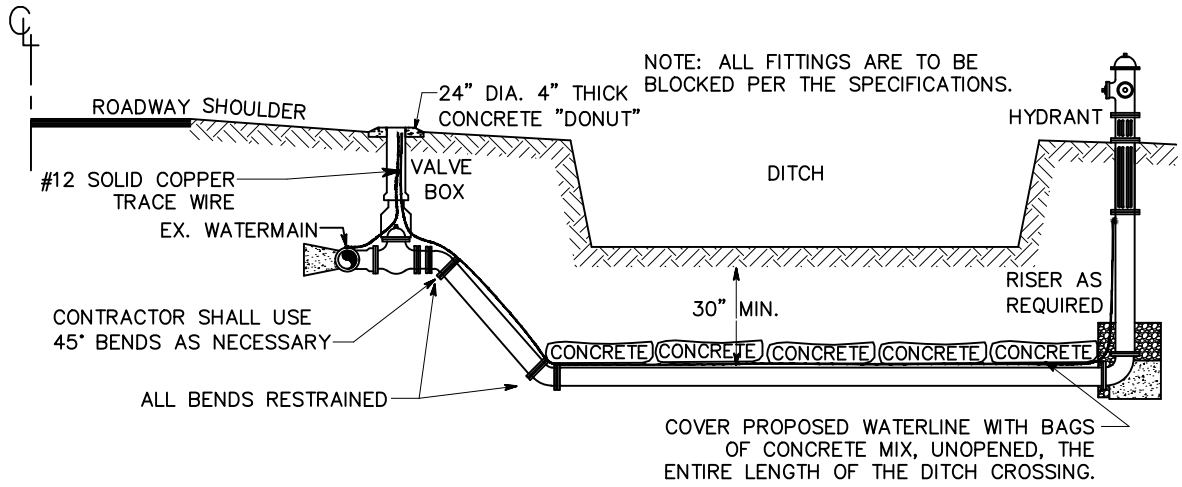
ROAD BORE DETAIL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

19



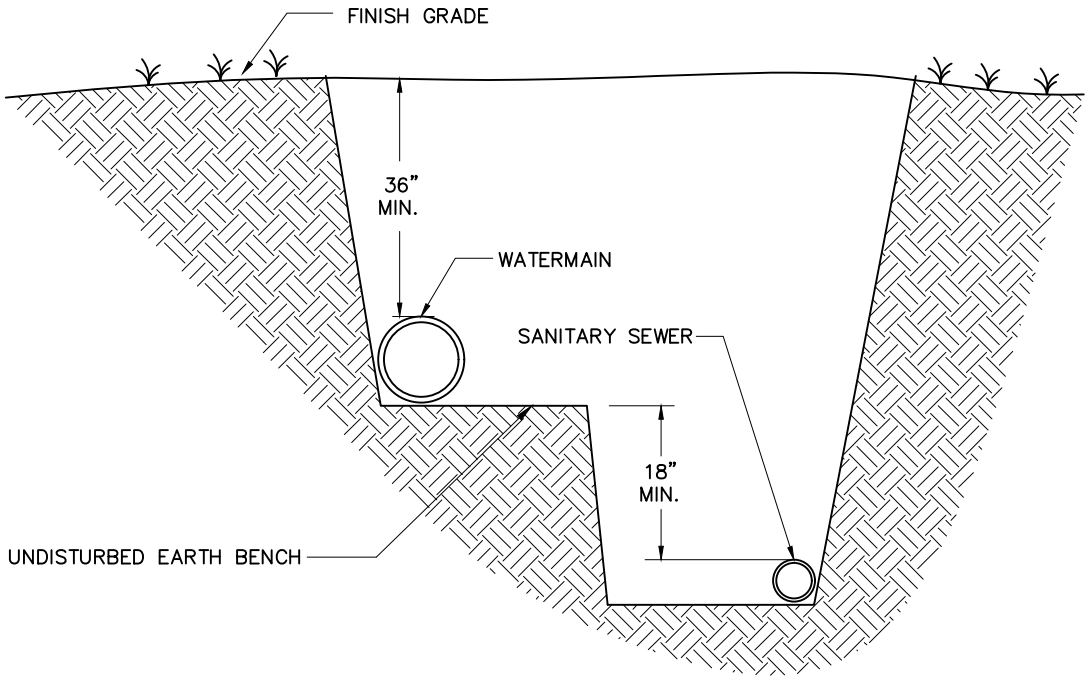
DITCH CROSSING DETAIL

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

20



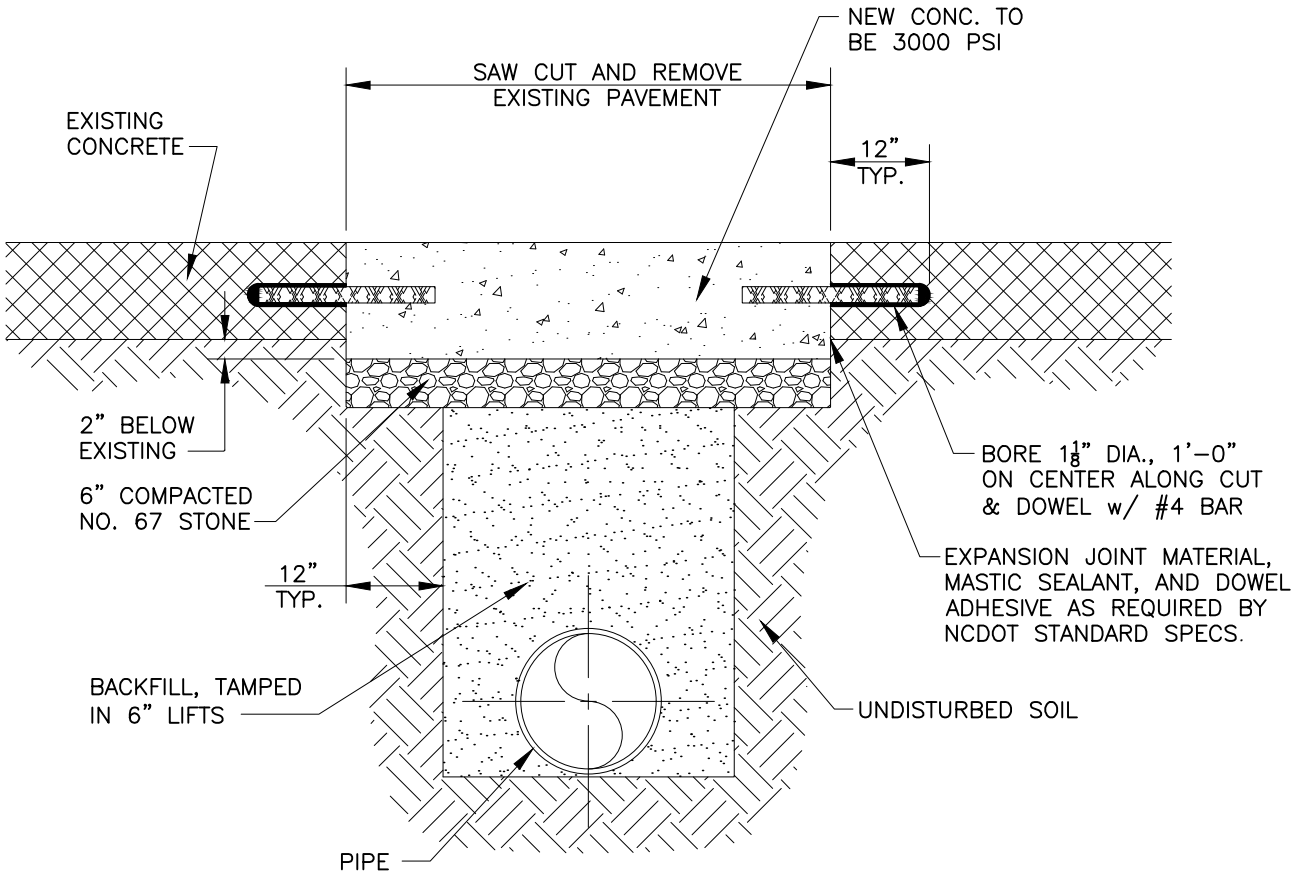
BENCHED WATER & SEWER PLACEMENT

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

21



NOTES

1. SEE DARE COUNTY STANDARDS FOR TRENCHES AND PIPE BEDDING FOR ADDITIONAL DETAILS.
2. PAVEMENT CUTS WITHIN NCDOT ROW SHALL CONFORM TO THE APPROVED ON SITE ENCROACHMENT PERMIT.
3. THE PAVEMENT CUT SHALL BE DEFINED BY A STRAIGHT EDGE AND CUT WITH AN APPROVED SAW CUT MACHINE.
4. THE TRENCH SUBGRADE MATERIAL SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO A DENSITY OF AT LEAST 95% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-99 AS MODIFIED BY NCDOT. 5. THE FINAL 6" OF FILL SHALL CONSIST OF ABC MATERAIL COMPACTED TO A DENSITY EQUAL TO 100% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-80 AS MODIFIED BY NCDOT .

COUNTY OF DARE NORTH CAROLINA

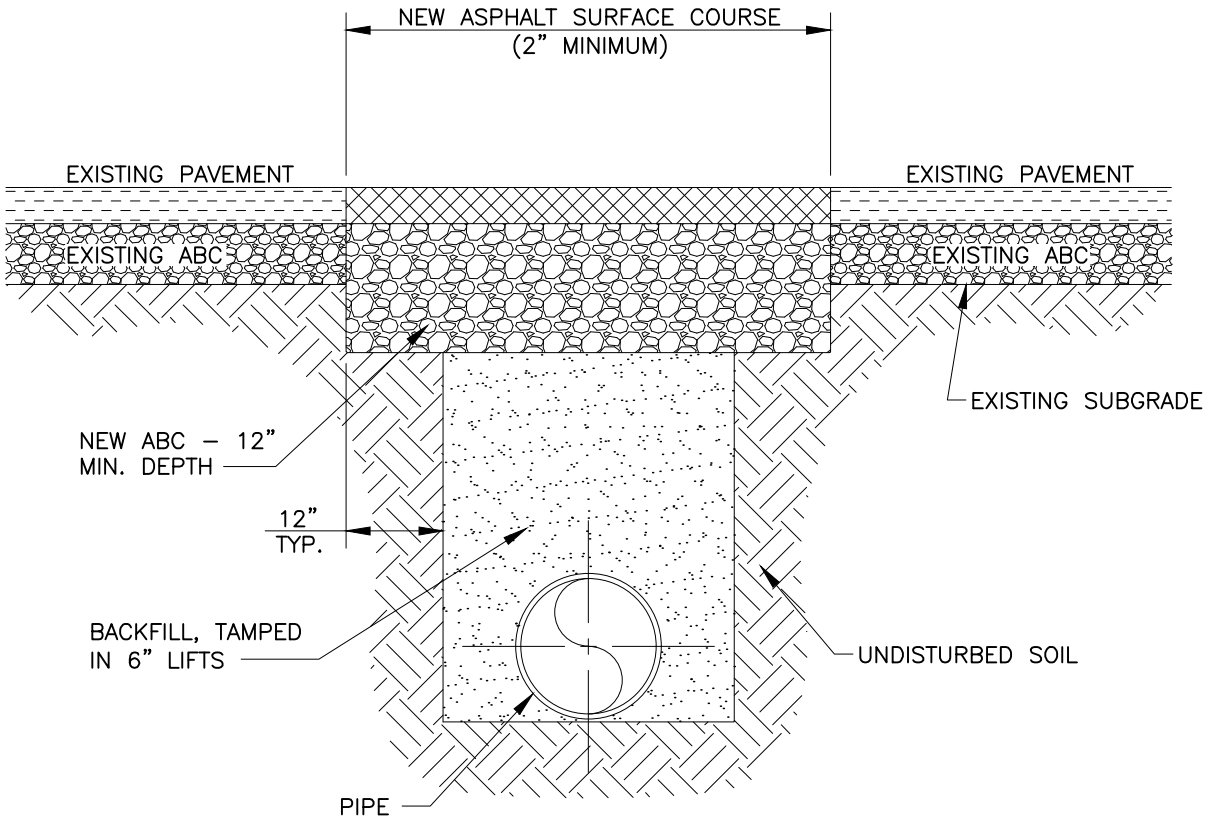
STANDARD CONCRETE PAVEMENT PATCH

NOT TO SCALE

ISSUED: 7/31/18

DETAIL NUMBER

22



NOTES

1. THE PAVEMENT CUT SHALL BE DEFINED BY A STRAIGHT EDGE AND CUT WITH AN APPROPRIATE SAW CUT MACHINE.
2. THE TRENCH SUBGRADE MATERIAL SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO A DENSITY OF AT LEAST 95% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T–99 AS MODIFIED BY NCDOT.
3. THE FINAL 1' OF FILL SHALL CONSIST OF ABC MATERIAL COMPACTED TO A DENSITY EQUAL TO 100% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T–80 AS MODIFIED BY NCDOT.
4. THE ENTIRE THICKNESS/ VERTICAL EDGE OF CUT SHALL BE TACKED.
5. THE SAME DEPTH OF PAVEMENT MATERIAL WHICH EXISTS SHALL BE REINSTALLED, BUT IN NO CASE SHALL THE ASPHALT BE LESS THAN 3" THICK.
6. THE ASPHALT PAVEMENT MATERIAL SHALL BE INSTALLED AND COMPACTED THOROUGHLY WITH A SMOOTH DRUM ROLLER TO ACHIEVE A SMOOTH LEVEL PATCH.
7. REFER TO DARE COUNTY STANDARDS FOR TRENCHES AND PIPE BEDDING FOR ADDITIONAL DETAILS.
8. NO HAND PATCHING ALLOWED.
9. PAVEMENT CUTS WITHIN NCDOT ROW SHALL CONFORM TO THE APPROVED ON SITE ENCROACHMENT PERMIT.

COUNTY OF DARE NORTH CAROLINA	STANDARD ASPHALT PAVEMENT PATCH	NOT TO SCALE ISSUED: 7/31/18 DETAIL NUMBER 23