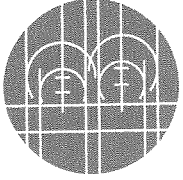


10.



SAMIR W. BAHHO P.E.  
CIVIL AND STRUCTURAL ENGINEERING

Date: October 26, 2006

Attn: Mr. Tony Chen  
Raleigh Regional Office  
3800 Barrett Drive

Reference: Application for Approval of Engineering Plans and Specifications for  
Water Supply Systems, the Woods @ Wilkinson Creek Subdivision,  
Chatham County, Baldwin Township

Dear Mr. Chen,

Attached to this cover letter are 3 copies of complete package of application for Approval of engineering plans and specifications for water supply systems. The package includes filled application, engineering report and sealed design drawings. Plans were reviewed by Chatham County Public Utilities Department and Application was signed by County's Manager.

The application is to request your approval for extending existing 8" water main to The Woods @ Wilkinson Creek Subdivision, a subdivision of 23 lots being developed in Chatham County, Baldwin Township. Extension will include 8" and 6" water main and other related appurtenances.

For any questions concerning the application, please call me or email me. My telephone number is (919) 621-0628. My email address is bahhos@bellsouth.net

Sincerely,

  
Samir W. Bahho, P.E.

Cc: ✓ Chatham County, Public Utilities Department  
Wilkinson Creek, LLC.  
File



**Engineering Report**  
**8" and 6" Water main extension, the Woods @ Wilkinson Creek Subdivision,**  
**Baldwin Township, Chatham County, North Carolina**

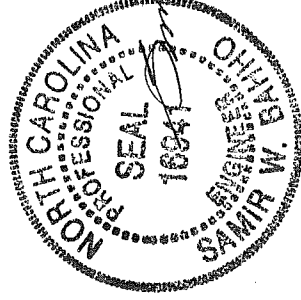
As requested by the owner, Wilkinson Creek, LLC, reviewed and approved by Chatham County, plans were prepared for design of approximately 2140' of 8" DIP water main and approximately 990' of 6" DIP water main, 4 ea fire hydrants and other related appurtenances. The water mains will serve the Woods @ Wilkinson Creek a new proposed subdivision comprising 23 single family housing lots. The subdivision is located of Tobacco Road (SR1537) in the Baldwin Township, Chatham County, North Carolina (see vicinity map on attached plans). Sealed plans prepared by Civil and Structural Engineering, Professional Engineer Samir W. Bahho were reviewed and approved by Chatham County Public Utilities and Application was signed by County Manager.

8" water main is available on Tobacco Road at the intersection with proposed road into the subdivision. A proposed 8" will run on Tobacco Road northwest to expend service to the end of subdivision limits on Tobacco Road. An 8" water main extension will serve property along the proposed main road, L-1. 6" water main extensions will serve proposed properties on roads L-2 and Y-1. Water main will be installed on the shoulders of proposed roads 5' outside pavement. The extended water main will serve 23 lots with 3/4" water services.

The project is designed in accordance with Chatham County Standard Specifications for Water Main Construction and in full accord with the provision of Chapter 130A-317 of the North Carolina General Statutes, and such other statutes related to public water systems.



Samir W. Bahho, P.E.





North Carolina Department of Environment  
And Natural Resources  
Division of Environmental Health  
Public Water Supply Section

**Application for Approval  
of Engineering Plans and Specifications  
For Water Supply Systems**

Date \_\_\_\_\_ Serial No. \_\_\_\_\_  
(for DENR use only) (for DENR use only)

To: Division of Environmental Health  
Department of Environment and Natural Resources

The Charlie Horne, Chatham County Manager  
(name of board, or council, authorized official and title, or owner)  
of Baldwin Township,  
(name of city, town, corporation, sanitary district, water company or other)

in the County of Chatham State of North Carolina authorized by law to act for  
the said Chatham County Commissioners  
(name of city, town, corporation, sanitary district, water company or other)

and to expend its funds for the water project described below, herewith submit for the counsel and advice of the Division  
of Environmental Health plans and specifications prepared by Samir W. Bahho, P.E. (engineer or firm)  
of Civil and Structural Engineering at 4612 Kaplan Drive, Raleigh, North Carolina 27606 (Tel: 919-621-0628, Fax: 919-  
854-1960) for the installation or construction of

Extension of 8" Ductile Iron water main to feed a proposed subdivision comprised of 23 lots with fire hydrants, valves, blow  
off assemblies, air release valve and other related appurtenances. An 8" water main exists on Tobacco Road (SR 1537) across  
the street from the driveway to the proposed subdivision. See attached plans and vicinity map.  
(describe project)

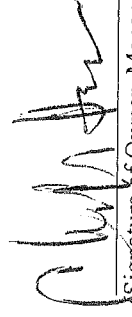
The Woods at Wilkinson Creek Subdivision, Baldwin Twonship, Chatham County  
(location of project)

in Chatham County and make application to the Division of Environmental Health for  
the approval of said plans and specifications as related to public health and protection of public water supplies and  
public water systems.

These plans have been approved and accepted by the applicant.

This application is made under and in full accord with the provision of Chapter 130A-317 of the North Carolina General  
Statutes, and such other statutes as related to public water systems. The applicant agrees that no change or deviation from the  
engineering plans and specifications approved by the Division of Environmental Health will be made except as allowed by  
T15A: 18C .0306 or with the written consent and approval of the Division of Environmental Health or its authorized  
representative. The applicant agrees that a professional engineer licensed to practice in the State of North Carolina shall  
submit a statement reflecting that adequate observations during and upon completion of construction, by the engineer or by a  
representative of the engineer's office who is under the engineer's supervision, indicates that construction was completed in  
accordance with approved plans and specifications.

Remarks: \_\_\_\_\_



(Signature of Owner, Manager, Mayor or Chairman)

Charlie Horne, Chatham County Manager  
(Type Name Signed Above)

70 South Street, P.O. Box 1550  
(Street or Box Number)

Pittsboro, North Carolina 27312-1150  
(City, State, Zip Code)

Status of Water System Management Plan (WSMP)

Check one of the following, and if applicable, provide the required information:

- The WSMP for the project, as defined in the attached engineering plans and specifications, is submitted with this application.
- The WSMP that includes this project, as defined in the attached engineering plans and specifications, was previously submitted.

Provide the following:

Water System Name: \_\_\_\_\_

Owner Name: \_\_\_\_\_

PWS I.D. No: \_\_\_\_\_

WSMP No: \_\_\_\_\_

WSMP Submittal Date: \_\_\_\_\_

County: \_\_\_\_\_

By my signature below, I certify that the previously submitted WSMP contains the information required by Rule .0307(c) for the project defined in the attached engineering plans and specifications.

NAME: \_\_\_\_\_

SIGNATURE:  \_\_\_\_\_  
(owner, manager, mayor or chairman)

DATE: 1/16/12

- The WSMP for the project, as defined in the attached engineering plans and specifications, has not been submitted.

**Note:** When the WSMP is submitted, the applicant must clearly identify the previously submitted project engineering plans and specifications for which the WSMP was prepared.

Status of Engineer's Report

Check one of the following, and if applicable, provide the required information.

- The Engineer's Report for the project, as defined in the attached engineering plans and specifications, is submitted with this application.
- The Engineer's Report that includes this project, as defined in the attached engineering plans and specifications, was previously submitted.

Provide the following:

Water System Name: \_\_\_\_\_

Owner Name: \_\_\_\_\_

PWS I.D. No: \_\_\_\_\_

Engineer's Report No: \_\_\_\_\_

Engineer's Report Title: \_\_\_\_\_

Engineer's Report Submittal Date: \_\_\_\_\_

County: \_\_\_\_\_

**Note:** If the previously submitted Engineer's Report covered multiple projects, then attach to this Application, a letter from the engineer stating that the previously submitted Engineer's Report contains the information required by Rule .0307(b) for the project defined in the attached engineering plans and specifications.

These plans and specifications cited in the foregoing application are approved insofar as the protection of public health is concerned as provided in the rules, standards and criteria adopted under the authority of Chapter 130A-317 of the General Statutes, with the following provisions:

This approval is given with the understanding that upon installation of such works, its operation shall be placed under the care of a competent person, and the operation shall be carried out according to best accepted practice and in accordance with the recommendations of the Division of Environmental Health.

The official copies of plans and specifications accompanying this application have been sealed and stamped with the serial number of this application \_\_\_\_\_. Only such plans and specifications are included in this approval and any erasures, additions or alterations of the proposed improvements except those permitted in T15A: 18C .0306 will make approval null and void.

This approval does not constitute a warranty of the design, construction or future operation of the water system.

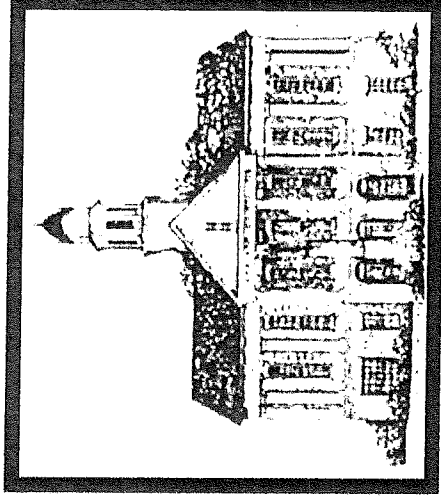
Signed:

\_\_\_\_\_  
Public Water Supply Section  
Division of Environmental Health



DWB  
10/26/06

# *Chatham County, North Carolina*



## *Standard Specifications For Water System Extensions*

*Adopted : August 2, 2004 Revised and Approved: 05/16/06  
by the Chatham County Board of Commissioners*

**CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS**

**WATER MAIN CONSTRUCTION**

**SECTION 1: PIPE FOR WATER MAINS**

01. **SCOPE:** The Contractor shall furnish all of pipe and other incidentals required for the construction of a complete water system as shown on the detailed drawings and as specified herein.  
  
Unless otherwise noted, the materials listed below are acceptable to the Owner for use in water distribution systems. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from the Chatham County Utilities Department or their assignees. The pipe material listed in this section shall serve as the minimum standard, Chatham County shall review and approve all pipe material for the project prior to construction.  
  
All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
02. **SUBMITTALS:** The Contractor shall submit to the Owner's Representative six (6) copies of all submittal data for review and/or approval. Submittals shall include at a minimum: (1) the manufacturer's name, (2) type of material, (3) ASTM, ANSI, AWWA or other quality standard and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all pipe materials prior to commencing construction.  
  
The Contractor shall submit to the Owner's Representative four (4) copies of a certificate of inspection from the pipe manufacturer that the pipe supplied has been inspected at the plant and meets the requirements of these specifications.
03. **PIPE DELIVERY, STORAGE AND HANDLING:** Units shall be delivered, handled, and maintained in a manner to avoid damage to the pipe. The pipe shall be stored in an open area on high, well-drained land not subject to flooding, mud or other means of contamination. Any PVC water mains approved by Chatham County Utilities and to be stored for more than 30 days shall be stored in a dry location and protected from the Sun.

04. DUCTILE IRON PIPE:

A. General: Ductile iron pipe shall be centrifugally cast in accordance with ANSI/AWWA C151/A21.51-96 or latest revision. Ductile iron shall meet the following minimum physical grade requirements:

Ultimate Strength	=	60,000 psi
Yield Strength	=	42,000 psi
Minimum Elongation	=	10%

B. Pipe Thickness: Pipe design conditions shall be as follows:

1. Working pressure of 150 psi plus 100-psi water hammer allowance.
2. External load of earth load of at least 3' cover plus a live truck super load (ASHTO H-20).

Pressure class thickness shall be calculated in accordance with ANSI/AWWA C150/A21.50-96, or latest revision, considering the above conditions and a safety factor of two. The standard service allowance and casting tolerance shall be added to the net thickness. Pipe up to and including 12" diameter as indicated on the plans and in the schedule of bid items shall be a pressure class 350. All larger pipe shall be a pressure class 250.

C. Joints:

1. Slip-Type: Pipe joints are to be slip-type single gasket bell and plain end or, where noted on the drawings, restrained joints in accordance with ANSI/AWWA C111/A21.11-95 or latest revision.
2. Flanged Pipe: All flanged pipe shall be of ductile iron pipe and ductile iron flanges manufactured per ANSI/AWWA C115/A21.15-94 or latest revision, and shall be rated for a maximum working pressure of 250 psi. Flanges shall be cast or screwed on by the pipe manufacturer only. Welding of flanges to the body of the pipe in lieu of methods outlined in ANSI A21.15 will not be acceptable. Flanges shall be standard Class 125 unless they are noted on plans as "F&D 250". F&D 250 flanges shall have a raised face and be faced and drilled to match Class 250 flanges shown in ANSI/AWWA C110/A21.10-93 or latest revision. Flanged pipe shall be used only when being placed in a meter vaults, pump stations, water plant or other locations approved by Chatham County Utilities Department. Flanged pipe shall not be installed in a direct bury application.
3. Mechanical Joints: ANSI Specification ANSI/AWWA C111/A21.11-95 or latest revision, for three inch pipe and larger, and CIPRA Specification 3-54

and 4-54 for two inch pipe. Bolted mechanical joints shall be used where specifically called for on the plans or in the Schedule of Bid Items.

4. Restrained Joints: Restrained joints for pipe and fittings shall be designed for a working pressure of 350 psi for 4" -24" pipe. Restrained joints shall be capable of being deflected a minimum of 4 degrees after assembly for 6" through 12" pipe and a minimum of 3 degrees after assembly for 14"-24" pipe. Restrained joints for pipe and fittings shall be U.S. Pipe TR FLEX, Griffin SNAP-LOK, CLOW Super-Lok or an approved equal. After market restraining mechanisms such as Mega-Lugs, Grip Rings may also be permitted if approved by the Chatham County Utilities Department.

a. Ductile Iron River Crossing Pipe: Push-on joints for such pipe shall meet the requirements of ANSI/AWWA C111/A21.11-95, and allow deflection of up to 15°. Pipe thickness shall be equal to manufacturer's standard. River crossing pipe shall be assembled and hydrostatically tested prior to shipment. Restrained joints for river crossing pipe and fittings shall be Griffin SNAP-LOK, US Pipe USIFLEX Pipe, CLOW, DI Ball and Socket Pipe. or an approved equal.

D. Pipe Lining: Cement-mortar lining shall conform to ANSI/AWWA C104/A21.4-95 or latest revision and shall be sealed with a bituminous coating.

E. Exterior Coating: The pipe shall have an outside pipe coating of bituminous material in accordance with ANSI/AWWA C151/A21.51-96 or 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.

F. Length and Weight: Pipe shall be furnished in 20' or 18' nominal lengths. Weights and length tolerances shall be within those specified by ANSI/AWWA C151/A21.51-96 or latest revision.

G. Marking: The net weight, pressure class or nominal thickness, sampling period and manufacturer shall be marked on each pipe. Pipe shall also be marked "D.I." or "Ductile".

05. POLYVINYL CHLORIDE (PVC) PIPE:

A. Dimension Ratio 18: PVC pipe shall conform with ANSI/AWWA C900-97 or latest revision for polyvinyl chloride pressure pipe sizes 3 inch through 12 inch. Class 150, DR 18 pipe as called for on the plans or in the schedule bid items shall be furnished. The pipe shall be plainly marked with the following information:

the "O"-Rings shall be filled with lubricant. Anti-friction washers shall be provided at the stem collar for inside screw design.

Valves for buried use shall be nonrising stem (NRS) with 2-inch square operating nut. Valves for aboveground use or for use inside vaults shall be NRS design with handwheel. Valves shall open by turning in a counterclockwise direction. The minimum valve design working water pressure shall be 200 psi. Valves shall be shell tested at 400 psi.

Valve ends for buried use with Ductile Iron pipe shall be bolted mechanical joint. Valve ends for buried use with PVC pipe shall be bolted mechanical joint. Valve ends for use in above ground or vault installations shall be flanged joint. Valves for buried use on Ductile Iron pipe fire hydrant legs shall be bolted mechanical joint.

Resilient-seated gate valves shall be manufactured by CLOW, American Flow Control, Mueller Company or an approved equal.

05. **RESILIENT-SEATED BUTTERFLY VALVES:** Butterfly valves shall be manufactured to meet or exceed the requirements of ANSI/AWWA C504-94 or latest revision. 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. The valve shall have Buna-N or Buna-S valve seats with bronze or stainless steel seating rings. The stuffing boxes shall be integrally cast with the valve body. The shaft bearings shall be of the self-lubricating sleeve type with thrust bearings to keep the valve disc centered.

Valves for buried use shall be mechanical-joint-end Class 150B. Valves for use in above ground or vault installations shall be short-body with flanged ends Class 150 B.

Butterfly valves shall be manufactured by Mueller, American Flow Control, Pratt, Dezurik, CLOW or an approved equal.

06. **SWING CHECK VALVES:** Swing check valves shall be manufactured to meet or exceed the requirements of ANSI/AWWA C508-93 or latest revision. The valve disc and clapper assembly shall be removable from valve body with valve remaining in pipeline. The disc shall not contact the body when the valve is in the full open position. Check valve shafts shall be stainless steel with corrosion resistant bearings provided at each end. Shaft and bearings are to be replaceable. Valves 2" to 12" shall be rated at 175-psi working water pressure.

Valves for use in above ground or in vault installations shall be flanged end without side spring and lever or when positioned horizontally weight and lever may be used. No buried Check Valve shall be permitted.

Swing Check Valves shall be manufactured by Mueller, American Flow Control, Pratt, or an approved equal.

07. **VALVE BOXES:** Valve boxes shall be of close-grained grey cast iron. The valve boxes shall be the two-piece screw type and the cover or cap shall have cast on the upper surface in raised letter the word "Water". Valve boxes shall be painted with a coat of protective bituminous paint before being shipped from the factory. Pre-Cast Concrete collars shall be an integral part of the valve box installation except when installed in a roadway or other impervious surface.

08. **FIRE HYDRANTS:** Dry-Barrel Fire hydrants shall be manufactured to meet or exceed ANSIAWWA C502-94 or latest revision. Fire hydrants shall be of the compression type with 4-1/2" valve opening designed to close against line pressure. Fire hydrants shall be furnished with a food grade sealed oil or grease reservoir located in the bonnet, so that all threaded and bearing surfaces are automatically lubricated. Teflon washers shall be used for ease of operation. The seat ring shall be bronze and threaded into a bronze drain ring located between the lower barrel and shoe.

The hose and pumper nozzles shall be threaded. The threads for nozzles shall be National Standard. The hydrants shall have two (2) 2-1/2" hose nozzles with cap, and one (1) 4-1/2" pumper nozzle and cap. Hydrants shall have a minimum 36" bury and shall stand approximately 30" above ground elevation. Hydrants shall be designed with a breakaway feature that will break cleanly upon impact. This shall consist of a two-part breakable safety flange. The operating nut shall be 1-1/2" pentagonal and shall open counterclockwise. All hydrants shall be cast marked on the outside such that visible identification can be made as to type and design

Hydrants permitted for installation may be American-Flow Control, Mark-73-1, Mueller Super Centurion 250 with Bronze Bushed Shoe or CLOW Medallion.

09. **TAPPING SLEEVES:**

A. **Mechanical Joint Tapping Sleeves:** Tapping sleeve to be manufactured from gray cast iron meeting or exceeding ASTM A126 Grade B or ductile iron meeting ASTM A536 Grade 65-45-12. Side flange seals shall be of the O-ring type of either round, oval or rectangular cross-sectional shape.

Tapping sleeve to be used in conjunction with a mating tapping valve from same manufacturer. Outlet flange of sleeve to be counterbored per MSS SP-60 for true alignment of tapping valve and tapping machine. Sizes of outlet to be available through equal opening of sleeve diameters up to 24".

Tapping sleeves shall be Mueller mechanical joint, Mueller Outlet Seal, American Uniseal or Kennedy Square Seal. All sleeves shall have a minimum of 150-psi

manufacturer's name, size, material (PVC) type and grade or compound, NSF seal, pressure class and reference to appropriate product standards. Pipe shall be furnished in 20 ft. laying lengths. Random lengths shall be a minimum of 10 feet long and shall comprise no more than 15 percent of the length of the piping system. Pipe shall be furnished in factory-packaged units.

Pipe shall be furnished in cast iron pipe equivalent outside diameters with rubber-gasketed separate couplings or push-on joints. Pipe shall not fail when subjected to the following tests; (1) sustained pressure (2) burst pressure (3) flattening and extrusion quality. Tests shall be conducted as outlined in ANSI/AWWA C900-97. Each length of PVC pipe shall pass a hydrostatic integrity test at the factory of 4 times the pressure class of the pipe for 5 seconds.

1. Standards: AWWA C900-97 PVC pipe shall conform to the following:

- a. Material: Virgin PVC resin, ASTM D1784
- b. Dimension Ratio & Press. Class: DR 18, Class 150
- c. Pressure Rating: 188 psi @ 2.5 factor of safety
- d. Sustained Pressure Requirement: 500 psi for 1,000 hrs., ASTM D1598, ASTM D2241
- e. Quick Burst Pressure: 755 psi for 60 sec., ASTM D1599

06. **WROUGHT PIPING:** Wrought steel pipe shall conform to ASTM A-53. Wrought iron pipe shall conform to ASTM A-72. All wrought piping shall be standard strength Schedule 40 and shall be galvanized inside and out. Wrought Piping has limited applications and will be subject to the approval of Chatham County Utilities.

07. **PIPE INSTALLATION:** Pipe shall be installed in accordance with the manufacturer's recommendations and as specified in Section 7 of these specifications. Disinfection and pressure testing shall meet the requirements in Section 7.

CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS

WATER MAIN CONSTRUCTION

**SECTION 2: VALVES and FIRE HYDRANTS**

01. **SCOPE:** The Contractor shall furnish all types of valves and fire hydrants and all other incidentals required for the construction of a complete water system as shown on the drawings and as specified herein. Unless otherwise noted, the materials listed below are acceptable to the Owner for use in water distribution systems. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from the Chatham County Utilities Department.

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

Valves supplied shall be of the designations and description indicated on the plans or specifications described herein.

02. **SUBMITTALS:** The Contractor shall submit to the Engineer six (6) copies of all submittal data for review and/or approval. Submittals shall include at a minimum: (1) The manufacturer's name, (2) type of material, (3) ASTM, ANSI, AWWA or other quality standard, and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all valves and fire hydrants prior to commencing construction.

The submittal information for all valves and hydrants shall include the number of turns necessary to fully open or close each valve and hydrant. This information may vary with each manufacturers product and shall be included in the contractor's submittal data.

03. **DELIVERY, STORAGE AND HANDLING OF VALVES AND HYDRANTS:** Units shall be delivered, handled and maintained in a manner to avoid damage to the valves. The materials shall be stored in an open area on high, well-drained land not subject to flooding, mud or other means of contamination.

04. **RESILIENT-SEATED GATE VALVES (2'-16"):** Gate valves shall be manufactured to meet or exceed the requirements of ANSI/AWWA C509-94 or latest revision for 2" -16" valves. All valves shall be of iron body, bronze mounted, resilient-seat type. The sealing mechanism shall provide zero leakage at the water working pressure against line flow from either direction. Valves shall be manufactured with "O" Ring stem seals. The area between



working pressure. All taps shall be of 150 psi working pressure. All taps shall be machine drilled – no burned taps will be allowed.

All sleeves are to include the end joint accessories and split glands necessary to assemble sleeve to pipe. MJ bolts and nuts are to conform to ANSI/AWWA C111/A21.11-95. No special tools other than standard socket wrench to be required for assembly of sleeve to main. Sleeve shall be coated with asphaltic varnish per Federal Specification TT-V-51, Military Specification MIL C-450, or equal.

All taps shall be air tested for a period of five minutes by the contractor performing the tap prior to connection to the tapping valve. The OWNER's representative shall witness the test.

10. **COMBINATION AIR RELEASE VALVES FOR WATER MAINS:** Combination air release valves shall be installed at high points in the water main as indicated by the plans in order to release air in the main as the main is filling and allow air to enter the system when draining or subject to negative pressure. Combination air release valves shall be manufactured to meet or exceed the requirements of ANSI/AWWA C512-92 or latest revision.

The valve shall operate through a compound lever system that will seal both the pressure orifice and the air vacuum orifice simultaneously. This lever system shall permit a 1/4" orifice to release an accumulation of air from the valve body at a capacity of 98 cfm of air and pressure of 200 psig.

The function of the lever system shall also permit a positive disengagement of the main valve from the large orifice. As the float drops and pressure decreases, the disengagement shall be immediate and not be limited to the initial draw of a vacuum.

The valves shall be 2" NPT screwed or ANSI Class 125 flanged inlet connection and shall be cast iron body, top and inlet flange (where required), stainless steel float and trim with buna-n seat. Valves, which operate the pressure plunger via a single lever and fulcrum, will not be acceptable. A protectop shall be supplied to prevent debris from entering the outlet of the valve. The valves shall be Crispin Model UL20 Universal Air Valve A.R.I. Model D-050, Apco/Valve and Primer No. 200A, Cla-Val or an approved equal.

Each valve assembly shall include a 2" NRS, solid disc, inside screw bonnet gate valve with a 200 WOG pressure rating and conforming to Federal Specification MSS SP-80. Each valve assembly shall be installed in a manhole as shown on the detail sheet in the plans.

11. **INSTALLATION:** Valves and hydrants shall be installed in accordance with the manufacturer's recommendations and as specified in Section 7 of these specifications. Disinfection and pressure testing shall meet the requirements in Section 7.

CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS  
  
WATER MAIN CONSTRUCTION

**SECTION 3: FITTINGS AND COUPLINGS FOR WATER DISTRIBUTION**

01. **SCOPE:** The Contractor shall furnish all types of fittings and couplings and all other incidentals required for the construction of a complete water system as shown on the drawings and as specified herein. Unless otherwise noted, the materials listed below are acceptable to the Owner for use in water distribution systems. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from the OWNER or the OWNER's Representative.

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

Fittings and couplings supplied shall be of the designation and description indicated on the plans or described herein.

02. **SUBMITTALS:** The Contractor shall submit to the Engineer six (6) copies of all submittal data and operation and maintenance manuals for review and/or approval. Submittals shall include at a minimum: (1) The manufacturer's name, (2) type of material, (3) ASTM, ANSI, AWWA or other quality standard, and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all fittings and couplings prior to commencing construction.

03. **DELIVERY, STORAGE AND HANDLING OF FITTINGS AND COUPLINGS:** Units shall be delivered, handled and maintained in a manner to avoid damage to the fittings. The material shall be stored in an open area on high, well-drained land not subject to flooding, mud or other means of contamination. For long-term exposure all material shall be covered and protected from elements.

04. **DUCTILE IRON FITTINGS:** Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10-93 or latest revision with the exception of the manufacturer's design dimensions and thickness. Mechanical Joint fittings 3"-24" shall have a working pressure rating of 350 psi. Flange joint fittings 3"-24" shall have a working pressure rating of 250 psi. Ductile-Iron Compact Fittings conforming to ANSI/AWWA C153/A21.5-94 or latest revision are also acceptable. **No push-on fittings will be allowed.**

Ductile iron shall conform with ASTM A-536, latest revision. The standard grade of iron shall be 70-50-05 with a minimum tensile strength of 70,000 psi, minimum yield strength of 50,000 psi and minimum elongation of 5%.

A. Coatings and Linings: Fittings shall have an outside coating of bituminous material in accordance with the manufacturer's specifications. 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.

Fittings shall have a cement mortar lining and seal coating conforming with ANSI/AWWA C104/A21.4-95 or latest revision.

When it is necessary to install fittings in locations that are considered difficult service locations all exposed bolts, nuts and uncoated materials shall be coated with a Bitumastic sealant to protect the bolts, nuts and other exposed surfaces from the elements.

B. Joints: Buried fittings shall have mechanical joints and above ground fittings or fittings in vaults shall have flange fittings as specified herein.

1. Mechanical Joint: ANSI/AWWA C111/A21.11-95 or latest revision, for 3"-48" fittings. Bolted mechanical joint fittings shall be used with ductile iron pipe, PVC pipe, for all hydrant tees, and where specifically called for on the plans or in the Schedule of Bid Items.
2. Flanged Joint: ANSI/AWWA C111/A21.11-95 or latest revision, for 3"-64" fittings. Flanged Joints are not approved for direct bury.
3. Mega Lug Restraint for D.I.P.: Mega Lugs may be used for restraint of mechanical joint fittings. The restraint mechanism shall consist of a plurality of individually actuated gripping surfaces to maximize restraint capability. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint bell. Twist off nuts, sized the same as tee-head bolts shall be used to insure proper actuating of restraining devices. The restraining glands shall have a pressure rating equal to that of the pipe on which it is used. When mechanical thrust restraints are used concrete thrust blocking shall be deleted from the installation.
4. Grip Ring Restraint for DIP and PVC C-900 Pipe restraints shall be utilized to prevent movement for push-on DI or PVC bell and spigot pipe connections or where a flexible coupling has been used to join two sections of plain end DI or PVC pipe to a DI MJ bell fitting. The pipe shall be restrained by a split retainer band. The Band shall be cast ductile

iron meeting or exceeding ASTM A536-80, Grade 65-45-12. The inside face or contact surface of the band shall be of sufficient width to incorporate cast or machined non-directionally sensitive serration to grip the outside circumference of the pipe. The serration shall provide full (360 degrees) contact and maintain pipe roundness and avoid any localized points of stress. The split band casting shall be designed to “bottom-out” before clamping bolt forces (110 ft-lb minimum torque) can over stress the pipe, but will provide full non-directionally sensitive restraint at the rated pressures. Grip Rings shall be manufactured by Romac Industries, Inc. or approved equal.

05. **PVC FITTINGS:** PVC Fittings are **NOT** acceptable for use in the Chatham County Water Systems. All Fittings for 2” PVC and smaller shall be brass fittings. **No Solvent Weld Piping Shall be permitted.**
06. **COUPLINGS:** Couplings may be used where applicable for completion of the work. Couplings supplied shall conform to the following:
- A. **Compression Sleeve Coupling:** Units shall be Dresser style 38, Smith-Blair No. 431, JCM 210 or equal.
  - B. **Victaulic Couplings:** Units shall be Victaulic Co., style 31, 41, 44, Grinnell or equal.
  - C. **Gruvagrip Couplings:** Units shall be Gustin-Bacon Division of Certainteed, Series 100 or equal.
  - D. **Flanged Adaptors:** Units shall be Dresser style 128, Smith-Blair No. 913, EBBA Iron MEGA-Flange or equal.

CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS

WATER MAIN CONSTRUCTION

**SECTION 4: 3/4" INCH TO 2-INCH SERVICES FOR WATER DISTRIBUTION**

01. **SCOPE:** The Contractor shall furnish all materials and all other incidentals required for the installation of a complete water service connection as shown on the detail drawings and as specified herein. Unless otherwise noted, the materials listed below are acceptable to the Owner for use in water services. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from the Owner's Representative.

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains or stresses to which it is normally subjected and be true to detail.

Materials supplied shall be of the designations and description indicated on the plans or described herein.

**Minimum Residential service line from the tap to the meter shall be 1" CTS PE pipe.**

02. **SUBMITTALS:** The Contractor shall submit to the Engineer six (6) copies of all submittal data and operation and maintenance manuals for review and/or approval. Submittals shall include at a minimum: (1) The manufacturer's name, (2) type of material, (3) **ASTM, ANSI, AWWA** or other quality standard, and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all materials prior to commencing construction.

03. **DELIVERY, STORAGE AND HANDLING OF MATERIALS:** Materials shall be delivered, handled and maintained in a manner to avoid damage due to breakage or contamination.

04. **TAPPING SADDLES:** Tapping saddles shall be of double strap type design and provide full support around the circumference of the pipe with a designed in safeguard against over-tightening to prevent deforming the pipe. All parts of the saddle shall be constructed of corrosive resistant bronze including bolts and nuts required to assemble. Only saddles designed specifically for the type water main pipe used shall be allowed. Threads shall be AWWA standard cc tapered. Tapping saddles shall be Ford 202B for DIP and S902 for C900 PVC, Mueller DR2A for DIP and H13000 for C900 PVC or approved equal.

05. **CORPORATION STOPS:** Corporation stops shall be of bronze, ASTM B 61 or ASTM B 62; and suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops, AWWA C800; coupling nut for connections to flared copper tubing, ASME/ANSI B16.26. Corporation Stops shall be Ford FI001, Mueller B25009 or approved equal and shall have a minimum pressure rating of 200psi.

06. **PIPE FOR SERVICE LINES:** Pipe for service lines shall be 200 psi CTS polyethylene tubing conforming with all applicable requirements in the latest revisions of the following standards. All service laterals shall be encased when crossing under interstates, highways, private subdivisions roads and graded roads.

A. AWWA C-901: Standard for polyethylene (PE) pressure pipe 1" through 3" for water. Service mains shall be seamless pipe, no couplings shall be permitted.

B. ASTM D-1248: Standard for polyethylene molding and extrusion materials.

C. ASTM D-2239: Standard for polyethylene (PE) Plastic pipe (SDR-7).

Polyethylene extrusion compound from which the polyethylene pipe is extruded shall comply with the applicable requirements for PE-3406 high density, ultra high molecular weight polyethylene material as described in ASTM D-1248, latest revision. The PE pipe shall be rated for use with water at 73.5 degrees F. at a hydrostatic design stress of 630 psi and a maximum working pressure of 200 psi.

Dimensions and tolerances shall comply with ASTM D-2239 (copper tubing size, SDR 7).

D. **Marking:** The following data shall be clearly marked on all service pipe installed:

- (1) Nominal size
- (2) Operating pressure @ 73.4 degrees F
- (3) Type of pipe, i.e. "water service pipe"
- (4) Material designation code.
- (5) Date code: Month, year and day
- (6) Manufacturer's brand name
- (7) **National Sanitation Foundation** logo (indicating approval for potable water and compliance with ASTM Specifications)
- (8) ASTM Specification - "ASTM D-2239" Plant location code

**NOTE:** Typical residential service shall be 5/8" x 3/4"; the minimum size of the tap, corporation stop and service lateral (line) up to the meter yoke being 1-inch diameter CTS polyethylene pipe. It shall be the contractor's responsibility to provide a brass reducing fitting at the meter yoke to reduce down to 5/8" x 3/4" as applicable.

07. **SERVICE ENCASEMENTS:** Service laterals shall be encased when crossing under interstates, highways or other roads with total pavement widths wider than 35 feet or when deemed necessary by Chatham County Public Utilities. Encasements for service mains shall be minimum of seamless polyethylene (PE) or seamless PVC.

Service Lateral Size

1"

2"

Encasement Pipe

1-1/2"

3"

Services laterals larger than 2" shall be encased in steel casing sufficient to provide 2" of annular space around the lateral.

08. **YOKE BAR ASSEMBLY:** The Contractor shall supply Yoke Bar with each service. Yoke Bars shall be 5/8" x 3/4" as manufactured by Ford (Y502). All Yoke Bars shall be equipped with a 300-psi angle ball valve and in-line check valve. Yoke Bars shall be "Ford Y502", Mueller or approved equal.

09. **STRAIGHT METER VALVE:** The Contractor shall supply Straight Meter Valves with each service. Meter valves shall be Straight Ball Meter Valves. Meter Valves shall brass and conforming to AWWA C800 and ASTM B-62. Meter Valves shall be of a locking wing type in the closed position. Meter Valves shall be non-directional and water tight with flow in either direction. Meter Valves shall be rated for 300 psi. Valves shall be male iron pipe thread inlet by meter swivel nut outlet.

Straight Meter Valves shall be "Ford B83", Mueller or approved equal.

11. **CHECK VALVES:** The Contractor shall supply with each service a check valve as described herein. Check Valves shall brass and conforming to AWWA C800 and ASTM B-62. Check valves shall be Straight Dual Cartridge type and shall be ASSE 1024 approved. Check valves shall be meter swivel nut inlet by female iron pipe thread outlet.

All check valves supplied under these specifications shall be manufactured by "Ford HHC31", Mueller or approved equal.

10. **COMPRESSION FITTINGS:** Compression fittings shall be compatible with all other service connection materials. A stainless steel insert will be required with any fitting that compresses the outside of the pipe to hold the pipe in place. Compression fittings shall be "Ford", Mueller or approved equal.

09. **TEFLON TAPE:** Teflon tape shall be used on all threaded connections to reduce the possibility of leaking joints.

10. **METER BOXES:** Meter boxes shall be supplied with each service connection. Boxes shall be of plastic construction and shall conform to the dimensions shown in the detail drawings for the water main installation. The meter boxes shall be equipped with a heavy duty cast iron reader compatible with the Hersey "Radio Read" meter. The word "WATER METER" shall be cast in the lid.

12. **PRESSURE REDUCING VALVES:** Pressure Reducing Valve shall be required at all service location. Pressure reducing valves shall be provided by the homeowner and shall be placed in a serviceable location and inspected by the Chatham County Building Inspection Department..

The valve shall automatically reduce a higher inlet pressure to a steady lower downstream pressure. The valves shall be constructed of bronze, copper or stainless steel and be equal to the size of the water service line. Pressure Reducing Valves, buried or placed in an outside location shall be rated for direct bury.

13. **COLD WATER METERS:** Meters for the project shall be furnished and installed by Chatham County Utilities Department. All appurtenances listed in the previous sections shall conform with Itron Mobile AMR System and with Itron ERT for 5/8" Through 6" PD Meters.

*Types of Meters shall be approved by the Chatham County Utilities Director or his assignees.*



**CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS**

**SECTION 5: BACKFLOW PREVENTERS**

01. **SCOPE:** This section covers the description of the backflow preventers and appurtenances that have been approved for use in the public water systems owned by Chatham County.
- The purpose of requiring backflow preventers is to protect the public potable water supply served by the Chatham County Water System from the possibility of contamination or pollution by isolating, within its customers' internal distribution system, such contaminants or pollutants which could backpressure or back-siphon into the public water system.
- This section seeks to promote the elimination or control of existing cross-connections, actual or potential, between its customers internal potable water systems, and non-potable systems, and also to provide for the maintenance of a continuing program of cross-connection control which will effectively prevent the contamination or pollution of all potable water systems by cross-connection.
02. **GENERAL:** The Contractor shall furnish all materials and all other incidentals required for the installation of a complete water service connection as shown on the detail drawings and as specified herein. Unless otherwise noted, the materials listed below are acceptable to Chatham County for use in water services. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from Chatham County.
- All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains or stresses to which it is normally subjected and be true to detail.
- Materials supplied shall be of the designations and description indicated on the plans or described herein.
03. **SUBMITTALS:** The Contractor shall submit to the Engineer six (6) copies of all submittal data and operation and maintenance manuals for review and/or approval. Submittals shall include at a minimum: (1) The manufacturer's name, (2) type of material, (3) ASTM, ANSI, AWWA or other quality standard, and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all materials prior to commencing construction.

04. **DELIVERY, STORAGE AND HANDLING OR MATERIALS:** Materials shall be delivered, handled and maintained in a manner to avoid damage due to breakage or contamination.

05. **APPROVED MANUFACTURERS OF BACKFLOW PREVENTERS:** Any backflow preventer used in Chatham County's public water systems shall be from the following manufacturers:

**DOUBLE CHECK VALVE ASSEMBLIES**

**Ames Company, Inc.**

Model 2000B - 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 2000 - 4", 6", 8", 10"  
Model 2000SS - 2 1/2", 3", 4", 6", 8"  
Model 2000SE - 2 1/2", 6", 8"

**Febco Sales, Inc.**

Model 805Y - 3/4", 1", 1 1/2", 2"  
Model 805YD - 2 1/2", 3", 4", 6", 8", 10"  
Model 850 - 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 850DC - 2 1/2", 3", 4", 6", 8", 10"  
Model 870/870V DC - 2 1/2", 3", 4", 6", 8", 10"

**Cla-Val**

Model DC6LW - 3/4", 1", 1 1/2", 2"  
Model DC7LW/DC7LY - 2 1/2", 3", 4", 6", 8", 10"  
Model DC8LW/DC8LY - 2 1/2", 3", 4", 6", 8", 10"  
Model DC8NW/DC8NY - 2 1/2", 3", 4", 6", 8", 10"  
Model DC8VW/DC8VY - 2 1/2", 3", 4", 6", 8", 10"

**Watts Regulator Company**

Model 007 QT - 3/4", 1", 1 1/2", 2", 2 1/2", 3"  
Model 709 RW - 2 1/2", 3", 4", 6", 8", 10"  
Model 775 QT - 1"

**Conbraco Industries, Inc.**

Model 40100 Series - 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 40100 Series - 2 1/2", 3", 4", 6", 8", 10"

**Wilkins Regulator Company**

Model 950 XLT - 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 950 - 2 1/2", 3", 4", 6", 8", 10"

**REDUCED PRESSURE PRINCIPLE ASSEMBLIES**

**Ames Company, Inc.**

Model 4000B - 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 4000 - 4", 6", 8", 10"  
Model 4000 SS - 2 1/2", 3", 4", 6"

**Febco Sales, Inc.**

Model 825Y - 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 825YA - 3/4", 1", 1 1/2", 2"  
Model 825RD - 2 1/2", 3", 4", 6", 8", 10"  
Model 860 - 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"  
Model 860 RP - 2 1/2", 3", 4", 6", 8", 10"

09. **PRESSURE VACUUM BREAKER ASSEMBLIES:** The assembly shall consist of one check valve with a vent to atmosphere, all contained within one body, along with an upstream and downstream shutoff valve. The assembly shall conform to ASSW 1020.
10. **DUAL CHECK VALVE DEVICES:** The device shall consist of two independently operating check valves. Required on all new water services. See Section 4 for more details. The assembly shall conform to ASSE 1024.
11. **DUAL CHECK VALVE WITH AN INTERMEDIATE ATMOSPHERIC VENT DEVICES:** The devices shall consist of two independently operating check valves with a vent to atmosphere. The assembly shall conform to ASSE 1012.
12. **ATMOSPHERIC VACUUM BREAKER DEVICES:** The device shall consist of one check valve with a vent to atmosphere. The assembly shall conform to ASSE 1001.
13. **HOSE BIBB VACUUM BREAKER DEVICES:** The device shall consist of two independently operating check valves with a vent to atmosphere. Required on all new water services. See Section 4 for more details. The assembly shall conform to ASSE 1011.
14. **ENVIRONMENTAL PROTECTION:** Any backflow preventer that is exposed to the natural environment (i.e. the elements, temperature, etc...) around the installation must be protected from said environment. Installation will not be deemed complete until approved environmental protection is in place.
15. **INSTALLATION:** Any installation of backflow preventors must be approved by the Director of Public Utilities or his assigns. Any installation that is deemed substandard must be reworked at no cost to Chatham County. An installation will not be deemed complete until a copy of a certified test has been received by Chatham County Public Works.

**CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS**

**WATER MAIN CONSTRUCTION**

**SECTION 6: BORING UNDER HIGHWAYS AND RAILROADS**

01. **SCOPE:** This section shall include furnishing all labor, tools, equipment and other incidentals required to bore casing pipe under highways or railroads.
02. **BORINGS:** Procedures for boring shall be in accordance with the best-accepted methods of the construction and as shown on the plans and described in these specifications. Casing pipes installed under highways and railroads shall be bored as shown on the detail drawings. Casings will be installed of the type, size, and thickness as specified herein or on the detail drawings.

A. **Boring Under Highways:** Lines installed under highways shall be bored as shown on the detail drawings contained in these specifications. Casings will be installed of the type, size, and thickness as specified herein or on the detail drawings. The Contractor shall be responsible for notifying the Department of Transportation at least five days prior to any contemplated work and for securing any required permits for performing the work. All work shall be accomplished under the supervision of the Engineer and the District Engineer of the Department of Transportation or his authorized representative.

1. **Carrier Pipe:** Carrier pipe used under highways shall be of an approved material and installed to the satisfaction of the District Engineer of the Department of Transportation. Carrier pipe shall be of the same material specified for water main construction unless otherwise noted.
2. **Casing Pipe:** The inside diameter of the casing pipe shall not be less than 2 inches greater than the largest outside diameter of the joints and couplings for carrier pipe less than 6" O.D., and 4" greater for carrier pipe 6" and larger. It shall, in all cases, be great enough to easily remove carrier pipe without disturbing the casing pipe.

Nominal D.I. Carrier Pipe Dia. (Inches)	Steel Casing		Min. Wall Thickness For Highways (Inches)
	Minimum O.D. (Inches)		
3	8.625		0.250
4	10.750		0.250
6	14.0		0.250
8	16.0		0.250

10	18.0	0.250
12	20.0	0.250
14	24.0	0.250
16	26.0	0.312
18	28.0	0.312
20	30.0	0.312
24	34.0	0.500

(c) Installation: The minimum depth from the roadway surface to the top of the casing pipe at its closest point shall be three feet. The casing pipe ends shall be sealed utilizing grant seal or other method approved by the Engineer. The casing pipe shall extend a minimum of 5' beyond the edge of pavement on either side unless otherwise noted on the plans or specified herein.

Contractors shall be required to provide shoring of boring pits and trenches more than 6 feet deep in accordance with the North Carolina Department of Transportation and Federal Occupational Health and Safety Act.

B. Borings Under Railroads: All work on railroad rights of way shall be done under the supervision of the Chief Engineer of the railroad, or his authorized representative, who shall be notified at least 15 days before construction is begun. In addition, this work shall only be done in the presence of the authorized representative of the Chief Engineer, and no methods shall be used that, in the opinion of the representative, could be hazardous to the railway.

1. Carrier Pipe: Carrier pipe and joints shall be of the material shown on the details of the railroad encroachment agreements or as approved by the Chief Engineer or his authorized representative.

2. Casing Pipe: The inside diameter of the casing pipe shall not be less than 2 inches greater than the largest outside diameter of the joints and couplings for the carrier pipe less than 6" o.d. and 4" greater for carrier pipe 6" and larger. It shall, in all cases, be great enough to easily remove carrier pipe without disturbing the casing pipe.

Steel pipe manufactured from steel having minimum yield strength of 35,000 psi and having a minimum permissible wall thickness as listed below shall be used as casing pipe.

Nominal D.I. Carrier Pipe Dia. (Inches)	Steel Casing Minimum O.D. (Inches)	Min. Wall Thickness For Railroads (Inches)
3	8.625	0.250
4	10.750	0.250
6	14.0	0.250
8	16.0	0.312
10	18.0	0.312
12	20.0	0.375
14	24.0	0.375
16	26.0	0.500
18	28.0	0.500
20	30.0	0.500
24	34.0	0.625

3. Installation: The depth from the base of the railway rail to the top of the casing at the closest point shall not be less than 5-1/2 feet. Also, there should not be less than 3 feet from the bottom of the side ditches to the top of the casing pipe. The casing pipe ends shall be protected from the entrance of foreign materials. The casing shall extend a minimum of 25 feet either side of the centerline of the railroad track unless otherwise noted on the plans or specified herein.

Contractors shall be required to shore all pits used for boring if it is over 6 feet deep.

- C. Casing Spacers: Casing spacer bands shall be 14-gauge steel of two-piece construction. Liners shall be minimum 0.90" thick PVC. Risers shall be 10-gauge steel MIG welded to band. Nuts bolts and washers shall be Stainless Steel. Runners shall be glass reinforced plastic spaced equally around the circumference. Casing spacer ferrous components shall be coated with corrosion resistant enamel paint. Casing Spacers shall be "off the shelf" as manufactured by BWM Company, Ford, Mueller or approved equal.

- D. Casing End Seals: The installation of casing seals shall be accomplished with the installation of a modular mechanical type consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the carrier pipe and the casing pipe. Casing End Seals shall be "Link-Seal" or approved equal.

CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS

WATER MAIN CONSTRUCTION

SECTION 7: CONSTRUCTION METHODS

01. **SCOPE:** The Contractor shall furnish all labor, tools, equipment and other incidentals required for the construction of the water distribution system as shown on the drawings and as specified herein.

The work shall include laying pipe and setting fittings, valves, hydrants, and services, pressure testing and sterilization of the water distribution system.

Materials shall be as specified in previous sections of these specifications.

02. **PIPE AND FITTINGS:** Pipe and fittings shall be installed as shown on the drawings as approved by Chatham County Utilities. No additional payment by Chatham County will be made due to location changes directed in the field by the Project Engineer unless approved by Chatham County Utilities.

A. **Trenching:** The trench shall be dug to the required alignment and depth as shown on the plans or directed by the Engineer, and only so far in advance of the pipe laying as the Engineer shall permit. The width of the trench shall be kept at a minimum. The depth of the trench shall generally be sufficient to allow a minimum of three feet of cover over the top of the pipe. The bottom of the trench shall be shaped by hand and shall support the pipe for the entire length. It shall be the responsibility of the Contractor to provide adequate bearing for all pipe lines laid in uncertain soil conditions. If the trench bottom should be softened by flooding, rain or other causes, the unsuitable material shall be removed and replaced with suitable material properly shaped and tamped to grade. The use of timber or other material to support the pipe is not permitted.

1. **Laying Conditions/Embedment:** All Ductile Iron and Polyvinyl Chloride (PVC) pipe shall be installed in Type 3 embedment. The pipe shall be bedded in 4" of loose soil. Backfill shall be lightly consolidated to the top of the pipe. Loose soil is defined as native soil excavated from the trench, free of rocks, foreign materials and frozen earth.

B. **Pipe Laying:** Water pipe shall be laid in conformance with the standards set forth by ANSI/AWWA C600-93 and/or ANSI/AWWA C605-94 or latest revisions. All water pipe shall be laid by experienced workmen with straight lines, even grades, and all joints shall be perfectly fitted. All pipe fittings, valves, hydrants, and

accessories shall be carefully lowered into the trench with suitable equipment in a manner that will prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Pipe and accessories shall be inspected for defects prior to their being lowered into the trench. Any defective, damaged or unsound material shall be repaired or replaced as directed by the Design Engineer or the Owner. All foreign matter or dirt shall be removed from the interior and machined ends of pipe and accessories before it is lowered into position in the trench. Pipe shall be kept clean by means approved by Chatham County, during and after laying. In the event that pipe defects are discovered or the pipe is not being installed in accordance with the manufacturers recommended installation all pipe laying activities shall be stopped until the magnitude or the cause of the problem has been identified or corrected.

1. Joining Mechanical Joint Pipe:

- a. Joining Existing Bell and Spigot to New Mechanical Joint: Due to the difficulty that may be encountered in attempts to make such a connection of this type, an adapter having a fitting bell and a M.J. socket may be used by the Contractor.
- b. Cleaning and Assembling Joints: Clean last 8" outside the spigot, and the inside of the bell of mechanical joint pipe to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint and then paint area clean with an approved soap solution. The ductile iron gland shall then be slipped on the spigot end of the pipe with the extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with thick edge toward the gland.
- c. Bolting of Joints: Push entire section of pipe forward to seat spigot end in the bell. Press gasket into place within the bell, being careful to have the gasket evenly located around the entire joint. Move ductile iron gland along the pipe into position for bolting, insert all bolts, and screw nuts up tightly with fingers. Tighten all nuts with a suitable (preferably torque-limiting) wrench. Tighten nuts that are spaced 180 degrees apart alternately in order to produce equal pressure on all parts of the gland.

2. Joining Rubber Gasket Pipe (Bell Tite, Tyton, or Equivalent):

- a. Cleaning Joint and Gasket: Clean gasket and spigot and inside of bell thoroughly to remove all dirt and other foreign matter.



- b. Inserting Gasket: Insert gasket furnished by the pipe manufacturer into the gasket seat in the bell. Gasket shall be properly seated in the grooves provided in the pipe bell.
- c. Lubricating Gasket and Spigot Pipe: Using a non-toxic vegetable soap, apply a film by hand to the inside surface of the gasket that comes into contact with the entering pipe and to the first 1" of the spigot end of the entering pipe. Use only lubricant specified by the pipe manufacturer.
- d. Final Assembling of Joint: Prior to final assembly of the joint the pipe gasket shall be inspected to ensure that the gasket is properly seated. Align entering pipe with the bell to which it is to be joined. Enter the spigot end into the bell until it just makes contact with the gasket. Apply sufficient pressure to force the spigot end past the gasket up to solid contact with the bell or until it achieves the proper alignment as indicated by the marking rings on the pipe. If the pipe assembly is not accomplished in accordance with the assembly instructions provided by the pipe manufacturer the pipe should be removed to check for proper positioning of the gasket and alignment of the pipe.
- e. Field Cutting Pipe: When it is necessary to field cut pipe with rubber gaskets, chamfer the cut end 1/8 inch x 30 degrees before inserting into a rubber gasket bell.
- f. Fittings: Fittings shall be installed where and as shown on the plans or as directed by the Engineer. All bends (1/16 to 1/4), y-branches, plugs and all other fittings requiring such shall be sufficiently backed, blocked, or braced to preclude the possibility of their blowing off the main.

03. **TRACER WIRE:** The Contractor shall be required to install Tracer wire for all water main installations.

- A. Locator wire is to be standard No. 12 gauge coated copper wire.
- B. Bury locator wire immediately above pipe.
- C. Location wire connections are to be a water tight connection. This may be done by using Twister DB Plus Waterproof wire connectors or an approved equal.
- D. The cost for this tracer wire shall not be paid for directly but shall be considered incidental to cost of water main installation.

E. Five feet of tracer wire slack shall be pulled to the outside of each in-line valve box as shown in the detail drawings for gate valve installations. Tracer Wire shall be affixed to each valve box by means of a stainless steel bolt, nuts and washer. Tracer Wire installation shall be performed in a manner not to cause any operational problems with the valve nor causing breaks in the locator wire.

04. **FIRE HYDRANTS AND VALVES:** Fire hydrants and valves shall be set as directed by the Chatham County and located as shown on the drawings. No additional payment will be made due to location changes directed in the field by the Chatham County.

A. Fire Hydrants: Fire hydrants shall be set where shown on the plans or as directed by the OWNER. The hydrants shall be set upon a bed of compacted crushed stone at least thirty-inches (30") square by ten inches (10") in depth. There shall be furnished and installed an approved restraint assembly to securely anchor the hydrant to the main line as shown on the detail contained in the project drawing details. When the hydrant is backfilled, washed stone or gravel shall be placed around the hydrant to a point just above the weep holes of the hydrant.

B. Valves: Valves shall be set and anchored with steel bars and concrete as shown on the detail sheet contained in the project detailed drawings. All valves set by the Contractor shall include a cast iron or ductile iron valve box set to grade encircled and protected by a precast concrete donut.

C. Adjustment of fire hydrant fittings and valves: Adjustment of fire hydrants and valves shown within Project limits shall be made by the Contractor in the field subject to the desire of the OWNER without any increase or decrease in the unit price for the Fire Hydrant Assembly. Fire Hydrants shall be set not higher than the bury line indicated on the lower hydrant barrel. All ductile iron pipe for the hydrant legs and extensions to bring the hydrant to grade shall be considered incidental to project costs and included in the unit price for the Fire Hydrant Assembly. All hydrants set vertically plumb 360 degrees around the hydrant barrel.

All hydrants shall receive two (2) exterior shop coats of fire hydrant red paint as specified by the AWWA C-502. In addition, one finish exterior coat of fire engine red paint shall be applied after construction operations are complete. The paint shall comply with the following schedule:

MANUFACTURER	SHOP PRIMER	FINISH COAT
Tnemec	37-77	Tnemec-Coat
Koppers	622	Glamortex
Pratt and Lambert	40.90	Vitralite Gloss

05. **COMPACTION:** All trenches and excavations shall be compacted to 95% density. Any density test requested by the OWNER or NCDOT shall be paid for by the Contractor. All trenches shall be compacted by mechanical means. Compaction shall be in accordance with AASHTO T-99 modified. The contractor shall supply density test as requested by Chatham County.

06. **INSTALLATION WITHIN NCDOT RIGHTS-OF-WAY:** All work performed within North Carolina Department of Transportation rights-of-way shall be performed in strict accordance with the NCDOT Construction and Maintenance Operations Supplement to the Manual on Uniform Traffic Control Devices and any other pertinent safety requirements. The Contractor shall be responsible for performing the work and adhering to the Right-of-Way Encroachment contract Standard and Special Provisions. A copy of the Standard Provisions and Special Provisions shall be on the project site at all times. The Contractor shall obtain a copy of the Right-of-Way Encroachment Agreement from the OWNER or Engineer. The Contractor shall also coordinate the procurement of any additional required bonds with NCDOT and notify NCDOT 48-hours prior to beginning construction.

07. **CONNECTIONS TO EXISTING MAINS:** The Contractor shall make connection to existing mains when and as directed by the Chatham County Utilities Department. In no case shall the Contractor shut off the water or operate the fire hydrants or gate valves of the existing distribution system without the expressed permission of the Chatham County. In the case it becomes necessary to delay the cut-off, such instructions shall be given and obeyed without recourse.

In making connections to the existing distribution system, valves shall be set as shown on the plan, or at such designated place as the Chatham County may direct. If due to unforeseen conditions, these locations have to be changed or additional valves or fittings added, the Contractor shall install the valves or fittings at the new locations this shall be done at no expense to Chatham County.

When connecting to existing Chatham County Water Mains by wet tap the Contractor shall provide the coupon from the tap to Chatham County.

08. **CONCRETE BLOCKING:** All turns, fittings, etc., that induces pressure which would cause separation of pipe, breakage, etc., shall be blocked with mixed 3,000 lb. concrete. Blocking shall be formed and poured in such a manner that the pressure to be exerted at the point of blocking shall be transferred to firm, undisturbed earth at a maximum load of 2,000 lbs, per square foot. The Contractor shall insure that blocking at all tees, bends, plugs, etc., shall be sufficient to contain all pressure exerted by the pipe up to 200 psi hydraulic pressure within the pipe, e.g., pressure at plug = 200 x (area of pipe in inches). Blocking shall be constructed as shown on the detail sheet contained in the project plans. The Contractor shall also be responsible for any damage or repairs caused by blowouts of any insufficiently blocked pipe.

09. **PIPE SEPARATION:** The following minimum pipe separations will be maintained: 12 inches vertical separation between crossing of sanitary sewer (including force main) and water main, and 10 feet horizontal separation between sanitary sewer (including force main) and water mains. If these separations cannot be maintained, ductile iron pipe will be used 10 feet either side of crossing and along entire length of line less than 10 horizontal feet or 18" vertical separation from water mains. The Contractor shall receive approval from the Engineer in the field before payment will be made at the ductile iron prices

10. **CLEANING OF WATER MAINS (Pigging):** The Contractor shall clean all new water mains installed in any project by using a flexible polyurethane swab ("pig"). Deviations in the pipe cleaning process must be approved by the Chatham County Utilities Department. The pig shall be of 5-lb/cf density polyurethane of the proper size for the water mains being cleaned.

The pig shall be inserted into the first section of pipe and shall remain there until construction of that line segment is completed. Cleaning shall be accomplished by propelling the pig down the water main by system pressure to the exit point as determined by the Contractor. After the pig exits the pipe, flushing shall be performed until the water is completely clear and the turbidity level is less than 1.0 NTU.

Cleaning of water mains with diameters larger than 12 inches or water mains that utilize butterfly valves shall be performed in the same manner excepting that the Contractor will be required to pig the main from valve to valve or in a manner acceptable to the Engineer and the Owner.

11. **PRESSURE AND LEAKAGE TESTING:** Hydrostatic pressure and leakage testing shall conform with **ANSI/AWWA C600-93** or latest revision for ductile iron water main and **ANSI/AWWA C605-94** or latest revision for polyvinyl chloride pipe. Pressure testing shall be performed on all pipe, valves, hydrants, and fittings. The test shall be conducted on line segments from shut valve to shut valve in segments not exceeding 5,000 linear feet. The Contractor shall provide a suitable pump for applying pressure and an accurate gauge for measuring the pressure and an Engineer approved method of determining volume of water used.

All newly laid pipe and any valved sections thereof shall be subject to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing or 200 psi (whichever is greater). At the same time the test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. The hydrostatic test shall be of at least two-hour duration. Removal of air shall be performed to the satisfaction of the Engineer through use of the air release valve assemblies (automatic and manual) and the fire hydrants. If determined necessary by Chatham County Utilities or the Design Engineer, the Contractor

shall install additional air taps to be abandoned after all air removal at no additional cost to the Owner.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (35 MPa or 0.35 bar) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time. No installation will be accepted if the leakage is greater than that determined by the following formulas:

When testing Ductile Iron Pipe:

$$L = \frac{SD \sqrt{P}}{133,200}$$

Where:

- L = allowable leakage, in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the leakage test, in pounds per square inch (gauge)

When testing Polyvinyl Chloride Pipe:

$$L = \frac{ND \sqrt{P}}{7,400}$$

Where:

- L = allowable leakage, in gallons per hour
- N = number of joints is length of pipeline tested
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the leakage test, in pounds per square inch (gauge)

When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. (0.0012 L/h/m) of nominal valve size shall be allowed.

Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.

All visible leaks are to be repaired, regardless of the amount of leakage.

Chatham County reserves the right to install Chatham County's pressure gauge onto the Contractor testing equipment at any time during the testing procedure. The Contractor shall be required to use a calibrated pressure gauge and meter during the testing process.

12.

**DISINFECTION OF WATER MAINS:** Disinfection of water mains shall be performed in accordance with the requirements of the **North Carolina Department of Environment, and Natural Resources, Rules Governing Public Water Systems, NCAC Title 15A, Subchapter 18C Section .1003.** and the requirements of **ANSI/AWWA C651-92** or latest revision. The pipe shall be sterilized in segments designated by the Contractor and subject to the approval of the Engineer.

All reasonable precautions shall be adhered to in protecting the interior of pipes, fittings, and valves against contamination. All openings in the pipeline shall be closed with watertight plugs at the end of the day's work or at other times when pipe laying has ceased. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. If dirt enters the pipe it shall be removed and the interior pipe surface swabbed with a five percent hypochlorite disinfecting solution.

A. Disinfection Procedure: The basis disinfection procedure consists of

1. Preventing contaminating materials from entering the water main during storage and construction.

Removing, by flushing or other means, those materials that may have entered the water main.

Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the main.

Protecting the existing distribution system from backflow due to pressure test and disinfection procedures.

Determining the bacteriological quality by laboratory test after disinfection.

Final connection of the approved new water main to the active distribution system.

The "tablet method" and the "slug method" of disinfection are not acceptable. The "continuous-feed method" as discussed in **ANSI/AWWA C651-92** shall be used to chlorinate the water mains.

B. Continuous-Feed Method of Chlorination: The continuous-feed method of chlorination consists of

1. Placing calcium hypochlorite granules in the main during construction.
2. Completely filling the main to eliminate air pockets.
3. Flushing the main to remove particulates.

4. Filling the main with potable water. The potable water shall be chlorinated so that after a 24-hour holding period in the main there will be a free chlorine residual of not less than 20 ppm.

Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main and at 500' intervals. The quantity of granules shall be as follows:

<u>Pipe Diameter (Inches)</u>	<u>Calcium Hypochlorite Granules (Ounces)</u>
4	0.5
6	1.0
8	2.0
12	4.0
16 and larger	8.0

The initial filling shall be at a rate such that water within the main will flow at a velocity no greater than 1 foot per second (fps). Precautions shall be taken to insure that air pockets are eliminated. Once the main has been completely filled with potable water and all air expelled, the main shall be flushed to remove particulates at a rate of not less than 2.5 fps. The discharge point for the flushing operation shall be coordinated with the Engineer.

The procedure for chlorinating the main shall begin with water being made to flow into the newly installed water main at a constant, measured rate. In the absence of a meter the rate may be approximated by a method approved by the Engineer (A hydrant meter is recommended). At a point not more than 10' downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 50-ppm free chlorine. The chlorine concentration should be measured at regular intervals using appropriate chlorine test kits.

Chlorine application shall not cease until the entire main (or isolated portion thereof) is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 20-ppm free chlorine.

1. Chlorine Application: The forms of chlorine that may be used in the disinfection operations are liquid chlorine conforming to **ANSI/AWWA B301**, sodium hypochlorite solution conforming to **ANSI/AWWA B300** and calcium hypochlorite granules or tablets conforming to **ANSI/AWWA B300**.

- (a) Liquid Chlorine: Liquid Chlorine shall be used only in combination with appropriate gas-flow chlorinators and ejectors and under the direct supervision of a person who is familiar with the physiological, chemical, and physical properties of liquid chlorine. Liquid chlorine may be used only

when appropriate safety practices are observed to protect working personnel and the public.

- (b) Sodium Hypochlorite Solution and Calcium Hypochlorite Granules: Hypochlorite solutions may be applied to the water to be chlorinated with a gasoline or electrically powered chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be able to withstand the corrosion caused by the concentrated chlorine solutions and the maximum pressures created by the pump.

C. Final Flushing: After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use.

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. (See **AWWA C-651 Appendix B** for neutralizing chemicals). Where necessary, Federal, State and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water. This effort shall be coordinated fully by the Contractor.

D. Bacteriological Tests: Twenty-four hours after final flushing to remove excess chlorine, representative water samples shall be taken from each water line segment for bacteriological quality tests in accordance with "Standard Methods for the Examination of Water and Wastewater". At least one sample shall be collected from every 1,200' of water main including one set from the end of the line and at least one set from each branch. No portion of the system shall be placed in operation until the tests are approved. If the presence of coliform bacteria is detected in the water samples, the section of pipe shall be re-sterilized and additional samples shall be taken.

If, during construction, trench water has entered the main, or if in the opinion of the Engineer, excessive quantities of dirt or debris have entered the main, bacteriological samples may be required at intervals of approximately 200 feet shall be identified by location. Samples shall be taken of water that has stood in the main for at least 72 hours after final flushing has been completed.

If the initial disinfection fails to produce satisfactory bacteriological samples, the main may be reflushed and shall be resampled. If check samples show the presence



of coliform organisms, then the main shall be rechlorinated by the continuous-feed of chlorination until satisfactory results are obtained.

13. **WATER FOR TESTING:** The Contractor shall be responsible for the cost of water used for testing. The OWNER shall install a meter to account for the volume of water used during the pressure testing, flushing and disinfection of the water mains being installed. The unit cost of water supplied by Chatham County shall be billed to the contractor at the prevailing per 1,000 gallon charge at the time of the testing.

CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS

WATER MAIN CONSTRUCTION

SECTION 8: SITEWORK ON WATER MAINS

01. **SCOPE:** This section shall include the clearing and grubbing of all required construction areas together with disposal of materials, site preparation, and clean up as specified herein.

02. **SITE PREPARATION:**

A. **Existing Facilities:** The Contractor shall provide protection for all existing structures, buildings, and utilities against all construction activity. The Contractor shall protect and preserve the Owner harmless against damage and claims resulting from these activities.

B. **Streets and Highways:** Effective barricades, danger signals and signs on all streets and in other locations where required for the protection of the work and the safety of the public, shall be provided, erected and maintained by the Contractor. Barricades and obstructions that encroach on, or are adjacent to, public rights of way shall be properly lighted between the hours of sunset and sunrise. The Contractor shall conform to all city, state and local laws and regulations in the use of streets and highways. The Contractor shall be responsible for all damages occurring due to neglect or failure to meet these requirements. When dictated by conditions that might endanger the public, a watchman shall be provided to fulfill the requirements stated herein. Upon determination that a proposed water main will be located within a NCDOT Right of Way the water main shall be constructed within the limits of the said right of way. The contractor shall not construct any portion of the water main outside of the NCDOT Right of Way for matters of convenience. Constructing water mains outside of the said right-of-way must be approved by Chatham County and proper easements must be obtained.

C. **Traffic Flow and Continuance of Services:** The work shall be arranged in a manner that will cause a minimum of disturbance to vehicular and pedestrian traffic. Adequate ingress and egress to both private and public property shall be provided by the Contractor during all stages of construction. Without written approval from the city or utility company, existing services shall not be interrupted by the construction work.

03.

**PRELIMINARY WORK:**

- A. Rights of Way: Adequate working space shall be cleared along the pipe lines and space shall be provided for control stakes and hubs. Trees and permanent structures not located within the right of way shall be removed only as directed.
- B. Valuable Trees and Shrubs: When the construction work involves the removal of valuable trees and shrubs on existing public rights of way, the work shall be done in cooperation with the county, or state.
- C. Protection of Private Property: The Contractor shall provide protection for privately owned trees and shrubs bordering the right of way and shall take full responsibility for any damage that does occur.
- D. Existing roads, subject to interference by the Contractor's work, shall be kept open in all cases. The Contractor shall provide, erect and maintain, at his own expense, effective barricades on which shall be placed acceptable warning and/or detour signs at each side of any road obstruction caused by the operations of the Contractor. All barricades shall comply with OSHA requirements and State or local laws, whichever is most strenuous.
- E. The Contractor shall protect all public roads and bridges which may be damaged by, interfered with, or given undue wear by reason of the work, and shall repair or replace them if damaged, at his own expense, to the satisfaction of governmental authorities and the Owner.
- F. When questions arise as to safe methods or suitable protection, the Contractor shall confer with the Owner but full responsibility for results shall rest with the Contractor.

04.

**FENCES AND GATES:**

- A. The Contractor shall not cut temporary openings or take down fences until he has contacted the property owner, tenant or occupant and arranged the ingress and egress to the right-of-way. All fences and gates removed for construction shall be replaced in like kind by the Contractor. Payment for fence and gate removal and replacement shall be the responsibility of the Contractor. Chatham County shall not be held responsible for any damages or claims resulting from the Contractor's negligence. Copies of any temporary construction easements and their terms shall be provided to Chatham County prior to construction.
- B. In each case where the fence is opened, braced posts shall be installed capable of holding the tension in the fence wires so that the adjacent fence spans will not

become slack. Where temporary openings are immediately adjacent to the corner post, the fence shall be firmly attached to the brace post, and the fence wire shall be removed or cut at the corner post. At other locations the fence openings shall be made by cutting the wires near one of the braced fence posts. In both the above cases, a gate shall be installed by the Contractor.

- C. The Contractor shall be held responsible for damage to crops, livestock, or other property caused by his failure to keep fences, gates, and gaps in proper condition. Damage claims resulting from the Contractor's negligence with respect to construction and maintenance and use of these gates, fences and gaps shall be the Contractor's full responsibility and Chatham County Utilities shall not be held responsible for negligence of the installing contractor.
- D. The continuity of electric fences shall be maintained at all times.

05. **DAMAGES AND COMPLAINTS:**

- A. The Contractor shall provide protection which, in the opinion of the Owner, will prevent damage to the property, such as lawns, roads, fences, buildings, drains, bridges and pipelines by passage of his equipment, and shall assume sole responsibility for damages thereby incurred and shall notify the Owner immediately if and when damage occurs. The Owner shall be promptly notified of all pipelines that are broken by the Contractor's operations and immediate arrangements made for repairs. Damage to property shall be repaired to a condition that is as good or better than original.
- B. The Contractor shall promptly comply with all reasonable requests of the landowners and tenants relative to access to right-of-way and to general conduct of his work; however, he shall not enter into any agreements with property owners or tenants that binds Chatham County Utilities on matters such as the saving of logs or firewood or the disposal of brush without prior approval of the Design Engineer. In cases of disagreement between any landowner or tenant and the Contractor, the Contractor shall notify the Design Engineer immediately and shall not perform any further operations against the objections of the property owner or tenant without prior approval of the Design Engineer.

- 06. **CLEARING AND GRUBBING:** Clearing and grubbing shall be performed in areas indicated and where required for construction. It shall include the complete removal and disposal of all brush, weeds, timber, stumps, rubbish and all other obstructions. All such material shall be removed to a depth of at least one foot below finished grade. In clearing and grubbing areas where excavation is done, all timber, roots, or stumps removed that are exposed by said excavation shall be removed to a depth of one foot below the excavated surface.

07. **DISPOSAL OF CLEARED AND GRUBBED MATERIAL:** All refuse from the clearing and grubbing operation shall be disposed by legal means.

08. **PAVEMENT REMOVAL AND REPLACEMENT:**

A. **Removal:** When pipe is to be laid in or across existing paved streets, driveways, sidewalks and swales, the pavement shall be cut to true and neat lines as directed by the Engineer. Power driven cutting saws are preferred; pavement breakers driven by air compressors are acceptable if approved by the Engineer. All broken pavement shall be removed before trenching is started.

B. **Replacement:** The pipe trench shall be backfilled with granular select material to within 8 inches of the pavement surface, compacted and finished per the plan details or as directed by the N.C. Department of Transportation. Base and sub-base shall be maintained in a workmanlike manner until the surface has been replaced in a manner consistent with the plans and specifications.

1. **Asphalt Replacement:** The edges of the asphalt shall be neatly trimmed to a new face and mopped with asphalt cement. The asphalt surface shall be placed and thoroughly rolled to a smooth, dense surface true to adjacent areas of the street. The asphalt surface course shall consist of Type I-2 bituminous concrete surface course in accordance with North Carolina Department of Transportation Specifications.

2. **Concrete Replacement:** Concrete replacement shall be performed in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures, 1991, Sections 848-1 through 848-3 and 850-1 through 850-3.

Cut areas shall be maintained by the Contractor in a safe, passable condition until paved. Should the area create a dusty condition, the Contractor shall remedy this condition by the use of water or calcium chloride. Special care shall be given to the areas cut in traffic lanes and intersections by placing crushed stone and maintaining in a smooth condition at the Contractor's expense.

C. **Curb and Gutter Replacement:** Existing curb and gutter removed, disturbed or destroyed by construction, shall be replaced or repaired in a manner consistent with North Carolina Department of Transportation Standard Specifications for Roads and Structures, 1991, Sections 846-1 through 846-3.

D. **State Highway Crossings:** All construction related to state highway crossings shall be in full compliance with all requirements of the permit and to the satisfaction of the Department of Transportation.

E. Culvert Replacement: All culverts that are damaged during construction shall be replaced in like size and material. Point repair on damaged culverts is not acceptable.

09. **RELATION OF WATER MAINS TO SEWERS:**

A. 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.

B. Crossing a Water Main Over a Sewer: Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18 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. The Contractor shall receive approval in the field from the Engineer before payment will be made at ductile iron prices.

F. 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.

11. **ARCHAEOLOGICAL**: If the Contractor, during the prosecution of work, encounters an unidentified archaeological or other cultural resource within the work area, the Contractor shall immediately stop work and notify the appropriate authority.

12. **METHODS OF MEASUREMENT**: The quantities to be measured under this item shall consist of the number of square yards of pavement replaced. The quantity shall include 8 inches of stone base and 2 inches of I-2 asphalt surface course. For this contract, the maximum trench width used for final measurement shall be four (4) feet.

CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS  
  
WATER MAIN CONSTRUCTION

**SECTION 9: SEEDING/TURFING and EROSION CONTROL**

01. **SCOPE:** This section shall include the furnishing of all labor, materials, equipment and incidental items to seed and establish a turf on all areas disturbed by the pipe laying operation.

All materials shall be of the best commercial quality available for the purposes specified.

02. **SEEDING:** Seed shall be furnished and sowed as follows:

Seeding and mulching shall be in accordance with Section 880 of the North Carolina Standard Specifications for Road and Structures. The following rates in pounds per acre shall apply:

**Clay Soil:**

100#	Kentucky 31 Tall Fescue or Alta Fescue
15#	Kenblue Bluegrass
500#	Fertilizer
4,000#	Limestone

\*\* May 1 to August 31: Add 10# Kobe or Korean Lespedeza and 10# Millet.

\*\* On cut and fill slopes 2:1 pr steeper add 30# Sericea Lespedeza from January 1 to December 31.

Quantities stated are in terms of total seed of the specified quantity. The two types of seed shall be mixed thoroughly prior to sowing.

All sowing of seed shall be completed within the time limit of the contract, or unless otherwise authorized by the Engineer. All seed shall be covered to an average depth of one-fourth (1/4) inch. Seeding mixtures in manicured areas or residential yards shall be consistent with the original vegetative condition.

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

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

Lime shall be applied at the rate of 4,000 lbs. per acre and mixed thoroughly with the topsoil, as the seedbed is prepared.

04. **FERTILIZER:** Applying Fertilizer - Fertilizer shall be distributed at the rate to provide 500 pounds per acre (Complete mix fertilizer - 10 parts nitrogen, 20 parts phosphoric acid and 20 parts potash), after topsoil is returned to the area and thoroughly mixed with the topsoil immediately before planting.

05. **ESTABLISHING TURF:** The establishment period shall continue for six (6) months from the date of seeding. The Contractor shall be responsible for maintenance, protection, repairing and resulting re-seeding and re-fertilization for six (6) months after initial seeding. No direct payment will be made for this work.

06. **MULCHING:** Where indicated on the plans or as described in encroachment agreements, mulch shall be applied as described herein. Prior to applying seed and mulch the graded area shall be free of sticks, twigs, rocks and other debris.

A. Materials:

1. Mulch Material: Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Low grade, musty, spoiled, partially rotted hay, straw, or other materials unfit for animal consumption will be acceptable. Mulch materials, which contain matured seed of species which would volunteer and be detrimental to the proposed overseeding or to surrounding farmland, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advance stage of decomposition as to smother or retard the planted grass, will not be acceptable.

2. Straw: Straw shall be the threshed plant residue of oats, wheat, barley, rye or rice from which grain has been removed as approved by the Engineer.

3. Asphalt Binder: Asphalt binder material shall conform to the requirements of **AASHTO M140**, Type SS-1, or RS-1 as appropriate.

B. Mulching: Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch shall be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.



Mulch material shall be furnished, hauled and evenly applied on the area shown on the plans or designated by the Engineer. Straw shall be spread over the surface to a uniform thickness at the rate of three (3) tons per acre to provide a loose depth of not less than 1-1/2 inches nor more than three (3) inches. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than one (1) inch or more than two (2) inches.

B. Securing Mulch: The mulch shall be held in place by asphalt binder on all slopes greater than 3 to 1 or as directed by the Engineer. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied.

C.  
D.

Care and Repair:

1. The Contractor shall care for the mulched area until final acceptance of the project.
2. The Contractor shall be required to, at his expense, repair or replace any mulching that is defective or becomes damaged until the project is finally accepted.
3. If the "Asphalt Spray" method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8.0 gallons per 1,000 square feet, or as directed by the Engineer, with a minimum of 6.0 gallons and a maximum of 10 gallons per 1,000 square feet, depending on the type of mulch and the effectiveness of the binder securing it. Bituminous binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than four (4) feet from the surface of the mulch and uniform distribution of the bituminous material shall be required. A pump or an air compressor of adequate capacity shall be used to ensure uniform distribution of the bituminous material. "Asphalt Spray" shall not be applied on concrete driveways, curbing, retaining walls, planters, fire hydrants nor any other permanent structure.

07. MANICURED AREAS (SOD):

A. Scope: The goal of sodding, where specified, is to return disturbed manicured lawns to their original vegetative condition, and to return the area to an aesthetically pleasing environment.

Vegetative restoration (sodding or seeding) shall be done as the work progresses.

All existing ornamental grass stands (commercial or private lawns) may be carefully taken up, protected and replaced to their original condition or the Contractor may elect to install new sod of the same type. In most instances the areas requiring sod restoration should be readily determinable by the Contractor based on preconstruction conditions. Questionable areas shall be restored in the manner (sodded or seeded) determined by the Engineer to be appropriate.

Any area disturbed without Owner authorization will be restored by the Contractor at his own expense. In all cases the Contractor will guarantee a stand of grass over the entire area.

The work to be done to acquire the necessary vegetative cover shall include but is not specifically restricted to appropriate tilling of the area, the application of fertilizer and lime for areas to be seeded, placement of sod, or sowing of seed and placing of a straw mulch to hold the seed and soil in place until germination and growth occur.

After bringing the area to be sodded or seeded to proper grade, the entire area shall be tilled to a minimum depth of four (4") inches by disking, harrowing or other approved means.

Following tilling, all large debris and stones shall be removed to the satisfaction of the Engineer and the surface leveled.

The Contractor shall provide general care for the restored areas as soon as the sod has been laid (or seeded and mulched), and such care shall continue until final inspection and acceptance of the work. All restored areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

B. Sodding: Sod furnished by the Contractor shall have good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials which might be detrimental to the development of the sod or to future maintenance. At least 70 percent of the plants in the cut sod

shall be composed of the existing lawn species, and any vegetation more than six (6") inches in height shall be mowed to a height of (3") inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not more than two (2") inches.

The sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than two (2") inches. Sod sections or strips shall be cut in uniform widths, not less than ten (10") inches, and in lengths of not less than eighteen (18") inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stored in an unrolled condition, irrigated, and protected from exposure to air drafts and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least four (4") inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen when replacing it shall work from ladders or treated planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sod sections. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one (1") inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around the manholes and

inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than 1 vertical to 2 1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than twelve (12") inches in length and have a cross-sectional area of not less than 3/4 square inch. The pegs shall be driven flush with the surface of the sod.

Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner which will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

08. **INSTALLATION:** Permanent erosion control shall be performed as follows:

- A. All disturbed areas shall be dressed to typical sections and plowed to a depth of 5 inches. The top 2 inches shall be pulverized to provide a uniform seedbed. NOTE: Lime should be applied before plowing operation.
- B. Lime, seed, and fertilizer shall be applied with necessary equipment to give uniform distribution of these materials. The hand/bucket method is not acceptable. Following are rates and kinds of these materials to be applied per acre.
- C. Seeded area shall be cultipacked to firm seedbed and cover seed.
- D. Grain straw shall be applied over seeded areas as a mulch base. Ground shall not be visible when riding by a mulched area if proper application is achieved. Thick clumps of straw are not permissible as a uniform coverage is expected.
- E. Mulched area shall be tacked with asphalt where required to hold straw in place.
- F. Ditch treatment shall be used in areas where steep grades could cause ditch erosion. Use of jute mesh, excelsior matting, or fiberglass roving is acceptable. Ditch treatment should be installed before mulching operation.
- G. The use of temporary erosion control measures shall be included to prevent siltation of waterways and adjacent property. The use of silt basins, brush barriers, and temporary seeding, and mulching, as needed is recommended.

09. **SEDIMENTATION AND EROSION CONTROL:** The Contractor is instructed to control sedimentation runoff by methods approved by the Engineer and OWNER during the course of construction of this project. The Contractor is reminded that all work shall meet all applicable requirements of the rules and regulations of erosion and sediment control as

published by the Department of Natural Resources – Land Quality Section. The Contractor shall be responsible for adhering to the seeding and mulching requirements as contained in the Erosion and Sedimentation Control permit and/or the NCDOT Encroachment Agreement. If due to the size and location permits are not required then the Contractor shall comply with the items outlined in these Specifications. The construction sequence for sedimentation and erosion control is as follows:

- A. Begin pipe laying activity.
  - B. Road shoulders shall be seeded and mulched as per the specifications within 30 working days of pipe installation on all portions of the project. Approval of final grade for disturbed road shoulders must be received from North Carolina DOT District Engineer prior to seeding and mulching.
  - C. Install erosion control device as detailed in project plans as directed by the Engineer.
  - D. Call for on-site inspection by the sedimentation and erosion control inspector.
  - E. When construction is complete and all road shoulders are stabilized, call for inspection by the sedimentation and erosion control office.
  - F. When the site is approved, remove temporary silt fence and sediment basins and seed and mulch resulting disturbed areas.
  - G. When vegetation is established call for final site inspection.
10. **MOWING:** No mowing will be required.

**CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS**

**WATER MAIN CONSTRUCTION**

**SECTION 10: DIRECTIONAL BORING - HDPE PIPE**

01. **SCOPE:** This specification covers high-density polyethylene (PE 3408) pressure pipe intended for the transmission of potable water.
- Unless otherwise noted, the materials listed below are acceptable to the Owner for use. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from the Owner's Engineer.
- All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
02. **SUBMITTALS:** The Contractor shall submit to the Engineer six (6) copies of all submittal data for review and/or approval. Submittals shall include at a minimum: (1) the manufacturer's name, (2) type of material, (3) ASTM, ANSI, AWWA or other quality standard and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all pipe materials prior to commencing construction.
- The Contractors shall submit to the Engineer four (4) copies of a certificate of inspection from the pipe manufacturer that the pipe supplied has been inspected at the plant and meets the requirements of these specifications.
03. **PIPE DELIVERY, STORAGE AND HANDLING:** Units shall be delivered, handled, and maintained in a manner to avoid damage to the pipe. The pipe shall be stored in an open area on high, well-drained land not subject to flooding, mud or other means of contamination.
04. **HIGH DENSITY POLYETHYLENE PIPE:**
- A. General: Materials used for the manufacturing of polyethylene pipe and fittings shall be PE 3408 High Density Polyethylene (HDPE) meeting the ASTM D3350 cell classification of 345434C.
- The material used in the production of potable water pipe shall be approved by the National Sanitation Foundation (NSF).

B. Pipe Thickness: The material shall have a minimum Hydrostatic Design Basis (HDB) of 1600 psi at 73°F when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.

Polyethylene pipe shall be manufactured in accordance with AWWA C906 for sizes 4" through 54".

Permanent identification of piping service shall be provided by co-extruding longitudinal blue stripes into the pipes outside surface. The striping material shall be the same material as the pipe material except for color.

C. Joints: Butt fusion or Electrofusion welded in accordance with ASTM D3261.

D. Marking: The net weight, pressure class or nominal thickness, sampling period and manufacturer shall be marked on each pipe.

05. METHOD OF MEASUREMENT: Pipe shall be measured per linear foot, complete in place and accepted, including the furnishing of all labor, tools, materials, and equipment necessary for trenching, laying, jointing, testing, backfilling, connections to existing mains, and all other necessary incidentals.

**CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS**

**WATER MAIN CONSTRUCTION**

**SECTION 11: DIRECTIONAL BORING - INSTALLATION**

01. **SCOPE:** This section includes the installation of the discharge main by guided boring, including connecting to the existing discharge main. The Contractor will furnish all labor, components, materials, tools and appurtenances necessary or proper for the performance and completion of the contract.
- A. **General Description of Method:** Guided boring is a method of trenchless construction using a surface launched steerable drilling tool controlled from a mobile drilling frame, and includes a field power unit, mud mixing system and mobile spoils extraction system. The drilling frame is sited and aligned to bore a pilot borehole that conforms to the planned installation of the main. The drilling frame is set back from an access pit that has been dug (typically at the location of a proposed manhole or other appurtenance) and a high-pressure fluidjet toolhead that uses a mixture of bentonite clay and water is launched. Pits are normally dug at the start point and endpoint of the proposed pipe installation and are used to align the toolhead, attach other equipment, and to collect and remove excess spoils. Using an electronic guidance system, the toolhead is guided through the soil to create a pilot borehole. Upon reaching the endpoint joint, the toolhead is removed and a reamer with the product pipe attached is joined to the drill string and pulled back through the borehole. In large diameter installations, pre-reaming of the borehole will usually be done prior to attaching the product pipe for the final pullback. A vacuum spoils extraction system removes any excess spoils generated during the installation. The connections, manholes or other appurtenances are then completed at both the start point and endpoint locations and the surface restored to its original condition.
- B. **Qualifications:**
1. Guided boring Contractors will have actively engaged in the installation of pipe using guided boring for a minimum of three years.
  2. Field supervisory personnel employed by the Guided Boring Contractor will have at least three years experience in the performance of the work and tasks as stated in the contract document.
- C. **Submittals:**



1. Submit documentation showing three years of guided boring experience. Information must include, but not be limited to, date and duration of work, location, pipe information (i.e., length, diameter, depth of installation, pipe material, etc.), project owner information, (i.e., name, address, telephone number, contact person), and the contents handled by the pipeline (water, wastewater, etc.).
2. Submit a list of field supervisory personnel and their experience with guided boring operations. At least one of the field supervisors listed must be at the site and be responsible for all work at all times when guided boring operations are in progress. Guided boring operations will not proceed until the resume(s) of the Contractor's field supervisory personnel have been received and reviewed by the Project Engineer.
3. Submit the following drawings and documents:
  - a. Working drawings and written procedure describing in detail the proposed method of installation. This will include, but not be limited to, size, capacity and setup requirements of equipment; location and siting of drilling and receiving pits; dewatering if applicable; method of fusion and type of equipment for joining pipe; type of cutting tool head; and method of monitoring and controlling line and depth. If the Contractor determines that modifications to the method and equipment as stated in the submittal is necessary during construction, the contractor will submit a plan describing such modifications, including the reasons for the modification.
  - b. Bentonite drilling mud products information (MSDS); special precautions necessary; method of mixing and application; and method of removing spoils.

D. Site Conditions:

1. Drilling operations must not interfere with, interrupt or endanger surface and activity upon the surface.
2. Contractor must comply with all applicable jurisdictional codes and OSHA requirements.
3. When rock stratum, boulders, underground obstructions, or other soil conditions that impede the progress of drilling operations are encountered, the Contractor and Engineer shall review the situation and jointly determine the feasibility of continuing drilling operations.

02.

MATERIALS:

A. Material requirements:

1. Pipe and fittings.
  - a. High Density Polyethylene Pipe (HDPE) and fittings will be used in accordance with the materials specifications. All additional appurtenances such as tees, gaskets, flange adaptors, etc. will meet the material specifications. The Contractor will supply the pipe and fittings and will include its price in the bid. All pipe installed by guided boring will be joined by an approved butt fusion or electrofusion technique according to the manufacturers specifications.
  - b. HDPE pipe shall be produced from resins with a material designation PE34408, and a cell classification PE3344434 as specified within ASTM D3350, and dimensions and workmanship as specified by ASTM F714. It will also meet the requirements of AWWA ASTM D3350. Pipe will be legibly marked at intervals of no more than five feet with the manufacturer's name, trademark, pipe size, HDPE cell classification, appropriate legend such as SDR 11, ASTM D3035, AWWA C901 or C906, date of manufacture and point of origin. Pipe not marked as indicated above will be rejected.
2. Drilling fluid.
  - a. Drilling fluid will be a mixture of water and bentonite clay. The fluid will be inert. The fluid should remain in the tunnel to ensure the stability of the tunnel, reduce drag on the pulled pipe, and provide backfill with the annulus of the pipe and tunnel.
  - b. Disposal of excess drilling fluid and spoils will be the responsibility of the Contractor who must comply with all relevant regulations, right-of-way, work space and permit agreements. Excess drilling fluid and spoils will be disposed at an approved location.

The Contractor is responsible for transporting all excess drilling fluid and spoils to the disposal site and paying any disposal costs. Excess drilling fluid and spoils will be transported in a manner that prevents accidental spillage onto roadways. Excess drilling fluid and spoils will not be discharged into sanitary or storm drain systems, ditches or waterways.

- c. Drilling fluid returns (caused by fracturing of formations) at locations other than the entry and exit points will be minimized. The Contractor will immediately clean up any drilling fluid that surfaces through fracturing. Clean up of excess drilling fluid shall be accomplished by the means mobile spoils removal equipment.
- d. Mobile spoils removal equipment capable of quickly removing spoils from entry or exit pits and areas with returns caused by fracturing will be present during drilling operations to fulfill the requirements of paragraphs b and c above. The Contractor shall not commence drilling operations without the presence of drilling fluid removal equipment. All excess drilling fluid shall be removed from the site(s).
- e. The Contractor will be responsible for making provisions for a clean water supply for the mixing of drilling fluid.
- f. The contractor shall contain all drilling fluids from the site until such time that the excess fluid may be removed from the site by mobile spoils removal equipment.
- g. At no time shall the contractor allow excess drilling fluids to drain into water bodies such as streams, rivers, lakes, wetlands etc..

03. **EXECUTION:**

A. General:

1. The Engineer shall be notified immediately if any obstruction is encountered that stops the forward progress of drilling operations.
2. Dewatering of pits and excavations must meet the general provisions and specifications for new water main construction in effect at Chatham County. The type of dewatering method will be at the option of the Contractor. When water is encountered, the Contractor must provide a dewatering system of sufficient capacity to remove water, keeping any excavations free of water until the backfill operation is in progress. Dewatering shall be performed in a manner that removal of soil particles are held to a minimum.

B. Preparation:

1. Excavate required pits in accordance with the working drawings.
2. The drilling procedures and equipment shall provide protection of workers, particularly against electrical shock. As a minimum, grounding mats, grounded equipment, hot boots, hot gloves, safety glasses and hard hats shall be used by crewmembers. The drilling equipment shall have an audible alarm system capable of detecting electrical current.
3. Removal of trees, landscaping, pavement or concrete shall be performed as specified.

C. Guided Boring Operations:

1. Equipment.
  - a. The drilling equipment must be capable of placing the pipe within the limits indicated on the contract plans. The drilling equipment shall also be capable of a minimum 79,000 pounds of pull back force.
  - b. Guided boring equipment shall consist of a surface launched steerable drilling tool controlled from a mobile drilling frame, and include a field power unit, mud mixing system and mobile spoils extraction system.
  - c. The number of access pits shall be kept to a minimum and the equipment must be capable of boring the following lengths in a single bore. The guided boring system will have the capability of boring and installing a continuous run without intermediate pits of a minimum distance for the following pipe diameters:

<u>Product Pipe Size</u>	<u>Minimum Boring Distance</u>
1 – 1 ½ inches	500 feet
2 – 4 inches	450 feet
6 inches	400 feet
8 inches	350 feet
10 – 18 inches	300 feet

d. The guidance system shall have the capability of measuring vertical (depth) position, horizontal position and roll. The guidance system must meet the following specifications in soft homogenous soils:

<u>Accuracy</u>	
Vertical position:	
± 1 inch at	18-96 inches of depth
± 2 inches at	97-144 inches of depth
± 4 inches at	145-180 inches of depth
± 6 inches at	181-300 inches of depth
± 10 inches at	301-480 inches of depth

Horizontal position:	
± 2 inches at	18-96 inches of depth
± 4 inches at	97-144 inches of depth
± 6 inches at	145-180 inches of depth
± 12 inches at	181-300 inches of depth
± 24 inches at	301-480 inches of depth

e. Equipment set-up requirements shall be prepared by the Contractor and submitted to the Engineer per the requirements as stated under "Submittals."

f. Required Safety Equipment: During drilling operations all equipment shall be effectively grounded and incorporate a system that protects operating personnel from electrical hazards. The system shall be equipped with an audible alarm that can sense if contact is made with an energized electric cable. Proper operation of the alarm system will be confirmed prior to the drilling of each tunnel. All equipment will be connected to ground with a copper conductor capable of handling the maximum anticipated fault current. Crew members operating drilling equipment and handling rods will do so while standing on grounded wire mesh mats, ensuring that all equipment is grounded, and wearing hot boots, hot gloves, safety glasses and hard hats. Crewmembers operating handheld locating equipment will wear hot boots.

g. Equipment set-up requirements and locations shall be determined by the Contractor and submitted to the Engineer per the requirements as stated under "Submittals."

2. Pilot Hole Boring.

- a. The entry angle of the pilot hole and the boring process will maintain a curvature that does not exceed the allowable bending radii of the product pipe.
- b. Alignment Adjustments and Restarts.
  - (1) The Contractor shall follow the pipeline alignment as shown on the Drawings, within the specifications stated. If adjustments are required, the Contractor shall notify the Engineer for approval prior to making the adjustments.

3. Installing Product Pipe

- a. After the pilot hole is completed, the Contractor shall install a swivel to the reamer and commence pullback operations. Pre-reaming of the tunnel may be necessary and is at the option of the Contractor.
- b. Reaming diameter will not exceed 1.5 times the diameter of the product pipe being installed.
- c. The product pipe being pulled into the tunnel will be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.
- d. Pullback forces will not exceed the allowable pulling forces for the product pipe.
- e. The Contractor shall allow sufficient lengths of product pipe to extend past the termination point to allow connections to the diffuser assembly. Pulled pipe will be allowed 24 hours of stabilization prior to making tie-ins. The length of extra product pipe will be at the Contractor's discretion.
- f. The contractor shall allow at a minimum of 20 linear feet of directional drilled pipe on each end of the installation. The additional pipe lengths shall be on a parallel plane with the existing grade at the point of connection to the Ductile Iron or PVC main.

- E. Clean-up: The Contractor shall maintain the work site in a neat and orderly condition throughout the period of work and after completing the work at each

site, remove debris, surplus material and temporary structures erected by the Contractor. The site shall be restored to a condition equal to the existing condition prior to being disturbed.

- F. As-Builts: The Contractor shall provide to the Engineer a bore plan (boring log) to provide the as-built condition of the bore. This information shall include the pipe depth at intervals of 50 lf which shall indicate the horizontal alignment with respect to a horizontal baseline.

**CHATHAM COUNTY  
WATER SYSTEM  
DETAILED SPECIFICATIONS  
WATER MAIN CONSTRUCTION**

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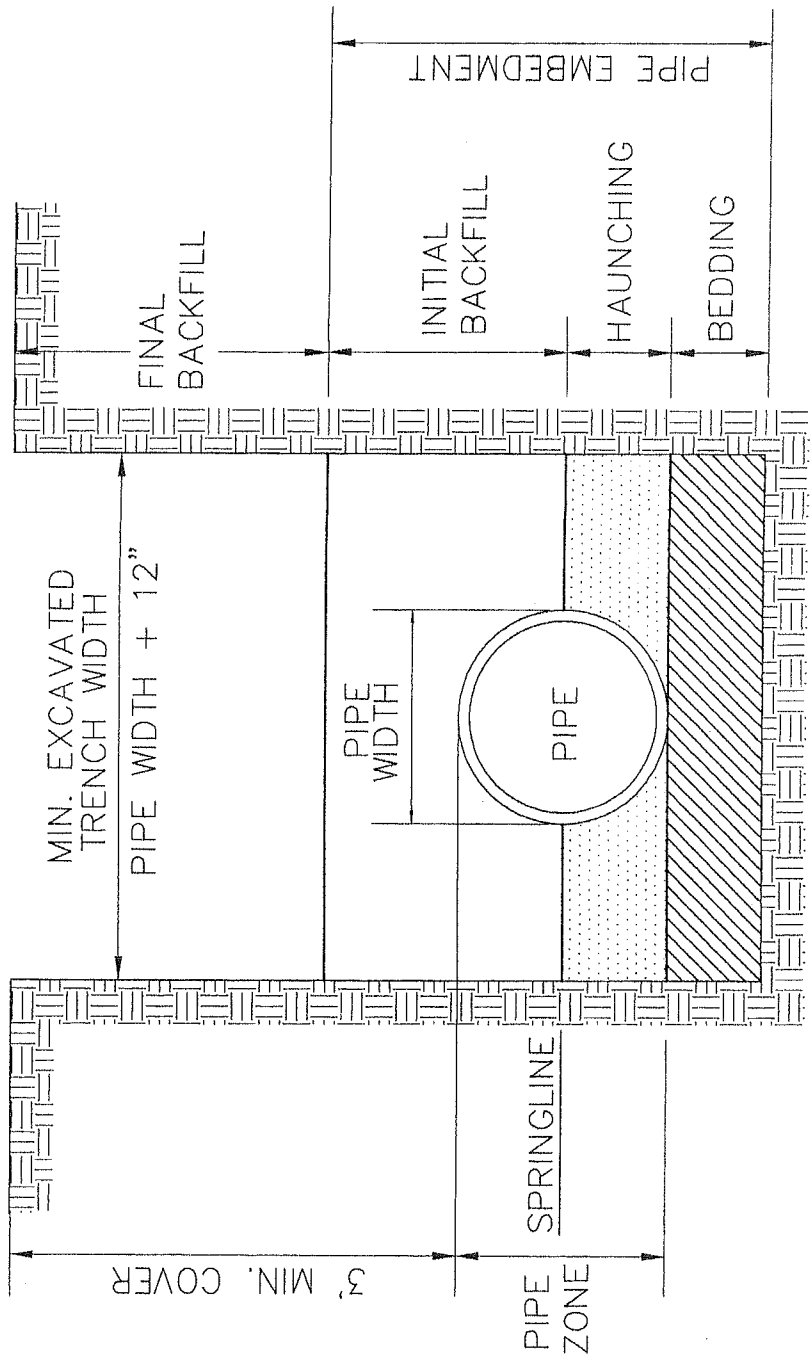
**APPENDICES:**

Appendix "A" – Project Detail Drawings



NOTE:

BEDDING SHALL BE SMOOTH TRENCH BOTTOM, OR COMPACTED LOOSE FILL MATERIAL AS REQUIRED TO PROVIDE A FIRM, STABLE AND UNIFORM SUPPORT FOR THE FULL LENGTH OF PIPE.

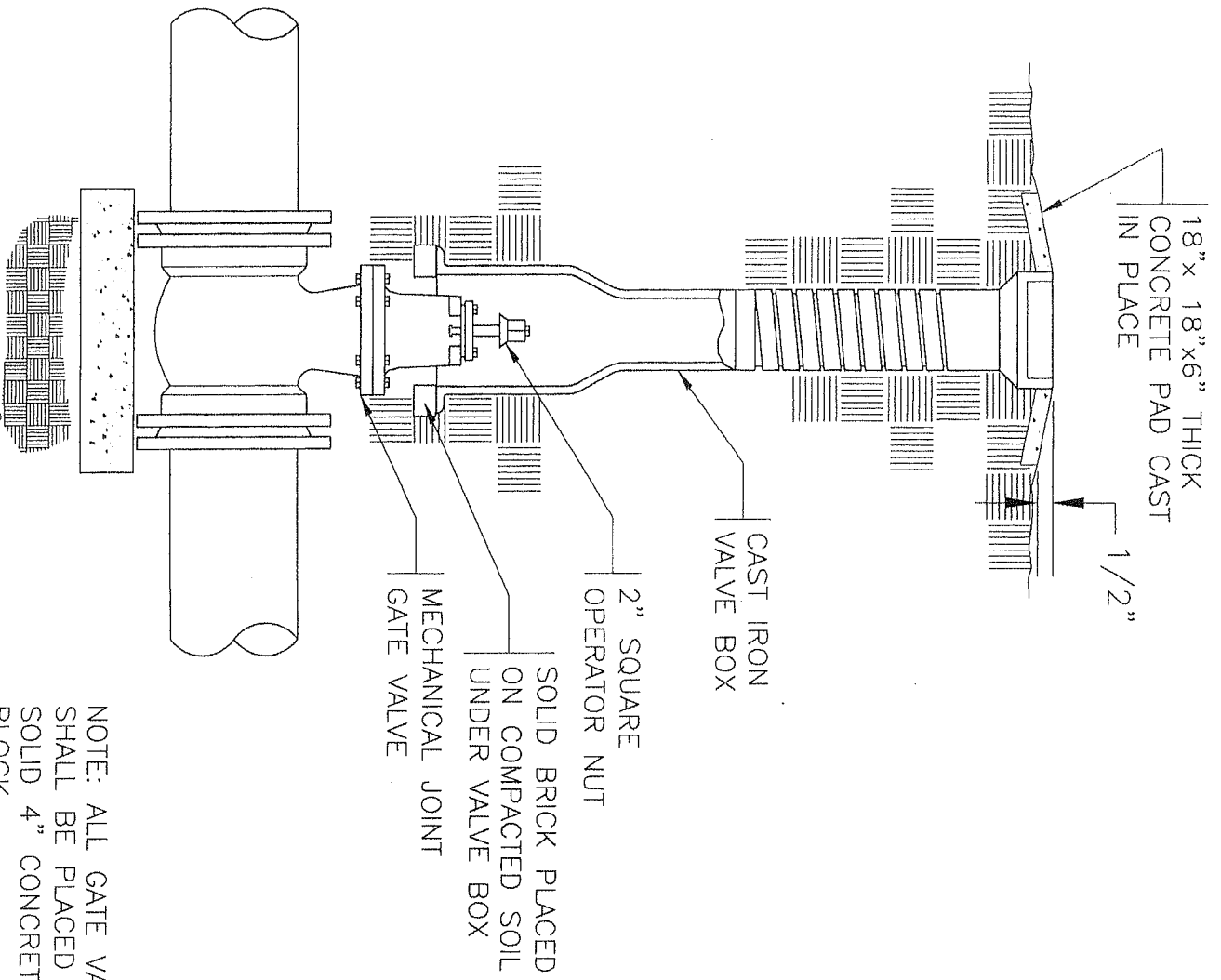


TRENCH DETAIL

N.T.S.



CHATHAM COUNTY  
WATER SYSTEM DETAIL



NOTE: ALL GATE VALVES  
SHALL BE PLACED ON A  
SOLID 4" CONCRETE  
BLOCK.

GATE VALVE ASSEMBLY

N.T.S.



CHATHAM COUNTY  
WATER SYSTEM  
DETAIL

18"x18"x6" THK.  
CONCRETE PAD  
CAST IN PLACE

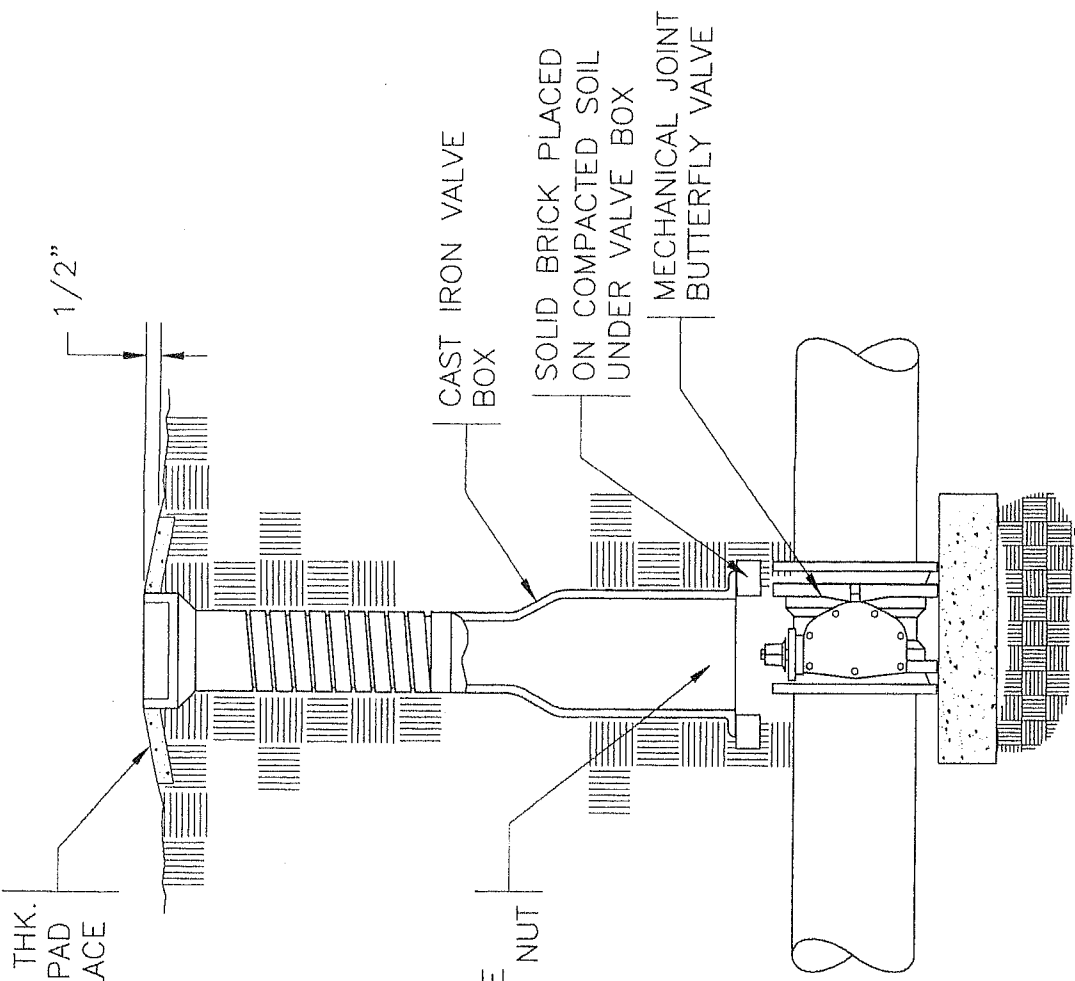
1/2"

2" SQUARE  
OPERATOR NUT

CAST IRON VALVE  
BOX

SOLID BRICK PLACED  
ON COMPACTED SOIL  
UNDER VALVE BOX

MECHANICAL JOINT  
BUTTERFLY VALVE



NOTE:

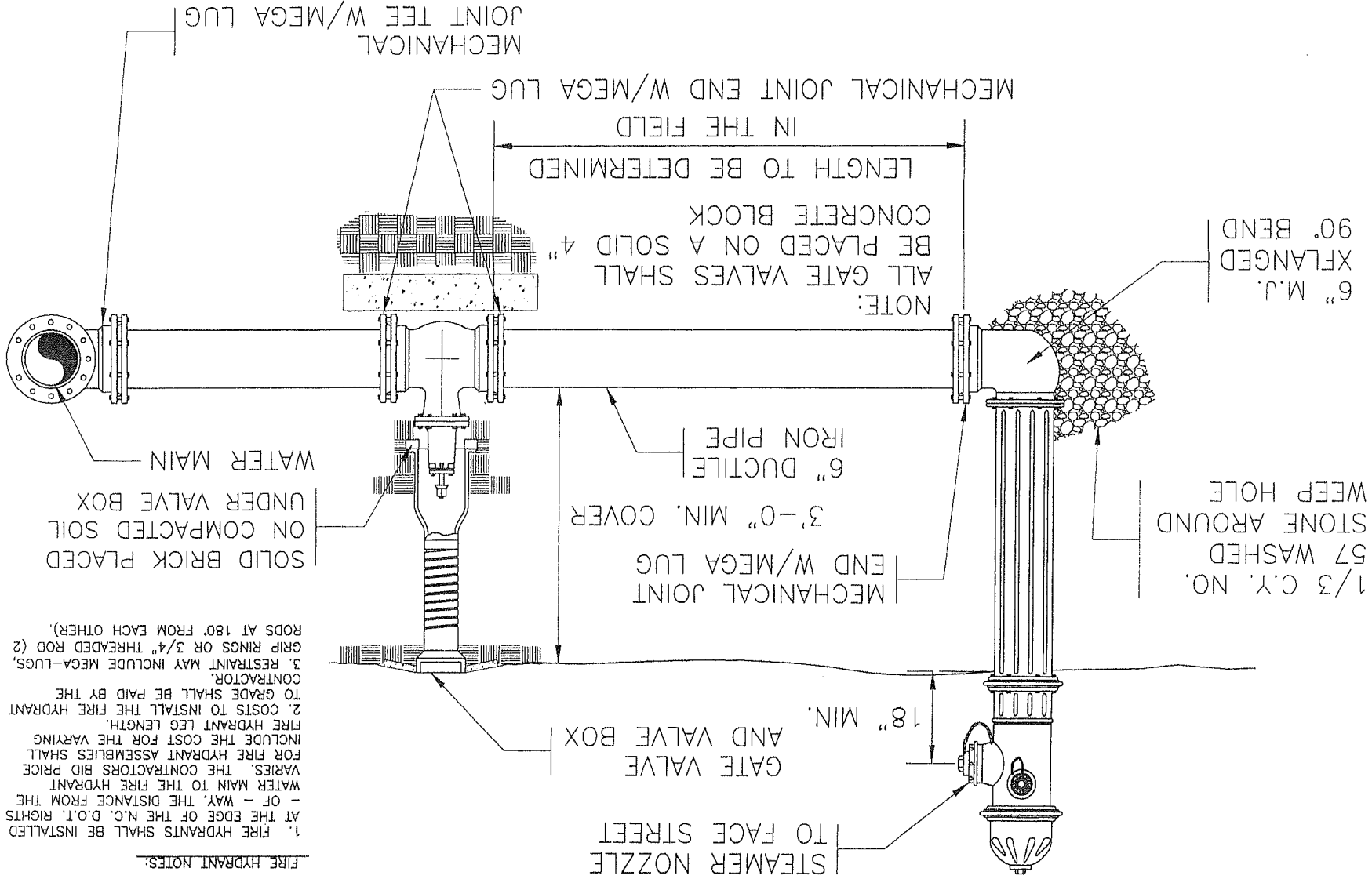
ALL GATE VALVES SHALL BE  
PLACED ON A SOLID 4"  
CONCRETE BLOCK (CMU)

BUTTERFLY VALVE ASSEMBLY

N.T.S.



CHATHAM COUNTY  
WATER SYSTEM DETAIL



FIRE HYDRANT NOTES:

1. FIRE HYDRANTS SHALL BE INSTALLED AT THE EDGE OF THE N.C. D.O.T. RIGHTS - OF - WAY, THE DISTANCE FROM THE WATER MAIN TO THE FIRE HYDRANT VARIES. THE CONTRACTORS BID PRICE FOR FIRE HYDRANT ASSEMBLIES SHALL INCLUDE THE COST FOR THE VARYING FIRE HYDRANT LEG LENGTH.
2. COSTS TO INSTALL THE FIRE HYDRANT TO GRADE SHALL BE PAID BY THE CONTRACTOR.
3. RESTRAINT MAY INCLUDE MEGA-LUGS, GRIP RINGS OR 3/4" THREADED ROD (2 RODS AT 180° FROM EACH OTHER).

18"x18"x6" THICK  
CONCRETE PAD  
CAST IN PLACE

1/2"

CAST IRON  
VALVE BOX

SOLID BRICK  
PLACED ON  
COMPACTED  
SOIL UNDER  
VALVE BOX

MECHANICAL JOINT  
TAPPING SLEEVE

TAPPING  
VALVE

6 CUBIC FEET  
CONCRETE MIN.

TAPPING SLEEVE  
AND VALVE ASSEMBLY  
N.T.S.



CHATHAM COUNTY  
WATER SYSTEM DETAIL

18"x18"x6" THK.  
CONCRETE PAD  
CAST IN PLACE  
OR PRE-CAST

1/2"

CAST IRON  
VALVE BOX

NOTE: ALL GATE VALVES  
SHALL BE PLACED ON A  
SOLID 4" CONCRETE  
BLOCK.

MECHANICAL JOINT  
TAPPING SLEEVE

SOLID BRICK PLACED  
ON COMPACTED SOIL  
UNDER VALVE BOX

TAPPING VALVE

1' MIN.

RESTRAINED JOINT 90° BENDS

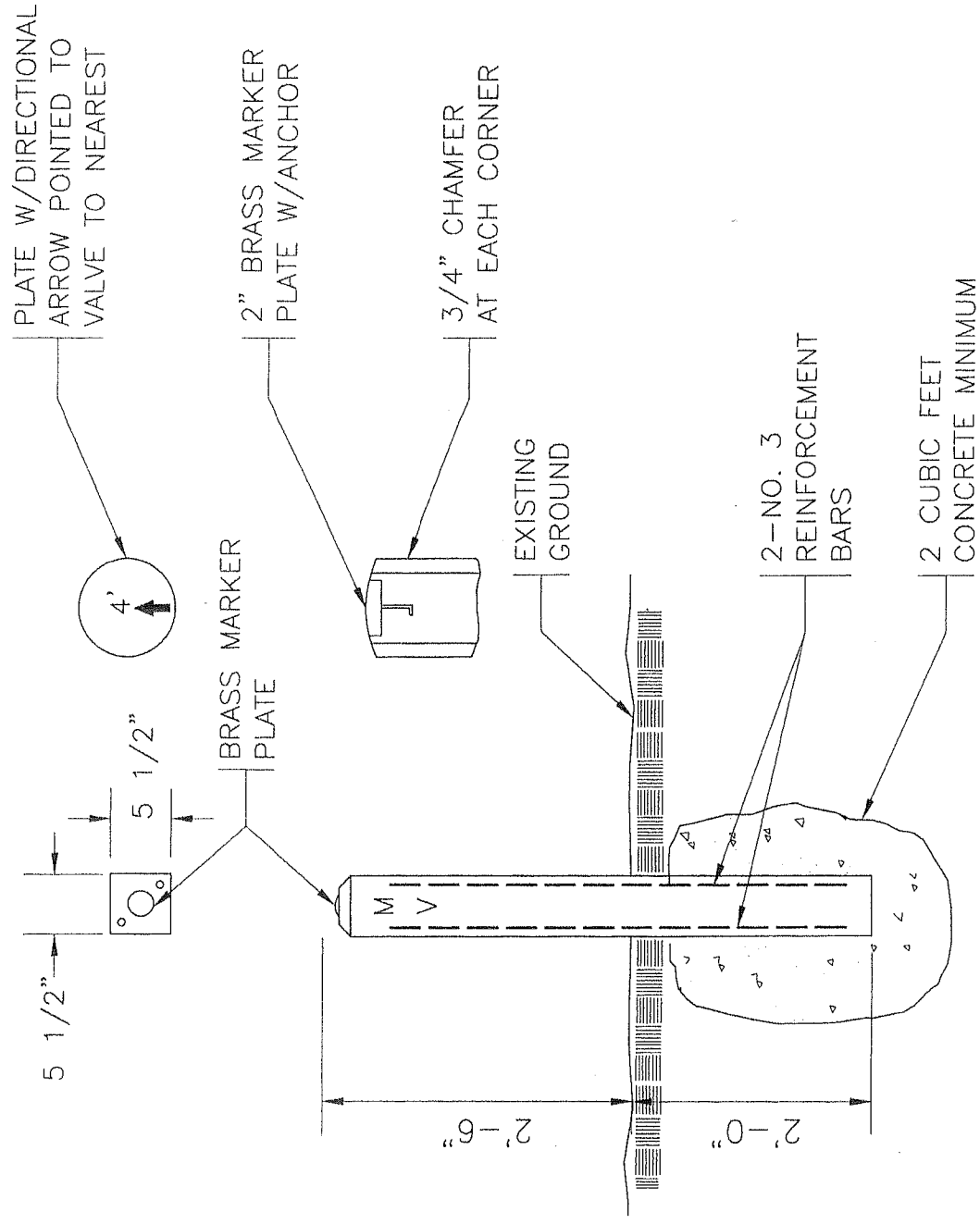
## WRAP AROUND TIE-IN ASSEMBLY



CHATHAM COUNTY  
WATER SYSTEM DETAIL

NOTES:

- 1.) INSTALL MARKER POSTS ON EDGE OF THE DOT R/W LINE.
- 2.) PROVIDE MARKER POSTS AT ALL LINE VALVES.
- 3.) ABBREVIATIONS STAMPED ON POST AS FOLLOWS:  
MV = MAIN VALVE      BO = BLOW OFF VALVE

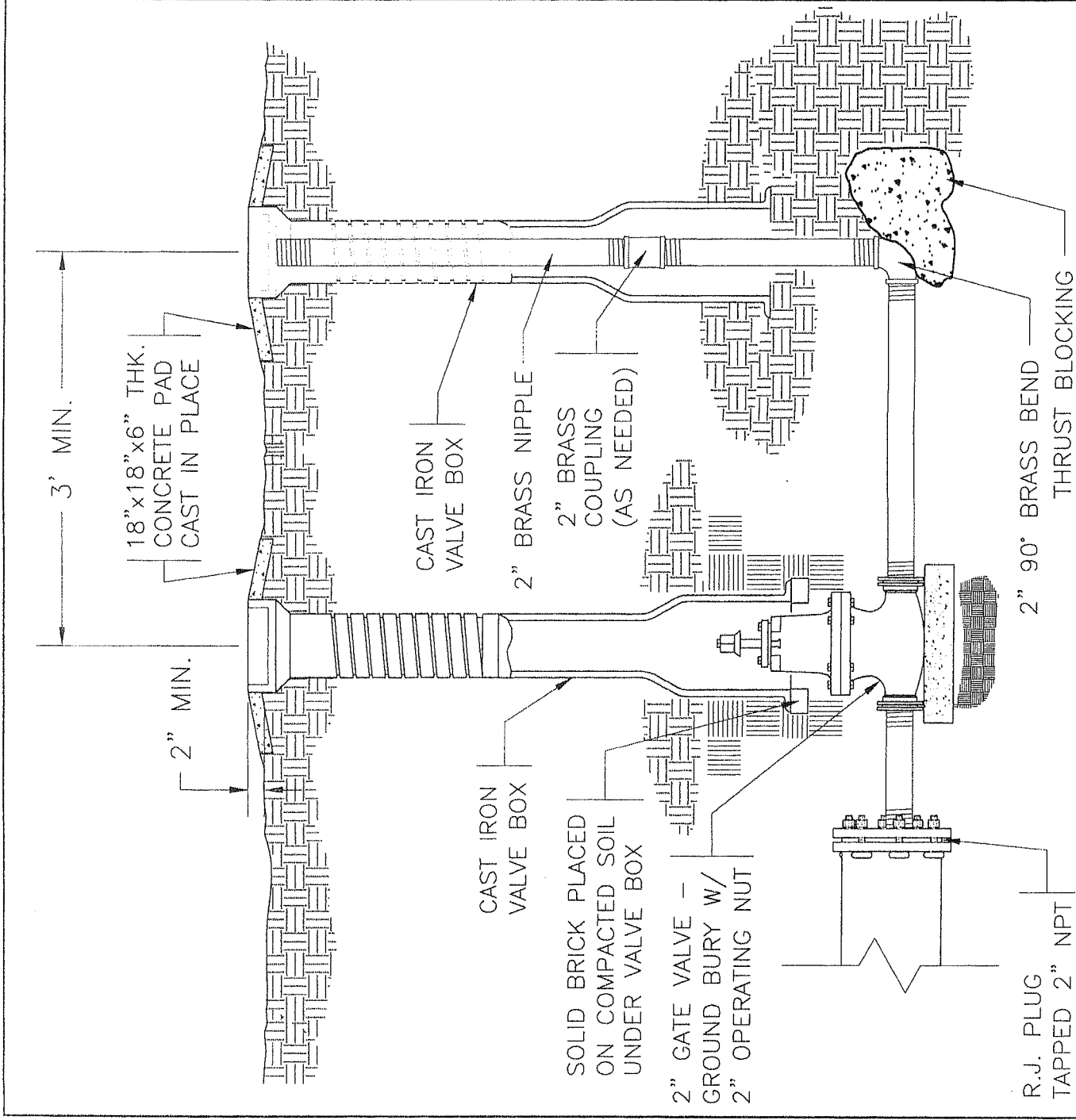


VALVE MARKER POST DETAIL

N.T.S.



CHATHAM COUNTY  
WATER SYSTEM DETAIL



NOTE: ALL GATE VALVES SHALL BE PLACED ON A SOLID 4" CONCRETE BLOCK.

**TYPICAL 2" BLOWOFF ASSEMBLY  
AT END OF WATER MAIN**

N.T.S.

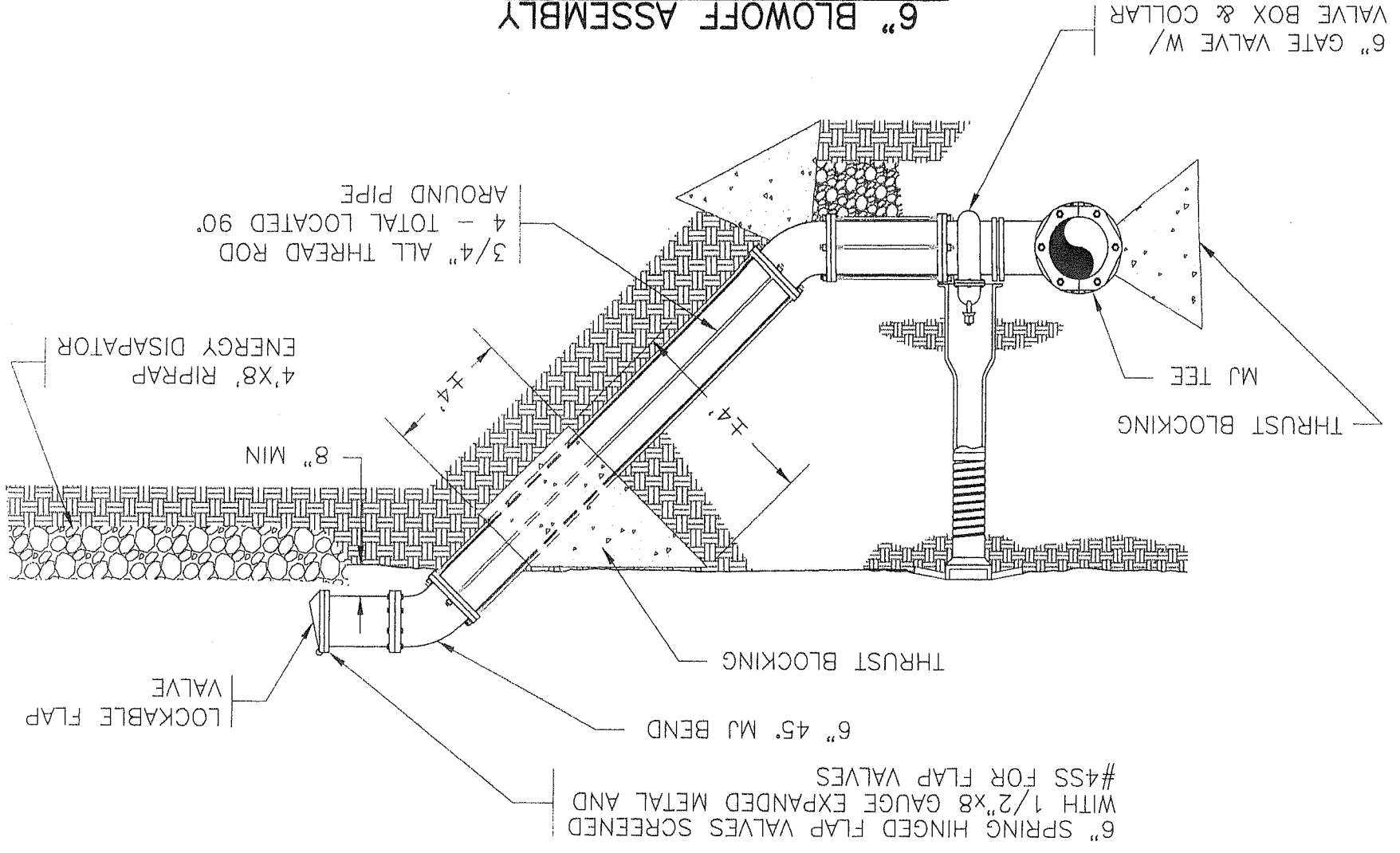


CHATHAM COUNTY  
WATER SYSTEM DETAIL





6" BLOWOFF ASSEMBLY  
N.T.S.





# TYPICAL BORING AND SPIDER DETAIL

N.T.S.

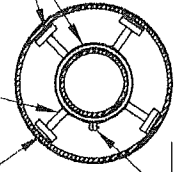
CHATHAM COUNTY  
WATER SYSTEM DETAIL

CARRIER PIPE SPIDER SIZE  
DETERMINED BY SIZE OF  
STEEL CASING AND  
CARRIER PIPE.

HEAVY DUTY STEEL SKIDS (4)

SPIDER, BY SPIDER MFG.  
OR APPROVED EQUAL

BOLTS TO  
PIPE

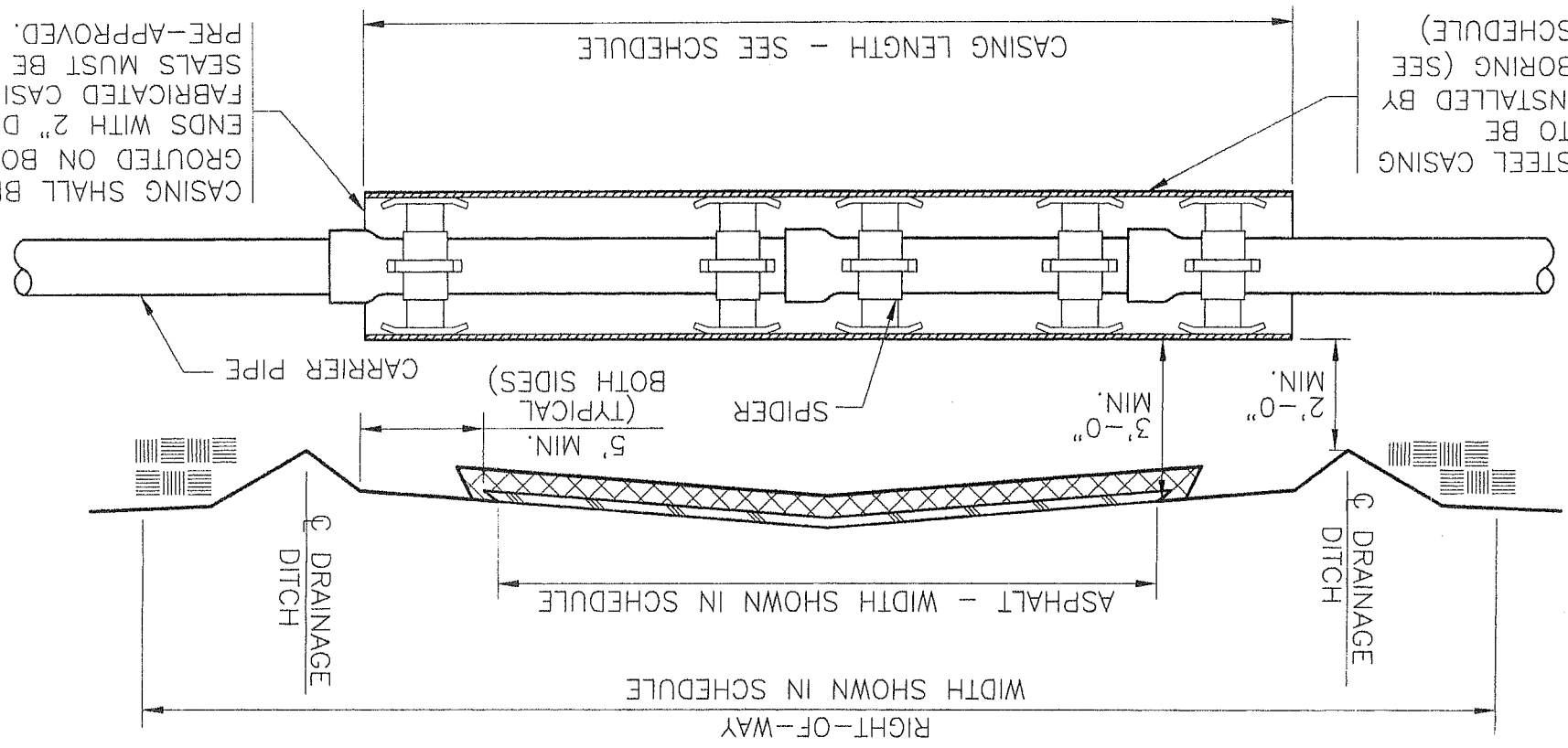


NOTE:  
CONTRACTOR SHALL COMPLY WITH ALL  
REQUIREMENTS OF THE "POLICIES AND  
PROCEDURES FOR ACCOMMODATING  
UTILITIES ON HIGHWAY RIGHTS-OF-WAY"  
AS PREPARED BY N.C.D.O.T.

CASING SHALL BE  
GROUTED ON BOTH  
ENDS WITH 2" DRAIN  
FABRICATED CASING  
SEALS MUST BE  
PRE-APPROVED.

STEEL CASING  
TO BE  
INSTALLED BY  
BORING (SEE  
SCHEDULE)

CASING LENGTH - SEE SCHEDULE



RIGHT-OF-WAY  
WIDTH SHOWN IN SCHEDULE

ASPHALT - WIDTH SHOWN IN SCHEDULE

Q DRAINAGE  
DITCH

Q DRAINAGE  
DITCH

5' MIN.  
(TYPICAL)  
BOTH SIDES)

SPIDER

3'-0"  
MIN.

2'-0"  
MIN.

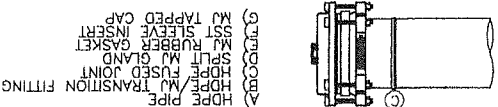
CARRIER PIPE



**CHATHAM COUNTY  
WATER SYSTEM DETAIL**

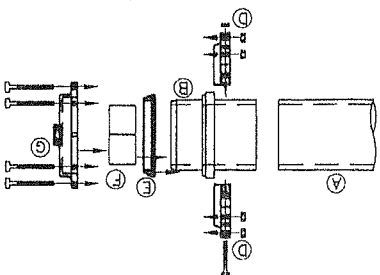
**HDPE/MJ TRANSITION  
ASSEMBLY**  
N.T.S.

ASSEMBLED

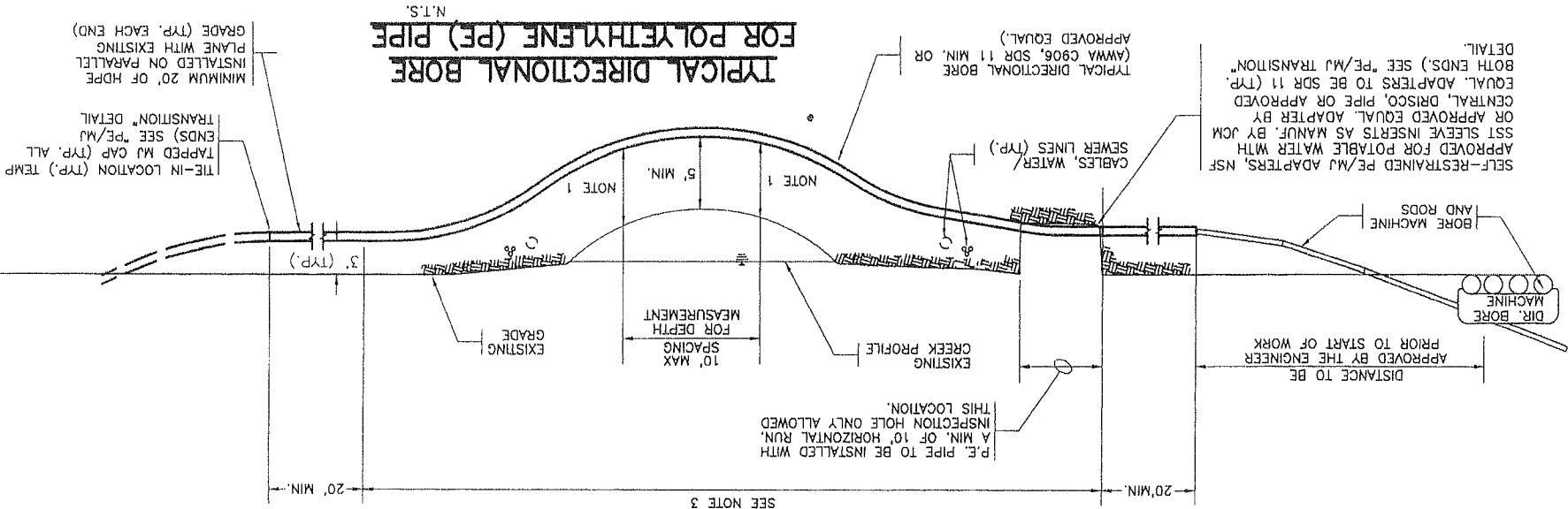


- (A) HDPE PIPE
- (B) HDPE/MJ TRANSITION FITTING
- (C) HDPE FUSED JOINT
- (D) SPLIT MJ GLAND
- (E) MJ RUBBER GASKET
- (F) SST SLEEVE INSERT
- (G) MJ TAPPED CAP

PRE-ASSEMBLY



**TYPICAL DIRECTIONAL BORE  
FOR POLYETHYLENE (PE) PIPE**  
N.T.S.



MINIMUM 20' OF HDPE  
INSTALLED ON PARALLEL  
PLANE WITH EXISTING  
GRADE (TYP. EACH END)  
TAPED MJ GAP (TYP. TEMP.  
THE-IN LOCATION (TYP.))  
ENDS) SEE "PE/MJ  
TRANSITION" DETAIL

P.E. PIPE TO BE INSTALLED WITH  
A MIN. OF 10' HORIZONTAL RUN.  
INSPECTION HOLE ONLY ALLOWED  
THIS LOCATION.

DISTANCE TO BE  
APPROVED BY THE ENGINEER  
PRIOR TO START OF WORK

BORE MACHINE  
AND RODS

SELF-RESTRAINED PE/MJ ADAPTERS, NSF  
APPROVED FOR POTABLE WATER WITH  
SST SLEEVE INSERTS AS MANUF. BY JCM  
OR APPROVED EQUAL ADAPTER BY  
CENTRAL DRISCO, PIPE OR APPROVED  
EQUAL ADAPTERS TO BE SDR 11 (TYP.  
BOTH ENDS.) SEE "PE/MJ TRANSITION"  
DETAIL.

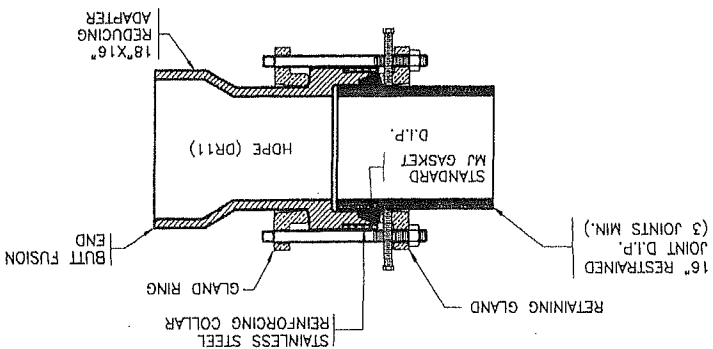
TYPICAL DIRECTIONAL BORE  
(AWWA G906, SDR 11 MIN. OR  
APPROVED EQUAL)

CABLES WATER/  
SEWER LINES (TYP.)

SEE NOTE 3

- NOTES:
1. A PROFILE AND PLAN SHALL BE PROVIDED FROM ENTRY TO EXIT FOR EACH DIRECTIONAL BORE SECTION BY THE DIRECTIONAL BORE CONTRACTOR.
  2. ALL FUSED HDPE PIPE SHALL BE AIR TESTED PRIOR TO BORING.
  3. ALL BORE SECTIONS SHALL BE HYDROSTATICALLY TESTED PER SPECIFICATION STANDARDS UPON COMPLETION OF INSTALLATION AND PRIOR TO PLACING THE WATER MAIN ON-LINE.
  4. LENGTH OF CROSSING, LOCATION OF INSPECTION/OBSERVATION EXCAVATION, NUMBER OF P.E. PIPE JOINTS, LOCATION OF BORE MACHINE, AUGER ENTRANCE LOCATION, AND THE-IN POINTS ARE TO BE APPROVED BY THE ENGINEER PRIOR TO ANY START OF WORK.
  5. THIS DETAIL IS ALSO APPLICABLE TO STREAMS, WETLANDS, LARGE STORM DRAINS, AND SIMILAR APPLICATIONS FOR DIRECTIONAL BORE WITH POLY-ETHYLENE PIPE.
  6. THE BORE DEVELOPED FOR THE LEAD IN END OF THE PIPE SHALL BE KEPT AT A MINIMUM DIAMETER FOR THE PIPE INSTALLATION. THE LEAD IN END SHALL BE PULLED THROUGH WITHOUT THE M.J. FLANGE ATTACHED FOR LARGER THAN 6" PIPE INSTALLATIONS. THE M.J. FLANGE FOR SAID LEAD IN END SHALL BE INSTALLED AFTER THE PIPE INSTALLATION WITH THE USE OF A SPLIT M.J. FLANGE PER THE DETAIL ON THIS DRAWING.
  7. CONTRACTOR SHALL FURNISH TO THE ENGINEER THE AS-BUILT LOCATION OF THE BORE IN ACCORDANCE WITH THE SPECIFICATIONS FOR DIRECTIONAL BORING.

**HDPE BY MECHANICAL  
JOINT REDUCING ADAPTER**  
N.T.S.



16" RESTRAINED  
JOINT D.I.P.  
(3 JOINTS MIN.)

STAINLESS STEEL  
REINFORCING COLLAR

RETAINING GLAND

BUTT FUSION

18"X16"  
REDUCING  
ADAPTER

HDPE (DR11)

D.I.P.

STANDARD  
MJ GASKET



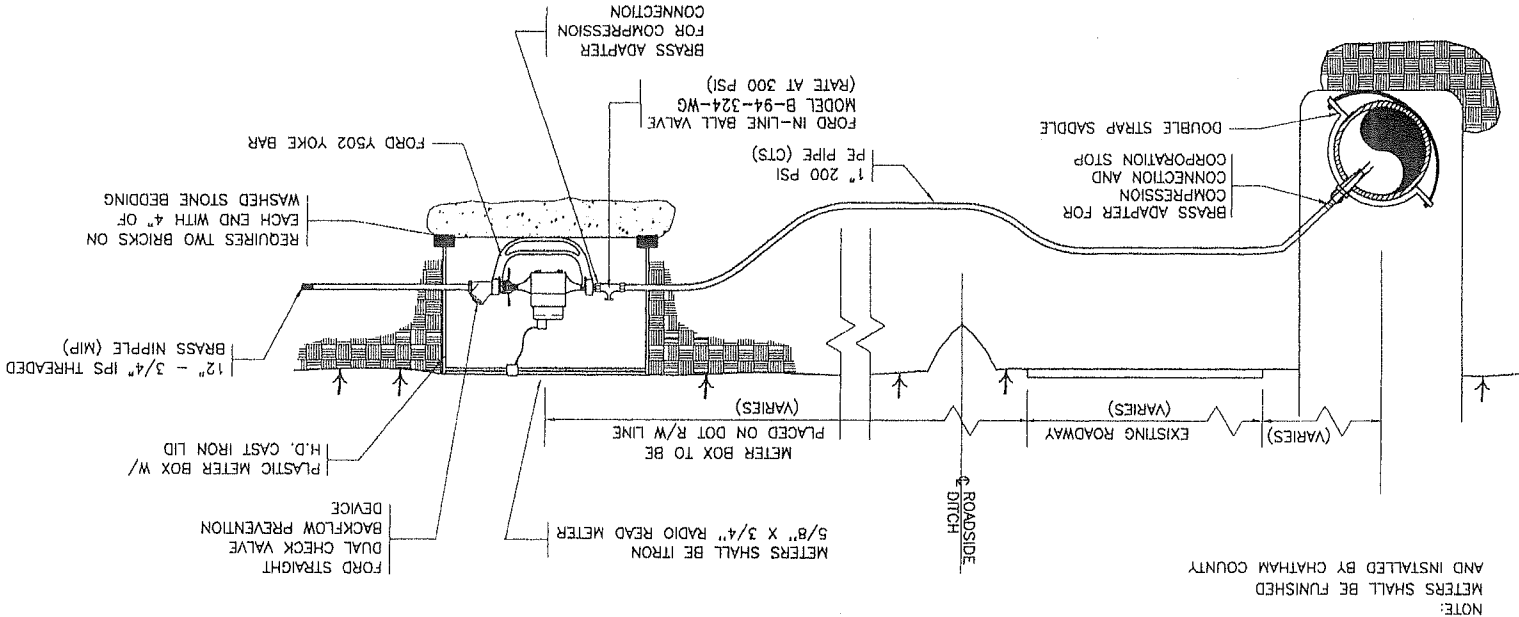
CHATHAM COUNTY  
WATER SYSTEM DETAIL



TYPICAL 3/4" SERVICE CONNECTION

N.T.S.

NOTE: METER TYPE TO BE DETERMINED BY CHATHAM COUNTY



CHATHAM COUNTY  
WATER SYSTEM DETAIL

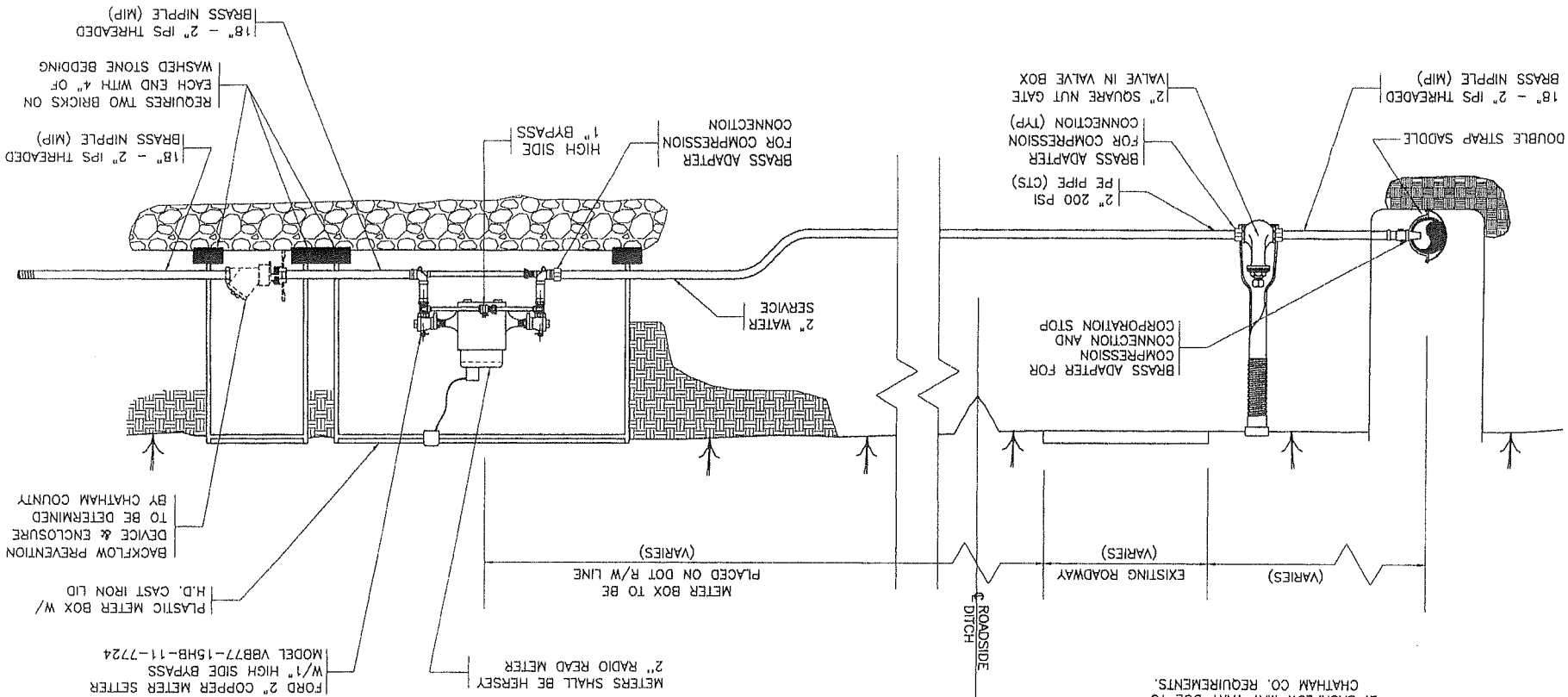


D-12A

TYPICAL 2" SERVICE CONNECTION

N.T.S.

NOTE:  
METER TYPE TO BE DETERMINED BY CHATHAM COUNTY



- NOTES:
1. METERS SHALL BE FURNISHED BY CHATHAM CO. AND INSTALLED BY CHATHAM CO.
  2. BACKFLOW MAY VARY DUE TO CHATHAM CO. REQUIREMENTS.

IRON READER SHALL BE  
COATED W/ BLACK  
BITUMINOUS FINISH

WEIGHT:

COVER - 2 1/2 LBS

BODY - 7 1/2 LBS

PLASTIC LID WITH  
IRON READER SHALL  
HAVE THE WORDS  
"WATER METER" CAST  
INTO LID

METER BOXES SHALL  
BE COMPATIBLE WITH  
HERSEY RADIO READ  
METERS

COVER SNAP -  
IN LOCKING  
RECESS

3" X 4" PIPE SLOT  
(EACH END)

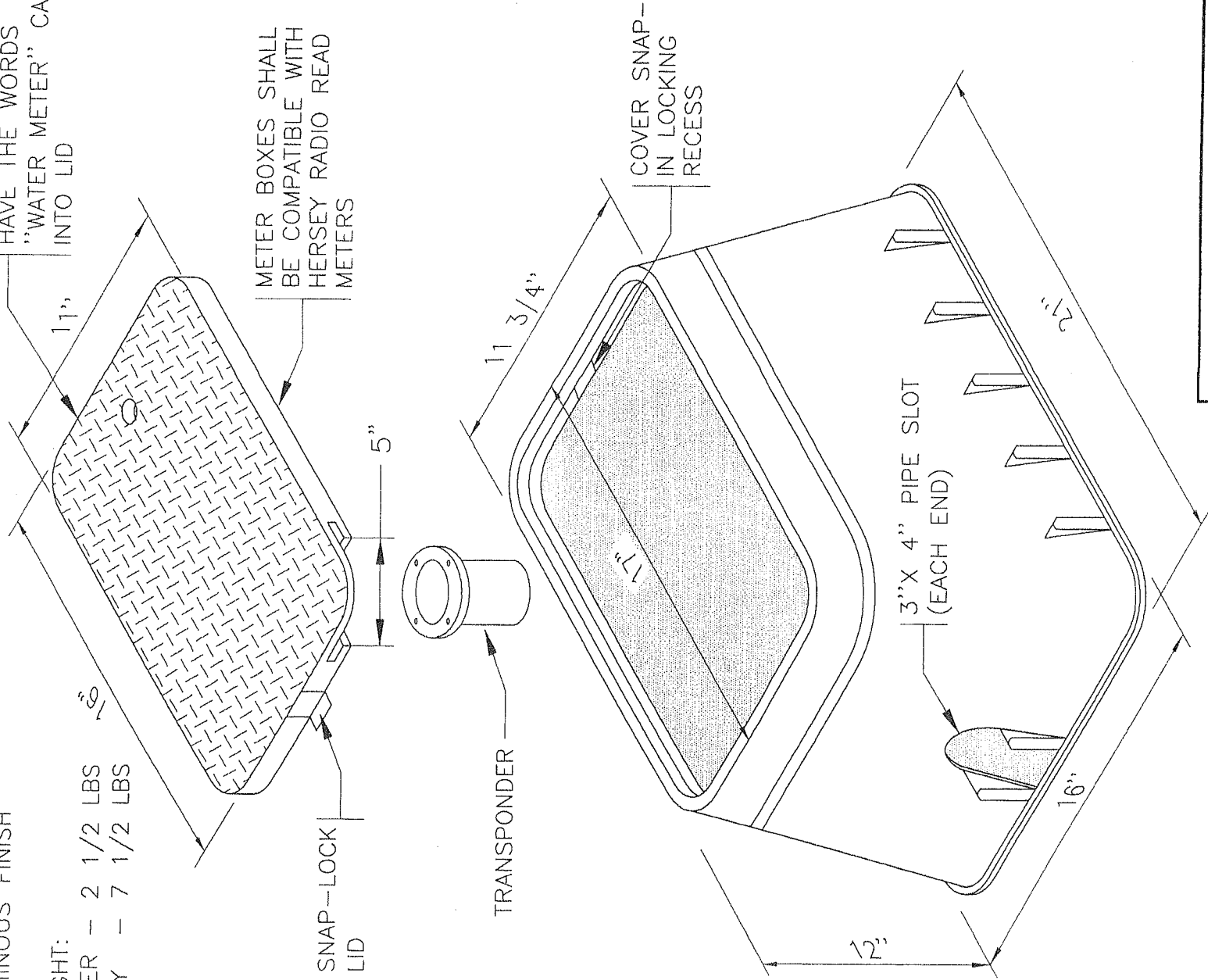
CHATHAM COUNTY  
WATER SYSTEM DETAIL



TYPICAL METER BOX

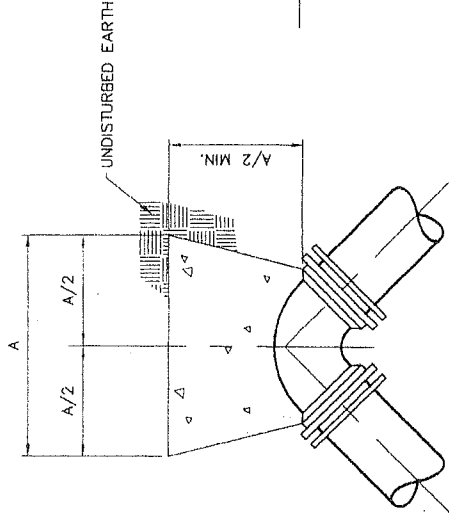
N.T.S.

D-13

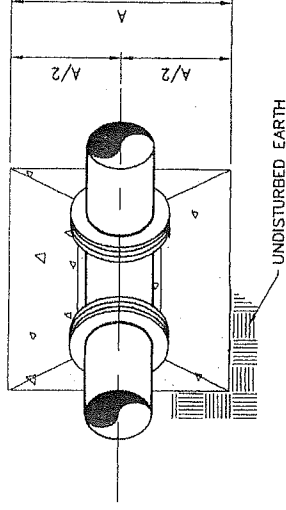








PLAN

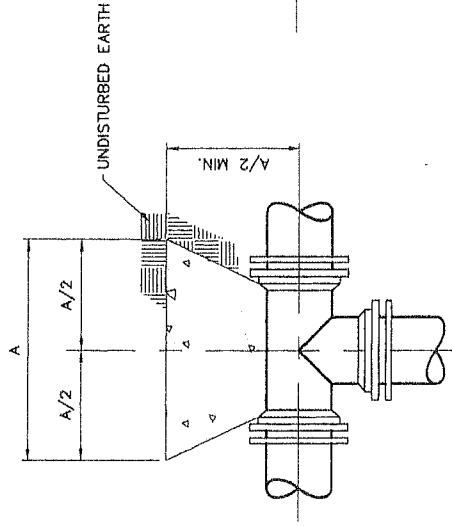


ELEVATION

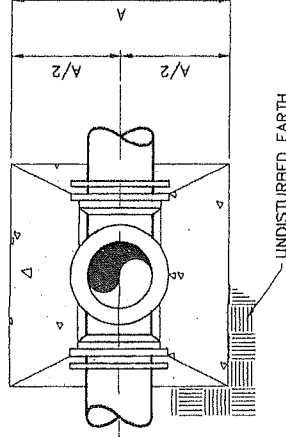
NOTE: THRUST BLOCKS SHALL BE CONSTRUCTED OF 2000 P.S.I. CONCRETE  
TABLE "A" DIMENSIONS (IN FEET)

BEND	PIPE SIZE (NOM. DIA. IN INCHES)										
	2	4	6	8	10	12	16	18	20	24	
90°	1.5	1.9	2.8	3.8	4.7	5.9	7.5	8.5	9.4	11.2	
45°	1.0	1.4	2.1	2.8	3.5	4.3	5.5	6.2	6.9	8.3	
22 1/2°	0.8	1.0	1.5	2.0	2.5	3.1	4.0	4.5	4.9	5.7	
11 1/4°	0.8	1.0	1.1	1.5	1.8	2.2	2.2	3.2	3.6	4.4	

**CONCRETE THRUST BLOCK DETAIL FOR WATER MAIN BENDS**  
N.T.S.



PLAN

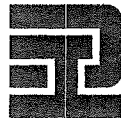


ELEVATION

NOTE: THRUST BLOCK SIZE DETERMINED BY SMALLEST DIA. OF TEE

DIM. (IN INCHES)	PIPE SIZE (INCHES)										
	2	4	6	8	10	12	14	16	18	20	
A	1.6	1.9	2.8	3.8	4.7	5.9	6.6	7.5	8.5	9.4	

**CONCRETE THRUST BLOCK DETAIL FOR TEES**  
N.T.S.



CHATHAM COUNTY  
WATER SYSTEM DETAIL

1

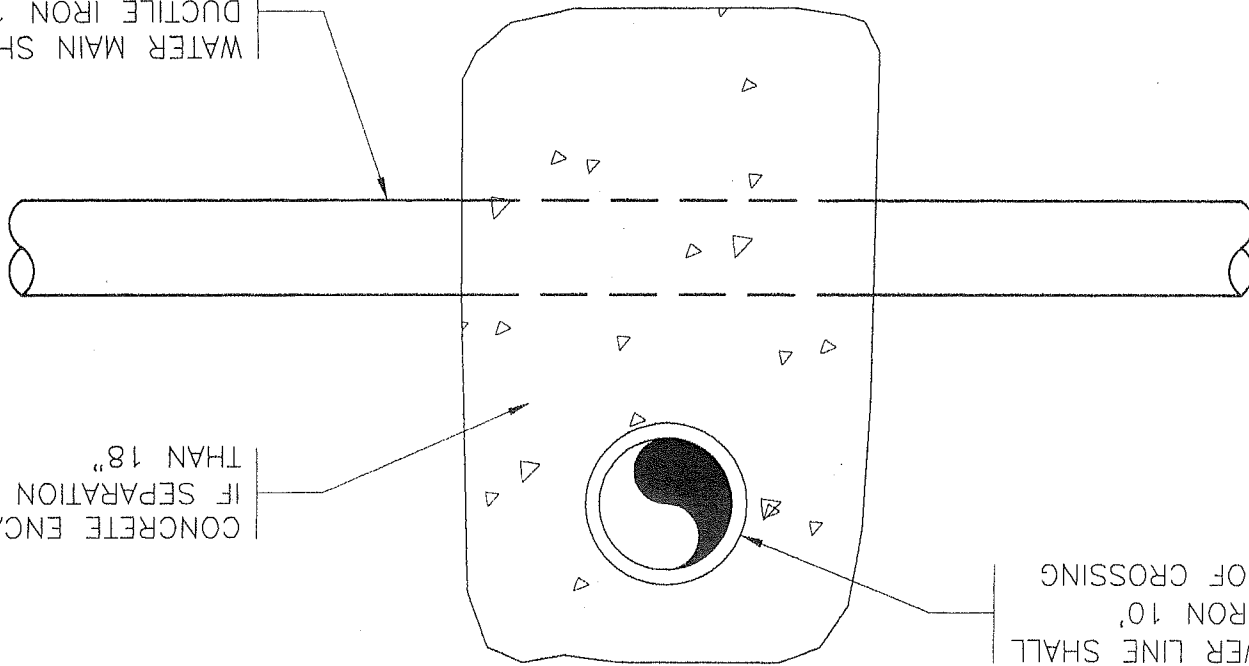




N.T.S.

SEWER AND WATER CROSSING

WATER MAIN SHALL BE  
DUCTILE IRON 10'  
EITHER SIDE OF CROSSING



CONCRETE ENCASEMENT  
IF SEPARATION LESS  
THAN 18"

EXISTING SEWER LINE SHALL  
BE DUCTILE IRON 10'  
EITHER SIDE OF CROSSING

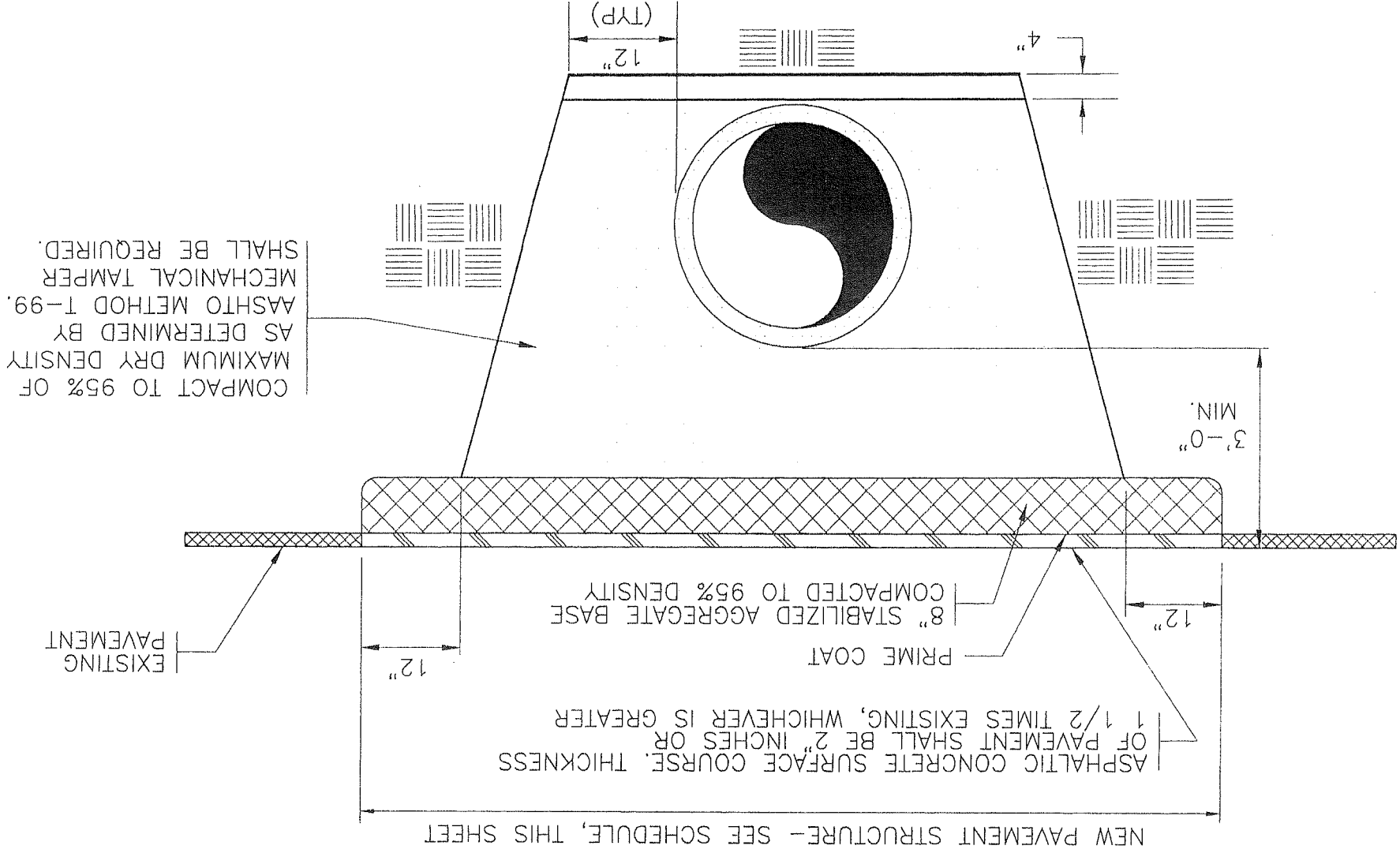
CHATHAM COUNTY  
WATER SYSTEM DETAIL

N.T.S.

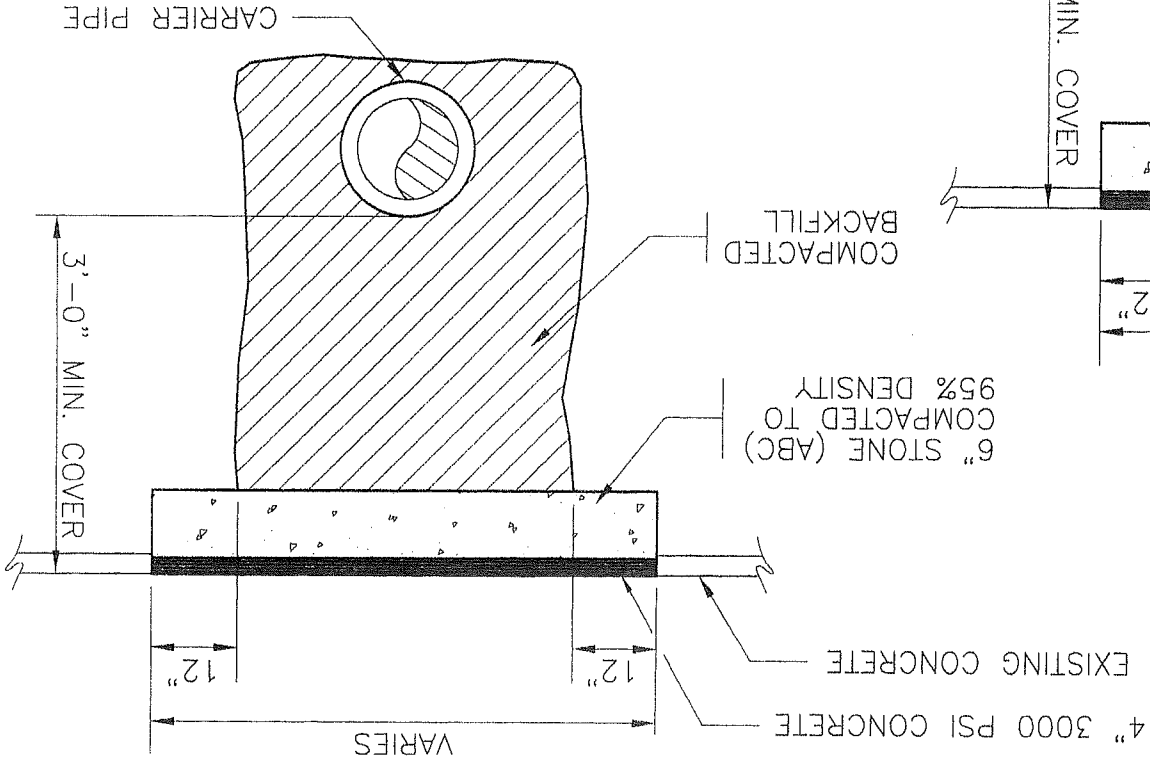
OPEN CUT ROADWAY CROSSING



D-17

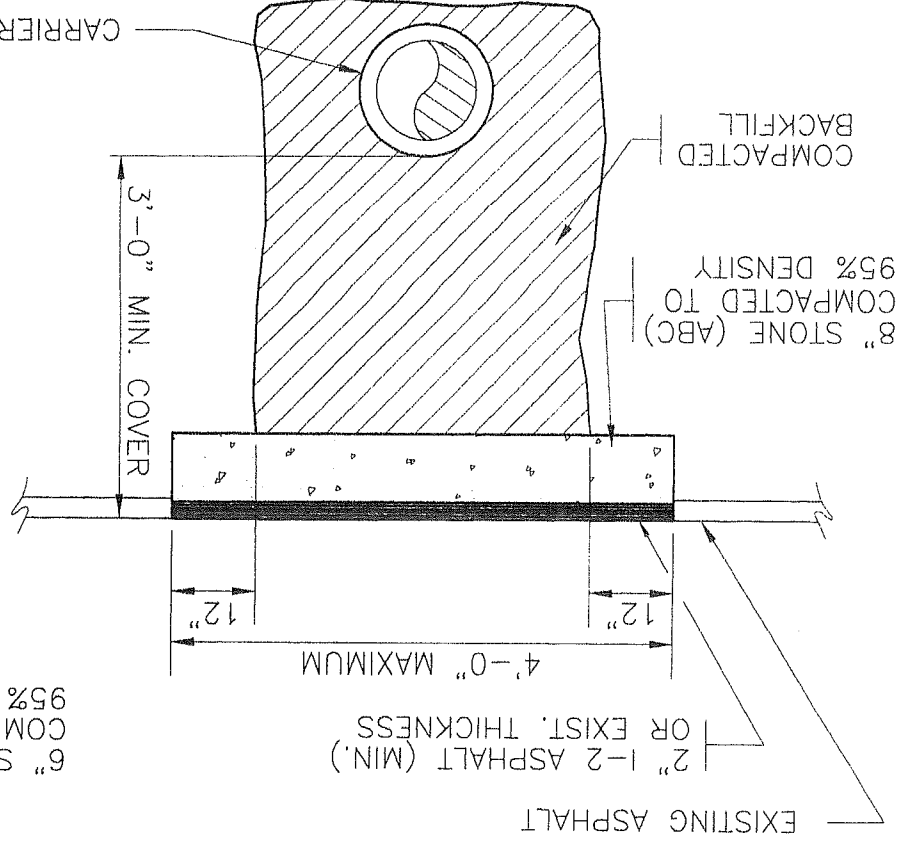


CONCRETE DRIVEWAY  
OPEN, CUT AND PATCH  
N.T.S.



CHATHAM COUNTY  
WATER SYSTEM DETAIL

ASPHALT DRIVEWAY  
OPEN, CUT AND PATCH  
N.T.S.

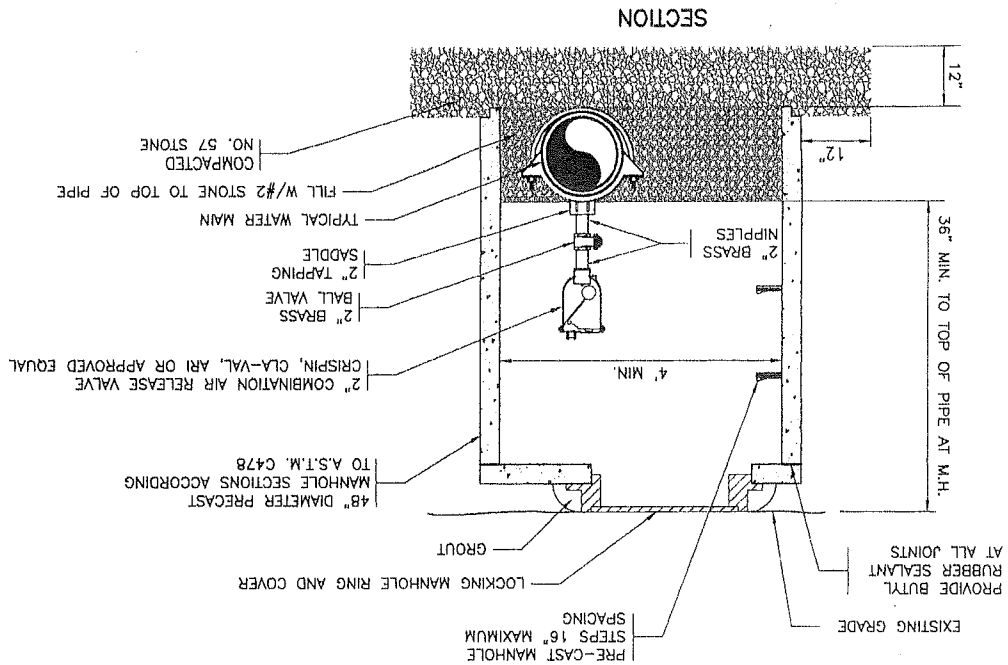


CHATHAM COUNTY  
WATER SYSTEM DETAIL



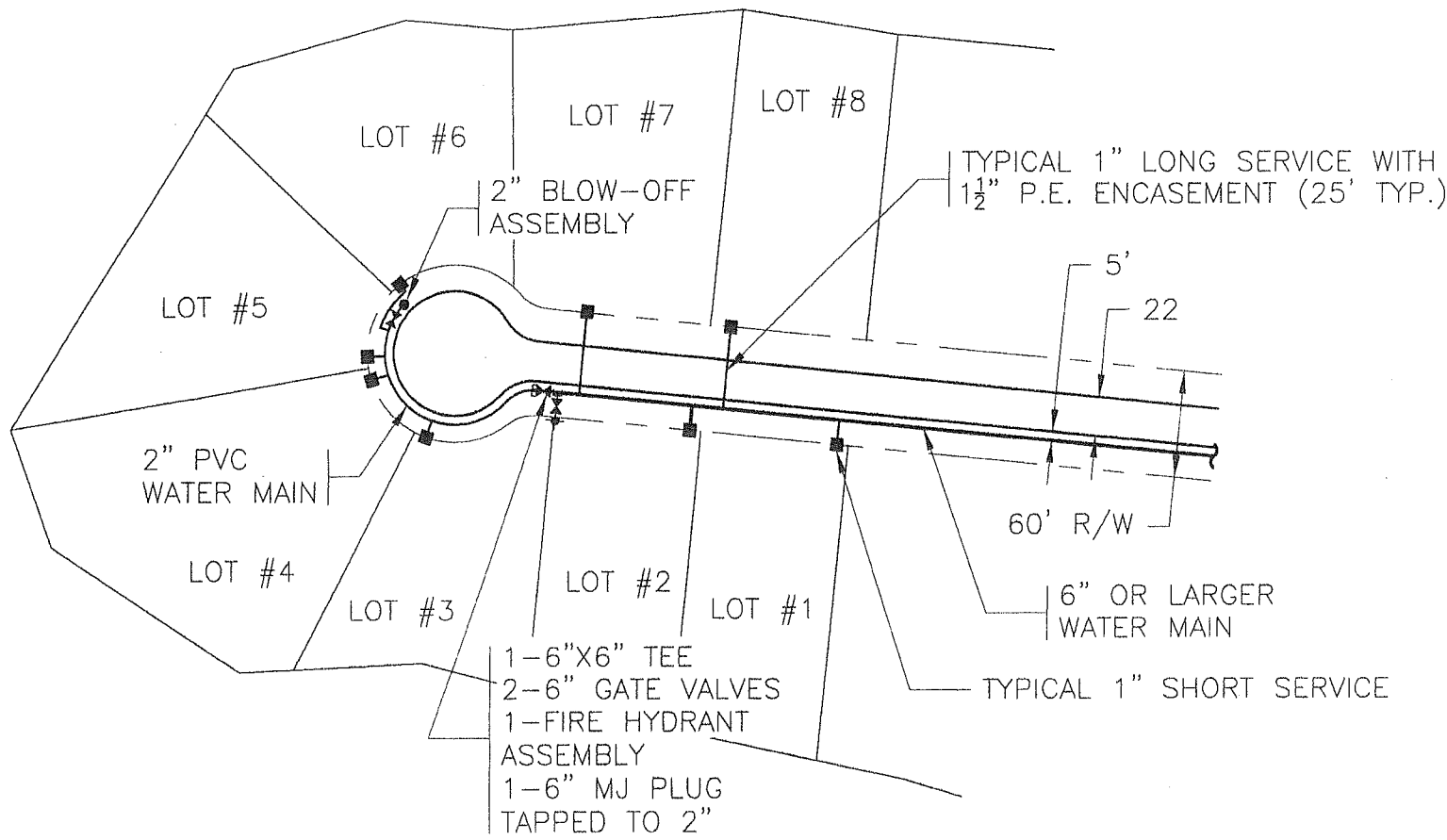
D-19

COMBINATION AIR VALVE ASSEMBLY DETAIL  
N.T.S.



THE VALVE SHALL OPERATE THROUGH A COMPOUND LEVER SYSTEM WHICH WILL SEAL BOTH THE PRESSURE ORIFICE AND THE AIR AND VACUUM ORIFICE SIMULTANEOUSLY. THIS LEVER SYSTEM SHALL PERMIT A 1/4" ORIFICE TO RELEASE AN ACCUMULATION OF AIR FROM THE VALVE BODY AT A CAPACITY OF 98 SCFM. OF AIR AND PRESSURE OF 150 PSIG. THE FUNCTION OF THE LEVER SYSTEM SHALL ALSO PERMIT A POSITIVE DISENGAGEMENT OF THE MAIN VALVE FROM THE LARGE ORIFICE, AS THE FLOAT DROPS AND PRESSURE DECREASES. THE DISENGAGEMENT SHALL BE IMMEDIATE AND NOT BE LIMITED TO THE INITIAL DRAW OF A VACUUM. THE VALVE(S) SHALL BE CRISPIN MODEL UL20 UNIVERSAL AIR VALVE AS MANUFACTURED BY MULTIFLEX MANUFACTURING CO., BERWICK, PA. OTHER APPROVED MANUFACTURERS ARE: APCO VALVE, CLOW CORP, EMPIRE CORP. THE VALVE(S) SHALL BE 2" NPT SCREWED OR ANSI CLASS (125,250) FLANGED INLET CONNECTION AND SHALL BE CAST IRON BODY, TOP AND INLET FLANGE (WHERE REQUIRED). STAINLESS STEEL FLOAT AND TRIM WITH BUNA-N SEAT. VALVES WHICH OPERATE THE PRESSURE PLUNGER VIA A SINGLE LEVER AND (WHERE REQUIRED), STAINLESS STEEL FLOAT AND TRIM WITH BUNA-N SEAT. TYPICAL WATER MAIN

NOTES:



TYPICAL CUL-DE-SAC WATER MAIN INSTALLATION

N.T.S.

CHATHAM COUNTY  
 WATER SYSTEM  
 DETAIL

