

WATER AND WASTEWATER STANDARDS TABLE OF CONTENTS

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ARTICLE 1 GENERAL REQUIREMENT

SECTION 101. POLICIES AND PROCEDURES

101.01 PURPOSE

The Oconee County Board of Commissioners recognizes that water is a natural resource of limited supply and that wastewater treatment and disposal is a necessity for public health.

The purpose of these Policies and Procedures is to establish requirements and guidelines for planning, design and construction of all water and wastewater improvements, including pumping stations and force mains, constructed in Oconee County. The procedures apply to all water / sewer development and construction projects, both public and private, within the jurisdiction of Oconee County.

101.02 DEFINITIONS

- A. Contractor: Utility contractor possessing valid Georgia Utility Contractor's License.
- B. County: Board of Commissioners, Oconee County, Georgia or its authorized representative.
- C. OCUD: Oconee County Utility Department or its authorized representative.
- D. Wastewater System: The Oconee County public wastewater system, including treatment facilities, sanitary sewers, and pump stations.
- E. Water System: The Oconee County water supply system, including water storage tanks, pumps, piping, hydrants, valves, lines, mains, meters and all other appurtenances.
- F. Owner or Developer: Any person, firm, corporation, association, partnership or agent thereof who undertakes or proposes to construct or extend water or wastewater facilities to serve a residential subdivision, industrial park, apartment complex, condominium, commercial or industrial institutional establishment.
- G. EPD: Environmental Protection Division of the State of Georgia Department of Natural Resources.
- H. ERU: Equivalent Residential Unit. A housing unit that meets the needs of a single-family residential unit. For example, a 10-unit apartment building would house 10 ERU's.

- I. Wastewater Treatment Plant Capacity: 85 percent of the peak 5-day monthly wastewater treatment plant flow permitted by EPD for the drainage basin served.
- J. Standards: Latest revision of the Water and Wastewater Standards adopted and published by the County.
- K. Transmission Main: Water main used to distribute water from its source to commercial, industrial, and residential areas.
- L. Distribution Main: Water main located inside of a subdivision or development which carries water from the transmission main to the customer.
- M. Professional Engineer: A registered, practicing engineer, licensed by the state of Georgia.

101.03 VARIANCES

Based on unique circumstances, OCUD may grant a variance to the Policies and Procedures.

101.04 PRE-DESIGN CONFERENCE

It is recommended that each Developer or Owner initiate a pre-design conference with OCUD.

101.05 PROCEDURES

Developers shall plan for and carry out construction of water and wastewater facilities in accordance with the following procedures.

1. OCUD will review and approve or make comment on all plans. OCUD will issue written acceptance of water main and sanitary sewer plans before construction. At any time during construction the inspector or an OCUD representative may deem it necessary, due to operational, field conditions, and or safety concerns, to vary from the approved plans and/or this manual. The contractor must obtain the written approval of the project's engineer and the OCUD inspector prior to the installation of any field changes. Refer to Article 12 Division 6 of the UDC, Field Changes.
2. The Developer or Project Engineer shall obtain all required permits and approvals; including but not limited to Land Disturbance Permits, EPD approval, stream buffer variances, and/or U.S Army Corps of Engineers permits. A copy of all required permits and approvals shall be provided to OCUD prior to plan approval.

3. Submit three (3) complete sets of approved plans to OCUD for all water and sewer facilities before construction.
4. Notify OCUD two (2) business days before beginning construction.
5. Obtain a regular inspection from OCUD of all work in progress.
6. An inspection by OCUD will be performed with the contractor and developer after all lines have been installed to ensure adequate pressure and flow of each service. This inspection does not relieve the developer of any requirements listed in these Specifications, in particular, Section 101.16 of the Policies and Procedures. Acceptance of the water systems after construction does not relieve the developer of meeting all OCUD requirements at the time of final plat.
7. Written permission must be obtained from OCUD before any utilities are installed after hours, on holidays or weekends.
8. Record drawings or "As-Built" shall be provided before written final acceptance is provided. Required as-builts shall be certified by the professional engineer (PE) of record as to installation per plans & specifications.
9. OCUD will make final inspection for acceptance when the utilities are properly installed and all inspections and tests are successfully completed.
10. A letter of acceptance will be issued after a satisfactory final inspection has been conducted and title to all water mains and sanitary sewers has been conveyed to Oconee County.

101.06 CONNECTION TO EXISTING SYSTEM

New connections to the existing County utility system are subject to all county standards, specifications, codes, and ordinances as they pertain to water or sewer systems and/or facilities.

101.07 EXISTING DEVELOPMENT REGULATIONS

The requirements of these Policies and Procedures for water and sewer systems shall be in addition to the requirements of the Oconee County Unified Development Code.

101.08 CONVEYANCE OF EXTENSION TO UTILITY SYSTEM

- A. The Developer shall construct and convey to the County, free and clear of all encumbrances and at no cost to the County, all water and wastewater system improvements.

- B. Developer shall submit to the County two (2) sets of engineering plans and specifications for the proposed extension prepared by the Developer's engineer, which shall be approved in writing by the County prior to any construction work being performed.
- C. Following conveyance by the Developer, the extension and any additions, repairs and replacements thereto shall at all times remain the sole, complete and exclusive property of and under the control of the County, and the Developer shall have no right or claim in or to the Developer's extension; provided, however, that the extension shall be used for providing service to the development.

101.09 FEES

- A. Connection Fee: Connection fees shall be charged for each establishment, structure and use added to the County water and/or wastewater utility system. Prior to receiving final approval from the County, the Developer will pay the current connection fee presently charged for connections to the County water and/or wastewater utility system as stipulated in the pertinent county code establishing rates, charges and regulations for water and/or wastewater systems.
- B. Account Deposits, Service Charge and Rates: All new accounts require a deposit and service charge. Refer to the current OCUD rate sheet for current deposits and rates.
- C. Front Footage Assessment Fees: A front footage assessment fee will be required of all developments that connect to existing infrastructure. This fee will be based on the cost per linear foot of installation, which must be provided in a certified public accountant's statement. If the original infrastructure was installed by a developer and granted to the county, this developer will be reimbursed the front footage assessment that is charged to anyone making connection. For example: A developer installs a water line to extend to their development at a cost of \$50.00 per linear foot. After this line is accepted by the county, another development wishes to connect. The new development will have 600 feet of property that borders this water line on one side of the road. The development shall be charged $\$50.00 \times 600' \times \frac{1}{2} = \$15,000$.
- D. Planning and Inspection Fees: The Developer shall pay a planning, inspection and review fee in order to defray all actual costs to the County, including any attorneys' fees, of:
 - 1. Conducting the review of the engineering plans and specifications;
 - 2. Conducting the inspection and testing of the installation of the water and/or sewer extension; and

3. All other administrative costs incident to either accepting the extension into the County water and/or wastewater utility system or becoming trustee of a non-county-owned system.
- E. Fees shall be paid in full prior to receiving County approval of plans and specifications.

101.10 GRANT OF EASEMENT RIGHTS

Before acceptance of water and wastewater improvements, the Developer shall execute a grant or grants of easement, in recordable form to be approved by the County.

101.11 UNDERGROUND UTILITY CONTRACTOR

- A. All extensions and additions to the County water and/or wastewater utility system shall be performed by a Georgia Licensed Utility Contractor.
- B. The County reserves the right to approve or disapprove the utility contractors or subcontractors.
- C. The contractor must be an active member of the County's Utility Coordinating Committee.

101.12 PLANS AND SPECIFICATIONS

- A. All engineering plans and specifications shall be reviewed and approved by OCUD. Plans shall be prepared, signed and sealed by a professional engineer. Plan approval is valid for 12 months from the date of acceptance by Oconee County. A written request for an extension of the expiration date must be submitted for review and approved by OCUD 30 days prior to the expiration date. This process must be repeated every 12 months until construction is completed and accepted by Oconee County.
- B. Extension of plan approval is not guaranteed. Current approved County Specifications may require changes to an originally submitted construction plan. For example: changes in design specifications and materials for construction.
- C. As a minimum, for the following types of facilities, include the indicated information:
 1. Gravity Sewers and Force Mains
 - a. Plan and Profile at a scale no smaller than 1 inch = 50 feet horizontal and 1 inch = 10 feet vertical.
 - b. Stations on manholes or distances between manholes.
 - c. State plane coordinates of manholes.

- d. Standard Construction Details
 - e. Locations of air release valves.
 - f. Lift station details
 - g. Materials of construction with specifications.
 - h. Supplemental attachments.
 - 1) Pump curve
 - 2) Release valve info
 - 3) Calculations including but not limited to pipe sizing, velocity wet well sizing, buoyancy, and release valve sizing.
2. Water Lines and Elevated Water Storage Tanks
- a. Water services, fire hydrants, valves.
 - b. Scale no smaller than 1 inch = 50 feet.
 - c. Location of valve vault, access road, altitude valve, hydrant, well building, parking area, and fence.
 - d. Materials of constructions with specifications.
 - e. Supplemental Attachments.
 - 1) Pump curve
 - 2) Release valve info
 - 3) Calculations including but not limited to pipe sizing, velocity, and residual pressure.

101.13 INSTALLATION AND INSPECTION

All water or sewer system improvements shall be constructed in accordance with the engineering plans and specifications approved by the County. The County shall be afforded the opportunity to make inspections as installation progresses.

101.14 TESTING

All water and wastewater improvements shall be tested in accordance with these Standards.

101.15 APPROVAL BY GOVERNMENTAL AGENCIES

The County's obligations are contingent upon Developer obtaining all necessary approvals for water and/or sewer system from all concerned governmental agencies. Developer assumes the risk of loss as a result of the denial or withdrawal of the approval of any concerned governmental agency, or caused by an act of any governmental agency which affects the ability of the County to provide water and/or sewer service to Developer not within the sole control of the County and which, by exercise of due diligence, the County is unable to overcome.

101.16 FINAL ACCEPTANCE BY COUNTY

Final acceptance of water / wastewater system improvements, and/or lift stations by the County shall occur in writing before the signing of the final plat, at such time as Developer has met all of the terms and conditions of these Policies and Procedures. Maintenance bonds in the form of Letters of Credit will be issued by the developer to cover any costs of repairs for one year from the date of final plat signature by the OCUD Director. Please refer to the specific sections to ensure that all requirements have been met before requesting acceptance. Final Plat procedures will be followed as described in the County UDC.

101.17 WARRANTY AND MAINTENANCE BONDS

- A. The Developer shall be responsible for, and make any repairs or replacement required as the result of, any breakage, vandalism or other damage caused to the improvements until final acceptance by the County. After the final acceptance the Developer shall indemnify and hold County harmless from the cost of any repairs for any breakage or other damage to the improvements from time of completion of the improvements until completion of all buildings and houses, roads, paving, drainage, and other construction on Developer's property. If, within 10 days of the receipt of County notice of such breakage or other damage, the Developer fails to make timely repairs and corrections, the County shall have the option to make such repairs or replacements at Developer's cost.
- B. Developer shall warrant water and wastewater system improvements and hold County harmless against all costs, expenses and losses, including, without limitation, incidental and consequential damages, resulting from any defects in the Developer's extension, including, without limitation, defects in material and workmanship, which are discovered or arise within a period of one year following the date of the final acceptance. Developer shall provide a Maintenance Bond in form and substance acceptable to the County, in the amount of ten percent (10%) of the total cost of improvements.

101.18 TRUST INDENTURE

- A. To assure continuity of maintenance and operation of a non-County owned community water and sewerage systems, the Developer shall file a trust indenture or

other legal contract or agreement with the Georgia State Department of Natural Resources (DNR), Environmental Protection Division (EPD) for their review and approval. For new or proposed systems, the legal document shall be submitted with the plans and specifications in accordance with DNR Rules and Regulations for Water Quality Control, Rule 391-3-6-.06(13). The County's participation in and supporting of any non-county owned utility system as trustee, is conditioned on:

1. The proposed water and/or sewer system being planned and designed is in accordance with these county standards and specifications.
2. A trust deed or other legal contract being prepared by the Developer(s) in form and content acceptable to the County.
3. All costs associated with preparation of plans and specifications (including reviews by the County or its designated representative) and the trust deed or legal contract, being borne by the Developer.

101.19 WASTEWATER TREATMENT PLANT CAPACITY

- A. All requests for wastewater treatment capacity shall include a SANITARY SEWER EXTENSION SUBMITTAL form completed by a Registered Professional Engineer. A copy of this form has been included in the appendix of this document.
- B. If available, written commitment of wastewater capacity will be provided to the Developer for a 12 (twelve) month period at the time of preliminary plat approval. If the Developer wishes to extend the capacity after 12 months, the Director must be informed at least 10 (ten) working days before the end of the 12 (twelve) month period is over and the capacity charge must be paid in full. If the capacity is not being utilized at any time after the 36 (thirty-six) month period expires, Oconee County may choose to refund payment with no interest for any unused portion of capacity and said excess capacity will be revoked.
- C. The reservation of wastewater treatment capacity will be limited to the actual number of equivalent residential units (ERU's) committed by the County to the development.

101.20 MODIFICATION OF DEVELOPMENT PLANS

Should the Developer modify his development plans which would require greater water and/or sewage flows, or additional water and/or sewage facilities than the service demands designed and approved under the engineering plans and specifications, then Developer shall enter into a new agreement with the County providing for the construction of such additional water and/or sewer facilities meeting all County and governmental design requirements and shall pay all additional contributions and fees as may be required.

101.21 NOTICE OF CONNECTION TO COUNTY UTILITY SYSTEM

Developer shall notify OCUD of connections to the water or sewer no less than 24 hours prior to said connection. If Developer fails to provide timely notice, the Developer will uncover and expose the connection for inspection.

101.22 INTERRUPTION OF FACILITY OPERATIONS

- A. The Developer shall provide the County with written notice at least five days prior to any proposed interruption in facility operations required by construction activity. The notice shall include the date and time of the scheduled interruption; the length of time the interruption will be in effect; the procedures to be followed in effecting the interruption; a complete identification of all those equipment and operations to be affected; and all other information the County may require. The Developer shall provide all equipment, piping, auxiliary power or other means necessary to sustain facility operations or function for the planned interruptions.
- B. The County must approve all proposed interruptions in facility operations. Such approval will be provided by the County to the Developer in writing.
- C. The Developer shall conduct operations in a manner and sequence, which will provide for the continued transportation of water and/or wastewater flows during construction of the Developer's project. The Developer shall take all actions required to prevent discharge of sewer flow from the system to the ground or stream. Any construction actions that impede or interrupt flow shall be carefully executed and monitored to prevent surcharging of sewer systems and overflow.
- D. Any damages resulting from sewer surcharging, overflow or back-up caused by the Developer's operations shall be the Developer's responsibility. Fines charged the County for overflows caused by the Developer shall be paid for by the Developer.

101.23 APPLICATION FOR SERVICE

The Developer, his successors, or the occupant(s) of the developer's property, shall make written application to the County for the opening of an account(s) for service. At the time of making application for service, the applicant shall pay all connection fees and service charges as set forth in the current county code(s) establishing rates, charges and regulations. Refer to the current OCUD rate and fee schedule for current commercial water and sewer deposits as approved by the Oconee County Board of Commissioners.

101.24 AS-BUILTS

- A. As- builds shall be submitted in the following format:
 - 1. Two full size hard copies, and

2. Electronic format acceptable to Oconee County. See UDC Section 1231 for digital submission requirements.
- B. Record Drawings shall be reproducible, shall have a title block indicating that the drawings are Record Drawings, the name of the company and PE preparing the Record Drawings, and the date the Record Drawings were prepared.
- C. Legibly mark drawings to record actual construction, including:
1. All new construction in addition to the following
 - a. Changes of dimension and detail.
 - b. Changes made by field order or by change order.
 - c. Details not on original Drawings.
 - d. Dimensions to each lateral connection from the downstream manhole.
 2. Underground Utilities
 - a. Horizontal locations of all valves, referenced to permanent surface improvements. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.
 - b. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.
 - c. For sewers, the Record Drawings shall include the plans and profiles displaying the state plane coordinates of each manhole, the distance between manhole covers, the depth and inverts of each manhole, the slope of the sewer line, and the stationing of the sewer laterals.
 - d. For force mains, the profile of the top of the pipe shall be provided. Elevations, not depths, shall be provided at air valves, low points, and any other locations deemed necessary by OCUD.
 3. Lift Stations
 - a. An overhead view of the layout of all components of the liftstation including vaults, valves, bypass pumps, etc. As approved by OCUD.

D. Precision

1. Unless noted otherwise, Record Drawings shall provide horizontal dimensions, distances and coordinates to the nearest 0.1-foot.
2. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01-foot for all pertinent items constructed by the Contractor.
3. For gravity sewers, the Contractor shall employ a currently registered surveyor to prepare the Record Drawings from a post construction, field run survey. The Record Drawings shall provide elevations to the nearest 0.01-foot for all manhole inverts, manhole frames and other pertinent items constructed by the Contractor. The Record Drawings shall provide dimensions, distances, and coordinates to the nearest 0.01 foot.
4. The Record Drawing shall provide dimensions, distances, and coordinates to the nearest .01 foot.

E. The cover of the Record Drawings shall include the following information:

1. Name, business address, telephone number, license number of the Contractor and 24 hour contact person.
2. Acceptance date by County.
3. (For sanitary sewer projects) The following statement signed by the engineer of record: "I hereby state that, based on the lines and grades of the as-built survey and my personal inspection during construction, the lengths and slopes of the gravity sewer as shown on these record drawings comply with OCUD standards and specifications."
4. (For water projects) The following statement signed by the engineer of record: "I hereby state that, based on the red lined drawings supplied by the contractor and my personal inspections during construction, the horizontal location of the waterline and of all valves and hydrants as shown on these record drawings complies with OCUD standards and specifications."
5. All asbuilts must be signed by the P.E.

END OF SECTION

Water System – Design Requirements
SECTION 102. WATER SYSTEM – DESIGN REQUIREMENTS
102.01 GENERAL

The Developer shall be responsible for the design of an adequate water distribution system and/or treatment facilities where necessary. The methods of design and construction shall be in accordance with all county codes, accepted engineering practices, and this Section. The Developer is responsible for the coordination of connection to a privately owned system. Public systems shall be located entirely within County-owned property, rights-of-way or dedicated easements.

102.02 DESIGN WATER DEMAND

- A. Average Residential, Single-Family and Multi-Family: In the absence of data to the contrary, the following shall be used:
1. 100 gallons per capita per day (gpcd)
 2. 260 gallons per day (GPD) per connection
 3. Fire flow shall equal or exceed 500 gpm for residential and 1,000 gpm for commercial and industrial areas. There shall be a minimum residual pressure of 20 psig with full fire flow and design peak hour flow demands acting simultaneously; or as required by the Fire Marshal and or Fire Chief in accordance with current International Fire Code. Fire flow shall be obtained by utilizing correct pipe sizing. Use of booster pump stations is prohibited.
 4. Subdivisions consisting of 25 residential units or less may be granted a variance by the OCUD in areas of the County where future plans call for installation of County waterlines.
- B. All Others: Actual flow or estimate for each individual case as approved by the County Utility Director.
- C. Design Peak Water Demand

Flow Condition	Gallons-per-minute
Peak Day	$1.8 \times (\text{no. of connection}) \times 0.3$
Peak Hour	$3.25 \times (\text{no. of connections}) \times 0.3$

- D. Design all water mains to comply with current International Fire Code requirements or at the discretion of the County Fire Marshall.

102.03 SIZES OF WATER MAINS

- A. Mains shall be 12-inch minimum nominal diameter pipe with the exception of water mains installed inside subdivisions which with OCUD approval may be 6 inch nominal diameter pipe.
- B. House service connection shall be ¾-inch pipe, minimum.

102.04 LOCATION

- A. Water Mains: within right-of-way of street or easement.
- B. Easements: Minimum 20-foot width for water main. Easements will be allowed only when there is no other way to service development.
- C. Elevated Water Storage Tanks: Located outside of street or easement right-of-way on a parcel of land no smaller than 1 acre.
- D. Pipeline Depth:
 - 1. Water Mains shall be designed to meet the following depth requirements:
 - a. Minimum four feet of cover.
 - b. Top of pipe shall be two feet below any creek, stream or ditch when such is crossed.
- E. Fire hydrants shall generally be located at intervals not to exceed 500 feet unless prior approval is received from the County Fire Marshal and/or Fire Chief and OCUD in accordance with current International Fire Code. Fire hydrants shall be located within five feet of the nearest property corner, unless otherwise approved. A fire hydrant must be located at the back of all cul-de-sacs and within 25 feet of the intersection of roads including alley ways, private streets, and public roads. All fire hydrants must be set back to the right-of-way.
- F. Valves shall be installed at each intersection or connection point, and in no case shall spacing exceed 2,000 linear feet.
- G. Proximity to Sewer Lines:
 - 1. There should be no physical connections between a public or private potable water supply system and a sewer, or appurtenances, which would permit the passage of any sewage or polluted water into the potable supply. No water pipes shall pass through or contact any part of a sewer manhole.
 - 2. Water mains shall maintain a minimum of 10 feet edge-to-edge separation from sewer lines, whether gravity or pressure. In cases where the main cannot

be installed within the prescribed easement or right-of-way and maintain 10 feet separation, OCUD may reduce this distance provided that the water main be placed in a separate trench or undisturbed earth shelf. A minimum of 18-inches of vertical separation between the bottom of the water main and the top of the sewer is required.

3. When neither of these two separation criteria is possible, the water main shall be installed below the sewer with a minimum vertical separation of 18-inches. The water main, when installed below the sewer, shall be encased either in a watertight casing pipe or in concrete with a minimum 6-inch concrete depth to the first joint in each direction. The encasement shall extend 10 feet on both sides of the crossing. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

102.05 SERVICE CONNECTIONS

- A. All service connections shall be 3/4-inch minimum size with a separate service connection to each lot located at property corners. A 1" tap with a "Y" to two 3/4" taps are also acceptable.
- B. Developer shall install an appropriate backflow prevention device as approved by OCUD and the Georgia Plumbing Code on all service connections including fire suppression systems.

102.06 MATERIALS AND CONSTRUCTION

- A. Residential Subdivisions: All water mains shall be constructed of ductile iron pipe.

END OF SECTION

SECTION 103. WASTEWATER SYSTEM DESIGN REQUIREMENTS

103.01 GENERAL

The Developer shall be responsible for the design of an adequate sanitary sewage collection system and/or treatment facilities where necessary. The methods of design and construction shall be in accordance with all county codes, accepted engineering practices, and this Section.

103.02 DESIGN FLOWS AND LOADING

- A. Average Residential Flow Rates, Single-Family and Multi-Family: In the absence of data to the contrary, the following shall be used:
 - 1. 80 gallons per capita per day (gpcd)
 - 2. 208 gallons per day (GPD) per connection
 - 3. 1,500 GPD/per commercial acre
- B. All Others: Actual flow or estimated for each individual case as approved by the County.
- C. Design Wastewater Peak Flow Factor shall be 4 times the average flow rate unless otherwise approved by OCUD.
- D. Loading shall be determined using the following:

$$\text{BOD}_5 \text{ Loading (lbs/Day)} = \frac{\text{average design flow}}{1,000,000} \times 8.34 \times 350 \text{ mg/L BOD}_5$$

$$\text{TSS Loading (lbs/Day)} = \frac{\text{average design flow}}{1,000,000} \times 8.34 \times 350 \text{ mg/L TSS}$$
- E. Peak Flow Design:
 - 1. Sewers that are 15-inches in diameter and smaller are to carry peak design flow when flowing at 50% full (no hydraulic head allowed).
 - 2. Sewers that are larger than 15-inches in diameter are to carry peak design flow when flowing at 75% full (no hydraulic head allowed).

103.03 HYDRAULIC DESIGN

- A. Mains, submains and lateral sewers, 8-inch pipe, minimum; actual as based on hydraulic computations.
- B. House service connection, 6-inch pipe minimum; from main to right-of-way clean out.
- C. When increasing size of gravity sewer piping, pipe crowns shall be matched at manholes.

103.04 LOCATION

- A. Sewers: On centerline of street or easement.
- B. Force Mains: Outside of pavements and on opposite side of street or easement from water main.
- C. Easements: Minimum 20-foot width for sewer or force main. Easements will be allowed only when there is no other way to service development.
- D. Pumping Stations: Located outside of street or easement right-of-way on a parcel of land no smaller than 35 x 35 feet. Parcel of land shall be large enough to allow a minimum of 2½ feet between the fence and the edge of the parcel. In addition, the parcel shall include a minimum 15 foot wide section along the access driveway.
- E. Proximity to Water Mains:
 - 1. There should be no physical connections between a sewer and a public or private potable water supply system, or appurtenances, which would permit the passage of any sewage or polluted water into the potable supply. No water pipes shall pass through or contact any part of a sewer manhole.
 - 2. Sewer mains, whether gravity or pressure, shall maintain a minimum of 10 feet edge-to-edge separation from all potable water mains. If the main cannot be installed within the prescribed easement or right-of-way and provide the ten feet separation, OCUD may reduce this distance provided the water main is above the sewer in a separate trench or an undisturbed earth shelf with a minimum of 18-inches of vertical separation between the bottom of the water main to the top of the sewer.
 - 3. In cases where the sewer main must be installed within the minimum horizontal separation, or vertical separation below the potable water main, or cross above the potable water main; the sewer main shall be encased either in a watertight casing pipe or in concrete, which extends 10 feet on both sides of the crossing.

F. Pipeline Depth:

1. Sewers shall be designed to meet the following depth requirements:
 - a. Minimum four feet of cover from the top of the pipe, unless sewer is constructed with ductile iron pipe, whereby minimum cover shall be two feet;
 - b. Top of pipe shall be two feet below any creek, stream or ditch when such is crossed and shall utilize casing.
 - c. Top of pipe shall be two feet below adjacent creeks, streams and ditches; and
 - d. Such a depth as to allow service connections to be constructed at minimum 2.0 percent slope from sewer to probable house location on each lot to be served, and assuming service line is three feet deep at probable house location.
2. Force mains shall be designed and constructed with a minimum of four feet of cover.

- G. Aerial Crossings: Aerial crossings for gravity sewers are not permitted unless approved by Oconee County. Specific design criteria shall be evaluated on an individual basis by the Utility Director.

103.05 SERVICE CONNECTIONS

- A. All service connections shall be 6-inch minimum size with a separate service connection to each lot.
- B. Wherever possible, services shall connect to the existing sewers at manholes instead of direct connections to the sewer pipe. Service connections are not permitted to directly penetrate 24-inch diameter or larger trunk sewers, unless otherwise approved by OCUD.
- C. Inline manhole service connections shall be limited to two, one from each side of the street. Invert of service connection shall be installed at an elevation not greater than two feet above the invert of the sewer main. A maximum of three may be installed in any terminal manhole, if the crown of the service connection and the lateral sewer line are at the same elevation.
- D. Vertical service connection risers are not permitted within street rights-of-way.

- E. Clean-outs are not permitted within street rights-of-way, except for service laterals; in such case the clean-out shall be located at the right-of-way line.

103.06 VELOCITIES

- A. Gravity Sewers: When flow is full or one-half full, minimum velocity shall be 2.0 feet per second. Maximum velocity for any gravity sewer shall not exceed 10.0 feet per second.
- B. Force Mains: Minimum velocity shall be 3.0 feet per second; maximum velocity shall be 7.0 feet per second.

103.07 MINIMUM GRAVITY SEWER PIPE SLOPE

Diameter, Inches	Min. Slopes, % **
8	.70
10	.50
12	.50
15	.40
16	.35
18	.30
21	.20
24	.10

* The above are designed to maintain 2.0 ft/sec

** Unless otherwise approved

Maximum slope shall not exceed 15%.

103.08 SEWER STRUCTURAL INTEGRITY

- A. In locations where the sanitary sewer may be exposed to non-routine installation conditions, the sewer shall utilize coated DIP as specified in this manual under Article 4, Standard Specifications for Wastewater System Construction. These conditions include, but are not limited to:
1. Where depth of cover is less than four feet or greater than fourteen feet;
 2. Where sewer crosses over or under a storm drain pipe;
 3. Where sewer crosses under a creek or stream;
 4. Where sewer crosses over or under a water main;
 5. Other locations deemed necessary by the County.
- B. Where ductile iron pipe is used, the ductile iron pipe shall extend from manhole to manhole.

103.09 MANHOLES

- A. Location: Provide manholes at all changes in pipe grade, pipe size, alignment, intersections, and at the end of a pipe run.
- B. Provide manholes at intervals not to exceed 350 linear feet
- C. An outside drop pipe shall be provided at manholes where the influent sewer enters the manhole at a height of two feet or greater above the invert elevation of the outgoing pipe.
- D. Sampling Manholes: For Industrial Users - In order to provide for accurate sampling and measurement of industrial wastes, each significant industrial user shall provide and maintain, on each of its industrial waste outlet sewers, a monitoring station to be located outside the plant. If specified manhole is inside the plant fence, there shall be a gate near the sampling manhole with a key furnished to the County. In accordance with the Oconee County Water and Sewer Specifications, there shall be ample room provided in each monitoring station to enable convenient inspection and sampling by the County, or its agent. The invert elevation of the incoming sewer shall be no less than 6-inches higher (2-feet maximum) than the manhole invert to facilitate the collection of a sample. Also, a parshall flume and a 110 volt electrical outlet may be required to allow for composite sampling. In certain monitoring stations where noxious fumes may accumulate, the County may require a fume exhaust system to protect the life and health of the County employees who are required to enter the monitoring station. The fume exhaust system shall extract the fumes from the bottom of the station and provided no less than one complete air exchange per minute.
- E. Force Main Discharge Manhole: The discharge receiving manhole and the 2 downstream manholes must meet the requirements of Wastewater Pumping – Design Requirements.

103.10 GREASE TRAPS

- A. Grease, oil, flammable liquid, and/or sand traps shall be provided at all vehicle service stations, commercial or industrial food-handling establishments, and at any other commercial or industrial establishment or public or municipal institutions, such as schools, hospitals and prisons, at which such devices are necessary for the proper handling of liquid wastes containing grease, oil, flammable liquids, or sand.
- B. Such grease traps shall be of a type and size approved by the County and shall be located as to be readily and easily accessible for cleaning and inspection. Oconee County will inspect all grease traps annually.
- C. Such grease traps shall be properly maintained by the sewer service customer. Maintenance shall include periodic removal of the contents of the grease trap with no reintroduction of any portion of the waste into the grease trap or introduction into the

County's sewer system. The County may require grease trap maintenance based upon the observation of material build-up in the grease trap.

- D. Food-handling establishments shall install an outside, in ground, grease trap. Grease Traps shall be sized based on 1,500 gallons per 50 seats with a minimum of 750 gallons.

103.11 PUMPING STATIONS

Sewage treatment plants and pumping stations to be dedicated to the County will be considered on an individual basis. It is the Developer's responsibility to contact the Oconee County Utility Department early in the planning stage for direction.

END OF SECTION

SECTION 104. WASTEWATER PUMPING STATION DESIGN REQUIREMENTS

104.01 GENERAL

- A. Sewage pumping stations shall be duplex, submersible type. Pumping stations shall have a paved or concrete access road located between the adjacent public road and the pumping station. With a minimum access easement width extending 2 ft beyond the edges of pavement. Refer to section 104.06.
- B. The method of design and construction shall be in accordance with standard specifications for Sewers and Accessories and paragraph 104.02 below. The system shall be designed with considerations for future expansion and maintenance.
- C. Pump manufacturers shall be Wilo EMU, Flygt, or other approved manufacturer. Selection of pump manufacturers shall be reviewed with the County and approved by OCUD prior to the start of project design.
- D. Lift station must be 100 percent complete and signed off as such by OCUD inspectors prior to scheduling a start-up. As-builts, O&M manuals (two copies), and any required spare parts must be presented to the Utility Department representative at the time of start-up. A minimum of two weeks notice will be given for all lift station start-ups.
- E. The developer shall consult with OCUD during the design of the system. The system shall be designed with all components sized to meet the development's flows adjusted for peaks. The developer may elect to size the system to meet future phases of his/her project or may upgrade the system at a later date to serve additional phases. Any such upgraded capacity shall be reserved for the developer (subject to availability of treatment capacity) for a period of three (3) years from the date of start-up. The reserved capacity shall only include the number of lots or commercial flow quantity as identified on plan submittals approved by OCUD. The difference in capacity between the development's projected flow and the actual pump flow is not to be considered as belonging to the developer. Any such "extra" capacity beyond that reserved for the original developer becomes available for OCUD to utilize at its discretion. The developer may relinquish his reserved pumping capacity at any time by notifying OCUD in writing.
- F. Odor control mechanisms shall be installed on all lift stations. The odor control must be approved by OCUD.
- G. Due to increasing O&M costs, a sewage / wastewater pump station maintenance fee may be imposed by the Board of Commissioners at rates to be determined from time to time by the Board. Any fee established by the Board must be paid in full to OCUD prior to the final acceptance of the pump station.

104.02 PUMPING SYSTEM EQUIPMENT AND APPURTENANCES

- A. Pumps: Submersible duplex system mounted on stainless steel guide rails. OCUD reserves the right to specify manufacturer of the pump or panel boxes.
- B. All hardware must be 316 stainless.
- C. Emergency Back-up: An emergency **diesel** or natural gas bypass pump capable of sustaining operation of pumping station with automatic operation utilizing float switches. If the development is served by natural gas, the bypass pump must be powered by natural gas. The bypass pump must be equipped with an electric or solar battery charging system. A spare starter will be provided at start-up. The bypass pump shall be a Godwin pump or OCUD approved equal.
- D. Controls: Controls shall meet the requirements of standard specifications for Sewers and Accessories and conform with manufacturers recommendations.
- E. Air-Vacuum Release Valves: As required at high points in force mains must include an inline shutoff valve adjacent to and upstream of the air relief valve.
- F. Piping: Meet requirements of standard specifications for Sewers and Accessories.
- G. Valves: Located outside of wet well in a vault with cover. Discharge line for each submersible pump and backup pump shall have a check valve and plug valve.
- H. Yard Hydrant: A frost-proof yard hydrant with 50' of ¾" nylon reinforced garden hose with brass nozzle shall be installed within the pump station fencing. Potable water service to the yard hydrant shall include an acceptable double check valve backflow prevention device.
- I. Ancillary components include:
 - 1. Spare parts required
 - a. One phase monitor
 - b. One pump impeller
 - c. One soft start if used
 - d. One starter for bypass pump
 - e. A minimum two of each fuse

2. Multi Smart Controller with Level sensor probe
3. Combustible gas detector and calibration kit, GasAlertQuattro4 manufactured by BW Technology.
4. Audible alarm with silencer
5. Visual alarm
6. Pressure gauges on all discharge piping inside vault
7. Site lighting with OCUD approved pole
8. Elapsed time meter and start counter, each pump
9. Metered water service connection for wash down, paid in full by the developer
10. An approved auto-dialer
 - a. One direct connect, diesel powered separate high level float
11. An approved pump hoist
12. An approved flow meter on discharge piping

104.03 PUMP SELECTION

- A. Pump selection shall consider full operating range; including shut off, duty point, and run out.
- B. Pump cycle times shall be configured so as to prevent septic conditions. Odor control equipment may be required by OCUD where necessary.
- C. Pump efficiency shall not be less than 45%, unless otherwise approved by OCUD.
- D. Pumps shall be designed to pump to the final high point of the force main route, whether that is the discharge manhole or another point on the force main route. Force mains will not be approved to flow downhill into the receiving manhole. After the proposed force main passes over the last high point along its route a new gravity sewer line must be installed to convey the flow downhill to the existing sewer system. Pumps selected shall not have a flat curve and Motor HP rating shall exceed the HP draw over the range of operating conditions of the pump. Exceptions to this requirement may be granted on a case by case basis if in the opinion of OCUD there is no benefit to the County for having gravity sewer in the particular location involved.

104.04 WET WELLS AND VALVE VAULTS

- A. Design: Wet wells and valve vaults shall be designed to counteract buoyancy forces during high ground water and/or flood conditions. Wet wells must be designed with 25% additional hydraulic storage capacity than anticipated.
- B. Only one influent into the wet well will be permitted without prior permission obtained from OCUD.
- C. Construction: Pre-cast reinforced concrete in accordance with standard specifications for Sewers and Accessories.
- D. Corrosion Resistant Coating: A corrosion resistant coating shall be applied to all interior surfaces within each precast concrete wet well structure and force main discharge manhole. Coatings shall be field applied in accordance with the manufacturer's recommendations, by qualified and experienced personnel. Acceptable coating Systems are as follows:
 - 1. Sauereisen
 - a. Surfacer for rehabilitation/repair shall be Sauereisen Underlayment Series F-120, F-121 or F-209 Filler.
 - b. Apply Sewergard Series 210, 210FS, 210S, 210RS or 210X to final cleaned and repaired surface.
 - c. At OWNER's option, following curing of initial coating layer(s), finish with Sewergard Series 210G.
 - 2. Tnemec
 - a. Surfacer for rehabilitation/repair shall be Tnemec Series 217 or 218 Filler.
 - b. Apply Tnemec Perma-Shield Series 434 to final cleaned and repaired surface.
 - c. Following curing of initial coating layer(s), finish with Tnemec Perma-Shield Series 435.
 - 3. Raven Lining Systems
 - a. Surfacer for rehabilitation/repair shall be Raven Series 700, 705CA or 710.
 - b. Apply Raven Series 155 Primer to final cleaned and repaired surface.

- c. Following curing of initial coating layer(s), finish with Raven Series 405.
- E. Access Cover: At a minimum, access covers shall be a 48"x48" double leaf aluminum, lockable hatch with stainless steel hardware. All hatches shall have metal safety grates.
- F. Vent: Wet wells require a vent pipe.
- G. Wet well shall be sized such that the pump does not start more than once every ten minutes.
- H. High Water Level Alarm(s): High water alarm(s) within the wet well shall meet the following two criteria:
 - 1. A minimum of five feet below the lowest floor slab of all houses, apartments, buildings, businesses, etc. being served as well as five feet below wet well top; and
 - 2. Below the lowest sewer invert connected to the wet well.

104.05 SECURITY FENCE

Provide an approved security fence in accordance with standard specifications in Section 2 – Site Work.

104.06 DRIVEWAY

- A. Driveways shall be paved with a 6" crushed stone base and 2" thick asphalt or with 4" of crushed stone and 4" of reinforced concrete.
- B. Driveways shall be 12 feet wide minimum.
- C. If a driveway is 50 feet or longer in length, a turnaround is required. The necessity of a turnaround on drives less than 50 feet in length will be determined on a case-by-case basis by OCUD. The turnaround shall be 20 feet off the pump station fence, 12 feet wide, and 18 feet deep with a 15 foot radius to the driveway.

104.07 LANDSCAPING

Landscaping must utilize low maintenance vegetation. The type of vegetation is to conform to the development in type and size of vegetation. OCUD must pre-approve all landscaping plans. Landscaping must incorporate evergreen shrubs and trees such as Leyland cypress, holly bushes, wax myrtle or other types of plants deemed appropriate by landscape architect.

104.08 LIFT STATION PAD

The lift station shall be provided with a concrete pad that extends one foot beyond the fencing and provides adequate sloping to prevent inflow and infiltration. The pad must pass a soil compaction test and shall be constructed with a minimum of 4 inches of crushed stone and 4 inches of reinforced concrete. Concrete shall meet the requirements of Section 202.06 of Article 2 Site Work.

END OF SECTION

Section 105. Applicable Water and Wastewater Standards

105.01 STANDARDS

- A. It is intended that the Developer and/or Owner be responsible for the design of adequate water and wastewater systems as necessary for the development being served. The methods of design and construction shall be governed by the applicable standards listed hereinafter. By reference, the standards are made a part of these specifications and standards.
1. Georgia State Department of Natural Resources (DNR), Environmental Protection Division (EPD), Rules and Regulations for Water Quality Control, Chapter 391-3-6, latest effective date, Drinking Water Rules 391-3-5, latest effective date.
 2. Water Environment Federation (WEF), Regulation of Sewer Use, WEF Manual of Practice No. 3, latest edition.
 3. Recommended Standards for Wastewater Facilities, 1990 or later editions, Policies for the Review and Approval of Plans and Specifications for Wastewater Facilities, A report of the Committee of the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, generally referred to as the "Ten (10) States Standards for Sewage Works".
 4. Gravity Sanitary Sewer Design and Construction, American Society of Civil Engineers (ASCE) Manuals and Reports on Engineering Practice No. 60, Water Environment Federal (WEF) Manual of Practice No.FD-5, revised April 1982.
 5. Criteria for Slow Rate Land Treatment and Urban Water Reuse, State of Georgia Department of Natural Resources, Environmental Protection Division, March, 1992.
 6. Utility Accommodations Policy and Standards, Georgia Department of Transportation, Office of Utilities, latest edition.
 7. Soils Survey of Oconee County, Georgia, by the United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Georgia College of Agriculture, Agriculture Experiment Stations.
 8. American Water Works Association (AWWA) Standards, latest editions.
 9. American National Standards Institute (ANSI) Standards, latest editions.
 10. American Society for Testing and Materials (ASTM) Standards, latest editions.
 11. Occupational Safety and Health Administration (OSHA) regulations, latest editions.

12. Georgia Department of Transportation (DOT) specifications and regulations, latest editions.
13. American Association of State Highway and Transportation Officials (AASHTO) specifications, latest editions.
14. American Society of Mechanical Engineers (ASME) standards, latest editions.
15. National Electrical Manufacturer's Association (NEMA) standards, latest editions.
16. American Concrete Institute (ACI) standards, latest editions.
17. American Welding Society (AWS) standards, latest editions.
18. Manual on Uniform Traffic Control Devices (MUTCD), Latest Edition
19. Oconee County Utilities Location Ordinance, Latest Revision
20. Oconee County Sewer Use Ordinance, Latest Revision
21. Manual for Erosion, Sediment and Pollution Control in Georgia, Latest Edition
22. Oconee County Unified Development Code, Latest Revision
23. International Fire Code, Latest Edition
24. Oconee County Utility Department Water & Wastewater System Ordinance (latest edition)

END OF SECTION

END OF ARTICLE

Article 2 Site Work

Section 201. Clearing and Grubbing

Part 1 General

201.01 SCOPE

- A. Clearing and grubbing includes, but is not limited to, removing from the Project site, trees, stumps, roots, brush, structures, abandoned utilities, trash, debris and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures that prevent damage to existing features to remain are part of the Work.
- B. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

201.02 QUALITY ASSURANCE

- A. The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.
- B. Open burning, if allowed, shall first be permitted by the local authority having jurisdiction. The Contractor shall notify the local fire department and abide by fire department restrictions.

201.03 JOB CONDITIONS

Location of the Work: The area to be cleared and grubbed shall be shown schematically on the Drawings and include all areas designated for construction.

PART 2 PRODUCTS

201.04 EQUIPMENT

The Contractor shall furnish equipment of the type normally used in clearing and grubbing operations including, but not limited to, tractors, trucks, loaders, root rakes and burning equipment.

PART 3 EXECUTION**201.05 SCHEDULING OF CLEARING**

- A. The Contractor shall clear at each construction site only that length of the right-of-way, permanent or construction easement which would be the equivalent of one month's pipe laying.
- B. The County may permit clearing for additional lengths of the pipe line provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass is established.

201.06 CLEARING AND GRUBBING

- A. Clear and grub along the pipeline route before excavating. Remove all trees, growth, debris, stumps and other objectionable matter. Clear the construction easement or road right-of-way only if necessary.
- B. Grubbing shall consist of completely removing roots, stumps, trash and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.
- C. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.
- D. Landscaping features shall include, but are not necessarily limited to, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.
- E. Surface rocks and boulders shall be grubbed from the soil and removed from the site if not suitable as rip rap.
- F. Where tree limbs interfere with utility wires, or where trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.
- G. All fences adjoining any excavation or embankment that, in the Contractor's opinion, may be damaged or buried, shall be carefully removed, stored and replaced by the contractor. Any fencing that, in the County's opinion, is significantly damaged shall be replaced by the contractor with new fence material.

- H. The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the limits of the construction area but not directly within excavation and/or fill limits. The Contractor shall be held liable for any damage the Contractor's operations have inflicted on such property.
- I. The Contractor shall be responsible for all damages to existing improvements resulting from Contractor's operations.

201.07 DISPOSAL OF DEBRIS

- A. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall any material or debris be left on the Project, shoved onto abutting private properties or buried on the Project.
- B. When approved in writing by the County, the Contractor may dispose of such debris by burning on the Project site. The authorization to burn shall not relieve the Contractor in any way from damages which may result from Contractor's operations. On easements through private property, the Contractor shall not burn on the site unless written permission is also secured from the property owner, in addition to authorization from the County.

END OF SECTION

Section 202. Erosion and Sediment Control

PART 1 GENERAL

202.01 SCOPE

A. Submittals and Permits

1. The Developer shall acquire Land Disturbance Permits from the appropriate authority and shall pay any fees for said permits. The Developer shall be responsible for submitting to the appropriate authority sufficient documents such that the authority can acquire approval from the local Soil and Water Conservation District. All fines imposed for improper erosion and sedimentation control shall be paid by the Developer. See the Oconee County Soil Erosion and Sediment Control Ordinance.
2. Land disturbance activity shall not commence until the Land Disturbance Permit is issued.
3. Working drawings shall indicate controls which will ensure that storm water and drainage from the disturbed jobsite areas, which will be denuded, stripped or modified of its naturally existing or artificially established stabilization or protection against erosion, shall pass through some type of filter system before being discharged. These areas shall be kept sufficiently moist to control dust.

B. Basic Principles

1. All erosion and sedimentation control techniques and procedures shall conform to the "Manual For Erosion and Sediment Control in Georgia."
2. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.
3. Minimize the disturbed area and the duration of exposure to erosion elements.
4. Stabilize disturbed areas immediately.
5. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.
6. Retain sediment on site that was generated on site.
7. Minimize encroachment upon watercourses.

C. Implementation

1. The erosion and sedimentation control measures shown on the Drawings are minimal requirements. The Contractor's methods of operation may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the Contractor's responsibility to determine and install said measures. The Contractor's failure to stabilize disturbed areas immediately following intermediate or final grading may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the Contractor's responsibility to determine and install said measures.
2. The Contractor shall notify the County of any changes and/or additions to the erosion and sedimentation control plan necessary to accommodate the Contractor's methods of operation.
3. The Contractor shall be solely responsible for control of erosion within the Project site and prevention of sedimentation of any adjacent waterways.
4. The Contractor shall install controls which will ensure that stormwater and drainage from the disturbed area of the Project site shall pass through some type of filter system before being discharged. The filter system must meet the requirements of the Georgia Erosion and Sedimentation Act of 1975 as amended.

D. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward:

1. Preventing soil erosion at the source.
2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.
3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.

E. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the Project site.

202.02 QUALITY ASSURANCE

- A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated herein and these Specifications.

- B. Conflicts: Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

PART 2 PRODUCTS

202.03 TEMPORARY EROSION AND SEDIMENTATION CONTROL MATERIALS

- A. Silt Fence: Silt fence shall meet the requirements of Section 171 - Temporary Silt Fence of the Department of Transportation, State of Georgia, Standard Specification, latest edition. Silt fence fabric must be on the Georgia DOT Qualified Product List.
- B. Hay bales shall be clean, seed free cereal hay type.
- C. Netting shall be 1/2-inch, galvanized steel, chicken wire mesh.
- D. Filter stone shall be crushed stone conforming to Georgia Department of Transportation Table 800.01H, Size Number 203.
- E. Concrete block shall be hollow, non-load-bearing type.
- F. Plywood shall be 3/4-inch thick exterior type.

202.04 RIP RAP

- A. Use only one method throughout the job.
- B. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Rip rap shall have less than 66 percent wear when tested in accordance with AASHTO T-96. Unless shown or specified otherwise, stone rip rap shall be Type 1 rip rap.
1. Type 1 Rip Rap: The largest pieces shall have a maximum volume of two cubic feet. At least 35 percent of the mass shall be comprised of pieces which weigh 125 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10 percent of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia Department of Transportation Section 805.01 Stone Dumped Rip Rap, Type 201
 2. Type 3 Rip Rap: The largest pieces shall have a maximum approximate volume of one cubic foot. At least 35 percent of the mass shall be comprised of pieces which weigh 15 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10

percent of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia Department of Transportation Section 805.01 Stone Dumped Rip Rap, Type 203.

C. Sand-Cement Bag Rip Rap

1. The bags shall be of cotton, burlap or fiber reinforced paper capable of containing the sand-cement mixture without leakage during handling and placing. Bags previously used for sugar or any other material which will adversely affect the sand-cement mixture shall not be used. Capacity shall be not less than 0.75 cubic foot, nor more than two cubic feet.
2. Sand and Portland cement shall be mixed at the maximum ratio of 5:1 by weight and shall obtain a minimum compressive strength of 500 psi in seven days. For sand-cement bag rip rap, the amount of water used shall be just enough to make up the optimum moisture content of the aggregate and cement, as determined by AASHTO T 134. When sand-cement rip rap is to be pre-bagged, the sand-cement shall be mixed dry, and after placing each course, the bags shall be wetted until sufficient moisture is present for proper cement hydration.

202.05 FILTER FABRIC

- A. The filter fabric for use under rip rap shall be a monofilament, polypropylene woven fabric meeting the specifications as established by Task Force 25 for the Federal Highway Administration. The filter fabric shall have an equivalent opening size (EOS) of 70.
- B. Filter fabric shall meet the requirements of Trivera Spunbound 011/280. Mirafi 180N or Amoco 455203.

202.06 CONCRETE

Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

202.07 GABIONS

- A. Gabions shall be large, multi-celled, rectangular wire mesh boxes filled with rip rap to prevent erosion, scour or sloughing of an embankment. Gabions shall have the following features:
 1. Hexagonal mesh pattern, which under stress will deform but not break.

2. Triple twist, which will make the mesh non-ravelling.
 3. Reinforcing wires woven into each corner, which will increase the strength at the stress points and help the gabion retain its shape during and after filling.
 4. A diaphragm securely attached to the base, which will prevent the shifting of the stone and at the same time, reinforce the gabion.
- B. The wire mesh shall have an opening of approximately 3 x 4-inches and shall be a minimum 12 gauge. Wire mesh shall be galvanized.
- C. Gabion baskets shall be 12 feet long x 3 feet high with four cells.
- D. Gabions shall be equal to Maccaferri Gabions, Inc.

202.08 GENERAL STANDARDS

Developer shall provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Act of 1975 as amended in 1989 and 2000, local enforcing agency guidelines and these Specifications.

202.09 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the creeks. The preferred method is to provide an undisturbed natural buffer, extending a minimal 25 feet from the top of the bank, to filter the run-off.
- B. Silt dams, silt fences, traps, barriers, check dams, appurtenances and other temporary measures and devices shall be installed as indicated on the approved plans and working drawings, shall be maintained until no longer needed, and shall then be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials. Detention ponds, if constructed, shall be maintained in a condition ensuring that unfiltered water will not leave the pond.
- C. Where permanent grassing is not appropriate, and where the Contractor's temporary erosion and sedimentation control practices is inadequate, the County may direct the Contractor to provide temporary vegetative cover with fast growing seedings. Such temporary vegetative cover shall be provided by the Contractor in compliance with the Manual for Erosion and Sedimentation Control in Georgia, specifically in the selection of species, planting dates and application rates for seedings, fertilizer and mulching, with the exception that kudzu shall not be permitted.

- D. All erosion and sedimentation control devices, including check dams, shall be inspected by the Contractor at least weekly and after each rainfall occurrence and cleaned out and repaired by the Contractor as necessary.
- E. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

202.10 PERMANENT EROSION CONTROL

- A. Permanent erosion control shall include:
 - 1. Restoring the work site to its original contours, unless shown otherwise on the approved Drawings.
 - 2. Permanent vegetative cover shall be performed in accordance with Article 202.11 of this Section.
 - 3. Permanent stabilization of steep slopes and creeks shall be performed in accordance with Article 202.12 of this Section.
- B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the Project. In no event shall implementation be postponed when no further construction activities will impact that portion or segment of the Project.

202.11 PERMANENT GRASSING

- A. General
 - 1. All references to grassing, unless noted otherwise, shall relate to establishing permanent vegetative cover as specified herein for seeding, fertilizing, mulching, etc.
 - 2. When final grade has been established, all bare soil, unless otherwise required by the Contract Documents, shall be seeded, fertilized and mulched in an effort to restore to a protected condition. Critical areas shall be sodded. All ditches and waterways shall have erosion control blankets installed as well as all slopes greater than 3:1 Erosion control blankets shall extend a minimum four feet from ditch bottom on both sides.
 - 3. Specified permanent grassing shall be performed at the first appropriate season following establishment of final grading in each section of the site.
 - 4. Permanent grassing shall be of a perennial species.

5. Permanent grassing shall be inspected for acceptable cover, which is a viable stand of grass that covers at least 98% of the total area with no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.
- B. Replant grass removed or damaged in residential areas using the same variety of grass and at the first appropriate season. Where sod is removed or damaged, replant such areas using sod of the same species of grass at the first appropriate season. Outside of residential or landscaped areas, grass the entire area disturbed by the work on completion of work in any area. In all areas, promptly establish successful stands of grass.
- C. Grassing activities shall comply with the Manual for Erosion and Sediment Control in Georgia, specifically for the selection of species; with the exception that kudzu shall not be permitted, planting dates and application rates for seeding, fertilizer and mulching. Where permanent vegetative cover (grassing) cannot be immediately established (due to season or other circumstances) the Contractor shall provide temporary vegetative cover. The Contractor must return to the site (at the appropriate season) to install permanent vegetation in areas that have received temporary vegetative cover.

202.12 RIP RAP

- A. Rip rap shall be placed where banks of streams or drainage ditches are disturbed by excavation, or at all points where natural vegetation is removed from banks of the streams or drainage ditches. Carefully compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction along side a stream or drainage ditch as well as crossing a stream or drainage ditch.
- B. When trenching across a creek, place rip rap a distance of 10 feet upstream and 10 feet downstream from the top of the trench excavation. Place rip rap across creek bottom, across creek banks and extend rip rap placement five feet beyond the top of each creek bank.
- C. Preparation of Foundations: The ground surface upon which the rip rap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers. Unless at creek banks or otherwise shown or specified, rip rap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet deep in original ground, and the side next to the fill or cut shall have that same slope. After the rip rap is placed, the toe ditch shall be backfilled and the excess dirt spread neatly within the construction easement.

- D. **Placement of Filter Fabric:** The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be placed loosely so as to give and therefore avoid stretching and tearing during placement of the stones. The stones shall be dropped no more than three feet during construction. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals or other contaminants.
- E. **Placement of Rip Rap:** The rip rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Rip rap shall be placed with its top elevation conforming with the finished grade or the natural slope of the stream bank and stream bottom.
1. **Stone Rip Rap:** Stone rip rap shall be dumped into place to form a uniform surface and to the thickness specified on the Drawings. The thickness tolerance for the course shall be -6-inches and +12-inches.
 2. **Sand-Cement Bag Rip Rap:** The bags shall be uniformly filled to the maximum capacity which will permit satisfactory tying. The bagged rip rap shall be placed by hand with the tied ends facing the same direction, with close, broken joints. After placing, the bags shall be rammed or packed against one another to produce the required thickness and form a consolidated mass. The top of each bag shall not vary more than 3-inches above or below the required plane.
- F. **Gabions**
1. Where the slope of the banks of the stream is too steep to support rip rap, gabions shall be provided in lieu of rip rap.
 2. Gabions shall be assembled according to the manufacturer's recommendations. Laterally adjoining gabions shall be wired together by vertical edges. Vertically adjoining gabions shall be wired together along the front and back edges. Rip rap size for gabion construction shall be large enough not to fall out of gabions, but small enough to form three layers. Gabions shall be placed over a 6-inch layer of soil, crushed stone or sand overlaying a filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric.

END OF SECTION

SECTION 203. BORE AND JACK CASING

PART 1 GENERAL

203.01 SCOPE

Perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable.

203.02 CONTRACTOR EXPERIENCE

- A. Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide evidence of successful casing installations. A minimum of five continuous years of experience in steel casing construction is required of the casing installer.
- B. The filling of the void between the casing wall and carrier pipe is deemed to be specialty contractor work. If the Contractor elects to perform this work, the Contractor shall provide evidence of successful performance of void filling operations.

PART 2 PRODUCTS

203.03 MATERIALS AND CONSTRUCTION

- A. Casing
 - 1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A 36.
 - 2. The thickness of casing shown in paragraph B. below are minimum thickness. Actual thickness shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired.
 - 3. The diameters of casing shown in paragraph B. below are minimum. Larger casings, with the County's approval, may be provided, for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

4. In the event that casing is need for a crossing other than crossing a railroad or highway, the minimum casing shall correspond with the information listed on the table for crossing under highways.

B. Casing Sizes

UNDER RAILROADS			
Pipe Diameter, inches	Casing Diameter, inches	Casing Wall Thickness, inches	
		Coated	Uncoated
6	14	0.250	0.282
8	18	0.250	0.313
10	20	0.281	0.344
12	22	0.312	0.375
14	24	0.344	0.407
16	30	0.406	0.469
18	30	0.406	0.469
20	32	0.438	0.501
24	36	0.469	0.532
30	42	0.500	0.563
36	48	0.625	0.688
42	54	0.750	0.813
48	60	0.813	0.876
54	66	0.938	1.000

UNDER HIGHWAYS		
Pipe Diameter, inches	Casing Diameter, inches	Casing Wall Thickness, inches
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312
20	30	0.312
24	36	0.375
30	42	0.375
36	48	0.500
42	54	0.500
48	60	0.500

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a

hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be Cascade Waterworks Manufacturing Company or Advanced Products & Systems, Inc.

2. Casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware shall be Pipeline Seal and Insulator, Inc.
- D. Grout: Grout may be used for filling the void between the casing pipe and the carrier pipe. Cement shall conform to ASTM C 150, Type I or Type II. Grout shall have a minimum compressive strength of 100 psi attained within 24 hours.
 - E. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs.

203.04 EQUIPMENT

- A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.
- B. On casing pipe for gravity sewer over 60 feet in length, the installation equipment shall include a steering head and a grade indicator.
- C. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing which would indicate the elevation of the front end of the casing or some other means for grade indication that meets industry standards.

PART 3 EXECUTION

203.05 GENERAL

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions is the sole responsibility of the Contractor. Any subsurface investigation by the Contractor must be approved by the appropriate authority having jurisdiction over the site.
- B. Casing construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the

ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition.

C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.

D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions.

E. Highway Crossings

1. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the highway right-of-way.
2. Work along or across the highway department rights-of-way shall be subject to inspection by such highway department.
3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts or other surface drainage facilities of the highway, street or its connections.
4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the highway department.
5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.
6. The Contractor shall be responsible for obtaining a blasting permit in a timely manner.

F. Railroad Crossings

1. The Contractor shall secure permission from the Railroad to schedule work so as not to interfere with the operation of the Railroad.
2. All work on the Railroad right-of-way, including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the Railroad affected and any decisions of this representative pertaining to

construction and/or operations shall be final and construction must be governed by such decisions.

3. If, in the opinion of the Railroad, it becomes necessary to provide flagging protection, watchmen or the performance of any other work in order to keep the tracks safe for traffic, the Contractor shall coordinate such work and shall reimburse the Railroad, in cash, for such services, in accordance with accounting procedures agreed on by the Contractor and affected Railroad before construction is started.
4. No blasting shall be permitted within the Railroad right-of-way.

203.06 GROUNDWATER CONTROL

- A. The Contractor shall control the groundwater throughout the construction of the casing.
- B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, take such action as necessary to maintain safe conditions and prevent damage.
- C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24 hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap.

203.07 SAFETY

- A. Provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.
- B. Observe all applicable requirements of the regulations of the authorities having jurisdiction over this site. Conduct the operations in such a manner that all work will be performed below the level of the roadbed.
- C. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons".

203.08 SURFACE SETTLEMENT MONITORING

- A. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the expense of, the Contractor.

203.09 BORING AND JACKING

- A. Shaft
 - 1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
 - 2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loading of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.
 - 3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if required due to soil conditions.
- B. Jacking Rails and Frame
 - 1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
 - 2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
 - 3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.
- C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wet boring.
- D. Auger the hole and jack the casing through the soil simultaneously.
- E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

- F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.
- G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of 60 feet.
- H. Any casing pipe damaged in jacking operations shall be repaired, or removed and replaced at Contractor's own expense.
- I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.
- J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.
- K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
- L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.
- M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.
- N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be left in place, cut off or removed.
- O. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.
- P. Grout backfill shall be used for unused holes or abandoned pipes.

- Q. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

203.10 VENTILATION AND AIR QUALITY

Provide, operate and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

203.12 ROCK EXCAVATION

- A. In the event that rock is encountered during the installation of the casing pipe which cannot be removed through the casing, the Contractor may complete the crossing by a method established in a change order.
- B. At the Contractor's option, the Contractor may continue to install the casing and remove the rock through the casing.

203.13 INSTALLATION OF CARRIER PIPE

- A. Check the alignment and grade of the casing and prepare a plan to set the carrier pipe at proper alignment, grade and elevation, without any sags or high spots.
- B. The carrier pipe shall be held in the casing pipe by one of the following methods:
1. The carrier pipe shall be held in the casing pipe by the use of hardwood blocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe shall not be greater than 10 feet.
 2. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum 10 foot intervals. Casing spacers shall also be provided within two feet of each end of the casing.
 3. Joints shall be restrained joint type for pipe and standard mechanical restrained joints for fittings. Mechanical joints shall conform to AWWA C11201 Restrained joints shall be equal to American "FLEX-RING" or "Fast-Grip", or U.S. Pipe "TR FLEX" or "Field-Lok Gasket". No field welding of restrained joint pipe will be permitted.
- C. Close the ends of the casing with a seamless synthetic rubber seal with stainless steel banding straps as manufactured by Pipeline Seal and Insulator, Inc. or approved equivalent.

203.14 SHEETING REMOVAL

Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

END OF SECTION

Section 204. TRENCH EXCAVATION AND BACKFILL

PART 1 GENERAL

204.01 SCOPE

- A. The work under this Section consists of furnishing all labor, equipment and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines as specified.
- B. Excavation shall include the removal of any trees, stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades as specified.
- C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.
- D. The pipe zone area of the trench is divided into five specific areas:
 - 1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization.
 - 2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.
 - 3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.
 - 4. Initial Backfill: The area above the haunching material and below a plane 18-inches above the top of the barrel of the pipe.
 - 5. Final Backfill: The area above a plane 18-inches above the top of the barrel of the pipe.
- E. The choice of method, means, techniques and equipment rests with the Contractor. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way and prevailing practice in the area.

204.02 QUALITY ASSURANCE

- A. Density: All references to “maximum dry density” shall mean the maximum dry density defined by the “Maximum Density-Optimum Moisture Test”, ASTM D 698. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, “Density of Soil In Place by the Sand Cone Method”, ASTM D 2937, “Density of Soil In Place by the Drive-Cylinder Method” or ASTM D 2922, “Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)”.
- B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specification requirements shall be performed by an independent testing laboratory. The Contractor's testing laboratory shall perform tests upon change of source and at sufficient intervals during the work to certify conformance of all select material furnished for use on the Project.

204.03 SAFETY

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P “Excavation, Trenching & Shoring” as described in OSHA 2226.

PART 2 PRODUCTS**204.04 TRENCH FOUNDATION MATERIALS**

Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

204.05 BEDDING AND HAUNCHING MATERIALS

- A. Unless specified otherwise, bedding and haunching materials shall be crushed stone as specified below.
- B. Crushed stone utilized for bedding and haunching shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.
- C. Earth materials utilized for bedding and haunching shall be suitable materials selected from materials excavated from the trench. The earth materials excavated from trenching operations shall conform to Class I, II, or III as described in ASTM 2321, if such materials are to be use for bedding or haunching for sewer

pipe. Suitable materials shall also be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as bedding or haunching material, provide select material conforming to the requirements of this Section.

D. Filter Fabric

1. Filter fabric associated with bedding shall be a polypropylene woven fabric. The fabric shall be a high modulus type with good separation capabilities. The fabric shall be inert to biological degradation and naturally occurring chemicals, alkalies and acids.
2. The fabric shall have an equivalent opening size (EOS or AOS) of 20 to 45. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Method	Minimum Value
Grab Tensile Strength	lbs.	ASTM D 4632	200
Grab Tensile Elongation	%	ASTM D 4632	30 (max.)
Mullen Burst Strength	psi	ASTM D 3786	400
Trapezoid Tear Strength	lbs.	ASTM D 4533	75
Puncture Strength	lbs.	ASTM D 3787	75

203. If ordered by the County, the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of 10 days during initial pipe installation.
4. Filter fabric shall be Mirafi 500X, Amoco 2002 or Exxon GTF-200.

204.06 INITIAL BACKFILL

- A. Initial backfill material shall be crushed stone or earth materials as specified for bedding and haunching materials.
- B. Earth materials utilized for initial backfill shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting

the specified compaction requirements. When necessary, initial backfill materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as initial backfill material, provide select material conforming to the requirements of this Section.

204.07 FINAL BACKFILL

Final backfill material shall be general excavated earth materials, shall not contain rock larger than 2-inches at its greatest diameter, cinders, stumps, limbs, man-made wastes and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

204.08 SELECT BACKFILL

Select backfill shall be materials which meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

204.09 CONCRETE

Concrete for bedding, haunching, initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

PART 3 EXECUTION

204.10 TRENCH EXCAVATION

- A. Topsoil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.
- B. Trenches shall be excavated to the required lines and grades with the centerlines of the trenches on the centerlines of the pipes and to the dimensions which provide the proper support and protection of the pipe and other structures and accessories.
- C. Width
 - 1. The sides of all trenches shall be vertical to a minimum of one foot above the top of the pipe. The maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.

2. Excavate the top portion of the trench to any width within the construction easement or right-of-way which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.
3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 9-inches clearance between the rock and any part of the pipe barrel or manhole.
4. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the next higher class (load factor) of bedding and haunching for the full trench width as actually cut, at no additional cost to the Owner. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the Contractor's tamping and compaction equipment, intentional over-excavation due to the size of the Contractor's excavation equipment, or other reasons beyond the control of the Engineer or Owner.

D. Depth

1. The trenches shall be excavated to the required depth or elevation which allow for the placement of the pipe and bedding to the thickness required for proper support.
2. Water Mains and Force Mains
 - a. Excavate trenches to provide a minimum of four feet cover measured from the top of the pipe to the ground surface. Within the right-of-way of highways, streets or roadways, also excavate to place the top of the pipe a minimum of four feet below the nearest pavement edge.
 - b. Increase the depth of cover, as measured from the top of pipe, where necessary to avoid interference with underground utilities and obstructions.
3. Where rock is encountered in trenches, excavate to the minimum depth which will provide clearance below the pipe barrel of 8-inches for pipe 21-inches in diameter and smaller and 12-inches for larger pipe, valves and manholes. Remove boulders and stones to provide a minimum of 6-inches clearance between the rock and any part of the pipe, manhole or accessory.

E. Excavated Materials

1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Topsoil shall be carefully separated and lastly placed in its original location.
2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

204.11 SHEETING, BRACING AND SHORING

A. Sheeting, bracing and shoring shall be performed in the following instances:

1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.
2. In caving ground.
3. In wet, saturated, flowing or otherwise unstable materials. The sides of all trenches and excavations shall be adequately sheeted, braced and shored.
4. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees or private properties which are required to remain.
5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.
6. Sheeting shall be steel sheeting.

B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.

C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.

D. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in 6-inch increments with

specified backfilling occurring simultaneously. At no time shall the trench shield be “dragged” with the bottom of the shield extending below the top of the pipe.

- E. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when it cannot be safely removed. Cut off any sheeting left in place at least two feet below the surface.

204.12 ROCK EXCAVATION

- A. Definition of Rock: Any material which cannot be excavated with conventional excavating equipment, and is removed by drilling and blasting, and occupies an original volume of at least one-half cubic yard.
- B. Blasting: Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage.
- C. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.
- D. The Contractor shall notify the County prior to any blasting. Additionally, the Contractor shall notify the County before any charge is set.
- E. Following review by the County regarding the proximity of permanent buildings and structures to the blasting site, the County may direct the Contractor to employ an independent, qualified specialty sub- contractor, approved by the County, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

204.13 DEWATERING EXCAVATIONS

- A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.
- B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.
- C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the pipe line crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.

- D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.
- E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.
- F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the trench bottom. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing, 6 to 10-inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

204.14 TRENCH FOUNDATION AND STABILIZATION

- A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.
- B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and require trench stabilization.
- C. Should the undisturbed material encountered at the trench bottom constitute, an unstable foundation for the pipe, the Contractor shall be required to remove such unstable material and fill the trench to the proper subgrade with crushed stone.
- D. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.
- E. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

204.15 BEDDING AND HAUNCHING

- A. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on Oconee County Standard Details, and the pipe shall be placed thereon and brought to grade by tamping the bedding material or by removal of the slight excess amount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint. All bedding shall extend the full width of the trench bottom. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.
- B. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.
- C. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.
- D. Gravity Sewers and Accessories: All gravity sewers shall be bedded in accordance with ASTM D 232201 Lay all sewer pipe with a minimum class B bedding, unless otherwise specified.
 - 1. Class "A" (Bedding Factor - 2.8): Excavate the bottom of the trench flat at a minimum depth as required below the bottom of the pipe barrel. Lay pipe to line and grade on concrete block. Place concrete to the full width of the trench and to a height of one-fourth of the outside diameter of the pipe above the invert.
 - 2. Class "B" (Bedding Factor - 2019): Excavate the bottom of the trench flat at a minimum depth as required below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.
 - 3. Class "C" (Bedding Factor - 2015): Excavate the bottom of the trench flat at a minimum depth as required below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then

be carefully placed by hand and compacted to provide full support under and up to a height of one-fourth the outside diameter of the pipe above the bottom of the pipe barrel.

4. HDPE Pipe: Excavate the bottom of the trench flat at a minimum depth as required below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall be carefully placed by hand and compacted to provide full support under and up to 18-inches over the top of the pipe for pipe 42-inches in diameter and larger, and 12-inches over the top of the pipe for pipe 36-inches in diameter and smaller.
 5. Type 5: Excavate the bottom of the trench flat at a minimum depth as required below the bottom of the pipe barrel. Place and compact bedding material to the proper grade before installing pipe. After the pipe has been brought to the proper grade, haunching material shall be carefully placed by hand and compacted to the top of the pipe.
- E. Manholes: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole. Place and compact crushed stone bedding material to the required grade before constructing the manhole.
- F. Water and Force Mains
1. Ductile Iron Pipe
 - a. Utilize earth materials for bedding and haunching. Type 2, 3, 4 and 5 bedding shall be as detailed on the Oconee County Standard Drawings.
 - b. Restrained joint pipe and fittings bedding shall meet the requirements for Type 3 Pipe Bedding.
 - c. Type 4 or Type 5 Pipe Bedding shall utilize crushed stone bedding and haunching material.
 2. Polyvinyl Chloride Pipe
 - a. Utilize earth materials for bedding and haunching.
 - b. Bedding and haunching shall meet the requirements for Type 2 Pipe Bedding, as detailed on the Oconee County Standard Drawings.
- G. Excessive Width and Depth
1. Gravity Sewers: If the trench is excavated to excess width, provide the bedding class with the next higher bedding factor. Crushed stone haunching

and initial backfill may be used in lieu of Class “A” bedding, where Class “A” bedding is necessitated by excessive trench width.

2. Water and Force Mains: If the trench is excavated to excess width, provide the next higher type or class of pipe bedding, but a minimum of Type 4, as detailed on the Oconee County Standard Drawings.
 3. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.
- H. Compaction: Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of 90 percent of the maximum dry density, unless shown or specified otherwise.

204.16 INITIAL BACKFILL

- A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.
- B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least 18-inches above the pipe barrel. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.
- C. Backfill on both sides of the pipe simultaneously to prevent side pressures.
- D. Compact each layer thoroughly with suitable hand tools or tamping equipment.
- E. Initial backfill shall be compacted to a minimum 90 percent of the maximum dry density.
- F. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

204.17 CONCRETE ENCASEMENT

- A. Where concrete encasement is required, excavate the trench to provide a minimum of 6-inches clearance from the bell of the pipe. Lay the pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 6-inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.
- B. For pipes under structures, provide concrete backfill.

204.18 FINAL BACKFILL

- A. Backfill carefully to restore the ground surface to its original condition.
- B. The top 6-inches shall be topsoil obtained as specified in Article 203.01 of this Section.
- C. Excavated material which is unsuitable for back filling, and excess material, shall be disposed of. Surplus soil may be neatly distributed and spread over the site if approved by the County. If such spreading is allowed, the site shall be left in a clean and sightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.
- D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.
- E. After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:
 - 1. In 6-inch layers, if using light power tamping equipment, such as a “jumping jack”.
 - 2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet.
 - 3. In 24-inch layers, if using a hydra-hammer.
- F. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.
- G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density.

204.19 ADDITIONAL MATERIAL

Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be required. Utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide additional suitable fill material.

204.20 BACKFILL UNDER ROADS

Compact backfill underlying pavement and sidewalks, and backfill under dirt and gravel roads to a minimum 95 percent of the maximum dry density. The top

12-inches shall be compacted to a minimum of 98 percent of the maximum dry density.

204.21 BACKFILL WITHIN GEORGIA DOT RIGHT-OF-WAY

Backfill within the Georgia DOT right-of-way shall meet the requirements stipulated in the “Utility Accommodation Policy and Standards”, published by the Georgia Department of Transportation.

204.22 BACKFILL ALONG RESTRAINED JOINT PIPE

Backfill along restrained joint pipe shall be compacted to a minimum 90 percent of the maximum dry density, unless located under pavement, sidewalks, dirt roads, or gravel roads in which case compaction shall be as specified in Section 204.20. If pipe is located within Georgia DOT right-of-way, compaction shall be as specified in Section 204.21

204.23 DETECTION TAPE

Where required, detection tape shall be buried 4 to 10-inches beneath the ground surface directly over the top of the pipe. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finished grade surface.

204.24 TESTING AND INSPECTION

- A. The soil testing will be performed by an independent testing laboratory selected by the County.
- B. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with section 204.03.
 - 2. Field density tests for each two feet of lift, one test for each 2,000 feet of pipe installed or more frequently if ordered by the County.
 - 3. Inspecting and testing stripped site, subgrades and proposed fill materials.
- C. The Contractor's duties relative to testing include:
 - 1. Notifying laboratory of conditions requiring testing.
 - 2. Coordinating with laboratory for field testing.
 - 3. Providing excavation as necessary for laboratory personnel to conduct tests.

D. Inspection

1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the County.
2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer, who shall verify suitable bearing and construction.

E. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

END OF SECTION

Section 205. Removing and Replacing Pavement

PART 1 GENERAL

205.01 SCOPE

The work to be performed under this Section shall consist of removing and replacing existing pavement, sidewalks and curbs in paved areas where such have been removed for construction of water mains, fire hydrants, sewers, manholes and all other water and sewer appurtenances and structures.

205.02 SUBMITTALS

Certificates: When requested by the County, provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

205.03 CONDITIONS

A. Weather Limitations

1. Apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least 50 degrees F for 12 hours immediately prior to application.
2. Do not conduct paving operations when surface is wet or contains excess of moisture which would prevent uniform distribution and required penetration.
3. Construct asphaltic courses only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
4. Place base course when air temperature is above 35 degrees F and rising.

B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

PART 2 PRODUCTS

205.04 MATERIALS AND CONSTRUCTION

- A. Graded Aggregate Base Course: Graded aggregate base course shall be of uniform quality throughout and shall meet the requirements of Section 815.01 of the Georgia Department of Transportation Standard Specifications.
- B. Black Base: Black base course shall be of uniform quality throughout and shall conform to the requirements of Section 828 of the Georgia Department of Transportation Standard Specifications.
- C. Binder Course: The binder course of all paved roadways shall conform to the requirements of Section 400, Type “B” of the Georgia Department of Transportation Standard Specifications.
- D. Surface Course: The surface course for all pavement, including prime or tack coat when required by the Engineer, shall conform to the requirements of Section 400, Type “F” of the Georgia Department of Transportation Standard Specifications.
- E. Concrete: Provide concrete and reinforcing for concrete pavement or base courses in accordance with the requirements of the Georgia Department of Transportation Standard Specifications, Section 430. Concrete shall be of the strength classifications that matches or exceeds that of existing concrete being replaced.
- F. Special Surfaces: Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g., brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

205.05 TYPES OF PAVEMENTS

- A. General: All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existing prior to construction. Materials, equipment and construction methods used for paving work shall conform to the Georgia Department of Transportation specifications applicable to the particular type required for replacement, repair or new pavements.
- B. Aggregate Base: Aggregate base shall be constructed in accordance with the requirements of Section 310 of the Georgia Department of Transportation Standard Specifications. The maximum thickness to be laid in a single course shall be 6-inches compacted. If the design thickness of the base is more than 6-inches, it shall be constructed in two or more courses of approximate equal thickness. After

the material placed has been shaped to line, grade and cross-section, it shall be rolled until the course has been uniformly compacted to at least 100 percent of the maximum dry density when Group 2 aggregate is used, or to at least 98 percent of maximum dry density when Group 1 aggregate is used.

- C. Concrete Pavement: Concrete pavement or base courses shall be replaced with concrete. The surface finish of the replaced concrete pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the same types and dimensions as those removed. Concrete pavements or concrete base courses shall be reinforced.
- D. Asphaltic Concrete Base, Binder and Surface Course: Asphaltic concrete base, binder and surface course construction shall conform to Georgia Department of Transportation Standard Specifications, Section 400. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry and the tack coat has been applied. Apply and compact the base in maximum layer thickness by asphalt spreader equipment. After compaction, the black base shall be smooth and true to established profiles and sections. Apply and compact the surface course. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.
- E. Surface Treatment Pavement: Bituminous penetration surface treatment pavement shall be replaced with a minimum thickness of 1-inch conforming to Section 424, Georgia Department of Transportation Standard Specifications.
- F. Gravel Surfaces: Existing gravel road, drive and parking area replacement shall meet the requirements of graded aggregate base course. This surfacing may be authorized as a temporary surface for paved streets until replacement of hard surfaced pavement is authorized.
- G. Temporary Measures: During the time period between pavement removal and complete replacement of permanent pavement, maintain highways, streets and roadways by the use of steel running plates anchored to prevent movement. The backfill above the pipe shall be compacted, as specified in Oconee County Standards, up to the existing pavement surface to provide support for the steel running plates. All pavement shall be replaced within seven calendar days of its removal.

PART 3 EXECUTION

205.06 LOCATIONS FOR PAVEMENT REPLACEMENT

- A. “Type I” pavement repair shall be used to replace pavement removed from concrete streets, parking lots or driveways. Removing and replacing curbing and sidewalks will be considered as “Type I” pavement repair.
- B. “Type II” pavement repair shall be used to replace pavement removed from asphalt streets, parking areas or commercial driveways.
- C. “Type III” pavement repair shall be used to replace paving removed from asphalt residential driveways.
- D. “Graded Aggregate” pavement repair shall be used only where approved by the County.

205.07 REMOVING PAVEMENT

- A. General: Remove existing pavement as necessary for installing the pipe line and appurtenances.
- B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench.
- C. Breaking: Break asphalt pavement along the marks using pavement shearing equipment, jack hammers or other suitable tools. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
- D. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.
- E. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
- F. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
- G. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

205.08 REPLACING PAVEMENT

- A. Preparation of Subgrade: Upon completion of back filling and compaction of the backfill, arrange to have the compaction tested by an independent testing laboratory. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.
1. The existing street pavement or surface shall be removed along the lines of the work for the allowable width specified for the trench or structure. After the installation of the sewerage or water works facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed shall be done immediately prior to replacing the pavement.
 2. Trench backfill shall be compacted for the full depth of the trench as specified in Oconee County Standards for Trench Excavation and Backfill.
 3. Temporary trench backfill along streets and driveways shall include 6-inches of crushed stone or cherty clay as a temporary surfacing of the trenches. This temporary surface shall be maintained carefully at grade and dust-free by the Contractor until the backfill of the trench has thoroughly compacted.
 4. When temporary crushed stone or chert surface is considered by the County to be sufficient surface for gravel pavement, the surface shall be graded smooth and to an elevation that will make the final permanent surfacing level with the adjacent surfacing that was undisturbed.
- B. Pavement Replacement
1. Prior to replacing pavement, make a final cut in concrete pavement 12-inches back from the edge of the damaged pavement with a concrete saw. Remove asphalt pavement 12-inches back from the edge of the damaged pavement using pavement shearing equipment, jack hammers or other suitable tools.
 2. Replace driveways, sidewalks and curbs with the same material, to nearest existing undisturbed construction joint and to the same dimensions as those existing.
 3. If the temporary crushed stone or chert surface is to be replaced, the top 6-inches shall be removed and the crushed stone surfacing for unpaved streets or the base for the bituminous surface shall be placed.
 4. Following this preparation, the chert or crushed stone base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.

Removing and Replacing Pavement

5. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary chert or crushed stone surface and any necessary backfill material, additional existing paving and new excavation shall be removed. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and crushed stone bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.
6. Where driveways or roadways, constructed of specialty type surfaces, e.g., brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

C. Pavement Resurfacing

1. Where pavement to be resurfaced has been damaged with potholes, the Contractor shall remove all existing loose pavement material and fill the hole with black base, as specified, to the level of the existing pavement. After all pipe line installations are complete and existing pavement has been removed and replaced along the trench route, apply tack coat and surface course as specified.
2. Resurfacing limits shall be perpendicular to the road centerline. The limits of resurfacing shall be 10 feet beyond the edge of the pavement replacement on the main road being resurfaced, and to the point of tangency of the pavement on the side streets.

- D. Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original.

205.09 SIDEWALK AND CURB REPLACEMENT

A. Construction

1. All concrete sidewalks and curbs shall be replaced with concrete.
2. Preformed joints shall be 1/2-inch thick, conforming to the latest edition of AASHTO M59 for sidewalks and AASHTO M 123 for curbs.

Removing and Replacing Pavement

3. Forms for sidewalks shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength, when in place, to hold the concrete true to line and grade without springing or distorting.
 4. Forms for curbs shall be metal and of an approved section. They shall be straight and free from distortions, showing no vertical variation greater than 1/8-inch in 10 feet and no lateral variation greater than 1/4-inch in 10 feet from the true plain surface on the vertical face of the form. Forms shall be of the full depth of the structure and constructed such to permit the inside forms to be securely fastened to the outside forms.
 5. Securely hold forms in place true to the lines and grades required.
 6. Wood forms may be used on sharp turns and for special sections, as approved by the Engineer. Where wooden forms are used, they shall be free from warp and shall be the nominal depth of the structure.
 7. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
- B. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distances required to prevent cracking.
- C. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surface of the new work shall form an even, unbroken plane with the existing surfaces.
- D. The subgrade shall be formed by excavating to a depth equal to the thickness of the concrete, plus 2-inches. Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrades shall be compacted by hand tamping or rolling. Soft, yielding or unstable material shall be removed and backfilled with satisfactory material. Place 2-inches of porous crushed stone under all sidewalks and curbs and compacted thoroughly, then finish to a smooth, unyielding surface at proper line, grade and cross section.
- E. Joint for Curbs
1. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
 2. Thoroughly spade and compact the concrete at the faces of all joints filling all voids.

3. Install expansion joint materials at the point of curve at all street returns. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
 4. Place contraction joints every 10 feet along the length of the curbs and gutters. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or they shall be notched to permit the reinforcement to be continuous through the joint. Contraction joints shall be a minimum of 1-1/2-inches deep.
- F. Expansion joints shall be required to replace any removed expansion joints or in new construction as required. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within 1/2-inch of the top of finished concrete surface.
- G. Finishing
1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
 2. Finish the face of the curbs at the top and bottom with an approved finishing tool.
 3. Finish edges with an approved finishing tool having a 1/4-inch radius.
 4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
 5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.
- H. Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured. Provide necessary barricades to protect the work. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor.

205.10 MAINTENANCE

The Contractor shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the Project. Maintenance shall include

replacement, scraping, reshaping, wetting and rerolling as necessary to prevent raveling of the road material, the preservation of reasonably smooth surfaces and the repair of damaged or unsatisfactory surfaces. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

205.11 SUPERVISION AND APPROVAL

- A. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.
- B. Complete pavement restoration as soon as possible after backfilling.
- C. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the bonded period, promptly restore or repair defects.

205.12 CLEANING

The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition.

END OF SECTION

Section 206. Chain Link Fences and Gates

PART 1 GENERAL

206.01 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment and miscellaneous items as necessary for the installation of a complete chain link fence system. Fencing shall be installed in complete conformity with the manufacturer's written recommendations and as specified herein.
- B. Security fencing for the Contractor is at Contractor's option and is not included as part of the work specified.

206.02 DELIVERY AND HANDLING

- A. Deliver materials with the manufacturer's tags and labels intact.
- B. Handle and store materials in such a manner that will avoid damage.

206.03 QUALITY ASSURANCE

- A. Standards of manufacturer shall comply with the standards of the Chain Link Manufacturers Institute and these Specifications.
- B. Provide fencing as a complete unit produced by a single manufacturer including the required erection accessories, fittings and fasteners.

PART 2 PRODUCTS

206.04 GENERAL

- A. Overall height for new fencing shall be six feet including three strands of barbed wire on malleable iron post tops. Posts shall be set at no more than 10 foot centers, a full three feet deep in concrete footings, poured the full size of the holes as excavated. Corner posts shall have the necessary strut and tie bracing. Gates shall be provided of the size and at the locations indicated on the Drawings.
- B. Where fencing crosses ditches, steep grades, and other unusual conditions, make special provisions to insure that the security, appearance, maintainability and permanence of the standard fencing are equaled or exceeded.

206.05 MATERIALS AND CONSTRUCTION

- A. Fence Mesh: 9 gauge wire, woven to 2-inch squares, galvanized after weaving, six foot wide roll. Continuous tension wire shall be provided at the lower edge of the mesh.
- B. Line Post: 2-1/2-inch O.D. Galvanized Pipe (203.65 #/ft.).
- C. Corner Post: 3-inch O.D. Galvanized Pipe (5.79 #/ft.).
- D. Gate Post: 4-inch O.D. Galvanized Pipe (9.11 #/ft.).
- E. Top Rail: 1-5/8-inch O.D. Galvanized Pipe (2.27 #/ft.) with extra long pressed steel sleeves.
- F. Gates shall be supplied with heavy-duty latches, keepers and heavy duty hardened bronze padlocks with duplicate keys.
- G. Gate Frames: 2-inch O.D. Galvanized Pipe Frame (2.72 #/ft.).
- H. Barbed wire shall consist of three strands of 12 gauge wire, with 4-point pattern barbs, galvanized after weaving.

PART 3 EXECUTION

206.06 INSTALLATION

- A. Fence installation shall not be started before the final grading is completed, with finish grade elevations established, unless otherwise permitted.
- B. Excavation: Drill holes of diameters and spacing required, for post footings in firm, undisturbed or compacted soil.
 - 1. Excavate holes to the minimum diameters as recommended by fence manufacturer.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3-inches lower than the post bottom, with bottom of posts set not less than 36-inches below the surface when in firm, undisturbed soil.
 - 3. If solid rock is encountered near the surface, drill into rock at least 12-inches for line posts and at least 18-inches for end, pull corner, and gate posts. Drill hole at least 1-inch greater diameter than the largest dimension for the post to be placed. If solid rock is below soil overburden, drill to full depth required. Penetration into rock need not exceed the minimum depths specified above.

- C. Setting Posts: Remove loose and foreign materials from sides and bottoms of holes and moisten soil prior to placing concrete.
 - 1. Center and align posts in holes 3-inches above bottom of excavation.
 - 2. Place concrete around posts in a continuous pour and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
 - 3. Trowel finish tops of footings and slope of dome to direct water away from posts. Extend footings for gate posts to the underside of bottom hinge. Set keeps, stops, sleeves and other accessories into concrete as required.
 - 4. Keep exposed concrete surfaces moist for at least seven days after placement or cure with membrane curing materials or other acceptable curing methods.
 - 5. Grout-in posts set into sleeved holes, concrete constructions or rock excavations with non-shrink Portland cement grout or other acceptable grouting material.
- D. Concrete Strength: Allow concrete to attain at least 75 percent of its minimum 28 day compressive strength, but in no case sooner than seven days after placement, before rails, tension wires, barbed wire or fabric is installed. Do not stretch and tension fabric and wires and do not hang gates until the concrete has attained its full design strength.
- E. Top Rails: Run rail continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.
- F. Brace Assemblies: Install braces so posts are plumb when diagonal rods are under proper tension.
- G. Tension Wire: Install tension wires by weaving through the fabric and tying to each post with not less than 6 gauge galvanized wire or by securing the wire to the fabric.
- H. Fabric: Pull fabric taut and tie to posts, rails and tension wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.
- I. Repair damaged coatings in the shop or during field erection by recoating with manufacturer's recommended repair compound, applied per manufacturer's directions.
- J. Stretcher Bars: Thread through or clamp to fabric 4-inches on center and secure to posts with metal bands spaced 15-inches on center.

- K. Barbed Wire: Install three parallel wires on each extension arm; on security side of fence, unless otherwise indicated. Pull wire taut and fasten securely to each extension arm.
- L. Tie Wires: Use U-shaped wire appropriate for the diameter of pipe. Attach pipe and fabric firmly with tie wire ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.
- M. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

206.07 CLEANING

Perform cleaning during installation of the work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from chain link fence system installation. Cleaning shall include appropriate site restoration to its original condition.

PART 4 WASTEWATER LIFT STATIONS

206.08 SECURITY FENCING

All security fencing must be pre-approved by OCUD. Security fencing must provide security for the site as well as provide screening as well as add beautification to the area.

END OF SECTION

END OF ARTICLE 2

ARTICLE 3 STANDARD SPECIFICATIONS FOR WATER SYSTEM CONSTRUCTION

SECTION 301. WATER MAINS AND ACCESSORIES

PART 1 GENERAL

301.01 SCOPE

- A. This Section describes products to be incorporated into the water mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. Supply all products and perform all work in accordance with applicable Water Standards. Latest revisions of all standards are applicable.

301.02 QUALIFICATIONS

- A. If requested by the County, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.
- B. All products shall be cast, fabricated, assembled and manufactured in the United States of America.
- C. All materials used and which come in contact with drinking water must meet NSF Standard 61 for potable water use.

301.03 TRANSPORTATION AND HANDLING

Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories in accordance with manufacturer's written instructions. Make equipment available at all times for use in unloading.

301.04 STORAGE AND PROTECTION

Store and protect all pipe and accessories which cannot be distributed along the route. Store all pipe and accessories in accordance with manufacturer's written instructions.

PART 2 PRODUCTS

301.05 PIPING MATERIALS AND ACCESSORIES

- A. Ductile Iron Pipe (DIP): all water mains larger than 6-inches shall be DIP. Pipe shall be manufactured by American, U.S. Pipe, or Griffin.

1. Ductile iron pipe shall be rated as indicated in the following chart. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet.

Pipe Sizes (inches)	Type Class	Pressure (psi)
4	51	350
6-16	50	350
18	50	350
20	50	300
24	50	250

2. Flanged pipe minimum wall thickness shall be equal to Special Thickness Class 53. Flanges shall be provided by the pipe manufacturer with the pipe or fittings.
3. Pipe and fittings shall be cement lined in accordance with AWWA C104. Pipe and fittings shall be furnished with a bituminous outside coating.
4. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.
5. Joints
 - a. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Push-on and mechanical joints shall conform to AWWA C111. Restrained joints shall be equal to American "FLEX-RING" or "Fast-Grip", or U.S. Pipe "TR FLEX" or "Field-Lok Gasket". No field welding of restrained joint pipe will be permitted.
 - b. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
6. Provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of 1/8-inch thick, cloth reinforced rubber; gaskets may be ring type or full face type.

7. Bolts and Nuts

- a. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.
- b. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimensions shown in AWWA C111/ANSI A21.11.
- c. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
- d. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.
- e. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.

8. Mechanical joint glands shall be ductile iron.

9. Ductile iron pipe shall be encased with polyethylene film where shown on the Drawings. Polyethylene film shall meet the requirements of AWWA C 105.

10. Pipe bosses shall be welded-on ductile iron body type and shall be faced and tapped for AWWA C110 flange connection. All welding, fabrication and outlet hole drilling shall be performed by the manufacturer. Outlets shall be free of burrs. The bosses shall be welded on minimum Thickness Class 51 ductile iron pipe.

11. Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

12. Field Locks shall be used on bores with casing pipe installed.

13. Detection tape shall be provided over all DIP water mains.

B. Polyethylene Tubing and Fittings (PE)

1. Service tubing shall conform to AWWA C901, high density, SDR 9 with copper tube size outside diameters. Solid stainless steel inserts shall be provided where compression fittings will be used. Tubing shall be rated for 200 psi working pressure for cold water service. Tubing shall be used on all service lines 2" diameter and smaller.
 2. Fittings and adapters shall be cast bronze, compression type connection, equal to Mueller Style 110 or Dresser Style 88.
- C. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2-inches when buried less than 10-inches below the surface. Tape width shall be a minimum of 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

301.06 GATE VALVES (GV)

- A. 3-Inches in Diameter and Smaller (Non-Buried Service): Gate valves for non-buried service shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or flanged type as appropriate. Valves shall have a minimum 200 psi working pressure for water (125 psi working pressure for steam). Gate valves shall be equal to Crane No. 428.
- B. 2-Inches Through 12-Inches in Diameter (Buried Service): Gate valves 2-inches through 12-inches for buried service shall be resilient wedge type conforming to the requirements of AWWA C509 rated for 200 psi working pressure.
1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
 2. The valve gate shall be made of cast iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

3. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550, latest revision.
4. Gate valves 2 through 12-inches shall be manufactured by Mueller, U. S. Pipe or M & H Valve.
5. All valves shall be right hand closed.

301.07 FIRE HYDRANTS (FH)

- A. All fire hydrants shall conform to the requirements of AWWA C502 with a minimum 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5-1/4-inches.
- B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
- C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
- D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
- F. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by grease or an oil reservoir.
- G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.
- H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2-1/2-inch hose connections and one 4-1/2-inch pumper connection, all with National Standard threads and each equipped with cap and non-kinking chain.
- I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.

- J. Minimum depth of bury shall be 4.5 feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations. Hydrants shall be installed to edge of rights-of-way on all roads unless directed by OCUD personnel.
- K. All outside surfaces of the barrel above grade shall be painted red with enamel equal to Koppers Glamortex 501.
- L. Hydrants shall be traffic model and shall be Mueller Super Centurion or M & H Valve.
- M. Provide the County with one OCUD approved adjustable fire hydrant wrench for every accepted water system.
- N. Hydrants must be marked on the road with a blue road reflector.

301.08 VALVE BOXES (VB) AND EXTENSION STEMS

- A. All buried valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.
- B. All valves shall be furnished with extension stems, as necessary, to bring the operating nut to within 30-inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A-26441 or M & H Valve Style 3801.

301.09 VALVE MARKERS (VM)

The Contractor shall provide a concrete valve marker for each valve installed on state and county roads. Valve markers shall be stamped "Water". White reflectors shall be installed in neighborhoods on roadways.

301.10 TAPPING SLEEVES AND VALVES (TS&V)

- A. Tapping sleeves for PVC or DIP pipe shall be fabricated of stainless steel, and shall be clamp-on type, equal to Smith-Blair, JCM or Romac Industries, Inc.

301.11 SERVICE SADDLES

Service saddles for water service connections shall be AWWA tapered thread and equal to Smith-Blair Series 313 or JCM 402.

301.13 CORPORATION AND CURB STOPS

Corporation and curb stops shall be ground key or ball valve type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of the system and pressure test. Ends shall be suitable for tube compression type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nut for connection to tubing shall conform to ANSI B16.26. Corporation or curb stops shall be manufactured by Mueller, Ford, or A.Y. McDonald.

Meter swivels shall be installed on curbstops.

301.14 BACKFLOW PREVENTERS (BFP)

- A. Double Check Valve Assembly (DCV): For low hazard conditions subject to back pressure and back siphonage. The assembly shall be constructed of epoxy-coated ductile iron valve bodies with removable seats and stainless steel trim. The assembly shall contain two independent check valves, each equipped with bronze ball valve type test ports. Unit shall be furnished with two resilient seated isolation gate valves equal to those specified herein. Isolation gate valves shall be equipped with OS&Y handwheel operator. Unit shall be rated for a minimum 175 psi working pressure. Joints shall be flanged, Class 125. Units shall meet AWWA C510 and have UL/FM rating and be equipped with detector assembly for detection of unauthorized water use. Assemblies shall be equal to Watts, Ames, or Febco.
- B. Reduced Pressure Zone Assembly (RPZ): For high hazard conditions subject to back pressure and back siphonage. The assembly shall be constructed of fused epoxy coated cast iron check valve body with replaceable bronze seats, epoxy coated cast iron relief valve with stainless steel trim. Unit shall be furnished with two resilient seated isolation gate valves equal to those specified herein. Isolation gate valves shall be equipped with OS&Y handwheel operator. Unit shall be rated for a minimum 175 psi working pressure. Joints shall be flanged, Class 125. Units shall meet AWWA C511-92 and have UL/FM rating. Assemblies shall be equal to Watts or Febco.

- C. Dual Check Valve Assembly: For low hazard conditions (residential services): The assembly shall be constructed of cast bronze body with plastic check modules, silicone disc and buna N seals, and stainless steel spring. Unit shall be rated for a minimum 150 psi working pressure. Units shall meet AWWA and have UL/FM rating. Assemblies shall be equal to Watts or Febco.

301.15 WATER METER

All meters must be purchased through OCUD.

301.16 ALTITUDE VALVE (AV)

- A. Altitude control valve shall be of the single acting type, hydraulically-operated, diaphragm-actuated, pilot-controlled, globe type body. The valve shall close off tightly when the water reaches a maximum pre-determined level in the tank to prevent overflow. The valve shall not re-open to refill the tank until the water level drops a specified amount as adjusted on a differential control pilot valve.
- B. Valve closing speed shall be adjustable. The tank water level control shall be by means of a diaphragm-operated, spring-loaded, three-way pilot valve which senses the difference between the static force in the tank and the adjustable spring load. This is done by means of a sensing line between the tank and the pilot control.
- C. Valves shall be furnished with all exterior piping, fittings, wye strainers and ball valves. Wye strainers shall be equipped with ball type, blow-off valves for strainer flushing without removing line pressure. Top cover shall be equipped with blow-off valve for air release without removing line pressure.
- D. Main valve body shall be constructed of high tensile cast or ductile iron. Main valve trim shall be brass and stainless steel. Altitude control shall be high tensile cast iron with brass and stainless steel trim. All internal hardware shall be brass or stainless steel. Diaphragms shall be nylon fabric with Buna-N coating. O-rings shall be Buna-N. Valves shall be furnished with Class 125 flange ends and be designed for 150 psi working pressure. Valves shall be serviceable in-place by removal of top cover. All internal parts, O-rings and valve seats shall be replaceable through top cover.
- E. Valves shall be Watts, Ames, or Cla Val.

301.17 CHECK VALVE (CV)

- A. Check valve shall be hinged disc type with cast iron body and bronze or bronze-fitted disc. Valve shall be designed for the operating head indicated and shall not slam shut. Valve shall be equipped with a 1/2-inch stop cock at the high point of the valve for bleeding air from the line.

- B. Valves shall be outside weight and lever cushioned type. The cushion chamber shall be attached to the side of the valve body externally and constructed with a piston operating in a chamber that will effectively prevent water hammer at the heads indicated. The cushioning shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.
- C. Valve ends shall be flanged, meeting the requirements of ANSI B16.1, Class 125.
- D. Valves shall be manufactured by APCO or GA Industries.

301.18 MANHOLES AND PRE-CAST CONCRETE PRODUCTS

- A. Pre-cast Concrete Sections
 - 1. Pre-cast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in pre-cast sections shall be 4,000 psi. The minimum wall thickness shall be one-twelfth of the inside diameter of the base, riser or the largest cone diameter.
 - 2. Transition slabs which convert bases larger than four feet in diameter to four foot diameter risers shall be designed by the pre-cast concrete manufacturer to carry the live and dead loads exerted on the slab.
 - 3. Seal joints between pre-cast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be pre-formed type with a minimum nominal diameter of 1-inch.
 - 4. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants CS 202.
- B. Brick and Mortar: Brick shall be whole and hardburned, conforming to ASTM C 32, Grade MS. Mortar shall be made of one part Portland cement and two parts clean sharp sand. Cement shall be Type 1 and shall conform to ASTM C 150. Sand shall meet ASTM C 144.
- C. Plastic Steps: Manhole steps of polypropylene, molded around a steel rod, equal to products of M.A. Industries may be used.
- D. Floor Door
 - 1. Door shall be single or double leaf type as approved by the County.
 - 2. The frame shall be 1/4-inch extruded aluminum alloy 6063-T6, with built-in neoprene cushion and with strap anchors bolted to the exterior. Door leaf

shall be 1/4-inch aluminum diamond plate, alloy 6061-T6, reinforced with aluminum stiffeners as required. Stainless steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. The door shall be built to withstand a live load of 150 pounds per square foot, and shall be equipped with a snap lock and removable handle. Bituminous coating shall be applied to exterior of frame by the manufacturer. The door shall also be provided with a hasp and padlock in addition to the built-in locking mechanism. Padlocks for all doors shall be keyed alike.

3. The floor door shall be Type K, equal to The Bilco Company, or Thompson Fabricating Company "TuffHatch".

301.19 RETAINER GLANDS AND FLANGE ADAPTERS

- A. Retainer glands shall be Megalug Series 1100, as manufactured by EBAA Iron, or Uni-Flange Series 1400, as manufactured by Ford Meter Box Company.
- B. Flange Adapter: Flange adapters shall permit the connection of unthreaded, ungrooved, open-ended, ductile iron pipe to ANSI/ASME B16.1, Class 125 flanges. Flange adapters shall meet the test requirements of ANSI/ASME B16.1 for Class 125 flanges. The adapter shall be a ductile iron casting incorporating a flange with extended throat, set screws and gasket. The gasket shall provide a compression seal between the adapter, the pipe and the adjacent flange. Flange adapters are to be used only in locations specifically approved by the County and in accordance with the manufacturer's recommendations. Flange adapters shall be manufactured by Uni-Flange (Series 400) or EBAA Iron.

301.20 HYDRANT TEES

Hydrant tees shall be equal to ACIPCO A10180 or U.S. Pipe U-592.

301.21 ANCHOR COUPLINGS

Lengths and sizes shall be as approved by the County. Anchor couplings shall be equal to ACIPCO A 10895 or U.S. Pipe U-591.

301.22 VALVE KEYS

The Contractor shall provide to the Owner two valve keys for every 8 valves provided. Valve keys shall be 72-inches long with a tee handle and a 2-inch square wrench nut unless otherwise specified by OCUD. Valve keys shall be furnished by the valve manufacturer. Valve keys shall be equal to Mueller A-24610 or ACIPCO No. 1303. Valve keys must be provided before final acceptance is given by OCUD.

301.23 CONCRETE

Concrete shall have a compressive strength of not less than 3000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

PART 3 EXECUTION**301.24 EXISTING UTILITIES AND OBSTRUCTIONS**

- A. The Contractor shall call the Utilities Protection Center (UPC) (811) as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.
 - 1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure, at the time of any excavation, that a valid utility location exists at the point of excavation.
 - 2. Expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
 - 3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
 - 4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any.
- C. Conflict with Existing Utilities
 - 1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent

approval by the County. Where such relocation of the water main is denied by the County, the Contractor shall arrange to have the utility, main, or service relocated.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the County. Where such relocation of the water main is denied by the County, the Contractor shall arrange to have the utility, main, or service relocated.

D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Sewer Separation

1. There should be no physical connections between a public or private potable water supply system and a sewer, or appurtenances, which would permit the passage of any sewage or polluted water into the potable supply. No water pipes shall pass through or contact any part of a sewer manhole.
2. Water mains should maintain a minimum 10 foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10 foot separation, OCUD may reduce this distance provided the water main be placed in a separate trench or undisturbed earth shelf with a minimum of 18-inches of vertical separation between the bottom of the water main to the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18-inches.
3. The water main, when installed below the sewer, shall be encased either in a watertight casing pipe or in concrete with a minimum 6-inch concrete depth to the first joint in each direction. The encasement shall extend 10 feet on both sides of the crossing. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

301.25 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

- A. Install pipe lines and appurtenances along highways, streets and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation and Oconee County with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Traffic Control
 - 1. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved training program.
 - 2. Construction traffic control devices and their installation shall be in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways.
 - 3. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation and Oconee County a minimum of 48 hours in advance of the activity.
 - 4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed.
 - 5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.
 - 6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.

7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the Georgia Department of Transportation and Oconee County. Sign panels shall be of durable materials capable of maintaining their color, reflective character and legibility during the period of construction.
8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the current Manual On Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

C. Construction Operations

1. Perform all work along highways, streets and roadways to minimize interference with traffic.
2. Stripping: Where the pipe line is laid along road right-of-way, strip and stockpile all sod, topsoil and other material suitable for right-of-way restoration.
3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.
5. Construction operations shall be limited to 400 feet along areas, including clean-up and utility exploration.

D. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off of the pavement in a timely manner.

E. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement.

The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

G. Maintaining Highways, Streets, Roadways and Driveways

1. Maintain streets, highways, roadways and driveways in suitable condition for movement of traffic until completion and final acceptance of the Work.
2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.
3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.
4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the Work.

301.26 PIPE DISTRIBUTION

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- C. No distributed pipe shall be placed inside drainage ditches.
- D. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

301.27 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. Lay all pipe and fittings to accurately conform to the lines and grades approved by the County. Mains shall be installed after concrete curb has been installed for roadways through developments.
- B. Pipe Installation
 1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves and hydrants shall be

lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

2. All pipe, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the County, who may prescribe corrective repairs or reject the materials.
3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.
4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
6. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
7. Provide detection tape for all pipe. Detection tape shall be buried 4 to 10-inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finish grade surface.
8. Installation of ductile-iron water mains & their appurtenances shall be per AWWA C600 (Latest Edition) and Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe & Fittings for Water shall be per AWWA C605 (Latest Edition), unless otherwise stated in this section.

C. Alignment and Gradient

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

- D. **Expediting of Work:** Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint.
- E. **Joint Assembly**
1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
 2. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.
- F. **Cutting Pipe:** Cut ductile iron pipe using an abrasive wheel saw. Cut PVC pipe using a suitable saw; remove all burrs and smooth the end before jointing. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.
- G. **Polyethylene Encasement:** Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired.
- H. **Valve and Fitting Installation**
1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the County. Valves shall be closed before being installed.
 2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
 3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve

operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 30-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation.
5. A valve marker/reflector as advised by the OCUD inspector shall be provided for each underground valve. Valve markers shall be installed 6-inches inside the right-of-way or easement.
6. The Contractor shall provide to the Owner two valves key for every 8 valves provided. Valve keys shall be 72-inches long with a tee handle and a 2-inch square wrench nut unless otherwise specified by OCUD. Valve keys shall be furnished by the valve manufacturer. Valve keys shall be equal to Mueller A-24610 or ACIPCO No. 1303. Valve keys must be provided before final acceptance is given by OCUD.
7. All fittings shall be installed with retainer glands as well as thrust blocking. Refer to Section 307.29 for further information on thrust restraint.

I. Hydrant Installation and Spacing

1. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected.
2. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway.
3. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 18-inches above the ground and no more than 24" above finished grade.
4. Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch valve. When a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6-inches above the drain port opening in the hydrant to a distance of 12-inches around the elbow.

5. When a hydrant is set in clay or other impervious soil, a drainage pit 2 x 2 x 2 feet shall be excavated below each hydrant and filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6-inches above the drain port.
6. Hydrants shall be located as approved by the County. In the case of hydrants that are intended to fail at the ground-line joint upon vehicle impact, specific care must be taken to provide adequate soil resistance to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6-inches thick to a diameter of 24-inches at or near the ground line around the hydrant barrel.

J. Vaults

1. Construct the vault or manhole as approved by the County.
2. The floor door shall be cast into the top slab. The floor door drain shall be piped to vault exterior.
3. Manholes shall be constructed such that their walls are plumb.

301.28 CONNECTIONS TO WATER MAINS

- A. Make connections to existing pipe lines with tapping sleeves and valves.
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary to confirm the nature of the connection to be made.
- C. Interruption of Services: Make connections to existing water mains only when system operations permit. Operate existing valves only with the specific authorization and direct supervision of the County.
- D. Tapping Saddles and Tapping Sleeves
 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
 2. Prior to attaching the saddle or sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
 3. Before performing field machine cut, the water tightness of the saddle or sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five minutes.

4. After attaching the saddle or sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one percent hypochlorite solution.
- E. Connections Using Solid Sleeves: Where connections are approved by the County using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line.
- F. Connections Using Couplings: Where connections are approved by the County using couplings, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging and backfill.

301.29 THRUST RESTRAINT

- A. Provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: Provide retainer glands where approved by the County. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- C. Harnessing
 1. Provide harness rods only where specifically approved by the County.
 2. Harness rods shall be manufactured in accordance with ASTM A 36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
 3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90 degree bend eye bolts.
 4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.
- D. Hydrants: Hydrants shall be attached to the water main by the following method:
 1. All hydrant valves will be attached to the hydrants by means of anchor couplings.

2. The isolation valve shall be attached to the main by the hydrant tee or by the use of a MJ tee, and a piece of ductile. It should be rodded & mega lugged to achieve the proper set back to the right of way.
- E. Thrust Collars: Collars shall be constructed as approved by the County. Concrete and reinforcing steel shall meet the requirements as specified in this Section. The welded-on collar shall be designed to meet the minimum allowable load. The welded-on collar shall be attached to the pipe by the pipe manufacturer.
- F. Concrete Blocking
1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically approved by the County.
 2. Form and pour concrete blocking at fittings as required by the County. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

301.30 INSPECTION AND TESTING

- A. Pressure and Leakage Test
1. All sections of the water main subject to internal pressure shall be pressure tested in accordance with AWWA C600 and/or AWWA C605. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
 2. Each segment of water main between main valves shall be tested individually.
 3. Test Preparation
 - a. For water mains less than 24-inches in diameter, flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For water mains 24-inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the County. Partially open valves to allow the water to flush the valve seat.
 - b. Partially operate valves and hydrants to clean out seats.
 - c. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.

- d. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves.
 - e. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure.
 - f. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
 - g. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
4. Test Pressure: Test the pipeline at 200 psi measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not greater than 5 psi.
5. Leakage
- a. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 - b. Leakage through existing valves shall not relieve the Contractor from successfully completing the leakage test.
6. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

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

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)

As determined under Section 4 and 5 of AWWA C600.

If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

7. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings. A hydrant graph of each hydrant shall be provided, if requested by, OCUD.

301.31 DISINFECTING PIPELINE

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feed method and these Specifications.
- B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water.
- C. Chlorination
 1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours.
 2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period. Operate all valves and hydrants.
 3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.
- D. Disposal of Chlorinated Water: Reduce chlorine residual of disinfection water to less than one milligram per liter if discharged directly to a body of water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.
- E. Bacteriological Testing: After final flushing and before the water main is placed in service, the Contractor shall collect samples from the line and have tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. Testing shall be performed by a laboratory certified by the State of Georgia. Re-chlorinate lines until required results are obtained.

301.32 PROTECTION AND RESTORATION OF WORK AREA

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
 - 1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 - 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 - 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
 - 4. The Department of Transportation's engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.
- B. Man-Made Improvements: Protect, or remove and replace with the County's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the Work.
- C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the County. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.
- F. Swamps and Other Wetlands
 - 1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
 - 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.
 - 3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
 - 4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

END OF SECTION

SECTION 302. WATER SERVICE CONNECTIONS

PART 1 GENERAL

302.01 SCOPE

- A. The work covered by this Section includes furnishing all materials and equipment, providing all required labor and installing water service connections and all appurtenant work according to these Specifications and/or to the Water Connection Detail as shown schematically on the Standard Detail Drawings.
- B. Water meters are not to be furnished nor installed. However, the water meter connection must be compatible with the water meters currently used by the County.

302.02 LOCATIONS

Locations shall be directed by the County along the route of the water mains.

302.03 SERVICE COMPATIBILITY

It is the intent of these Specifications that the water service connections shall duplicate those presently being provided by the County in order to be compatible with their service maintenance procedures.

302.04 QUALITY CONTROL

All materials installed under this Section shall have the approval of the NSF for water services.

PART 2 PRODUCTS

302.05 MATERIALS AND CONSTRUCTION

- A. Service Line
 - 1. Polyethylene (PE) Tubing: The water service line shall be copper tube size polyethylene tubing conforming to or exceeding the requirements of ASTM D 2737. Working pressure rating shall be minimum of 200 psi with minimum burst pressure of 630 psi at 73.4 degrees F. All service lines 2" and smaller shall use polyethylene (PE) tubing.
 - 2. Detection tape shall be provided over all service lines.

B. Meter Box

1. Meter boxes placed in natural ground shall be plastic. Material shall meet or exceed the following:
 - a. Tensile Strength: 3,400 psi (ASTM D 638).
 - b. Flexural Modulus: 191,000 psi (ASTM D 790).
 - c. Impact Strength, Izod: 0.6-feet 16/inch (ASTM D 256).
 - d. Deflection Temperatures: 200 degrees F (ASTM D 648).
2. Plastic meter boxes shall be equal to Ametek, Plymouth Products Division or Brooks Products, Inc., Model D-1200 (Touch Read).
3. Meter box shall be fitted with cast iron cover.
4. Minimum dimensions shall be 10-3/4 x 16-inches top and 18-1/2 x 13-1/4-inches at bottom and 12-inches deep.
5. Once the meter box is in place it shall be marked with 2" pvc painted blue on the top. "W" shall be cut in the curb to indicate water.
6. Meter boxes placed in concrete/asphalt or high traffic areas shall be traffic rated and approved by OCUD.

C. Connections to Water Mains

1. Connections to ductile iron pipe water mains shall be by the service clamp method in full accordance with AWWA requirements.
2. Pressure ratings shall be as required for the installation.

PART 3 EXECUTION**302.06 INSTALLATION****A. Water Service Connections**

1. Water service connections shall be installed to the properties adjacent to the water transmission mains both to the same side of the roadway (Short Side Service) and to the opposite side of the roadway (Long Side Service) as directed by the County.

2. Water service connections installed under roadway (long side service) shall be pulled through a 2" PVC casing. Casings shall be installed through a bored hole approximately equal in diameter to the external diameter of the casing. Minimum cover under roadway shall be four feet. At other locations, minimum cover shall be two feet.
3. Installation shall conform to the details for water service connections appearing schematically on the Standard Detail Drawings. Contractor shall provide any and all appurtenant work required to provide the intended water service connections.
4. An inspection by OCUD will be performed after all service lines have been installed to ensure adequate pressure and flow of each service. If all services, meter boxes, valves, hydrants, and all other appurtenances meet county specifications and requirements, the contractor, developer, inspector, and utility coordinator shall sign a statement of completion and satisfaction for the operation of the water system. This statement will not relieve the developer of liability should another utility provider damage the water system in the future, but only serve as documentation of the completed installation. Acceptance of the water system after construction does not relieve the developer of meeting all OCUD requirements at the time of final plat.

B. Permanent Water Services

1. Each new service line shall be tapped into the main through a corporation stop, utilizing a service clamp, as detailed on the Standard Detail Drawings. A new service line shall be provided to the meter.
2. A corporation cock shall be provided in the water main for each service line.
3. A curb stop shall be provided at each existing or future water meter location.
4. A service line, sized to match the existing line unless directed otherwise by the County, shall be provided between the corporation cock and curb stop.

- C. Temporary Water Services: Temporary services shall consist of relocating an existing water meter to just outside the construction limits to clear proposed grading by the DOT Contractor. Temporary services shall include connecting the relocated meter to the existing or new water main as appropriate by means of a new service line and any additional depth service line installation required to clear proposed grading work.

D. Relocation of Service Lines

1. Relocate the existing meter to the new right-of-way limits and reconnect to the house service. Existing meters already located at the new right-of-way limits will not need relocating.
2. Before disconnecting the existing meter, the existing corporation in the main shall be closed. All existing meters and meter boxes shall be removed, if not already located at the right-of-way, reinstalled and reconnected.
3. Existing service lines shall be field-located by the Contractor. The Contractor shall be responsible for locating existing water meters, relocating the meters and meter boxes as necessary, and determining the existing size service line to reconnect the meters to the new water mains. All service lines installed under existing pavement, including streets, driveways and sidewalks, shall be installed by boring.
4. The Contractor shall be prepared to make emergency repairs to the water system, if necessary, due to damage by others working in the area. In conjunction with this requirement, the Contractor shall furnish and have available at all times, a tapping machine, for the purpose of making temporary water service taps or emergency repairs to damaged water services.

- E. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line, or the existing private service line, shall be provided by the Contractor. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

END OF SECTION

SECTION 303. WELL SYSTEMS

303.01 PURPOSE

This Article of the Specifications describes procedures, design criteria, and products to be incorporated into well systems to be owned and operated by the Oconee County Public Utilities Department. The Developer shall furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

303.02 GENERAL

The Developer shall furnish all products and perform all labor necessary for the well system to meet the requirements of the State of Georgia, Department of Natural Resources, Environmental Protection Division. Also, well systems shall be constructed according to Rules for Safe Drinking Water, Georgia State Code O.C.G.A. 12-5-120 to 138 Water Well Standards, and Minimum Standards for Public Water Systems, latest revision. All wells shall comply with Wellhead Protection Regulations.

303.03 SUBMITTAL REQUIREMENTS AND PROCEDURES

- A. Prior to submitting the Preliminary Design to the County, the Developer shall receive approval on the entire proposed water system from the Georgia Environmental Protection Division as outlined in Chapter 391-3-5.04 of Rules for Safe Drinking Water, latest revision.
- B. Construction Phase: The County inspector shall be given 24 hours advance notice prior to the well system start-up, in which pump, controls, hydro-pneumatic tank, chlorinator, valves and all appurtenances shall be demonstrated. Copies of all well construction data shall be submitted.
- C. Post-Construction Phase: All permanent easements required by the well system shall be shown on the record drawings and dedicated to the County in writing. A street address shall be provided for the well site.

303.04 DESIGN CRITERIA

- A. Well Capacity: The well shall be constructed to provide the higher amount of the following minimum capacities:
 - 1. As approved by the EPD.
 - 2. Five gallons per minute (5 gpm) per service connection in the proposed

- development.
 3. 50 gallons per minute
 4. The minimum diameter of the well shall be 6 inches.
 5. The well flow shall be recorded by a water meter housed at the well site. The minimum size of the well discharge line shall be 4 inches.
- B. The well flow shall be recorded by a water meter housed at the well site. The minimum size of the well discharge line shall be 4-inches.
- C. Chlorination: The water system shall be disinfected by a chlorine solution pumping system housed at the well site.
- D. System Pressure: The system pressure shall be maintained by a hydropneumatic storage tank and air charging system housed at the well site. The system pressure in the tank shall be maintained between 40 and 60 psi. The distribution system shall be designed to maintain a minimum pressure of 20 psi at each service connection in the system under all instantaneous system demands. The minimum size of the tank discharge line shall be 6-inches.
- E. Well Building and Site: The well and equipment shall be housed in a building whose exterior conforms to the subdivision's characteristics such as stucco finish, brick siding, etc., conforms to building codes, and is approved by the County on an individual basis. Building size shall be determined by the County based on treatment equipment to be housed (iron filters/treatment, fluoridation, chlorination, etc.). The building shall have a shingle covered, sloped, rafter-framed roof with a "hatch" above the well casing to allow for installation and repair of the well pump. Ceilings shall be insulated. Floors shall be 6-inch thick reinforced concrete slab with a 2-inch (minimum) diameter floor drain. All doors shall be metal and there shall be no windows. The building shall contain a wall-mounted electric heater, rotary gable vent fan, lighting, fan, and emergency power generator. Lot size shall have minimum dimensions of 40 feet by 40 feet. Access roads leading to the site shall be graded with drainage ditches and covered by #57 stone.

303.05 MATERIALS

- A. Well Pump: The pump shall be a deep well submersible turbine pump.
1. Operating Requirements:

Minimum discharge pressure @ well head (psi)	60
Diameter of well casing, inches (minimum)	6
Pump rpm, maximum	3,600

The pump shall be non-overloading throughout the operating range and shall not cavitate nor overload in the event that the discharge is against atmospheric pressure.

2. Housing: The pump shall be housed in a stainless steel casing to hold the bowls in alignment and compression.
3. Pump Bowls: The pump bowls shall be of bronze or glass-filled polycarbonate accurately formed and fitted to close dimensions.
4. Shaft: The impeller shaft shall be stainless steel of not less than 12 percent chrome, supported by a combination of water lubricated, fluted rubber and bronze bearings.
5. Impellers: Impellers shall be of bronze or glass-filled polycarbonate, accurately finished, mechanically balanced, and securely fastened to the impeller shaft.
6. Suction Screen: The pump shall have a stainless steel or bronze suction screen.
7. Thrust Bearing: The thrust bearing shall have ample capacity to carry the weight of all the rotating parts plus the hydraulic thrust with an ample safety factor. This factor should be based on an average life expectancy of five years operation at 24 hours per day.
8. Check Valve: The pump shall be equipped with an integral check valve.
9. Motor: The motor shall be designed and manufactured in accordance with the standards of NEMA and shall have the following characteristics:

Design B
230/460 volt, 60 Hz, three phase
Class B insulation
Service factor – 1.115
Continuous Duty
Submersible
Full voltage starting

10. Controls: Provide well pump controls for operation on the power source indicated. Controls shall include oil filled capacitors, manually reset overload protection, and lightning arrestor.

11. Accessories: Provide the following accessories:

- a. Power Cable: The pump manufacturer shall provide adequate submersible cable for the installation. The cable shall bear the U/L Seal of Approval. All splices shall be made in a manner approved by the manufacturer.
 - b. Discharge Pressure Gauge: A discharge pressure gauge shall be furnished and installed in a suitable location on the pump discharge.
12. Manufacturer: The pump shall be manufactured by Myers, Goulds, Red Jacket or REDA.

B. Ductile Iron Pipe

1. Ductile iron pipe shall be utilized where required by the County.
2. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as approved by the County. All pipe shall have a minimum pressure rating of 350 psi.
3. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer. Flanged joints shall conform to ANSI A21.10.
4. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolts and nuts shall conform in dimensions to the American Standard heavy series. Nuts shall be hexagonal, cold pressed. Bolts and nuts shall be cadmium plated, cold pressed, steel machine bolts, conforming to ASTM A 307, Grade B. Cadmium plating shall be by an approved process and shall be 3 to 5 mils thick.
5. Gaskets shall be full-face gaskets, 1/8-inch thick.
6. Flanged ductile iron pipe approximately 12-inches or less in length shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than 12-inches may be of the screw type. Pipe threads shall be of such length that with flanges screwed home, the end of the pipe shall project beyond the face line of the flange. Flange and pipe shall then be machined to give a flush finish to the pipe and the flange and surface shall be normal to the axis of the pipe. Ductile iron flanges shall be of such design that the flange neck completely covers the threaded portion of the pipe to protect same against corrosion. All pipe with screw type flanges shall be assembled, faced, and drilled at the point of manufacture, unless otherwise approved by the County.

- C. Polyvinyl Chloride Pipe: Unless directed otherwise by the County, use schedule polyvinyl chloride pipe for all interior polyvinyl chloride pipe and for all chemical and chlorination system piping. Schedule 80 in accordance with ASTM D 1785 shall be used. Joints shall be solvent weld socket type, with the same schedule as associated piping conforming to ASTM D 2466 or D 2467. Solvent cement shall conform to ASTM D 2564.
- D. Stainless Steel Pipe: All stainless steel pipe shall conform to ASTM A 269, Grade TP 316 and shall be Schedule 40, unless otherwise specified or shown on the Construction Plans. Fittings for stainless steel pipe shall be stainless steel threaded type.
- E. Check Valves
 - 1. Check valves shall be hinged disc type with cast iron body and bronze-fitted disc. Valves shall be designed for the operating head indicated and shall not slam shut on pump shutdown. Valves shall be equipped with a 1/2-inch stopcock at the high point of the valve for bleeding air from the line.
 - 2. Valves shall be outside weight and lever cushioned type. The cushion chamber shall be attached to the side of the valve body externally and constructed with a piston operating in a chamber that will effectively prevent hammering action at the pump discharge heads specified. The cushioning shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.
 - 3. Valves shall be manufactured by G-A Industries or APCO.
- F. Deep Well Air Valve: The valve shall be a float operated air and vacuum valve designed to release a large quantity of air on pump start-up and to allow air to enter the pump discharge column when the pump stops. The float shall be a stainless steel ball floating in a commercial bronze cup with phosphor bronze hangers. The valve seat shall be resilient rubber. The body flange and top shall be cast iron. The valve shall be equipped with an adjustable air flow regulator to control air flow and prevent float flutter. The valve shall be sized to meet individual system requirements. The valve shall be as manufactured by Crispin or APCO.
- G. Water Meter: The meter shall be the Class II turbine type meeting the requirements of AWWA C701. The meter shall have a bronze case with round flanges. The register shall be straight reading type calibrated in gallons, hermetically sealed, magnetically coupled, and shall have a center sweep test hand. The manufacturer shall submit an affidavit of compliance with specification requirements and shall furnish all required companion flanges, gaskets, bolts, Nuts, and other accessories. The minimum size of the meter shall be 2-inch. The meter shall be manufactured by Sensus or BJR.

- H. Chlorination System: Each well system shall have an automatic chlorination system consisting of a metering pump, a 50 gallon plastic solution tank, mixer, and all accessories required for a complete system. The metering pump shall have the capacity to meet the system demands. The solution shall be sodium hypochlorite. The tank shall be sized to provide one week's supply of solution to the system. The system shall be Wallace & Tiernan or Fisher & Porter.
- I. Hydropneumatic Storage Tank: The tank shall be a horizontal steel cylinder with a minimum capacity of 1000 gallons or as required by EPD.
1. Construction: The tank shall be fabricated in accordance with the ASME code requirements for unfired pressure vessels, and shall bear an ASME stamped nameplate. The tank shall be fabricated using steel meeting the requirements of ASTM A 284. The tank shall have a minimum rated working pressure of 75 psi. The tank shall be pressure tested at 100 psi for 30 minutes. The tank shall be fitted with two 125 pound ANSI flange connections for the required sizes. Provide on 1-1/2 -inch NPT connection for the air charging system and 1/4-inch connection for the pressure gauge. Provide a 12 x 16-inch elliptical manhole in a lower quadrant of the tank head.
 2. Coatings: All interior coatings shall be approved by the National Sanitation Foundation (NSF). Protective coatings shall be applied only when the temperature is above 40 degrees F. No coating shall be applied upon damp surfaces. Finish coats shall be applied by conventional or airless spray. Coatings shall be manufactured by Tnemec, Carboline or Induron.
 - a. Shop Cleaning: After fabrication, all steel shall be grit or shot blasted to remove all mill scale. Surface preparation shall conform to the requirements specified in the following Material Schedule.
 - b. Shop Prime: All steel shall receive shop primer applied immediately after cleaning. Shop primer shall be applied by conventional or airless spray. Shop primer shall be as specified in the following Material Schedule for Primer.
 - c. Interior Coatings: The tank interior shall receive finish coats at the factory. Each coat shall be tinted to facilitate positive identification of areas receiving subsequent coats. All "overspray dust" from previous coats must be removed before subsequent coats are applied.
 - d. Exterior Field Coating: After completion of the tank installation all surfaces on the exterior of the tank shall be inspected for abraded areas. Abraded areas shall receive field prime. After priming, all exterior surfaces shall receive finish coats. The exterior paint shall be applied by brush, spray or roller.

3. Installation: The tank shall be installed as shown on the Construction Plans and in accordance with the manufacturer's recommendations. Number and location of supports shall be as recommended by the manufacturer, and shall provide a minimum of 18-inches clearance under the tank.
 4. Disinfection: Upon completion of all work, the Contractor shall disinfect the tank before placing in service. The Contractor shall furnish all necessary materials, equipment and labor required to accomplish the disinfection. Disinfection shall be done by a method approved by the Owner and in accordance with the Section 391-3-5-.12 of the Rules for Safe Drinking Water of the Environmental Protection Division, Georgia Department of Natural Resources.
- J. Air Charging System: The air charging system shall be an automatic, integral compressor and volume control for hydropneumatic tanks. The system shall consist of 120 volt single phase air compressor, liquid level switch, in-line pressure switch and weather proof enclosure suitable for mounting on top of the tank. The pressure switch shall be set to maintain a tank pressure of 40-60 psi. The air charging system shall be equal to Air Rite manufactured by Whitewater.

303.06 WELL CONSTRUCTION

A. General

1. All public water supply wells must be constructed in accordance with the requirements of the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, by a water well contractor licensed in the State of Georgia.
2. Pitless adapter wells shall not be constructed for public water supply systems.
3. Wells shall be tested for plumbness and alignment in accordance with the latest edition of AWWA A100 Standard.
4. Drilling fluids must be from an uncontaminated source or must be disinfected.
5. All permanent casing, liners, screens and other manufactured material used in the well installation must be new. Material used shall preferably be wrought iron or steel.
6. All casing and liner pipe joints shall be watertight the entire length in drilled wells. They shall have full circumferential welds or threaded coupling joints.

7. The well casing shall neither terminate below ground or in a pit.
8. Packers shall be of a material that will not impart taste, odor, toxic substances or bacterial contamination to the water in the well.
9. During periods of stoppage of the well construction and when the site is unattended, the drilling contractor must have the well opening securely covered to prevent tampering and possible contamination. A welded metal plate is preferred for capping a well.
10. During the well construction, the premises, construction material, tools and equipment must be maintained in a sanitary manner to prevent contamination of the well by the person excavating the well.
11. The pump house floor shall be at least one foot above the original ground surface and not less than two feet above the highest known flood elevation.

B. Steel Casing

All well casing shall be steel pipe conforming to American Society for Testing and Materials (ASTM) Specification A120 or A53 or American Petroleum Institute (API) Specification 5L or 5LS or equal standard and meet the following minimum wall thickness:

Nominal Casing Diameter In inches	Minimum Wall Thickness In inches
4	0.188
5	0.188
6	0.188
8	0.219
10	0.250
12	0.250
14	0.312
16	0.312
18	0.375
20	0.375
24	0.375

C. Casing Depth and Grouting

1. The outer, permanent, protective casing shall extend at least five (5) feet into the first solid, unweathered or impervious subsurface rock strata encountered, and shall have a minimum length of twenty-five (25) feet from the ground surface into a well excavated into water bearing formations in crystalline rocks.
2. The outer, permanent, protective casing shall be cement grouted its entire length with a cement slurry consisting of not more than six (6) gallons of

water to one cubic foot of cement, plus standard additives, when necessary, to facilitate placing or setting. The neat cement shall conform to ASTM Standard C150.

3. The outer protective casing shall be provided with sufficient guides or centralizers attached or welded to the casing to permit unobstructed flow and uniform thickness of grout.
4. The guides or centralizers shall be attached to the bottom of the casing and at intervals not greater than 25 feet.
5. The grout shall be placed under pressure by a positive displacement method, such as pumping, from the bottom of the annular space upward until the grout is extruded at the earth's surface in one continuous operation.
6. The wall thickness of the cement grout surrounding the outer, permanent, protective casing shall be not less than one and one-half (1-1/2) inches at any point.
7. Subsurface well construction shall cease for at least twenty-four (24) hours after grouting.

D. Well Development

1. The well shall be properly developed, disinfected, and pump tested by the Developer's drilling contractor.
2. Development of the well shall accomplish removal of native silts and clays, drilling mud, and shall continue until the maximum specific capacity is obtained from the completed well.
3. Every well shall be tested for yield and drawdown. The static water level, drawdown and pumping water level must be measured.
4. The well shall be test pumped at not less than the desired yield for a period of at least twenty-four (24) hours and shall continue for at least four (4) hours after the pumping level has stabilized.
5. The method of testing shall be the Step Drawdown Method. It involves the wellbeing "step" tested at rates approximately 1/2, 1, and 1 1/2 times the design capacity of the well. Each step consists of equal periods of pumping except the final step shall be continued for a longer period of time if desired by the County. The pump is operated continuously for the entire period of the test. The discharge must be controlled with a gate valve, if electric driven, or a gate valve and throttle if engine driven. The discharge

is controlled and maintained at approximately the desired discharge for each step with an accuracy of + 5 percent. Pump discharge shall be measured with a meter such as a circular orifice meter that will permit instantaneous determination of the discharge rate. A half-inch I.D. or larger pipe shall be installed from a point about 2 feet above the pump intake to the well head. The top of the pipe is readily accessible to insert remove and read the depth to the water using either a steel tape or 2-wire electric sound. Measurements of pumping rate and water level are to be made for each step of the test according to the following schedule:

Start to 10 minutes of test	10 minutes to 20 minutes	20 minutes to 1 hour
Every minute	Every 2 minutes	Every 5 minutes

1 hour to 2 hours of test	2 hours to 5 hours of test	5 hours to remainder of test
Every 15 minutes	Every 30 minutes	Every 60 minutes

Recovery water level measurements are made with the same frequency until the well has fully recovered or until sufficient data have been obtained to extrapolate full recovery. The test pump shall be capable of pumping 150 percent of the desired yield of the well.

6. The pumping equipment shall be capable of operating continuously without interruption for the maximum period contemplated for the test.

E. Well Disinfection

1. The well must be disinfected prior to the pumping test by the introduction of a chlorine solution into the well under sufficient pressure to overcome the natural flow pressures of all developed water bearing zones, and in sufficient quantity to produce a minimum chlorine residual of fifty (50) parts per million (mg/l) in six (6) hours after such application.
2. After disinfection, the well must be pumped until no trace of chlorine remains in the water, and water samples taken for microbiological analysis. If the water samples submitted are found to be unsatisfactory, the disinfection procedure must be repeated.
3. The permanent pump and pumping equipment shall be disinfected with a chlorine solution prior to being placed into service.

END OF SECTION
END OF ARTICLE

ARTICLE 4
STANDARD SPECIFICATIONS FOR WASTEWATER SYSTEM CONSTRUCTION

SECTION 401. SEWERS AND ACCESSORIES

PART 1 GENERAL

401.01 SCOPE

- A. This Section describes products to be incorporated into sewers and accessories and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.

401.02 QUALIFICATIONS

If requested by the County, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

401.03 TRANSPORTATION AND HANDLING

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.
- B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.

401.04 STORAGE AND PROTECTION

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves shall be drained and stored in a manner that will protect them from damage by freezing.

- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.
- D. Store Joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first in, first out basis.

PART 2 PRODUCTS

401.05 PIPING MATERIALS

A. Ductile Iron Pipe (DIP)

1. Ductile iron pipe shall be utilized in force mains for stream crossings, highway and railroad crossings, and other applications as required by the County. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Ductile iron pipe on piers shall be furnished in exact lengths of 20 feet.
2. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise required by the County:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 18	350
20	300
24	250
30 - 54	200
60 - 64	200

1.
 3. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer.
 5. Pipe and fittings shall be cement lined in accordance with AWWA C104. Pipe and fittings shall be furnished with a bituminous outside coating.
 5. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 manufacturer's standard for 54-inches and larger with a minimum rated working pressure of 250 psi.

6. Joints

- a. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Joints shall conform to AWWA C111. Flanged joints shall conform to AWWA C115. Restrained joints shall be equal to American “LOK-FAST” “FLEX-RING” or “LOK-RING”, Clow “SUPER-LOCK” or U.S. “TR-FLEX” or “LOK-TYTE.”
 - b. Restrained joint pipe on supports shall have bolted joints and shall be specifically designed for clear spans of 36 feet, minimum. Joints for restrained joint pipe on supports shall be American “LOK-FAST”, Clow “LONG SPAN” or U.S. Pipe “LOK-TYTE”. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Joints shall conform to AWWA C111. Flanged joints shall conform to AWWA C115. Restrained joints shall be equal to American “LOK-FAST” “FLEX-RING” or “LOK-RING”, Clow “SUPER-LOCK” or U.S. “TR-FLEX” or “LOK-TYTE.”
7. Provide the appropriate gaskets for joints. Gaskets for flange joints shall be made of 1/8-inch thick, cloth reinforced rubber; gaskets may be ring type or full face type.
 8. Provide the necessary bolts for mechanical, restrained and flange connections. Bolts for flange connections shall be steel with American Regular unfinished square or hexagon heads. Nuts shall be steel with American Standard Regular hexagonal dimensions, all as specified in ANSI B17.2. All bolts and nuts shall be threaded in accordance with ANSI B1.1. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A and 2 B fit. Mechanical joint glands shall be ductile iron.
 9. Provide Detection tape over all DIP sewers
 10. Combustible gas detectors must be provided for all sewer extensions.
 11. Acceptance will be on the basis of the County’s inspection and the manufacturer’s written certification that the pipe was manufactured and tested in accordance with the applicable standards.
 12. Detection Tape: Provide detection tape over all DIP sewers.

13. Acceptance: Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

B. Polyvinyl Chloride (PVC) Gravity Sewer Pipe

1. Pipe shall be SDR 26, Class 160 and green in color..
2. PVC gravity sewer pipe shall be supplied in lengths not less than 13 feet, and not longer than 20 feet.
3. Fittings
 - a. Fittings 15 inches in diameter and less shall be manufactured in accordance with ASTM D 3034. PVC compound shall be 12454B or 12454C as specified in ASTM D 1784.
 - (1) For sizes 8-inches and less in diameter, fittings shall be molded in one-piece with no solvent welded joints. Minimum socket depths shall be as specified in ASTM D 3034, Table 2.
 - (2) For sizes 10-inches and larger in diameter, fittings shall be fabricated from pipe conforming to ASTM D 3034 using solvent welding. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings shall be delivered ready for use.
 - b. Fittings 18 inches in diameter and larger shall be fabricated from pipe conforming to ASTM F 679 using solvent welding. No field fabrication of fittings will be allowed. Gravity lines shall utilize HARCO fittings. All fabrication shall be the same material manhole to manhole.
4. Joints: Joints for pipe and fittings shall be of the integral bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage, when tested in accordance with ASTM D 3212. Gaskets shall meet the requirements of ASTM F 477. The joint system shall be subject to the approval of the County and shall be identical for pipe and fittings.
5. Manhole Connections
 - a. Solid Wall and Closed Profile Wall Pipe: The sewer shall be connected to manholes utilizing a standard pipe section.

- b. Open Profile Wall Pipe: The sewer shall be connected to manholes with an adapter piece. The adapter piece shall have an open profile pipe bell and a solid wall pipe spigot for penetrating the manhole wall.
 - c. A minimum of 2, OCUD approved, manhole hooks must be provided to OCUD for every 8 manholes installed.
 - d. A GasAlertQuattro4 Gas detector with calibration kit must be provided for all sewer extensions.
6. Acceptance: Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe and fittings were manufactured and tested in accordance with the applicable standards.

C. Polyvinyl Chloride (PVC) Pressure Pipe

- 1. Pipe: PVC pipe shall conform to AWWA C900, DR 18, Class 150 or DR 14, Class 200 based on design pressure. Pipe shall be green.
- 2. Fittings: Fittings for pipe 8-inches and less in diameter shall be one-piece with no solvent-welded joints. Fittings for pipe 10-inches and larger may be fabricated using solvent welding; however, no field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings delivered ready for use.
- 3. PVC pressure pipe shall be supplied in 20 foot nominal lengths.
- 4. Fittings
 - a. Fittings shall be cast or ductile iron meeting the requirements of AWWA C110 or AWWA C153 with rated working pressure of 250 psi. Fittings shall be cement lined in accordance with AWWA C104. Furnish fittings with a bituminous outside coating.
 - b. Special adapters or gaskets shall be provided as recommended by the Manufacturer
 - c. Manufacturer to adapt the PVC pipe to mechanical joints with cast or ductile iron pipe, fittings or valves.
- 5. Joints: Pipe and fittings shall have integral bell and spigot type joints with elastomeric gaskets having the capability of absorbing expansion and contraction without leakage. Joints shall meet the requirements of ASTM D 3139; gaskets shall meet the requirements of ASTM F 477. Joint system shall be subject to the approval of the County and shall be identical for pipe and fittings.

6. Detection tape: Provide detection tape over all PVC sewers
 7. Acceptance: Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.
- E. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Sanitary Sewerage Systems, Safety Green, "Caution: Sewer Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be minimum 2-inches when buried less than 10-inches below the surface. Tape width shall be minimum 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.
- F. Retainer Glands: Retainer glands shall be Megalug, Series 1100, as manufactured by EBBA Iron.

401.06 MANHOLES AND PRE-CAST CONCRETE PRODUCTS

- A. Pre-cast Concrete Sections
1. Pre-cast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in pre-cast sections shall be 4,000 psi.
 2. The minimum wall thickness shall be one-twelfth of the inside diameter of the base, riser or the largest cone diameter. Additionally, the wall thickness shall be sufficient for the proper installation of the rubber boots.
 3. Transition slabs which convert bases larger than four feet in diameter to four foot diameter risers shall be designed by the manhole manufacturer to carry the live and dead loads exerted on the slab.
 4. Seal joints between pre-cast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be pre-formed type with a minimum nominal diameter of 1-inch. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants CS202.

5. The force-main dropout manhole and the next two man holes down, and any manholes adjacent to lift station, slope must be sealed with a corrosion resistant coating. The coating shall be SewperCoat, Strong-Seal, SpectraShield or approved equal. Coating shall be field applied in accordance with the manufacturer's recommendations, by qualified and experienced personnel.
- a. Manholes of 5' diameter or larger shall be required on gravity sewer lines greater than 14" in depth with grade elevation.

B. Iron Castings

1. Cast iron manhole frames, covers and steps shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, smooth and free from blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95 percent of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop and given two coats of approved bituminous paint before rusting begins.
2. Manhole frames and covers shall be equal to the following:

Type	Design Weight	Manufacturer's Reference	
Standard	270#	Neenah R-1642	Vulcan 1480-1
Traffic	400#	Neenah R-1642	Vulcan 1480-1
Watertight	400#	Neenah R-1916-F1	Vulcan V-2358

3. All frames and covers shall have machined horizontal bearing surfaces.
4. All manholes shall have standard frames and covers except where specifically required by the County.
5. Watertight covers shall be bolt-down type and shall be equipped with four 1/2-inch stainless steel bolts and a 1/8-inch red rubber or rubber O-ring gasket. Covers shall be rotatable and interchangeable. Bolt holes shall be bored through so that debris entering the bolt hole will fall into the manhole. Bolt holes shall have the full 360 degree circle within the cover's radius when bored through the cover.
6. A minimum of 2, OCUD approved, manhole hooks must be provided to OCUD for every 8 manholes installed.

- C. Plastic Steps:** Manhole steps of polypropylene molded around a steel rod equal to products of M.A. Industries shall be used as determined by Oconee County.

- D. Rubber Boots: Provide preformed rubber boots and fasteners equal to those manufactured by Kor-N-Seal or Press Seal Gasket Corporation.
- E. Floor Door
 - 1. Door shall be a single or double leaf type as required by the County and built to withstand 150 pounds per square foot.
 - 2. The frame shall be 1/4-inch extruded aluminum with built-in neoprene cushion and with strap anchors bolted to the exterior. Door leaf shall be 1/4-inch aluminum diamond plate reinforced with aluminum stiffeners as required. Stainless steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. Doors shall be equipped with a snap lock and removable handle. Door shall also be equipped with hasp and padlock in addition to built-in locking mechanisms. Padlocks for all doors shall be keyed alike. Bituminous coating shall be applied to the exterior of the frame by the manufacturer. All parts shall be aluminum or stainless steel.
 - 3. Door shall be manufactured by The Bilco Company or manufactured by Washington Aluminum Company.

401.07 CONCRETE

Concrete shall have a compressive strength of not less than 3000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

401.08 PLUG VALVES

- A. Valves shall be 90 degree turn, non-lubricated, eccentric type with resilient faced plugs. Design of the valve shall provide that contact between the seat and the plug shall only occur in the final degrees of plug movement. Valves shall be suitable for throttling service and service where valve operation is infrequent.
- B. Operating Requirements: Valves shall provide drip-tight shut-off up to the full pressure rating with pressure in either direction. Pressure ratings shall be established by hydrostatic tests conducted in accordance with ANSI B16.1. Valves shall be rated at a minimum of 150 psi. Valves 20-inches and smaller shall have a port area equal to at least 80 percent of the full pipe area.
- C. Valve Body: Bodies shall be cast-iron conforming to ASTM A 126, Class B. All exposed nuts, bolts, springs, washers, etc. shall be zinc coated in accordance with

ASTM A 153. Valves shall have flanged or mechanical joint ends. Flanged valves shall have ANSI 125 pound standard flanges. Mechanical joint valves shall have bell ends conforming to applicable requirements of ANSI 21.11. Flanged valves with flange-to-MJ adapters shall not be acceptable in lieu of MJ valves.

- D. Valve Seats: Valve seats shall be a raised welded-in overlay of not less than 90 percent pure nickel, machined to mate with the resilient faced plug. Overlay shall be minimum of 1/8-inch thick.
- E. Valve Plug: The plug shall be of semi-steel conforming to ASTM A 126 Class B. Plug facing shall be a synthetic rubber compound of approximately 70 durometer hardness bonded to the plug. Facing material shall be abrasion resistant and suitable for service in sewage and sludge applications.
- F. Shaft Bearings: Valves shall be furnished with replaceable sleeve-type bearings in the upper and lower journals. Bearings shall comply with applicable requirements of AWWA C507. Bearing materials shall have a proven record of service of not less than five years.
- G. Shaft Seal: The valve body shall be fitted with a bolted bonnet incorporating a stuffing box and pull-down packing gland. Packing shall be the split chevron type. Design of exposed valves shall allow visible inspection of the shaft seal, adjustment of the packing, and replacement of the packing, all without disturbing the bonnet or valve operator. The shaft seal shall comply with the requirements of AWWA C504.
- H. Manual Operation: Valves 8-inches and smaller in diameter shall be equipped with lever operators. Provide one valve wrench for each exposed valve.
- I. Buried Service: Valves and operators for buried service shall have seals on all shafts and gaskets on valve operator covers to prevent the entry of water. All exposed nuts, bolts, springs and washers for buried valves shall be stainless steel.
- J. Manufacturer: All plug valves shall be products of a single manufacturer who must submit evidence of five years satisfactory service in sewage applications of the same design and of the sizes required. Valves shall be manufactured by DeZurik or Keystone.

401.09 CHECK VALVES

- A. Check valves shall be hinged disc type with cast iron body and bronze or bronze-fitted disc. Valves shall be designed for 150 psi and shall not slam shut on pump shutdown. Valves shall be equipped with a 1/2-inch stop cock at the high point of the valve for bleeding air from the line.
- B. Valves shall be outside spring and lever type.

- C. Valves shall be of the globe design with ANSI 125 pound flanges.
- D. Valves shall be G.A. Industries or APCO.

401.10 AIR VALVES

- A. Air Release Valves: Valves shall be automatic air release valves designed to allow escape of air under pressure and close water-tight when liquid enters the valve. Valve shall have a maximum orifice diameter of 5/16-inch. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve.
- B. Air/Vacuum Valves: Valves shall be automatic air and vacuum valves designed to allow escape of air, close water-tight when liquid enters the valve, and allow air to enter in the event of a vacuum. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve.
- C. Combination air valve shall consist of an air release valve tapped into the body of an air and vacuum valve.
- D. Single Body Valve: In lieu of C. above, a single body, double orifice, sewage combination valve may be used. Materials of construction, orifice size, venting capacity and accessories shall meet the requirements of A. and B. above.
- E. Valve tees shall be installed with a 4" tap and reduced to 2" with a ball valve followed by the air relief valve.
- F. Valves shall be recommended by the manufacturer for wastewater service and shall be equal to APCO Valve Corporation, Val-Matic or G.A. Industries.a H-Tec Model 986 Automatic air and vacuum valve with a stainless steel body, 2 " thread and 250 psi, or an OCUD approved equal.
- G. Manholes for air valves shall have a minimum diameter of 6'. A minimum clearance of 6" shall be maintained between the top of the air valve and the bottom of the manhole top.
- H. Inline plug valves shall be installed directly before air relief valves. Plug valves shall be installed between air relief valves no more than 1250 feet apart on all force

mains 8" or larger. Plug valves shall be installed no more than 2000 feet apart on all 6" force mains.

- I Manhole lids shall be vented.

401.11 VALVE BOXES (VB) AND EXTENSION STEMS

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "SEWER" cast into them. Valve boxes shall be manufactured in the United States.
- B. All valves shall be furnished with extension stems, as necessary, to bring the operating nut to within 30-inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller 26441 or M & H Valve, Style 3801.

401.12 VALVE MARKERS (VM)

The Contractor shall provide a concrete valve marker as detailed on the Standard Drawings for each valve installed. Valve markers shall be stamped "SEWER".

401.13 ANCHOR COUPLINGS

Anchor couplings shall be equal to Tyler Pipe 5-198.

401.14 VALVE KEYS

The Contractor shall provide to the County one valve key for every five valves provided, but no more than three and not less than one valve key. Valve keys shall be 72-inches long with a tee handle and a 2-inch square wrench nut. Valve keys shall be furnished by the valve manufacturer. Valve keys shall be equal to Mueller A-24610 or ACIPCO No. 1303.

401.15 FLANGE ADAPTER

The flange adapter shall permit the connection of unthreaded, ungrooved, open-ended ductile iron pipe to ANSI 125 pound flanged pipe and fittings. The adapter shall be a ductile iron casting incorporating a flange with extended throat, set screws and gasket. The gasket shall provide a compression seal between the

adapter, the pipe and the adjacent flange. Install only in locations specifically approved by the County and in accordance with the manufacturer's recommendations. The flange adapter shall be equal to Uni-Flange or Kwik-Flange.

PART 3 EXECUTION

401.16 EXISTING UTILITIES AND OBSTRUCTIONS

- A. The Contractor shall call the Utilities Protection Center (UPC) (811) as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.
- B. Water and Sewer Separation
 - 1. Sewers should maintain a minimum 10 foot edge-to-edge separation from water mains. Where the sewer crosses below a water main, an 18-inch vertical separation shall be maintained where possible. Where possible, a full joint of sewer pipe shall be centered below the water main. Any deviation shall be requested in writing to the County.
 - 2. Where the sewer crosses over a water main, either:
 - a. The water main shall be encased in concrete to the first joint in each direction, or
 - b. The sewer main shall be encased either in a watertight casing pipe or in concrete with a minimum 6-inch concrete depth to the first joint in each direction.
 - 3. No water main shall be permitted to pass through or come in contact with any part of a manhole.

401.17 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

- A. Install pipe lines and appurtenances along highways, streets and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation, and Oconee County with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Traffic Control
 - 1. The Contractor shall: provide, erect and maintain all necessary barricades; suitable and sufficient lights and other traffic control devices; provide

qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved flagman training program.

2. Construction traffic control devices and their installation shall be in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways.
3. Placement and removal of construction traffic control devices shall be coordinated with the Department of Transportation, and Oconee County a minimum of 48 hours in advance of the activity.
4. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the current Manual On Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

C. Construction Operations

1. Perform all work along highways, streets and roadways to minimize interference with traffic.
2. Stripping: Where the pipe line is laid along road right-of-way, strip and stockpile all sod, topsoil and other material suitable for right-of-way restoration.
3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day; under no circumstances should any section of trench be left open, uncovered overnight, or unattended.
4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.

D. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off the pavement in a timely manner.

E. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

- F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.
- G. Maintaining Highways, Streets, Roadways and Driveways
 - 1. Maintain streets, highways, roadways and driveways in suitable condition for movement of traffic until completion and final acceptance of the work.
 - 2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets and roadways by the use of steel running plates. The edges of running plates shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted, as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.
 - 3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. Make the grader or front-end loader available at all times.
 - 4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the work.

401.18 PIPE DISTRIBUTION

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the County. The County reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

401.19 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. Lay all pipe and fittings to accurately conform to the lines and grades approved by the County.
- B. Pipe Installation
 - 1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings and valves shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances shall sewer materials be dropped or dumped into the trench.
 - 2. All pipe, fittings, valves and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the County, who may prescribe corrective repairs or reject the materials.
 - 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe which contains dirt shall be laid.
 - 4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
 - 5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
 - 6. It is common practice to lay pipe with the bells facing the direction in which work is progressing, however, it is not mandatory.
 - 7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted.
 - 8. Detection tape shall be buried 4 to 10-inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finish grade surface.
 - 9. Polyethylene Encasement: Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed

with tape and all damaged areas shall be completely repaired to the satisfaction of the Engineer.

C. Alignment and Gradient

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.
3. The Contractor shall check the invert elevation at each manhole and the pipe invert elevation at least three times daily, start, mid-day and end of day. Elevations shall be checked more frequently if more than 100 feet of pipe is installed in a day or if the pipe is being constructed at minimum slope.
4. The Contractor shall check the horizontal alignment of the sewer at the same schedule as for invert elevations.

D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the County.

E. Joint Assembly

1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.
3. The Contractor shall internally inspect each pipe joint to insure proper assembly for pipe 24-inches in diameter and larger after the pipe has been brought to final alignment.

F. Cutting Pipe

1. Cut ductile iron pipe using an abrasive wheel saw.
2. Cut PVC pipe using a suitable saw.

3. Remove all burrs and smooth the end before jointing.
4. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

G. Valve and Fitting Installation

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the County. Valves shall be closed before being installed.
2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve.
3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 30-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the County.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
5. A valve marker shall be provided for each underground valve. Unless otherwise required by the County, valve markers shall be installed 6-inches inside the right-of-way or easement.

H. Air Valve Manholes

1. Construct the manhole as approved by the County.

2. Air valve manholes are to conform to ASTM C478.
 3. The frame and cover shall be cast into the top slab or cone.
 4. Install vent pipes or insure that the frame and cover or floor door shall be provided with 1-inch holes to provide equivalent opening as an air valve, but not less than two. The quantity for each valve size is as follows: 2-inch, 4; 3-inch, 9; 4-inch, 16; 6-inch, 36; 8-inch, 64.
- I. I.House Connections: Install wyes or tees in locations designated by the County for future connection of service lines. Plug the branch of the wye or tee. Record the location of fittings installed on a copy of the Contract Drawings to be submitted as Record Drawings.

401.20 MANHOLE AND PRECAST CONCRETE PRODUCT CONSTRUCTION

- A. Construct manholes as approved by the County.
- B. Pre-cast Concrete: Handle sections carefully to prevent cracking or chipping. Provide uniform bedding of the bottom section to prevent uneven loading. Install gaskets and joint sealants in accordance with manufacturer's recommendations to produce a watertight structure.
- C. Pipe Tee: Place, joint, and properly backfill the pipe tee prior to placing any riser sections. Meet all requirements for pre-cast manholes.
- D. Brick: Bed the bottom and sides of every brick in mortar. Apply a smooth coat of mortar, 3/4-inch thick, on the inside and outside.
- E. Pipe Connections for HDPE Pipe: Install the manhole entry pieces as follows:
1. Do not cut the smoothwall manhole entry piece. Instead, cut the spigot end off of standard quarter, half or full length pipe so that the manhole entry piece is properly positioned in the manhole wall.
 2. Prepare the field cut end so that a standard sealing ring can be installed for a watertight joint in accordance with manufacturer's recommendations.
 3. Connect rubber boot to the manhole entry piece and to the manhole wall using fasteners recommended by the boot manufacturer.
- F. Pipe Connections: All pipes shall be connected to pre-cast concrete manholes by a rubber boot provided in a cored or pre-cast hole of the proper diameter.

- G. Inverts: Form channels as shown on the Standard Detail Drawings, rounded, and troweled smooth. Maintain consistent grade through the invert.
- H. Top Elevations: Build manholes outside of paved areas to 3618-inches above finished grade unless otherwise required by the County. Build manholes in paved areas to existing grades, unless otherwise pre-approved by OCUD..
- I. Drop Connections: Manholes requiring drop connections are determined by the County. Construct drop connections of the same materials as the upstream sewer and in accordance with the details shown on the Standard Detail Drawings. Outside drop connections shall be constructed when the invert of the inflowing pipe is 24-inches or greater above the manhole invert.
- J. Frames and Covers: Unless frame and cover is at grade, the frame shall be cast into the cone section.
- K. Seal all manhole joints and lift holes, both inside and out, with grout. Between precast sections, this is in addition to joint sealant.
- K. Manholes shall be constructed such that their walls are plumb.
- M. 18" or larger sewer needs to be placed in a precast manhole

401.21 THRUST RESTRAINT

- A. Provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: Provide retainer glands where required by the County and all associated fittings, valves and related piping. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- C. Harnessing: Provide harness rods only where required by the County. Harness rods shall be manufactured in accordance with ASTM A 36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90 degree bend eye bolts. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.
- D. Concrete Blocking

1. Provide concrete blocking for all other bends, tees, valves, and other points where thrust may develop, except where other means of thrust restraint are required by the County.
 2. Form and pour concrete blocking at fittings as required by the County. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.
 3. Refer to Detail W10 for minimum dimensions for concrete blocking.
- E. Thrust Collars: Collars shall be constructed as required by the County. Concrete and reinforcing steel shall meet the requirements specified in Article 2.03 of this Section. The welded-on collar shall be attached to the pipe by the pipe manufacturer.

401.22 CONCRETE COLLARS

Construct collars as shown on the Standard Detail Drawings.

401.23 INSPECTION AND TESTING

- A. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the sewers by means of rods, swabs, or other instruments. When requested by the County, flush out lines and manholes before final inspection.
- B. Coordination of Inspection: The Contractor is responsible to coordinate with the County to inspect the construction of the sewer lines and appurtenances. Pre-notification by the Contractor is required to allow scheduling of inspection.
- C. Gravity Sewers: Pipe lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection.
1. Pipe joints for sewers 30-inches in diameter and larger shall be air tested individually. The joint tester assembly shall be placed over the joint and shall pressurize the joint area to 4 psi. The pressure shall not drop more than 2 psi in 10 seconds. The joint tester assembly shall be equal to Cherne Industries, Inc.
 2. Infiltration Tests: Use only when groundwater is two feet above the top of the pipe.
 - a. Install suitable weirs in manholes selected by the County to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be 5,000 feet. Measure leakage only

when all visible leaks have been repaired and the ground water is two feet above the top of the pipe. If leakage in any section of the sewer line exceeds 50 gpd/inch diameter/mile, locate and repair leaks. Repair methods must be approved by the County. After repairs are completed, re-test for leakage.

- b. Furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests. Where continuous monitoring of flow level is required, the County will provide and operate monitoring equipment.
3. Exfiltration Tests: The following must be done when groundwater is not two feet above the top of the pipe.

- a. Low-Pressure Air Test

- (1) Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in accordance with UNI-B-6 is as follows:

Nominal Pipe Size, inches	T (Min:Sec) or (Time Sec/100 Feet)
6	5:40 (0.854 x L)
8	7:34 (1.520 x L)
10	9:26 (2.374 x L)
12	11:20 (3.418 x L)
15	14:10 (5.342 x L)
18	17:00 (7.692 x L)

- (2) Required test equipment, including inflatable balls, braces, air hose, air source, timer, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure

gauge with gradations in 0.1 psi and accuracy of \pm two percent, shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.

- (3) The Contractor shall keep records of all tests made. Copy of such records will be given to the County. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the County.
- (4) The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

3. 4. Line Camera Test

- a. Prior to camera testing all lines must jetted and cleared of all debris and tested by filling with water to assure that all pipes are clear of dips. Inverts must be installed in manholes.
- b. Test all gravity sewer for excessive deflection by passing a camera through the pipe. Deflection of the pipe shall not exceed the following:

Nominal Pipe Diameter	Maximum Allowable Deflection
\leq 12-inches	5%
15 to 30-inches	4%
$>$ 30-inches	3%

The tape of the line inspection shall be provided to OCUD.

Excavate and install properly any section of pipe not passing this test. Re-test until results are satisfactory.

Upon completion of roads, lines shall be video inspected or jetted and vacuumed to remove any debris.

D. Force Main Pressure and Leakage Test

- 1. All sections of pipeline subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of line will be considered ready for testing after completion of all thrust restraint and backfilling. Each segment of pipeline between line valves shall be tested individually.

2. Test Preparation
 - a. Flush pipeline section thoroughly at flow velocities adequate to remove debris from pipe and valve seats. Partially operate valves and hydrants to clean out seats. Provide correctly sized temporary outlets in number adequate to achieve flushing velocities.
 - b. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.
 - c. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Unless permanent air vents are in place, insert temporary corporation stops at highpoints to expel air as line is filled with water.
 - d. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure. Differential pressure at valves and hydrants shall equal the maximum possible, but shall not exceed manufacturer's pressure rating.
3. Test Pressure: Test the pipeline at the greater, the highest pressure in the system or 150 psi, measured at the lowest point for at least two hours. The test pressure shall not vary by more than 5 psi for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not less than 5 psi.
4. Leakage
 - a. Leakage shall be defined as the quantity of water that must be pumped into the test section equal to the sum of the water, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 - b. The County assumes no responsibility for leakage occurring through existing valves.
5. Test Results: No test section shall be accepted if the leakage exceeds the limits determined under Section 4 of AWWA C600. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.
6. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.

- E. Manholes: Prior to testing manholes for water-tightness, all lift holes shall be plugged with a non-shrink grout, all joints between pre-cast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass one of the following tests:
1. Exfiltration Tests: The manhole, after proper preparation as noted above, shall be filled with water. The maximum allowable leakage shall be eight gallons per foot of depth per 24 hours for 48-inch diameter manholes. Tests shall last a minimum of eight hours. The manholes may be backfilled prior to testing.
 2. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested after completion of road binder. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to effect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The Manhole shall pass if the time is greater than 60 seconds for 48 inch diameter manholes. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.

401.245 PROTECTION AND RESTORATION OF WORK AREA

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
 4. The Department of Transportation's engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.
- B. Man-Made Improvements: Protect, or remove and replace with the County's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the work.
- C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the County. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.
- F. Swamps and Other Wetlands
1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.

3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

END OF SUBSECTION

SECTION 402. SEWER SERVICE CONNECTIONS

PART 1 GENERAL

402.01 SCOPE

The work covered by this Section shall consist of furnishing and installing service connections in the sewers.

PART 2 PRODUCTS

402.02 MATERIALS

- A. Service connections shall be made at the top or from the side at 45 degrees of the sewer line using 6-inch diameter pipe as shown on the Standard Detail Drawings. Service pipe shall be of the same material and quality as the main sewer line.
- B. Riser connections shall be required when the main sewer line is 10 feet or more below finished grade, unless otherwise directed by the County.
- C. The service connection shall extend from the sewer line to the edge of the permanent easement or right-of-way and be plugged.
- D. If the service connection ends in rock, the Contractor shall excavate the rock an additional 10 feet beyond the plugged end.
- E. Connection of service lines or risers to sewer line shall be by means of standard tees, as indicated on the Standard Detail Drawings. Drawings shall reflect details of service connection from main to right of way.
- F. All sewer services must be marked with a minimum of 2" PVC painted green. "S" shall be cut into the curbing to indicate sewer.

PART 3 EXECUTION

402.03 INSTALLATION

Laying of service connection lines shall be in accordance with requirements of these Specifications for Sewers and Accessories.

END OF SECTION

END OF ARTICLE