VOLUME I

GENERAL REQUIREMENTS
FOR
WATER SYSTEMS

For:

CITY OF WINDER

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SECTION 1: Policies and Procedures

1.01 Scope and Intent

The intent of these Policies and Procedures is to establish minimum requirements and guidelines for water distribution system projects, constructed in the City of Winder (City). The procedures will apply to all water development and construction projects, both public and private, within the jurisdiction of the City of Winder. The procedures shall also apply to all existing water facilities which are being upgraded or have failed and are being corrected, both public and private, within the jurisdiction of the City. Before any proposed project can be considered or reviewed for approval, verification must be provided to ensure the project is consistent with the current City of Winder Service Delivery Strategy.

1.02 Purpose

The City of Winder recognizes that water is a natural resource of limited supply and water treatment and distribution is a necessity for public health. Thus, the water supply must be regulated and controlled and subjected only to reasonable and beneficial use to assure an adequate water treatment capacity for all members of the public served by the City Utility System. Therefore, the water supplied by the City Utility System to any development is subject to regulation, prohibition, limitation and restriction by local, State and Federal governmental agencies, including the Board of Health, as well as the City of Winder.

1.03 Definitions

A. City: City of Winder, Georgia or its authorized representative.

B. City Utility System: The City of Winder public water system.

C. Developer or Owner: Any person, firm, corporation, association or partnership or any agent thereof who undertakes or proposes to undertake the development of land so as to constitute a residential subdivision, apartment complex, condominium, or commercial/industrial/institutional establishment.

D. EPD: Environmental Protection Division of the Georgia Department of Natural Resources (EPD).

1.04 Variances

Under special conditions with specific applications, the procedures and policies may be altered to meet certain conditions that are beyond the control of the Developer, provided such alterations or deviations are acceptable to the City. Final decisions concerning such alterations shall be made by the City Council or its designee.

1.05 Pre-Design Conference

It is required that each Developer or owner initiate a pre-design conference between himself, his engineer, and the City Utility Director or his designated representative.

1.06 Connection to Existing System

A. All new connections to the existing City Utility System are subject to all City standards, specifications, codes, and ordinances as they pertain to water systems and/or facilities and the *Minimum Requirements for Water Systems* as published by EPD.

1.07 Existing Subdivision Regulations

The requirements of these Policies and Procedures for water systems shall be in addition to the requirements of the City of Winder Zoning Ordinance, and all amendments thereto.

1.08 Conveyance of Extension to City Utility System

A. The Developer shall construct and convey to the City, free and clear of all encumbrances and at no cost to the City, the extension to the City Utility System and the complete water system on the Developer's property.

B. Developer shall submit, to the City, engineering plans based on the City Standard Water Specifications for the proposed extension prepared by the Developer's engineer, which shall be approved in writing by the City prior to any construction work being performed.

C. Following acceptance by the City, 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 City, and the Developer shall have no right or claim in or to the Developer's extension; provided however, that the extension shall provide required water service to the development. Any excess capacity may be utilized by the City for uses outside the development area.

1.09 Fees

A. Water Connection Fee: Water Connection Fee shall be charged for each establishment, structure and use connected to the City Utility System. The Developer and/or builder will pay the current Water Connection Fee presently charged for connections to the City Utility System as stipulated in the pertinent water rate sheets and regulations for water systems.

B. Water Plan Review and Inspection Fees: The Developer shall pay an inspection and review fee in order to defray all actual costs to the City, 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 extension; and
3. All other administrative costs incident to accepting the extension into the City Utility System.

C. Fees shall be paid in full prior to receiving City approval of plans.

1.10 Grant of Easement Rights

A. Developer shall grant to the City, its successors and assigns, the exclusive perpetual right, privilege and easement to construct, reconstruct, operate, maintain, repair, replace, improve, alter, remove, relocate and inspect water distribution mains, service lines, valves, connections and appurtenant equipment over, across and under the strip of land wherein the system lies on the Developer's property, together with the right of ingress and egress to each of the building sites on Developer's property which are to be served by the City Utility System. The easement rights granted with respect to public places shall be subject to the authority of the public authority having jurisdiction over such public places.

B. Prior to the City Utility System providing service to the development, the Developer shall execute a grant or grants of easement, in recordable form to be approved by the City, specifically granting to the City the above rights necessary, in the discretion of the City to provide water utility service to the Developer's property.

C. Nothing shall prevent Developer or any subsequent owner of Developer's property from exercising itself or granting exclusive or non-exclusive rights, privileges and/or easements to any other parties for the furnishing of utility services other than water, provided that the City's use and occupancy of its easements are not unreasonably interfered with. Use of the easement for any purpose other than water will require approval by the City.

D. The City shall not be obligated to furnish any water service to any building which may be built on Developer's property to which it does not have access.

1.11 Underground Utility Contractor

A. All extensions and additions to the City Utility System shall be performed by a current Georgia Licensed Utility Contractor as defined in O.C.G.A §43-14-2, or by the City's own work force.

B. The City reserves the right to approve in writing the underground utility contractor and/or his subcontractor installing utility lines for the Developer under the terms of these Policies and Procedures.

1.12 Developer's Plans

A. All engineering plans prepared by Developer's engineer, as provided in Article 1.09 above, shall be reviewed and approved by the City prior to Developer submitting plans and specifications to any other governmental agencies. The Developer's engineering design and plans shall conform to the applicable standards and specifications and the City's Unified Development Code including applicable erosion and sedimentation control requirements of EPD.

B. As a minimum, the following information shall be shown:
   1. General
      a. Project Name
      b. Land Lot, District, Zoning
      c. 1" = 2000' Location Map with North Arrow
      d. Owner, Developer, Engineer and Surveyor Contact Information
      e. Existing and Proposed Roads with Names, Streets, Lots, Owner and Street Addresses, R/W, High and Low Elevations, Topography with two-foot contours, Features, Utilities and Existing Structures
      f. FEMA Map with Project Site Outlined or Shaded
      g. Index of Drawing Sheets
      h. "Call Before You Dig" Logo and Number
      i. Legend of all Symbols
   2. Water Mains
      a. Plan at a scale no smaller than 1 inch = 100 feet horizontal. Preliminary design showing existing and proposed mains, valves, hydrants, services, connections, materials, details and two-foot contours.

1.13 Installation and Inspection

The Developer's water system shall be constructed in accordance with the engineering plans approved by the City. The City shall have the right, but not the obligation, to make inspections as installation progresses. Field revisions to approved plans must be submitted in writing with documentation. The revisions must be reviewed and approved by the Design Engineer and City Utility Director or his designated representative prior to construction of requested revision.

1.14 Test of Developer's System

All required tests must be arranged by the Developer and witnessed by the City, or its representative, to determine whether the facilities are constructed in accordance with

the approved engineering plans and the *General Requirements for Water Systems*. Developer will be responsible for locating and repairing leaks found during testing.

1.15 Conditions Precedent to System Usage

A. Prior to the City accepting the water system, Developer shall comply with all terms of these Policies and Procedures and shall:
   1. Pass all required inspections.
   2. Successfully complete all necessary tests.
   3. Provide to the City releases of liens received by the Developer, or its agent, in connection with the construction of the facilities.
   4. Furnish the City with one set of Record Drawings as specified in Article 1.32.
   5. Furnish, in form and substance acceptable to the City, all of the following relating to the facilities:
      a. All permits and governmental approvals obtained by the Developer, its contractors and agents.
      b. Certification by Developer's engineer that the facilities have been constructed substantially in accordance with approved plans and specifications.
   6. Furnish Maintenance Bond, in accordance with Paragraph 1.22.B of this document.

B. City shall have the right to withhold water and sewer connections until all requirements have been satisfied.

1.16 Right of Termination of Service

The City shall refuse to provide service and reserves the right to terminate service to any lot or building within Developer's property, in the event Developer defaults or fails to comply with any of the terms and conditions of these Policies and Procedures in a timely manner and fails to cure such default or fails to comply within 30 consecutive calendar days following the receipt by Developer of City's notice of such default or failure to comply.

1.17 Limitation of Liability of City

The City shall not be liable or responsible to the Developer as a result of injury to property or person, which injury was created by acts of God, strikes, lockouts, or other industrial disturbances, acts of public enemy, wars, blockades, riots, acts of armed forces, epidemics, delays by carriers, inability to obtain materials or right-of-way on

reasonable terms, acts of public authorities, acts of vandals or other third parties, or any other causes whether or not of the same kind enumerated herein.

1.18 Indemnification

To the fullest extent permitted by Laws and Regulations, Developer shall indemnify and hold harmless City, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Developer, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

1.19 Approval by Governmental Agencies

The City's obligations are contingent upon Developer obtaining all necessary approvals for water 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 City to provide water service to Developer not within the sole control of the City and which, by exercise of due diligence, it is unable to overcome.

1.20 No Prohibition of Further Extension

These Policies and Procedures shall not prohibit or prevent the City from extending the City Utility System in or to other areas to serve other Developers or customers, so long as extensions and the furnishing of services do not interfere with the furnishing of the services to the Developer's establishment.

1.21 Final Acceptance by City

Final acceptance by the City of the completed water system shall occur at such time as Developer has met all of the terms and conditions of these Policies and Procedures, all engineering tests and evaluations have been completed and approved by the City.

1.22 Warranty and Security

A. Developer shall warrant its extension and hold City 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.

B. As security for Developer's performance of this representation and warranty, simultaneously with the conveyance of the Developer's extension, Developer shall deliver to the City an executed contract bond in form and substance satisfactory to the City in the amount of 50 percent of total cost of the water system construction. The contract bond shall have as the surety thereon such surety company, acceptable to the City, as is authorized to write bonds of such character and amount under the laws of the State of Georgia, is listed in the current edition of the U.S. Treasury Circular 570, and has an underwriting limitation in said document in excess of the required bond amount. The attorney-in-fact, or other officer who signs a contact bond for a surety company, must file with such bond a certified copy of his power of attorney authorizing him to do so.

C. Subject to the approval of the City, the Developer may elect to deliver to the City a contract bond in compliance with all requirements herein and in a form acceptable to the City from the Developer's contractors as the principal with the Developer and City as co-obligees.

D. The contract bond shall remain in force for one year following the date of final acceptance by the City. Should the Developer fail to make or commence timely repairs or replacements of any defects in the Developer's extension discovered or arising within said one-year period, the Developer or his surety shall be liable to the City for all costs arising therefrom.

1.23 Developer's Liability for Damage

Developer shall be responsible for, and make any repairs or replacement required as the result of, any breakage, vandalism or other damage caused to his extension until final acceptance by the City. After the final acceptance the Developer shall indemnify and hold City harmless from the cost of any repairs for any breakage or other damage to his extension from time of completion of Developer's extension until completion of all buildings and houses, roads, paving, drainage, and other construction on Developer's property necessary to complete the development. If, within 10 days of the receipt of City notice of such breakage or other damage, Developer fails to make timely repairs and corrections, the City shall have the option to make such repairs or replacements at the Developer's cost.

1.24 Limited Reservation of Distribution Capacity

The reservation of water distribution capacity will be limited to the actual number of equivalent residential units (ERU's) committed by the City to the development pursuant to preconstruction approval of the water system facilities.

1.25 Period of Construction

Developer must begin construction of water facilities within 180 consecutive calendar days from the date of City approval of drawings and shall not cease for a continuing period of 180 consecutive calendar days or until final completion and acceptance of the constructed facilities, whichever is sooner. Should the Developer not strictly adhere to these time frames, any obligations or duties of the City shall be null and void.

1.26 Modification of Development Plans

Should the Developer modify his development plans, which would require greater water demand, or additional water facilities than the water service demands designed and approved under the engineering plans and *City Standard Specifications*, then Developer shall enter into a new agreement with the City providing for the construction of such additional water facilities meeting all City and governmental design requirements and shall pay all additional contributions and Fees as may be required.

1.27 Notice of Connection to City Utility System

Developer shall deliver to the City written notice that he will be connecting the water facilities to the City Utility System no less than 24 hours prior to said connection to allow time for City inspection. If Developer fails to provide timely written notice, the City may require Developer to uncover and expose connection for inspection, at the sole cost of Developer.

1.28 Interruption of Facility Operations

A minimum of twenty-four (24) hours, but no more than seven (7) days advance, notice shall be given to any occupied building served by a water line that is required to be shut off. Occupants shall be informed of the date, time of cutoff and the duration of stoppage. Failure to do so will make the contractor liable for any damages reported to the City. For outages affecting several customers, notice shall be prepared and placed with local news media and to be coordinated with Water Department at least forty-eight (48) hours prior to the interruption.

1.29 Connection of Buildings

The Developer shall at his sole cost and expense connect the private property water services of each dwelling or other building constructed on Developer's property to the water meter of the Developer as reflected in plans and specifications approved by the City.

1.30 Application for Service

Developer, his successors, or the occupant(s) of the Developer's property, shall make written application to the City for the opening of account(s) for service. Application is to be made only after the payment of all water unit connection fees presently being charged by the City. At the time of making application for service, the applicant shall pay all service charges set forth in the current City code(s) establishing rates, charges and regulations pertaining to the City water system.

1.31 Notice of Transfer of Developer's Property

Developer agrees to provide proper written notice to City of the actual date of the legal transfer of water services from Developer to any third party. Developer shall remain responsible for all costs and expenses, including utility bills, which arise as a result of Developer's failure to notify or improper notification to the City.

1.32 Record Drawings and Video Requirements

A. Record Drawings shall be submitted in the following format:
   1. Two sets of photocopy prints, and
   2. Digital plans in AutoCad *DWG* format (State Plane coordinate system) and PDF format.

B. Record Drawings shall be reproducible, have title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.

C. Legibly mark drawings to record actual construction, including:
   1. All Construction
      a. Changes of dimension and detail.
      b. Changes made by Requests for Information (RFI), field order, clarification memorandums or by change order.
      c. Details not on original Drawings.
      d. Contractor and Design Engineer name.
   2. Underground Utilities

a. Water Mains including size and type should be shown.
b. Service Tap and meter locations and sizes should be shown.
c. Fire hydrants, gate valves, fittings, air release valves should be shown with size and type indicated.
d. Plan of fire meters or detector meters with size should be shown if applicable.

D. Precision
1. Unless noted otherwise, Record Drawings shall provide horizontal dimensions, distances and coordinates to the nearest 0.1 foot.
2. The cover of the Record Drawings shall include the following information:
a. Name and license number of the Georgia Utility Contractor.
b. Name of supplier and manufacturer of pipe, fire hydrants, gate valves, fittings, air release valves, and meters.
c. Name of manufacturer of precast concrete manholes.
d. Name of Surveyor
e. Name of Design Engineer
f. Name of Developer

END OF SECTION

SECTION 2: APPLICABLE WATER STANDARDS

2.01 Applicable Standards

It is intended that the Developer and/or Owner be responsible for the design of an adequate water system as necessary for the development. The methods of design and construction shall be covered by the applicable standards listed hereinafter. By reference, the standards are made part of these specifications and standards.

1. Georgia State Department of Natural Resources (DNR), Environmental Protection Division (EPD), *Rules for Safe Drinking Water*, Chapter 391-3-5, latest effective date.
2. Georgia State Department of Natural Resources (DDR), Environmental Protection Division (EPD), *Minimum Standards for Public Water Systems*, current edition.
3. *Recommended Standards for Water Works*, 2007 or later editions, Policies for the Review and Approval of Plans and Specifications for Public Water Supplies, A report for the Water Supply 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 Water Works".
4. *Utility Accommodations Policy and Standards*, Georgia Department of Transportation, Office of Utilities, latest edition.
5. American Water Works Association (AWWA) Standards, latest editions.
6. American National Standards Institute (ANSI) Standards, latest editions.
7. American Society for Testing and Materials (ASTM) Standards, latest editions.
8. Occupational Safety and Health Administration (OSHA) regulations, latest editions.
9. Georgia Department of Transportation (DOT) specifications and regulations, latest editions.
10. American Association of State Highway and Transportation Officials (AASHTO) specifications, latest editions.
11. American Society of Mechanical Engineers (ASME) standards, latest editions.
12. National Electrical Manufacturer's Association (NEMA) standards, latest editions.
13. American Concrete Institute (ACI) standards, latest editions.
14. American Welding Society (AWS) standards, latest editions.

END OF SECTION

SECTION 3: WATER SYSTEM – DESIGN REQUIREMENTS

3.01 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 City codes, accepted engineering practice standards listed in Section 2, and this Section. When the owner or Developer of a parcel of land desires to connect to the City Utility System, it shall be his/her responsibility to contact the City. The Developer is responsible for the coordination of connection to a privately-owned system. Public systems shall be located entirely within City-owned property, rights-of-way or dedicated easements.

3.02 Design Flows

A. Average Residential Flow Rates, Single-Family and Multi-Family: In the absence of data to the contrary, the following shall be used:
   1. 120 gallons per capita per day (gpcd)
   2. 300 GPD per unit
   3. Fire flow shall be calculated on a per project basis and coordinated with the City of Winder.

B. All Others: Actual flow or estimated for each individual case as approved by the City.

C. Design Water Peak Flow Factors

Flow Condition	Peak Flow Factor	Peak Flow Calculations (GPM)
Peak Day	1.8	Avg. Daily Flow x Peak Day Factor = Peak Day Flow
Peak Hour	3.25	Avg. Daily Flow x Peak Hour Factor = Peak Hour Flow

3.03 Water Meters and Sizing and Design Flow Guidelines

A. The size of each water meter and each potable water supply pipe shall be based on the total demand and shall be determined according to the methods and procedures outlined in this section by Developer's Engineer and approved by the City.

B. Water meters/services will be sized in accordance with the table below. The columns list the design allowable GPM for any given meter. Project designs which exceed the listed GPM unit values must be upsized to a larger meter as necessary.

City of Winder Water Department

METER SIZE AND DESCRIPTION	DESIGN ALLOWABLE (GPM)
3/4" x 5/8" PD	12
3/4"	30
1"	50
2"	200
3"	400

3.04 Minimum Pipe Size of Main

A. The minimum size of pipe for principal water mains and for water mains where fire hydrants are to be attached shall be 6-inch diameter.

B. The minimum size water main shall be six (6) inches in nominal diameter. However, the size of water mains shall be justified by a hydraulic analysis performed by a professional engineer. Water mains smaller than six (6) inches may be considered on a case by case basis and require authorization by the City.

C. The system must be designed to maintain a minimum pressure of 20 psi at each service connection and at all points in distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 psi and not less than 35 psi.

3.05 Location

A. Water mains shall be installed only in rights-of-way or easements dedicated to the City of Winder, Barrow County or the State of Georgia.

D. The location of mains shall be designed to minimize installation under paved areas. Water mains installed parallel to roads shall be installed in the shoulder of the road. Roadway crossings shall be installed as nearly at right angles as possible to minimize lengths of crossings under pavement.

B. Water mains installed parallel to existing or proposed sanitary sewers shall be positioned to maintain a 10-foot minimum separation between the pipes. Where water mains must cross sanitary sewers, a minimum vertical clearance of a least 18-inches shall be maintained, and a section of water main shall be centered as nearly as possible over the sewer so as to maintain the maximum separation from the individual joints.

3.06 Service Lines

A. Service lines shall be located with a minimum cover of 48 inches within the right-of-way and rise to a buried depth of 18 inches at the water meter location. There shall be no splices of service lateral pipe under any pavement.

B. Service laterals crossing all roads shall be placed inside a minimum of a 2-inch diameter Sch. 40 PVC casing.

C. A "W" shall be sawed into the curb where each service tap is made to indicate its permanent location.

D. Service tubing shall be ¾" or 1" copper service, Type "K", soft temper, seamless copper tubing conforming to ASTM B-88. Long and short side services shall be 1" for service to two (2) meters and ¾" for one (1) meter.

E. Services for subdivision shall be sized and located as shown on the Standard Detail Drawings.

F. Water meters shall be located at the limits of the street right-of-way.

G. Residential backflow preventers shall be provided and installed by the City as part of the meter-set.

H. Fire line meters shall be designed to meet site-specific conditions, see Standard Details for conceptual layout of meter.

3.07 Water Valves

A. At Intersections - Valves on water mains at intersections shall be located behind the curb. Generally, the number of valves shall equal the number of streets in the intersection minus one. The City may require valves in excess of this requirement if the water system layout warrants additional valves.

B. At End of Line - A water valve shall be provided at the end of all lines for phased developments, and at locations where the water main may be extended in the future for water system improvements. The end of the line shall be provided with a temporary plug and thrust collar. A 1-inch tap for chlorination/dechlorination purposes shall be provided.

C. Along Mains - Maximum spacing of water valves along water mains shall be 1,000 feet. In addition, a hydrant lead valve shall be located at every fire hydrant.

D. Concrete Pads - All valves shall have a concrete pad.

E. Air and Vacuum (A&V) Release Valves - Air and vacuum release valves shall be located where appropriate as determined by the design professional responsible for the project design or the City. All A&V release valve locations are subject to approval of the City. In general, within subdivision A&V release valves are not necessary as long as services are located at the water main high points.

F. Polyethylene Encasement - DIP water mains shall be provided with polyethylene

encasement where the water main either crosses or is within 10 LF of a steel gas main.

3.08 Record Drawings

When construction is completed, Record Drawings shall be submitted for all systems for review and approval in AutoCad DWG (Georgia State Plane coordinates), Adobe PDF and hard copy.

3.09 Environmental Impacts

The Water System shall be designed to minimize the impact on the environment. This includes taking into consideration the proximity of impounded water, rivers, streams, wetlands, and the contours of the land, and the construction's impact on soil erosion and sedimentation. Soil erosion and sedimentation control devices shall be designed in accordance with Volume II, Section 2 of this document.

END OF SECTION

SECTION 4: EPD SUBMITTAL GUIDELINES

4.01 General

As stated in Georgia Department of Natural Resources (DNR), Environmental Protection Division (EPD), Rules and Regulations for Water Quality Control, Chapter 391-3-6, plans and specifications for water system construction must be approved by the Georgia Department of Natural Resources, Environmental Protection Division (EPD) or a delegated authority representative. The Georgia EPD has approved the City of Winder Standard Specifications for Water Systems, Volumes 1 and 2.

The following are guidelines as to the information needed for the submittals to EPD or the delegated authority representative. This appendix should not be considered a complete list of all information required by EPD.

Plans must be sealed and signed by a professional engineer (P.E.) registered in the State of Georgia and with experience designing water distribution (and treatment, if applicable) systems.

The Drawings or contract documents should incorporate by reference, the *Standard Specifications for Water System Construction* for the City of Winder. If separate specifications are prepared, the cover and/or fly sheet of the specifications shall indicate the project title, as well as the name, address and phone number of the engineering consultant preparing such document.

4.02 Transmittal Letter

A transmittal letter should be prepared by the professional engineer responsible for the design of the project. This letter should be addressed to the City of Winder Planning Department and shall specifically address the following items:

E. Provide the necessary information for the project for the City to complete the EPD Drinking Water Project Submittal Form.

A. Provide a statement indicating whether or not any of the watermains, services or other utilities associated with the project are proposed to be constructed on a solid waste landfill site.

B. Provide a COPY of the Report of Technical Review (ROTR) by EPD.

4.03 Drawings

The Drawings for the project must include the following:

A. A cover sheet containing the following information:

1. Title of the Project
2. Owner/Developer's name, address, phone number and fax number
3. Engineer's name, address, phone number and fax number
4. Funding source (i.e. private, state or federally funded)
5. Project Location Map (map shall have a north arrow with indicated scale, and shall be legible and detailed enough for someone not familiar with the project to find the project site.)
6. A copy of the FEMA map with the project site outlined or shaded on the map. The actual map must be copied onto the cover, not just the FIRM or panel number.
7. Drawing sheet index
8. The Utility Protection Center "Call Before You Dig" logo and phone number
9. Other requirements from Section 1.12

B. A legend of symbols used on Drawings (may be included on the cover sheet or on the first sheet of the drawings).

C. Include a note on each plan sheet stating, "Contractor shall call the Utility Protection Center "Call before you dig" 800.282.7411 prior to commencing any excavation work on the project."

D. Provide a standard detail sheet. These details shall be the same as included in the *Standard Specifications for Water System Construction* for the City of Winder. The Drawings may incorporate, by reference, the *Standard Details of the Standard Specifications for Water System Construction* for the City.

E. Include a plan sheet of the overall development (on one sheet if possible) that shows all watermains, service lines and water meters for each lot. This plan should show the street edge of pavement, right-of-way, lot lines, and water utilities only. All other utilities and contours should be excluded from this plan sheet.

F. Provide a plan of the water mains. Also provide matchlines on the Drawings when more than one sheet is required to show the plan.

G. Indicate
   1. Locations of all fittings, valves, and fire hydrants
   2. The pipe material(s) on the plan.

H. Indicate on the plans whether or not the project is located within a flood zone. When a body of water is located adjacent to the proposed water main, indicate the 100-year flood zone elevation and graphically show the flood zone boundary of the stream/river on the plans. For adjacent lakes and reservoirs, indicate the high water/winter pool elevations. If flood elevations are not available, the Developer shall determine the 100-year flood elevation to ensure facilities are not in flood prone areas.

I. Plan sheets at a scale no smaller than 1 inch = 100 feet horizontal.

4.04 City Responsibilities

The City Utility Director or designated representative will prepare the submittal for EPD, including executing the Drinking Water Project Submittal.

END OF SECTION

VOLUME II

STANDARD SPECIFICATIONS
FOR
WATER SYSTEM CONSTRUCTION

For:

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PREFACE

The Standard Specifications have been prepared to complement and include by reference the Standard Detail Drawings and to provide the qualitative requirements for products, materials and workmanship for construction of additions to and replacements of the water distribution system which is to be operated by, or to be assured by a trust indenture with the Winder City Council. These Standard Specifications are only to be used for projects with Drawings which have been approved by the Georgia Environmental Protection Division, as prepared by the City's design consultant, or by a developer's engineer, whose Drawings must first be approved by the City of Winder.

All references in these Standard Specifications to "City" and "Owner" shall mean the legal and authorized representative of the City of Winder. All references to "Project" shall mean the work being constructed under the jurisdiction of these Standard Specifications. All references to "Contractor" shall mean the individual, company or corporation constructing work under the jurisdiction of these Standard Specifications. All references to "Drawings" shall include, by reference, the Standard Detail Drawings accompanying these Standard Specifications. All references to "Developer" shall mean the person responsible for development of property.

These Standard Specifications are subject to revision for a specific project, with such revisions noted on the Drawings approved by the City of Winder.

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SECTION 1: CLEARING AND GRUBBING

PART 1. GENERAL

1.1 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 is part of the Work.

B. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

1.2 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.

1.3 JOB CONDITIONS

A. Location of the Work: The area to be cleared and grubbed is shown schematically on the Drawings or specified below. It includes all areas designated for construction.

1.4 PROJECT ACCESS

A. Where private property is used for access to the Project site, the Contractor shall obtain written permission for such access from the affected private property owners. The Contractor shall be solely responsible for all damage caused by access through the private property and restoring it to its pre-construction conditions or better.

PART 2. PRODUCTS

2.1 EQUIPMENT

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

PART 3. EXECUTION

3.1. SCHEDULING OF CLEARING

A. The City 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 Engineer may permit clearing for additional lengths of the pipeline provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass is established. Should a satisfactory stand of grass not be possible, no additional clearing shall be permitted beyond that specified above.

C. A satisfactory stand of grass shall have no bare spots larger than one square yard. Bare spots shall be scattered, and the bare area shall not comprise more than one percent of any given area.

3.2. CLEARING AND GRUBBING

A. Clear and grub as required on each side of the pipeline alignment 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 within two feet of existing ground level 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, 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 the tree limbs interfere with utility wires, or where the 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. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

H. 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. Any fencing that, in the Engineer's opinion, is significantly damaged shall be replaced with new fence material.

I. 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.

J. The Contractor shall be responsible for all damages to existing improvements resulting from Contractor's operations.

3.3. 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. A copy of written consent shall be provided to the Owner for permanent records. 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 Owner and when authorized by the proper authorities, the Contractor may dispose of such debris by burning on the Project site provided all requirements set forth by the governing authorities are met. 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 proper authorities.

END OF SECTION

SECTION 2: EROSION AND SEDIMENTATION CONTROL

PART 1. GENERAL

1.1. SCOPE

A. All erosion and sedimentation control measures must be designed and conducted using Best Management Practices (BMP) in accordance with the Georgia Erosion and Sedimentation Act of 1975 (GESA), as amended, the *Manual for Erosion and Sedimentation Control in Georgia*, latest edition, Section 402 of the Federal Clean Water Act and applicable codes, ordinances, rules, regulations and laws of local and municipal authorities having jurisdiction.

B. It is the Owner/Developer's responsibility to ensure compliance with GESA and conform to any and all NPDES guidelines and requirements.

C. Comply with requirements of State of Georgia Department of Natural Resources Environmental Protection Division General Permit No. GAR 100002. Permit governs storm water discharge associated with construction activity for infrastructure construction projects under the National Pollutant Discharge Elimination System (NPDES).

D. Temporary erosion controls and Best Management Practices, include, but are not limited to, grassing, mulching, watering and reseeding on-site surfaces and spoil and borrow area surfaces, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the regulations listed in Paragraph 1.1.A above.

E. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, filter stone and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Federal Clean Water Act of 1987, as amended.

F. Land disturbance activity shall not commence until all erosion and sedimentation control measures have been installed and the Land Disturbance Permit has been issued.

G. Basic Principles

1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.

2. Minimize the disturbed area and the duration of exposure to erosion elements.

3. Stabilize disturbed areas immediately.

4. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.

5. Retain sediment on site that was generated on site.

6. Minimize encroachment upon watercourses.
7. All erosion and sedimentation control measures shall be designed as required by regulations listed in Paragraph 1.1.A above.
8. Construct erosion and sedimentation control devices prior to clearing and excavation activities.

H. 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.

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

END OF SECTION

SECTION 3: TRENCH EXCAVATION AND BACKFILL

PART 1. GENERAL

1.1. 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 shown on the Drawings and 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 shown on the Drawings and 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 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 12 inches above the top of the barrel of the pipe or the top of duct bank.

5. Final Backfill: The area above a plane 12 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.

1.2. QUALITY ASSURANCE

A. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D 698, except that for cohesionless, free draining soils "maximum dry density" shall mean the maximum index density as determined by ASTM D 4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, ASTM D 2922 or ASTM D 2937.

B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory. All imported fill materials shall meet the requirements of on-site fill materials.

1.3. SAFETY

A. 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 publication 2226. Particular attention is drawn to the requirement that the Contractor must have on site an individual with current competent person training certification.

PART 2. PRODUCTS

2.1. TRENCH FOUNDATION MATERIALS

A. 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 sizes shall be between No. 57 and No. 4, inclusive.

2.2. BEDDING AND HAUNCHING MATERIALS

A. Unless shown on the Drawings or specified otherwise, bedding and haunching materials shall be earth materials as specified below.

B. Earth materials utilized for bedding and haunching 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, 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.

2.3. INITIAL BACKFILL

A. Unless shown on the Drawings or specified otherwise, initial backfill material shall be 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.

2.4. FINAL BACKFILL

A. Unless shown on the Drawings or specified otherwise, final backfill material shall be general excavated earth materials, shall not contain more than one/third broken rock, of which no stone or boulder shall weigh more than 50 pounds, 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.

2.5. SELECT BACKFILL

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

2.6. CONCRETE

A. 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.

2.7. FLOWABLE FILL

A. Flowable fill, where required for trench backfill or abandoning existing water mains under roadways, shall meet the requirements of Georgia Department of Transportation Standard Specifications, Section 600 for Excavatable or Non-Excavatable type.

2.8. GRANULAR MATERIAL

A. Granular material, where required for trench backfill, shall be sand, river sand, crushed stone or aggregate, pond screenings, crusher run, recycled concrete, or other angular material. Granular material shall meet gradation requirements for Size No. 57 or finer.

PART 3. EXECUTION

3.1. 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 non-paved, finished grading areas.

B. Trenches shall be excavated to the lines and grades shown on the Drawings 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. Trench Width for Pipelines

1. The sides of all trenches shall be as vertical as is practical to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, 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 6 inches clearance between the rock and any part of the pipe or manhole.

4. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the next higher Class or Type of bedding and haunching as shown on the Drawings for the full trench width as actually cut. 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 dimensions shown on the Drawings or specified.

2. Water Mains

a. Excavate trenches to provide a minimum cover of 48 inches. Within the right-of-way of highways, streets or roadways, also excavate to place the top of the pipe a minimum of 48 inches below the nearest pavement edge or drainage ditch.

b. Increase the depth of cover where specifically shown on the Drawings and where necessary to avoid interference with underground utilities and obstructions.

3. Where rock is encountered in trenches for pipelines, 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 Material

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.

F. Trench excavation shall not extend more than 400 feet beyond pipe installation.

3.2. 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.

B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended. The City shall direct where density tests will be performed along the Project route.

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. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities.

E. 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 or utility.

F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed or is within three feet of an existing structure, utility, or pipeline. Cut off any sheeting left in place at least two feet below the surface.

3.3. 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. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the City may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

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 City prior to any blasting. Additionally, the Contractor shall notify the Engineer and local fire department before any charge is set.

E. The Contractor shall conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

F. Where blasting is to be performed on Georgia Department of Transportation right-of-way, the Contractor shall be responsible for providing the Owner sufficient information to obtain a blasting permit from the Georgia DOT in a timely manner.

G. It shall be Contractor's responsibility to incorporate the use of seismic monitoring should rock excavation, by use of explosives, occur within 150 feet of any residential structure and within 300 feet of any miscellaneous structure. Blasting conducted near dams or bridge foundations shall incorporate the use of a seismic monitor should such blasting occur within 25 feet of said dam and/or bridge foundation. Contractor shall maintain all seismic records and blasting logs to be furnished to City upon request.

3.4. 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 utility 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.

3.5. 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 the City shall then authorize placement of trench stabilization.

C. Should the undisturbed material encountered at the trench bottom constitute, in the opinion of the City, 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 as directed by the City.

D. 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.

3.6. BEDDING AND HAUNCHING

A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.

B. 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 the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade 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.

C. 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.

D. 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.

E. Ductile Iron Pipe Water Mains

1. Unless otherwise shown on the Drawings or specified, utilize earth materials for bedding and haunching.

2. Unless specified or shown otherwise, bedding shall meet the requirements for Type 2 Pipe Bedding. Unless specified or shown otherwise for restrained joint pipe and fittings, bedding shall meet the requirements for Type 3 Pipe Bedding.

F. Excessive Width and Depth

1. If the trench is excavated to excess width, fill the trench with crushed stone to the quarter point on the pipe.

2. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.

G. 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.

3.7. 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 12 inches above the pipe barrel. Layer depths shall be a maximum of 6 inches.

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, unless shown or specified otherwise.

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.

3.8. CONCRETE ENCASEMENT FOR PIPELINES

A. Where concrete encasement is shown on the Drawings for pipelines, excavate the trench to provide a minimum of 12-inches clearance from the barrel 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 12 inches above the pipe barrel. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

3.9. FINAL BACKFILL

A. Backfill carefully to restore the ground surface to its original condition.

B. Except under pavement areas, the top 6 inches shall be topsoil obtained as

specified in "Trench Excavation" of this Section.

C. Excavated material which is unsuitable for backfilling, and excess material, shall be disposed of in a manner approved by the Engineer and in a manner that will not adversely impact the environment. Surplus soil may be neatly distributed and spread over the site, if approved by the Engineer. 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, unless specified otherwise.

3.10. ADDITIONAL MATERIAL

A. Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be as shown on the Drawings. 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.

3.11. BACKFILL UNDER ROADS

A. 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.

3.12. BACKFILL WITHIN GEORGIA DOT RIGHT-OF-WAY

A. 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, current edition.

3.13. BACKFILL ALONG RESTRAINED JOINT PIPE

A. Backfill along restrained joint pipe shall be compacted to a minimum 90 percent of the maximum dry density.

3.14. FLOWABLE FILL

A. Where flowable fill is required, excavate the trench to provide a minimum of 6-inches clearance on either side of the pipe barrel. Lay the pipe to line and grade on solid concrete blocks or bricks. In lieu of bedding, haunching and initial backfill, place flowable fill to the full width and depth of the trench.

B. Flowable fill shall be protected from freezing for a period of 36 hours after placement. Minimum temperature of flowable fill at point of delivery shall be 50 degrees F.

C. The Contractor shall provide steel plates over flowable fill in road locations.

3.15. COMPACTED GRANULAR MATERIAL

A. Where compacted granular material is required as initial and final backfill material, it shall be placed after bedding and haunching material specified elsewhere has been placed. Compacted granular material shall be compacted so that individual stone facets are properly oriented.

3.16. TESTING AND INSPECTION

A. All costs associated with compaction testing ordered by the City shall be paid for by the Contractor.

B. Frequency: The extent of testing required shall be reasonable, but shall also be dependent upon soil conditions, Contractor's means and methods of operation, and regulatory requirements. The City will direct where density tests will be performed along the Project route.

C. The soils testing laboratory is responsible for the following:

1. Compaction tests in accordance with Article 1.2 of this Section.
2. Inspecting and testing stripped site, subgrades and proposed fill materials.

D. The Contractor's duties relative to testing include:

1. Notifying laboratory of conditions requiring testing.
2. Coordinating with laboratory for field testing.
3. Paying costs for testing, including testing performed beyond the scope of that required, and for re-testing where initial tests reveal non-conformance with specified requirements.
4. Providing excavation as necessary for laboratory personnel to conduct tests.

E. 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 City.

2. Where required by the City, foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer, who shall verify suitable bearing and construction.

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

END OF SECTION

SECTION 4: BORE AND JACK CASINGS

PART 1. GENERAL

1.1. SCOPE

A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings and to properly complete pipeline construction as described herein and/or shown on the Drawings.

B. Supply all materials and 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. If requested by the Engineer, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

1.2. SUBMITTALS

A. Contractor shall submit to the City shop drawings, product data and experience.

B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:

1. Shop drawings for casing pipe showing sizes and connection details.
2. Design mixes for concrete and grout.
3. Casing Spacers.

C. Experience Submittals: Boring and jacking casings is deemed to be specialty contractor work. A minimum of five continuous years of experience in bore and jack casing construction is required of the casing installer. Evidence of this experience must be provided for review by the City.

1.3. STORAGE AND PROTECTION

A. All materials shall be stored and protected in accordance with the manufacturer's recommendations and as approved by the City.

PART 2. PRODUCTS

2.1. 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 thicknesses of casing shown in paragraph B. below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on its 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 and shown on the Drawings are minimum. Larger casings, with the City's approval, may be provided for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

B. Casing Sizes

UNDER HIGHWAYS			UNDER RAILROADS	
Pipe Diameter, Inches	**Casing Diameter, Inches**	**Wall Thickness, Inches**	**Casing Diameter, Inches**	**Wall Thickness, Inches**
6	12	0.250	14	.250
8	16	0.250	18	.250
10	16	0.250	20	.281
12	18	0.250	22	.312
16	24	0.312	30	.406
18	30	0.375	30	.406

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.

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. Carrier Pipe: Carrier pipes shall meet requirements as specified in Section 6 of these Specifications.

F. Surface Settlement Markers: Surface settlement markers within pavement areas shall be nails. Surface settlement markers within non-paved areas shall be wooden hubs.

2.2. EQUIPMENT

A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.

B. 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 approved by the Engineer.

PART 3. EXECUTION

3.1 GENERAL

A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding 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/railway surface and activity thereon, 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 bore and jack 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. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor at no additional cost to the City. Due to restrictive right-of-way and construction easements, casing lengths less than the nominal 20-foot length may be necessary.

E. Highway Crossings

1. The Contractor shall be held responsible and accountable for the coordination 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. Where blasting is to be performed on Georgia Department of Transportation right-of-way, the Contractor shall be responsible for providing the City sufficient information to obtain a blasting permit from the Georgia DOT 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. Additional insurance is required for each railroad crossing. The Contractor shall furnish the Railroad with such additional insurance as may be needed. Cost of the same shall be borne by the Contractor.

3. 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.

4. 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 for such services, in accordance with accounting procedures agreed on by the Contractor and affected Railroad before construction is started.

5. No blasting shall be permitted within the Railroad right-of-way.

3.2 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, notify the Engineer immediately and 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 minimum. Dewater into

a sediment trap and comply with requirements specified in Section 3 of these Specifications.

3.3 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/railway 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".

3.4 SURFACE SETTLEMENT MONITORING

A. Provide surface settlement markers for casings 24-inches in diameter and larger. Place marker as specified and as directed by the City. The Contractor shall place settlement markers outside of pavement area, along the centerline of the casing at 20-foot intervals and offset 10 feet each way from the centerline of the casing. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement and at 10 and 25 feet in each direction from the centerline of the casing. Tie settlement markers to benchmarks and indices sufficiently removed as not to be affected by the casing operations.

B. Make observations of surface settlement markers, placed as required herein, at regular time intervals acceptable to the City. In the event settlement or heave on any marker exceeds 1-inch, the Contractor shall immediately cease work and using a method approved by the City and the authority having jurisdiction over the project site, take immediate action to restore surface to elevations prior to start of casing operations.

C. Take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within 50 feet of the casing heading, at the beginning of each day; more frequently at the City’s direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot.

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

E. Promptly report any settlement and horizontal movement immediately to the Engineer and take immediate remedial action.

3.5 CASING INSTALLATION

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 loadings 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 directed by the City 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, if approved by the Engineer, 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, as designated by the Engineer.

O. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements of Section 3 are included under this Section.

P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

Q. Grout backfill shall be used for unused holes or abandoned pipes.

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

3.6 FREE BORING

A. Where the Drawings indicate a pipeline is to be installed by boring without casing, the Contractor shall construct the crossing by the free bore method. The free bore method shall be accomplished by the dry auger boring method without jetting, sluicing, or wet boring.

B. The diameter of the free bore shall not exceed the pipe bell outside diameter or the pipe barrel outside diameter plus 1-inch, whichever is greater.

C. Free boring, where indicated on the Drawings, is to be performed at the Contractor's option. The Contractor may choose to construct the crossing by the conventional bore and jack casing methodology.

D. The Contractor shall be responsible for any settlement of the roadway caused by the free bore construction activities.

3.7 VENTILATION AND AIR QUALITY

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

3.8 ROCK EXCAVATION

A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the City, cannot be removed through the casing, the City may authorize the Contractor to complete the crossing by another method.

B. At the Contractor's option, the Contractor may continue to install the casing and remove the rock through the casing.

3.9 INSTALLATION OF PIPE

A. After construction of the casing is complete, and has been accepted by the City, install the pipeline in accordance with the Drawings and Specifications.

B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

C. 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 one casing spacer per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum 18 to 20-foot intervals.

D. Seal the ends of the casing with one-piece synthetic rubber especially formulated for sealing casing/carrier pipe.

3.10 SHEETING REMOVAL

A. 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.

3.11 INTERSTATE RESTORATION

A. When boring and jacking operations encroach upon the rights-of-way of the Federal interstate system, the Contractor shall restore all screening trees with seedlings of like species.

END OF SECTION

SECTION 5: REMOVING AND REPLACING PAVEMENT

PART 1. GENERAL

1.1 SCOPE

A. 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 utilities and appurtenances.

B. Existing pavement, sidewalks and curbs shall be replaced to the current City standards or to match existing, whichever is more stringent.

1.2 SUBMITTALS

If required by the City, provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

1.3 CONDITIONS

A. Weather Limitations

1. Apply bituminous tack coat 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

2.1 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. Bituminous Tack Coat: The bituminous tack coat shall conform to the requirements of Section 400 of the Georgia Department of Transportation

Standard Specifications.

D. Surface Course: The surface course for all asphaltic concrete pavement shall conform to the requirements of Section 400, Type "E" 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 shown on the Drawings.

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.

2.2 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, unless otherwise directed by the Engineer. 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, Bituminous Tack Coat and Surface Course: Asphaltic concrete base, tack coat 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 of design and operation approved by the Engineer. After compaction, the black base shall be smooth and true to established profiles and sections. Apply and compact the surface course in a manner approved by the Engineer. 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 by the City 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 Section 3 of these Specifications, 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

3.1. REMOVING PAVEMENT

A. General: Remove existing pavement as necessary for installing the pipeline and appurtenances.

B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipelines 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.

3.2. REPLACING PAVEMENT

A. Preparation of Subgrade: Upon completion of backfilling and compaction of the backfill, arrange to have the compaction tested by an independent testing laboratory approved by the City. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.

Anchored steel plate may be used to maintain traffic flow after pipeline installation and prior to replacement of pavements, but the duration of use shall not exceed three (3) days.

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 facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed, as shown on the Design Drawings, 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 Section 3 of these Specifications.
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 in the opinion of the Engineer and permission is granted to replace the street pavement.
4. When temporary crushed stone or chert surface is considered by the Engineer 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. Pavement cuts shall be parallel or perpendicular to the road centerline as much as practical. On parallel installations the final cut shall be long and straight and consistent.
2. Replace all street and roadway pavement as shown on the Design

Drawings. 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.

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 to the depth and width shown on the Design Drawings. 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. When possible, specialty services shall be avoided and may only be disturbed when approved by City.

C. Pavement Resurfacing

1. Certain areas to be resurfaced are specified or noted on the Design Drawings. 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, at a minimum, 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 unless directed otherwise by the Engineer.

3.3. 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 M 153 for sidewalks and AASHTO M 213 for curbs.
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 indicated on the Design Drawings:
6. Wood forms may be used on sharp turns and for special sections, as approved by the City. 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 shown on the Design Drawings.

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 compact thoroughly, then finish to a smooth, unyielding surface at proper line, grade and cross section.

E. Joint for Curbs

1. Joints shall be constructed to match existing and as specified. 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 wherever shown on the Design Drawings. 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 of the radius indicated on the Design Drawings.

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. Driveway and Sidewalk Ramp Openings

1. Provide driveway openings of the widths and at the locations indicated on the Design Drawings and as directed by the City.

2. Provide sidewalk ramp openings as indicated on the Design Drawings, in conformance with the applicable regulations and as directed by the City.

I. 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.

3.4. 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, to the satisfaction of the Engineer. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

3.5. 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. Obtain the City’s approval of restoration of pavement, such as private roads and drives, that are not the responsibility of a regulatory agency.

C. Complete pavement restoration as soon as possible after backfilling.

D. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.

3.6. 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 6: WATER MAINS AND ACCESSORIES

PART 1. GENERAL

1.1 SCOPE

A. This Section describes products to be incorporated into water mains 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. General: 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.

1.2 QUALIFICATIONS

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

1.3 SUBMITTALS

A. Submit to the City, complete shop drawings, product data and engineering data, including shop drawings.

1.4 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.

C. Lined pipe shall be handled and transported to prevent damage to linings.

1.5 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.

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.

1.6 QUALITY ASSURANCE

A. Product manufacturers shall provide the City with written certification that all products furnished comply with all applicable provisions of these Specifications.

B. If ordered by the City, each pipe 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 five days during initial pipe installation.

PART 2. PRODUCTS

2.1 DUCTILE IRON PIPE (DIP)

A. Ductile iron pipe shall be utilized for all water mains. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet, with a bituminous outside coating.

B. Ductile iron pipe shall conform to ANSI A21.50 (AWWA C-150) latest revisions and ANSI A21.51 (AWWA C-151) latest revision. Pipe shall be cement lined and seal coated with approved bituminous seal coat in accordance with AWWA C-104, latest revision. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 1 6	350
1 8 - 2 0	300
24 and larger	250

C. Joints for Ductile Iron Pipe and Fittings

1. General

a. Joints for ductile iron pipe and fittings shall be mechanical joint, flanged, in accordance with ANSI 131.1, Coarse Thread Series, Class 2A external joint, ball joint, restrained joint, or push-on joint as shown on the Drawings or specified herein.

b. Unless otherwise shown on the Drawings, specified or directed, all ductile iron pipe laid underground shall be joined using push-on type joints.

c. In all cases, gaskets shall be made of material that will not be damaged by the fluid being transported nor by the environment in which the pipe is installed.
d. Provide the necessary bolts for connections. All bolts and nuts shall conform to ANSI B18.2.1 and ANSI B18.2.2, respectively.

2. Mechanical Joints

a. Joints shall conform to AWWA C111/ANSI A21.11.
b. Bolts and nuts 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. Gaskets shall be in accordance with AWWA Ci11/ANSI A21.11 and shall be constructed of plain rubber.
d. Mechanical joint glands shall be ductile iron.

3. Push-On Joints

a. Push-on joints and gaskets shall conform to AWWA C111/ANSI A21.11.
b. Details of the joint design shall be in accordance with the manufacturer's standard practice such as ACIPCO "Fastite", McWane (Clow) "Bell-Tite", or U.S. Pipe "Tyton" joints.

4. Flanged Joints

a. Flanged joints shall conform to AWWA C115/ANSI A21.15. Flanges shall be ductile iron and shall be furnished by the pipe manufacturer.
b. Gaskets shall be made of 1/8-inch thick, cloth reinforced rubber. Gaskets may be ring type or full-face type.
c. Flanged ductile iron pipe shall have flanges cast solidly or threaded to the pipe barrel. 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 threaded type flanges shall be assembled, faced, and drilled at the point of manufacture, unless otherwise approved by the City.
d. Flange filler shall conform to AWWA C 110/ANSI A21.10. Joint bolt length shall be increased by the thickness of the flange filler.
e. Where tap or stud bolts are required, flanges shall be drilled and tapped accordingly.
f. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
g. 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.

h. 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.

5. Restrained Joints

a. Restrained joints shall be ACIPCO "FLEX-RING" or "FAST-GRIP", or U.S. "TR-FLEX" or "FIELD LOK"

b. Bolts and nuts shall be in accordance with the manufacturer's recommendations.

c. Gaskets shall be in accordance with the manufacturer's recommendations.

D. Cement Linings: Pipe and fittings shall be cement lined in accordance with AWWA C 104/ANSI/AWWA C 104/A21.4. Seal coat is not required.

2.2 FITTINGS

A. Fittings for Ductile Iron - All fittings shall be ductile iron furnished in accordance with the latest revision of ANSI A21.10 (AWWA C110) or ANSI A21.53 (AWWA C153) and have a minimum Pressure Class of 250 psi. Joints shall be mechanical joints with ductile iron retainer glands conforming to ANSI A21.11 (AWWA C-111), latest revision. Ductile iron retainer glands shall be equal to EBAA Iron Mega-Lug mechanical joint or approved equal. All fittings shall be furnished with a cement mortar lining.

B. Fittings for Flanged Pipe – Shall be manufactured in accordance with ANSI B 16.1, Class 125 flanges.

2.3 GATE VALVES

A. Two (2) Inches and Larger Valves – Shall be cast iron or Ductile iron body, bronze mounted, resilient wedge design, with non-rising stems, conforming to AWWA C-515. Valves shall be tested and certified to ANSI/NSF 61, be Underwriters Laboratories, Inc. Listed and be Factory Mutual approved. They shall have ends to match the pipe to which they are attached. Attachment to plastic pipe shall be made by special adapters. Valves shall be designed for a minimum working pressure of 200 psi and be tested at 400 psi. Gate valves sized 2" through 12" shall be Mueller Co. A-2360 Series with mechanical joints or approved equal. Mechanical joints shall be furnished with Megalugs. Stems shall be bronze; stainless steel stems will not be allowed.

B. Valves shall be furnished with “O” ring packing. Two (2) “O” rings shall be located above the thrust collar and one (1) “O” ring below. The thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

C. Valves installed in pits or above ground shall be furnished with hand wheels. Buried valves shall be furnished with 2” square operating nuts. Valves shall open when turned counterclockwise.

D. Smaller Than Two (2) Inches – Shall be all brass, ball valve type. The pressure rating shall be 175 psi.

2.4 TAPPING SLEEVES AND VALVES

A. Shall be Mechanical Joint Type sized to fit the intercepted pipe. They shall have duck-tipped end gaskets and shall be equal to Mueller H-615/715 with a tapping valve attached. The outlet end of the valve shall have a joint suitable for the type of pipe to be used in the new branch. The Sleeve/Cross shall be sized to fit the intercepted pipe without leaking.

B. Stainless steel tapping sleeves may be used and shall be equal to Mueller H-304.

2.5 VALVE BOXES

A. Valve boxes for valves shall be approved standard cast iron adjustable shaft boxes having a minimum shaft diameter of 5-1/4". The casing shall be coated with two coats of coal tar pitch varnish. The lids of all boxes shall bear the word "WATER" or the letter "W". Boxes shall be equal to Vulcan Pattern VVB-4 or approved equal.

2.6 FIRE HYDRANTS

A. General – Hydrants shall be manufacturer's current model design and construction. All hydrant units are to be complete including joint assemblies. Physical characteristics and compositions of various metal used in the hydrant components shall meet the requirements as specified in AWWA C-502 latest revision. Hydrants shall meet all test requirements, be Underwriters Laboratories Listed and be Factory Mutual Inc. approved. Hydrants shall be suitable for working pressure of 250 psi. Fire hydrants shall be manufactured by M&H Valve Company.

B. Bonnet – Bonnet may have oil filled or dry reservoir. If oil filled, bonnet must have "O" ring packing so that all operating parts are enclosed in a sealed oil bath. Oil filter plug shall be provided in bonnet to permit checking of oil level and adding oil when required. If bonnet is the dry type, the hydrant top must have a lubricating hole or nut for ease of lubrication. All parts must be removed through top of hydrant without moving entire barrel section from safety flange.

C. Nozzles and Caps – The hydrant shall have two (2) 2-1/2-inch connections and one (1) 4-1/2" steamer connection, National standard threads. Nozzles shall be bronze and have interlocking lugs to prevent blowout. Nozzle caps shall be secured to fire hydrant with non-kinking type chain with chain loop on cap ends to permit free turning of caps.

D. Seat Ring – Seat ring shall be bronze.

E. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.

F. Main Valve – Valve shall be designed to close with the pressure and remain

closed. Valve shall be made from material that will resist rocks or other foreign matter. Valve shall have a full 5-1/4-inch opening.

G. Barrel and Safety Flanges – Hydrants shall have a safety-type vertical barrel with depth of bury as needed for pipe size and be designed with safety flanges and/or bolts to protect the barrel and stem from damage and to eliminate flooding when hydrant is struck. Bury depth shall be cast on barrel of hydrant. Hydrant shall be installed with a locked hydrant tee equal to American A-10180 and a locked hydrant adapter equal to American A-10895

H. Operating Stop and Nut – Hydrant shall have a positive stop feature to permit opening of hydrant without over travel of stem. Operating nut shall be bronze, 1-1/2", point to flat, pentagon.

I. Bolts and Nuts – Bolts, washers and nuts shall be corrosion resistant.

J. Inlet – Bottom inlet of hydrant shall be provided with mechanical joint connection as specified and shall be 6-inch nominal diameter.

K. Direction of Opening – Hydrant shall be designed to close "right" or clockwise and open "left" or counter-clockwise.

L. Coatings – All inside and outside portions of hydrant shall be coated in accordance with AWWA C-502. The exterior portion of hydrant above ground level shall be painted with two (2) coats of best grade zinc chromate primer paint and with two (2) coats of approved hydrant enamel. Color shall be Red unless otherwise designated by the City.

M. Joint Assemblies – Complete joint assemblies consisting of gland, gasket, bolts, and nut shall be furnished for mechanical joint inlets.

N. Post Hydrants: Post hydrants shall be non-freeze design, bronze exposed head with aluminum casing guard and bronze casing. Minimum depth of bury shall be two feet. Post hydrants shall be equal to Zurn Z-1385.

2.7 METERED SERVICES

A. Service Connections

1. Taps in pipe larger than 3-inches shall be made with a tapping machine. A corporation stop shall be installed at the connection to the main. The corporation stop shall be brass manufactured in conformance with AWWA C-800, NSF 61 and latest requirements of the US Federal Safe Drinking Water Act. Inlet and outlet threads shall conform to AWWA C-800.

2. The key and body seating surfaces shall be accurately machined and fit to a taper of 1-3/4 inches per foot. The stem and retaining nut shall be so designed that failure from over tightening of the retaining nut results in thread stripping rather than stem fracture. Corporation stops shall be 1" or 3/4" equivalent to Mueller H-15008 or Ford F-1000 with a stainless-steel stiffener. Service saddles shall be 1-inch AWWA taps, equal to Ford Styles

202B, Romac Style 202 or Smith-Blair 313. Contractor shall adhere to pipe manufacturer's recommendations on maximum tap sizes for each main size.

3. Where connections to larger service pipes are required, multiple taps shall be made and connected by branch. The connection shall be capable of withstanding internal water pressure continuously at 200 psi. House service lines will be copper with a curb stop at the property line. Location of service line must appear on the "as-built" information and record drawings and will be located by the City using their GPS system.

B. Curb Stops and Wyes

1. All metal parts of curb stops shall be made of bronze. The stops shall be Ford model B43-232W or approved equal. The cock shall be operated with a combined cap and tee and shall open when turned counterclockwise. All curb stops shall have locking device. The Contractor shall furnish and install all necessary couplings, adapters and fittings to plumb to service tubing.

2. Wyes shall be Ford model Wye 44 or approved equal.

C. Service Tubing:

1. Service tubing shall be copper service pipe, type "K" for ¾" or 1" services and PE IPS DR11 or greater for 2" services, sized to match meter size.
2. Service lines will be run so as to sit on private property, preferably 1-2 feet behind property stakes. Curb stop with meter swivel nut shall be utilized.
3. If soldered joints are used anywhere in the installation, solder and flux used shall be "lead free" conforming to NSF 61 and the latest requirements of the US Federal Safe Drinking Water Act.

D. Corporation Stops

1. Corporation stops shall be ground key 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. Ends shall be suitable for grip type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.
2. Corporation stops shall be Ford F-1000 or approved equal.

E. PVC Casing for Freebore

1. PVC casing pipe shall be used for long-side services. The PVC casing pipe shall be Schedule 40 and a minimum of 2" diameter extending a minimum of 3 ft. beyond the pavement on each side of the road.

F. Meter Box

1. Meter boxes shall be cast iron in accordance with ASTM A48, Class 30B.

2. Cast iron meter boxes shall be equal to SIP Industries model MBX 6413, Star Pipe MBX-1LR or approved equal.

3. Meter box shall be fitted with cast iron cover. Holes for AMI mounting shall be in the middle of the meter box lid.
4. Meter box shall be oval with minimum dimensions of 19 inches x 12 inches x 10 inches.

D. Backflow Preventers, Reduced Pressure Zone Type (RPZ) (3/4 to 2-Inch Size)

1. Provide reduced pressure zone backflow preventers where noted on the Drawings. Backflow preventers shall be rated for operation with inlet water pressures up to 175 psig and water temperatures up to 140-1/2 degrees F. Backflow preventers shall be tested and certified in accordance with ASSE 1013 and AWWA C506 and C511
2. Provide with bronze body construction, rubber check valve and relief valve assemblies, and Clecon check seats.
3. Provide isolation valves on the inlet and outlet of each backflow preventer for maintenance. These valves shall be quarter turn, full port, resilient seated, bronze ball valves.
4. Provide bronze ball body valve test cocks.
5. Provide bronze body strainer on the inlet of each backflow preventer.
6. Acceptable Manufacturers: Watts Series 909, Wilkins, Hersey.
7. Enclosures shall be aluminum or fiberglass providing access for testing purposes. It shall have ground anchor capabilities that provide for complete removal. The enclosure should be constructed with drain openings to accommodate the maximum discharge of the RPZ assembly and provide protection to -30˚F. The enclosure shall be lockable.

2.8 DETECTION TAPE

A. 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, 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 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.

2.9 TRACING WIRE

A. Tracer wire shall be installed on ALL non-metallic pipelines and service lines in a continuous fashion. It shall be brought to the surface at each locator post. It shall be accessible from surface at all valve and meter boxes. At locations tracer wire surfaces between valves, regular valve box with plain lid and collar shall be installed between a pipeline marker pair. Tracer wire shall be 12 GA

single strand or up to 7 stands, copper with insulation UL rated for direct bury underground service. Splices shall be UL rated for direct bury and shall be minimized. Wire for directionally drilled bores shall be a minimum of #8 gauge. Color shall be blue.

2.10 LOCATOR POSTS

A. Valve markers shall be made of 3,000 psi concrete and shall be four (4) feet long and four (4) inches on each side, with two (2) No.4 reinforcing bars. The markers shall be set with an even number of feet between the centerline of the valve and the centerline of the aluminum disc in the top of the marker and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

2.11 PIPE CONNECTION COUPLINGS

A. Pipe connections between new pipe and existing pipe shall be made with dresser Style 90 long steel couplings for pipe sizes 2" and below; for pipe sizes above 2", M.J. solid sleeves (long style) shall be used. Spacer rings must be used at all solid sleeve locations. A spacer ring is defined as a short section of pipe cut to fit into the gap between the two plain ends of pipe at the sleeve location.

PART 3. EXECUTION

3.1. EXISTING UTILITIES AND OBSTRUCTIONS

A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall call the Utilities Protection Center (UPC) (1-800-282-7411) as required by Georgia law (0.C.G.A. §§ 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. The Contractor shall ensure, at the time of any excavation, that a valid utility location exists at the time of excavation.

2. Expose the facility to verify its true location and grade 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 protecting it 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 and complies with regulatory agency requirements after a written request to and subsequent approval by the City. If, in the opinion of the City, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the City will direct the Contractor to have the utility 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 provides minimum required capacity, maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by the City. If, in the opinion of the City, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the City will direct the Contractor to have the utility relocated.

3. 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.

D. Water and Sewer Separation

1. Water Mains should maintain a minimum 10-foot edge-to-edge separation from sewer mains. Where the water main crosses over or under a sewer main, an 18-inch vertical separation shall be maintained where possible. Where possible, a full length of water main shall be centered on the sewer main. Any deviation shall be requested in writing to the Engineer.

2. Where the water main crosses under a sewer main, the water main shall be encased in concrete 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 sanitary sewer manhole.

3.2. CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

A. Install pipelines and appurtenances along highways, streets and roadways in accordance with the applicable regulations of, and permits issued by, the Georgia Department of Transportation, the City of Winder and Barrow 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.

2. Construction traffic control devices and their installation shall be in accordance with the current U.S. DOT *Manual on Uniform Traffic Control Devices for Streets and Highways* Section 104.05 and 107.07, and the Georgia Department of Transportation Standard Specification.

3. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation and the City of Winder 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 the City of Winder. 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 ensure 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 pipeline 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.

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.

3.3. 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 City. The City 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

3.4. LAYING AND JOINTING PIPE AND ACCESSORIES

A. Lay all pipe and fittings to accurately conform to the lines and grades established. by the Engineer.

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 materials and protective coatings and linings. Under no circumstances shall 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 City, 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. 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, where shown on the Drawings, 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. Any pipe which has had its alignment, grade or joints disturbed after installation shall be removed and reinstalled to the correct vertical and horizontal alignment.

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 City.

E. Joint Assembly

1. Push-on, mechanical, flange, restrained type joints and HDPE fused 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

1. Cut ductile iron pipe using an abrasive wheel saw.
2. Remove all burrs and smooth the end before jointing.
3. 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.
4. Pipes in length less than 10 feet shall not be "belled" to other pipe but may be used for connection by MJ joints or discarded.

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 City. 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 bricks, 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 Engineer.
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.

3.5. THRUST RESTRAINT

A. Provide restraint at all points where hydraulic thrust may develop.

B. Retainer Glands: Provide retainer glands where shown on the Drawings 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 specifically shown on the Drawings or directed by the City. 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, stainless steel, 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 specifically shown on the Drawings.

2. Form and pour concrete blocking at fittings as shown on the Details and as directed by the City. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

E. Thrust Collars: Collars shall be constructed as shown on the Details. The welded-on collar shall be attached to the pipe by the pipe manufacturer.

3.6. CONCRETE COLLARS

A. Construct collars as shown on the Drawings

3.7. INSPECTION AND TESTING

A. 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 such that the pressure shall be a minimum of 1.5 times the working pressure, but not less than 200 psi, whichever is greater, 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: 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 the specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. Leakage shall be the total cumulative amount measured on a water meter. The Owner assumes no responsibility for leakage occurring through existing valves. No installation will be accepted if leakage is greater than that determined by the formula:

For Ductile Iron Installations: $L = \frac{ND(P)^{0.5}}{133{,}200}$ Where:

L is the allowable leakage in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gauge.

Leakage values determined by the above formula are to be found in the following Table 1.

Table 1: Allowable Leakage for Water Main Installation (Per 1,000 ft) in Gallons per Hour

Nominal Pipe Diameter, Inches	Allowable Leakage (gallons)/1,000 ft. 200 PSI - DIP
4"	0.43
6"	0.64
8"	0.85
10	1.06
12"	1.28
14”	1.48
16”	1.70
18”	1.91
20”	2.12
24”	2.55
30”	3.19
36”	3.83

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.

3.8. DISINFECTION OF MAINS

A. Disinfection of Mains: The Contractor shall disinfect all new mains in accordance with AWWA C651 furnishing all labor, equipment and material necessary for the complete disinfection of the mains as hereinafter provided. Mains shall be disinfected by the application of a chlorinating agent into the water used for the initial filling of the mains. The chlorinating agent may be chlorine gas-water mixture, sodium hypochlorite, calcium hypochlorite in water, or chlorinated lime of known chlorine content in water and shall be fed through a suitable solution feed device. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates. Potable water shall be supplied through a temporary connection that shall include an appropriate cross-connection device for backflow prevention to the active distribution system. The flushing velocity in the main shall not be less than 2.5 ft/s. For mains 24-inches and larger, an acceptable alternative to flushing is to broom sweep the main, carefully removing all sweeps prior to chlorination. The chlorinating agent shall be applied at a point not more than 10 feet from the

beginning point from which the main is being filled and shall be injected at a constant measured rate into the new main through a corporation cock tapped into the newly laid main. The water being used to fill the line shall be controlled to flow into the section to be sterilized very slowly and the rate of application of the chlorinating agent shall be in such proportion to the rate of the water entering the pipe that the chlorine dose applied to the water shall be at least 25 ppm. The chlorine treated water shall be retained in the new main at least 24 hours and a 10 ppm of residual chlorine shall remain after the 24-hour period. During the 24-hour period, all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. Following chlorination all treated water shall be flushed from the mains until replacement water shall have a chlorine content of not more than 0.1 ppm in excess of the residual in water from the supplying main and in any event not less than 0.2 ppm. Samples of the water shall be taken from several points in the new lines and sent to the City who will submit them to a State Approved lab for bacteriological analysis. The Contractor shall be responsible for cost associated with sampling and microbiological analysis by a certified microbiological laboratory of each section of pipeline tested. Should the analysis show contamination, the system shall be re-chlorinated and further samples taken and submitted for analysis until no contamination is indicated. The Contractor shall pay for all costs associated with re-chlorinating and re-testing of water samples including, but not limited to, the cost of additional bacteriological testing.

3.9. 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. Prepare photographic documentation of sensitive areas along the project route/site to document conditions existing prior to project construction.

3. 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.

4. 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.

5. The Georgia Department of Transportation's engineer or the City will be authorized to stop all work by the Contractor on its right-of-way when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.

B. Man-Made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mailboxes, pipelines, 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 Engineer. 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. 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.

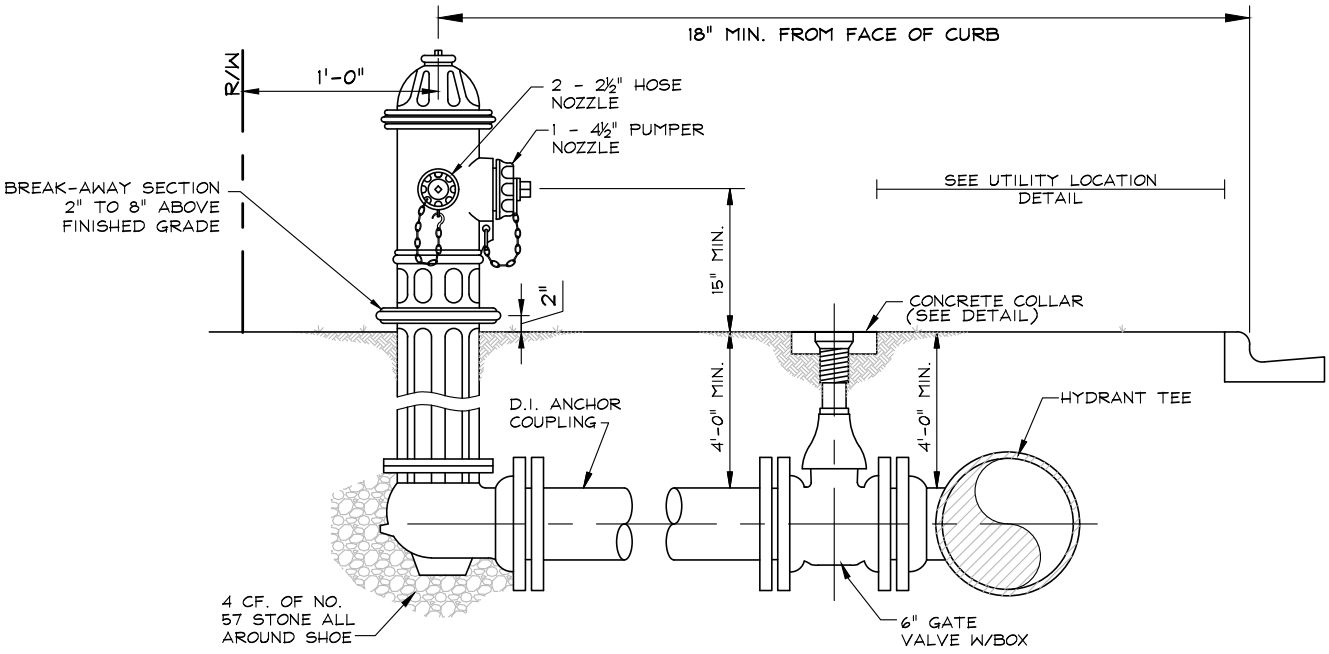
3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.

4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

F. Dust Control: The Contractor shall use all means necessary to control dust on and near the work, and on and near all off-site borrow areas when dust is caused by the operations during performance of the work or if resulting from the condition

in which the subcontractor leaves the site. The Contractor shall thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of work on the site.

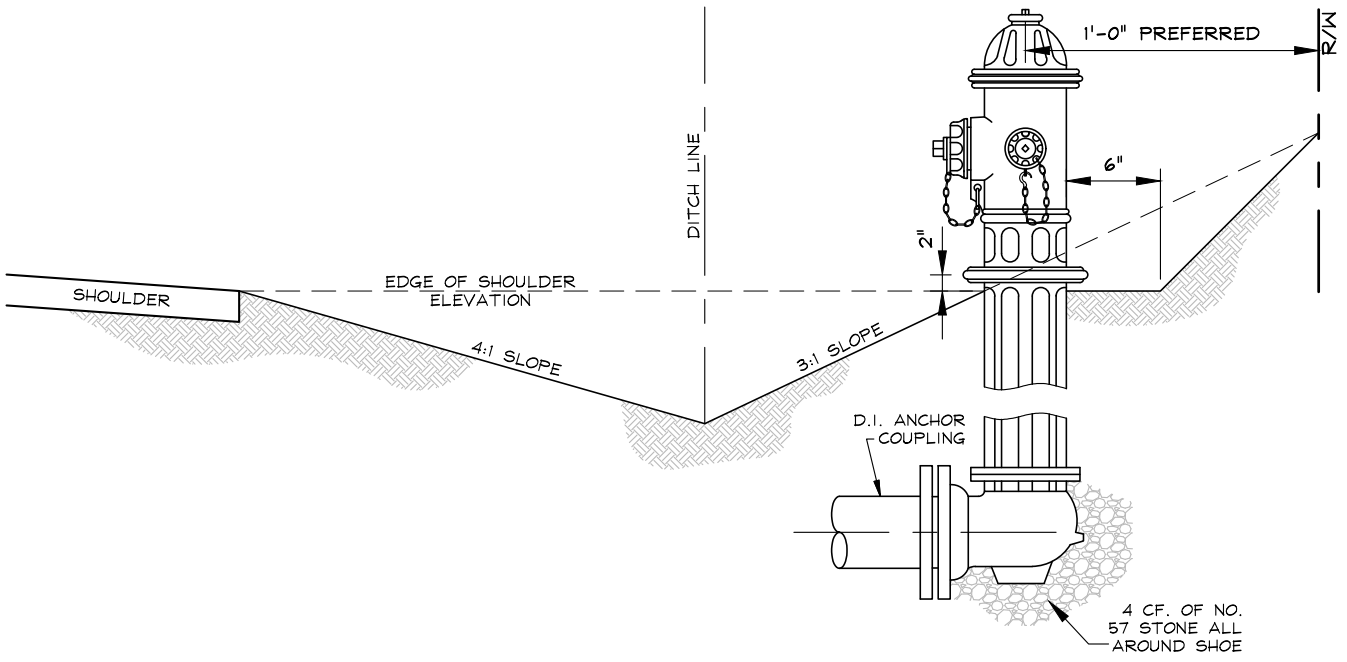
END OF SECTION



TYPICAL SECTION W/ CURB & GUTTER

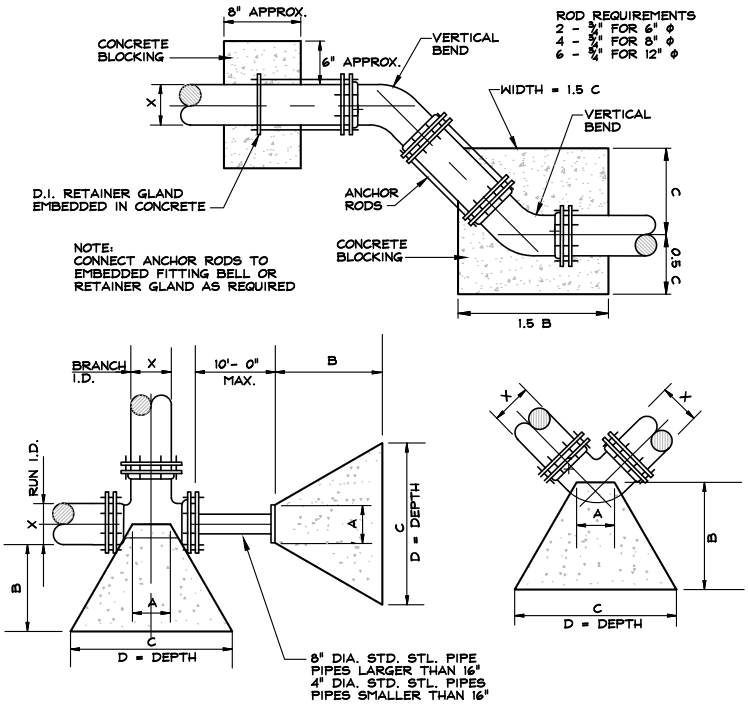
NOTES:

1. PUMPER NOZZLE TO FACE STREET.
2. HYDRANT SHALL NOT BE SET ON THE CURB SIDE OF WATER MAIN.
3. ADJUST VALVE BOX TO FINISHED GRADE.
4. CONCRETE COLLAR REQ'D AROUND VALVE BOX EXCEPT IN PAVED AREAS.
5. GRAVEL TO BE PLACED AROUND HYDRANT DRAIN, MINIMUM 2 FT. x 1 FT. x 2 FT.
6. NO HYDRANT SHALL BE INSTALLED SO THAT ANY PART OF THE HYDRANT IS IN CONFLICT WITH A SIDEWALK.



TYPICAL SECTION WITHOUT CURB & GUTTER

WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	TYPICAL FIRE HYDRANT SETTING	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W1



BLOCKING DIMENSIONS

90° BEND

BENDS				
X	A	B	C	D
30"	2'-0"	11'-6"	15'-3"	6'-0"
24"	2'-0"	7'-9"	10'-9"	5'-6"
20"	1'-9"	6'-0"	8'-6"	5'-0"
16"	1'-3"	4'-0"	6'-0"	4'-6"
12"	10"	2'-9"	4'-0"	4'-0"
10"	10"	2'-6"	3'-9"	3'-0"
8"	8"	1'-9"	2'-6"	2'-6"
6"	6"	1'-3"	2'-0"	2'-0"
4"	4"	1'-0"	1'-6"	1'-6"

45° BEND

BENDS				
X	A	B	C	D
30"	1'-6"	7'-6"	10'-0"	5'-0"
24"	1'-3"	5'-9"	8'-0"	4'-0"
20"	1'-0"	4'-9"	6'-8"	3'-6"
16"	1'-3"	3'-3"	5'-0"	3'-3"
12"	10"	1'-9"	3'-0"	2'-9"
10"	10"	1'-9"	3'-0"	2'-0"
8"	8"	1'-6"	2'-0"	2'-0"
6"	6"	1'-3"	1'-6"	1'-6"
4"	4"	1'-0"	1'-0"	1'-0"

22-½° BEND

BENDS				
X	A	B	C	D
30"	1'-0"	4'-8"	6'-4"	4'-0"
24"	1'-0"	3'-0"	5'-0"	3'-6"
20"	1'-0"	2'-6"	4'-4"	3'-0"
16"	1'-0"	1'-9"	3'-0"	2'-6"
12"	10"	1'-3"	2'-3"	2'-0"
10"	10"	1'-0"	2'-0"	1'-6"
8"	8"	1'-0"	1'-9"	1'-9"
6"	6"	1'-0"	1'-6"	1'-6"
4"	4"	1'-0"	1'-3"	1'-3"

11-¼° BEND

BENDS				
X	A	B	C	D
30"	1'-0"	2'-10"	4'-3"	3'-0"
24"	1'-0"	2'-6"	3'-8"	2'-6"
20"	10"	2'-0"	3'-0"	2'-0"
16"	16"	1'-8"	2'-6"	1'-6"
12"	8"	1'-0"	1'-6"	1'-6"
10"	10"	1'-0"	1'-6"	1'-0"
8"	8"	1'-0"	1'-6"	1'-0"
6"	6"	1'-0"	1'-0"	1'-0"
4"	4"	1'-0"	1'-0"	9"

TEES & DEAD ENDS

X	A	B	C	D
30"	3'-0"	8'-9"	13'-0"	5'-0"
24"	2'-6"	7'-3"	10'-8"	3'-9"
20"	2'-0"	5'-3"	8'-0"	3'-6"
16"	1'-0"	4'-8"	6'-4"	3'-0"
12"	10"	2'-9"	4'-6"	2'-6"
10"	10"	2'-0"	3'-3"	2'-6"
8"	8"	1'-9"	2'-6"	2'-0"
6"	6"	1'-3"	2'-0"	1'-6"

NOTE: 200 P.S.I. TEST PRESSURE
SOIL BEARING OF 2500 P.S.F.
3000 P.S.I. CONCRETE
PIPE LESS THAN 4" IN DIAMETER
SHALL HAVE THE SAME REQUIREMENTS
AS 4" DIAMETER PIPE

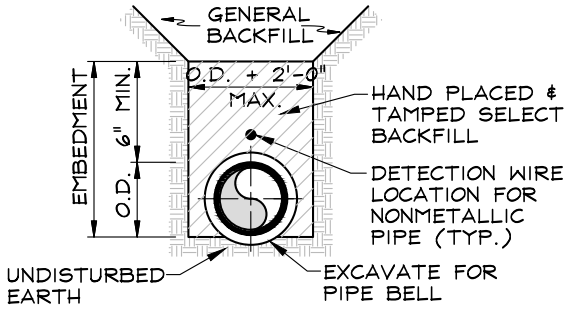
WINDER, GEORGIA
EST. 1893
"CITY OF OPPORTUNITY"

THRUST BLOCK DETAIL

DATE: JANUARY 2020
SCALE: N.T.S.

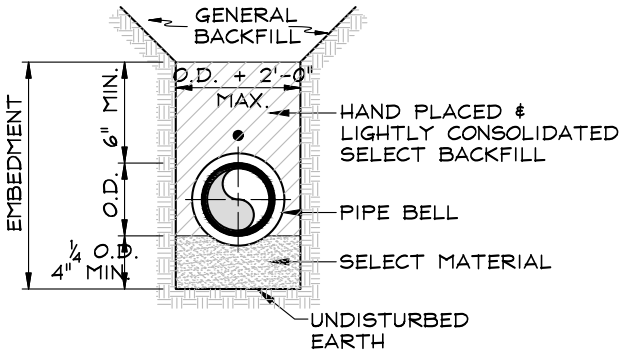
STANDARD DETAILS
WATER SYSTEM CONSTRUCTION

STANDARD W2



TYPE 2

(FLAT BOTTOM TRENCH)

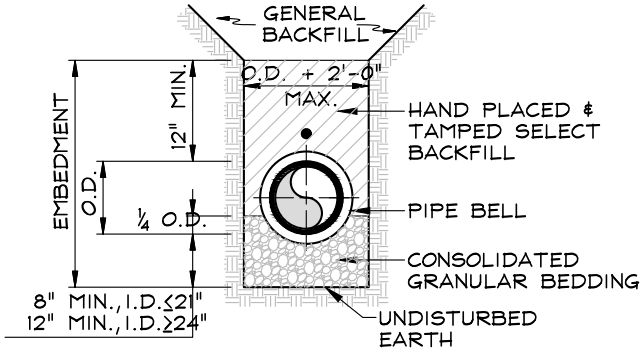


TYPE 3

(LOOSE SOIL BEDDING)

NOTES

1. TYPE 2 CAN ONLY BE USED IN DRY EARTH TRENCHES.
2. IF ROCK IS ENCOUNTERED OR OVER EXCAVATION OCCURS, TYPE 4 SHALL BE USED.
3. TYPE 1 & TYPE 5 DO NOT APPLY TO WATER MAINS AND ARE NOT SHOWN
4. SEE VOLUME II, SECTION 3 FOR ADDITIONAL REQUIREMENTS.



TYPE 4

(GRANULAR BEDDING)

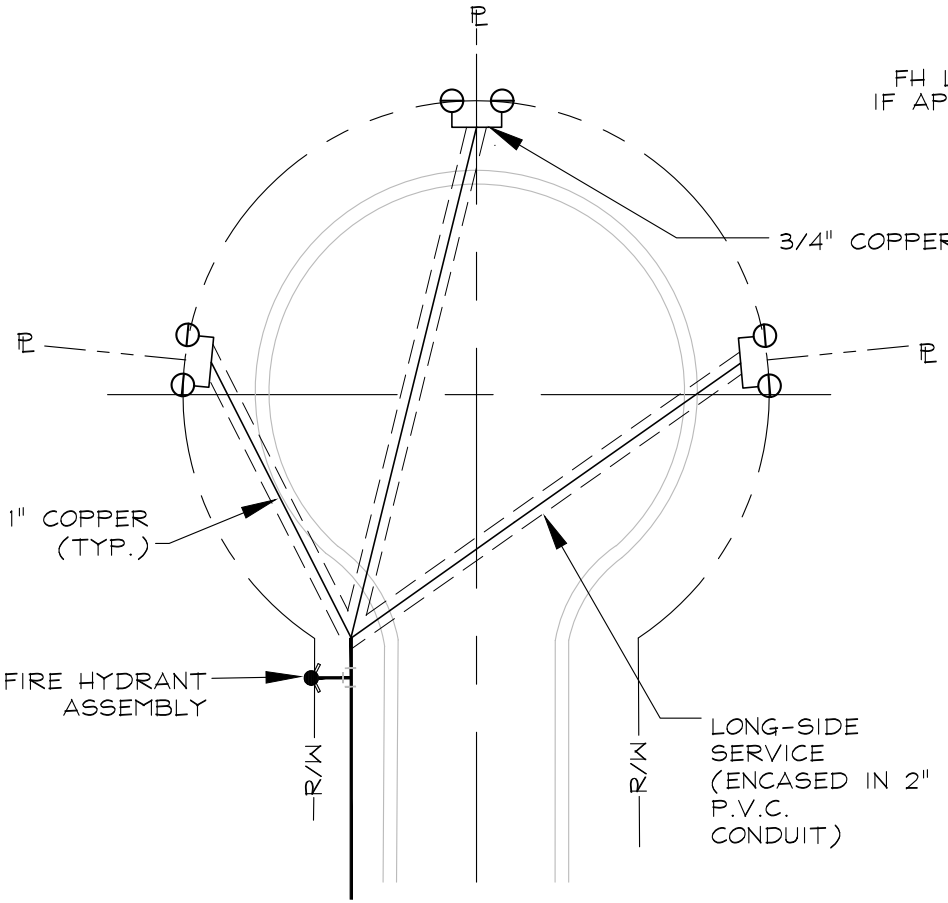
WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	PIPE BEDDING AND HAUNCHING GRAVITY AND PRESSURE PIPES	DATE: JANUARY 2020
		SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W3

WATER MAIN LOCATION
SUBDIVISION STREET

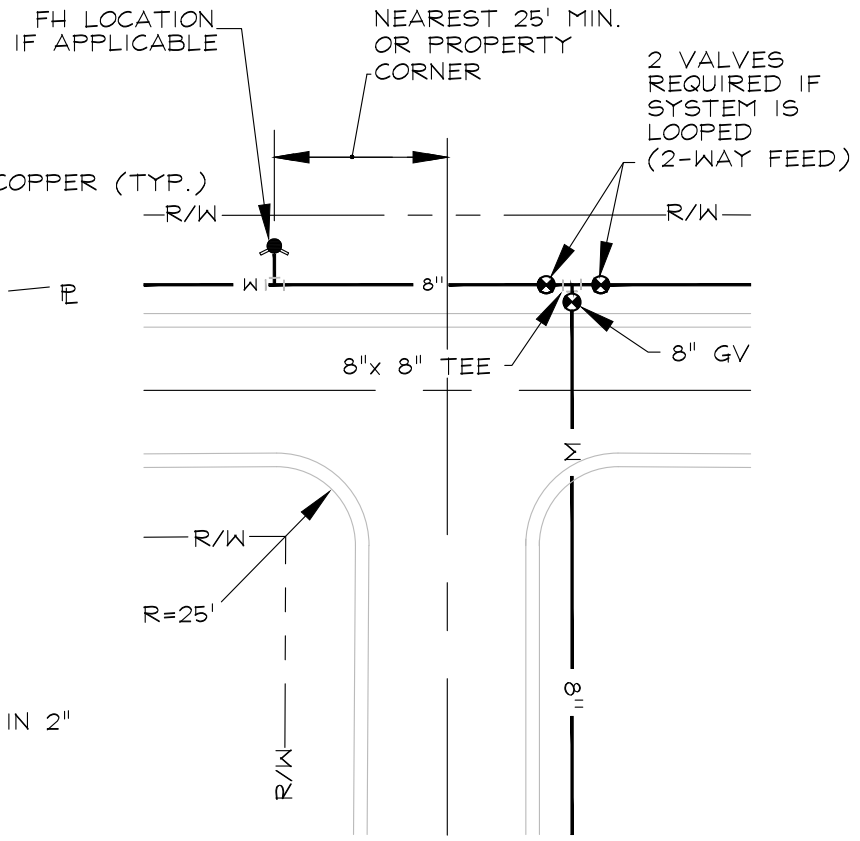
STANDARD DETAILS
WATER SYSTEM CONSTRUCTION

DATE: JANUARY 2020
SCALE: N.T.S.

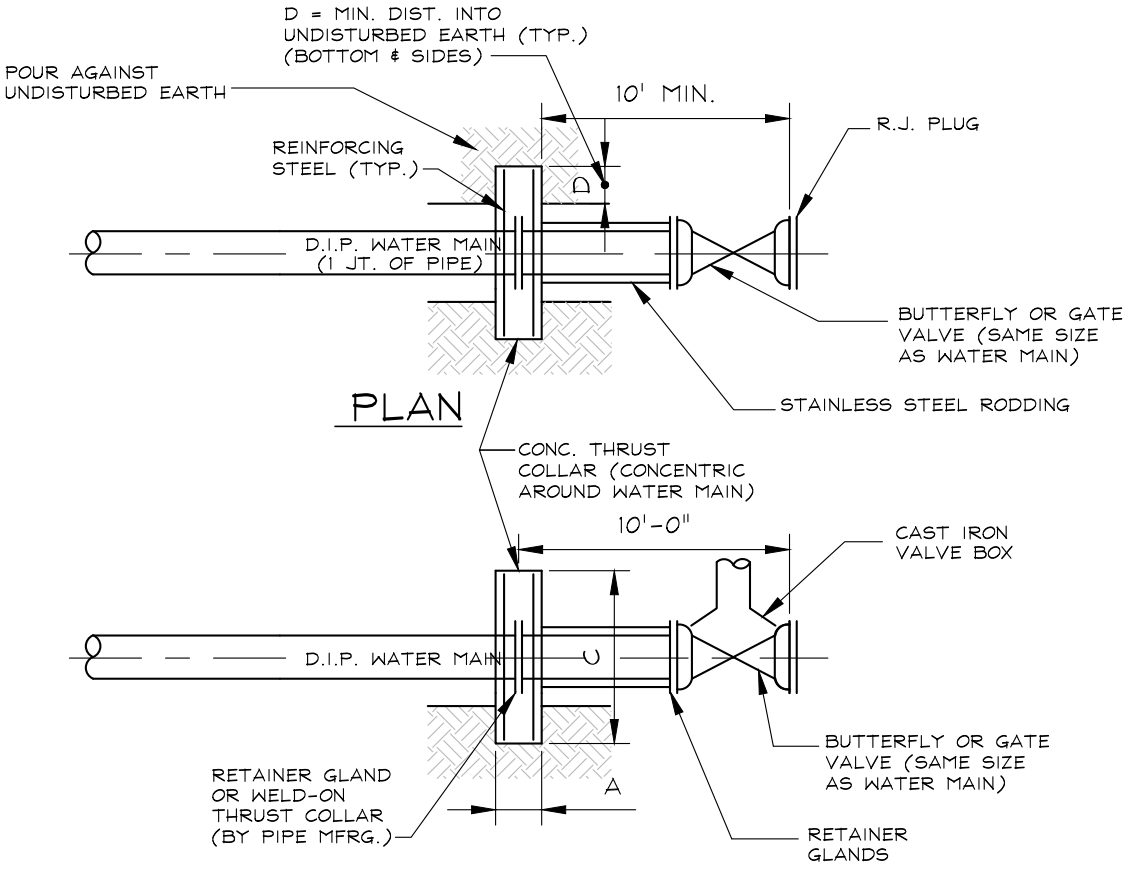
STANDARD W4



CUL-DE-SAC



TEE INTERSECTION



SECTION

MAIN DIA	CONCRETE COLLAR DIM.				REINFORCING STEEL
	A	B	C	D	
16"	1'-3"	6'-6"	6'-6"	1'-6"	#8 @ 12" O.C. E.W.E.F.
12"	1'-2"	5'-3"	5'-3"	1'-0"	#7 @ 12" O.C. E.W.E.F.
6" or 8"	1'-0"	4'-0"	4'-0"	0'-8"	#6 @ 12" O.C. E.W.E.F.

TEST PRESSURE: 200 P.S.I.
SOIL BEARING PRESSURE: 2500 P.S.F.

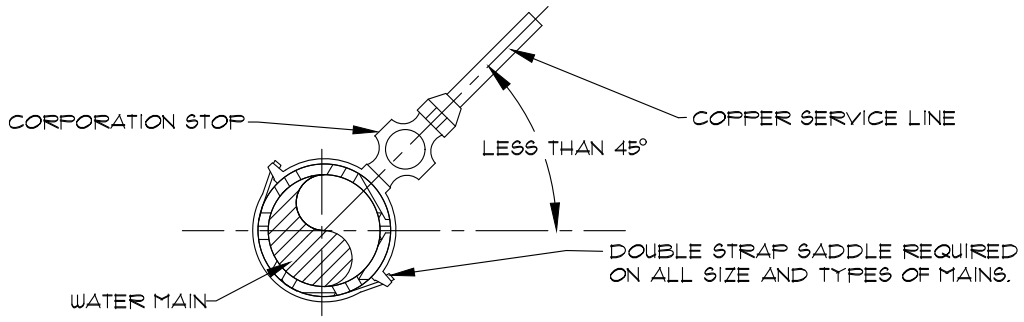
WINDER, GEORGIA
EST. 1893
"CITY OF OPPORTUNITY"

WATER MAIN TERMINATION

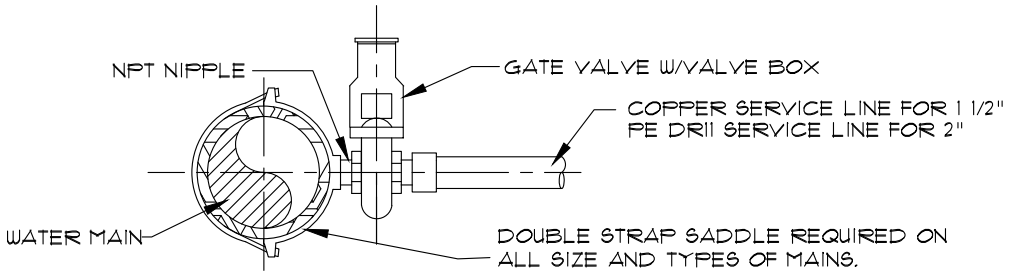
DATE: JANUARY 2020
SCALE: N.T.S.

STANDARD DETAILS
WATER SYSTEM CONSTRUCTION

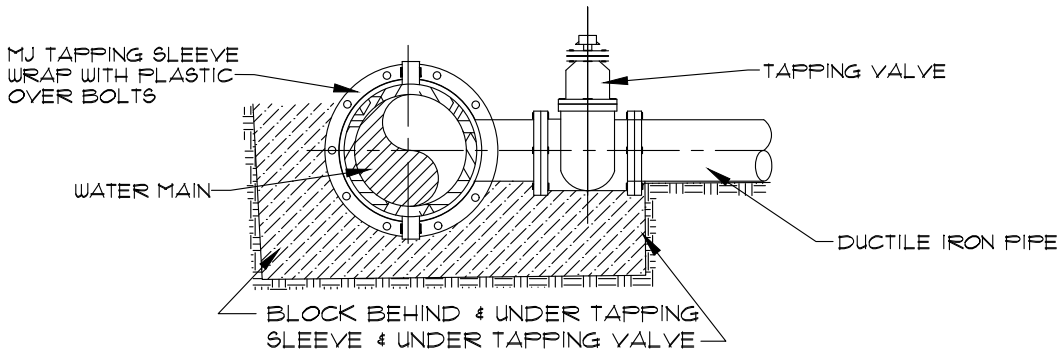
STANDARD W5



3/4" & 1" SERVICE CONNECTIONS



1 1/2" & 2" SERVICE CONNECTIONS

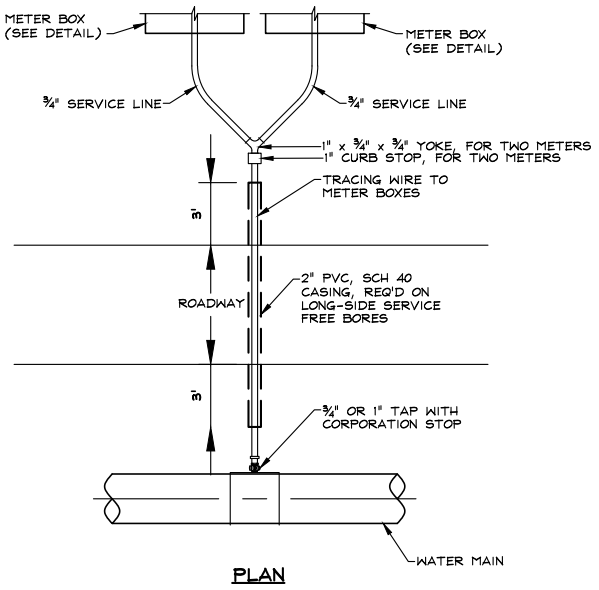


3" SERVICE CONNECTIONS

NOTES:

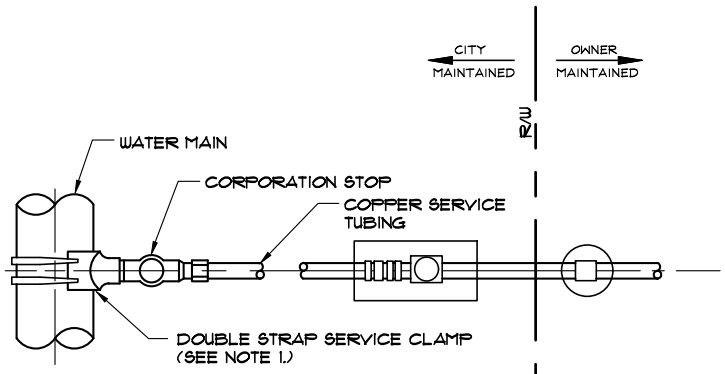
1. VAULT - 4,000 PSI REINFORCED PRECAST CONCRETE OR CAST-IN-PLACE, CONTRACTOR'S OPTION.
2. TOP OF VAULT ELEVATION TO BE AT LEAST 3" - 6" ABOVE FINISHED GRADE UNLESS OTHERWISE APPROVED BY CITY.
3. ALUMINUM HATCH EQUAL TO BILCO, 300 PSF, STAINLESS STEEL HARDWARE WITH RECESSED PADLOCK HASP.
4. VAULT MFR. SHALL CAST HATCH FLUSH IN TOP SLAB. DRAIN HATCH TO DAYLIGHT, NOT VAULT INTERIOR.
5. PROVIDE MIN. 4'-0" COVER OVER LINES OR PER APPROVED SITE DRAWINGS.
6. CLASS 350 DIP REQ'D; RESTRAIN MJ WITH MEGA-LUGS FOR BURIED SERVICE, FIELD-LOK OR TR-FLEX RJ FOR PUSH-ON JOINTS.
7. CLASS 125 FLANGE JOINTS INSIDE VAULT: FLANGE DIP = THICKNESS CLASS 53. ALL VALVES AND FITTINGS INSIDE THE VAULT SHALL BE FLANGED.
8. JOINTS IMMEDIATELY UPSTREAM OR DOWNSTREAM OF VAULT SHALL BE RESTRAINED JOINT
9. PRESSURE TEST AND DISINFECT IN ACCORDANCE W/ AWWA.
10. TESTABLE PER AWWA STANDARDS.
11. DOUBLE CHECK VALVE BACK FLOW PREVENTION IS REQUIRED ON PROPERTY OWNER'S SIDE OF METER.
12. IF GROUND WATER PRESENT, PROVIDE PERMANENT PUMP WITH POWER AND SEAL OPENING IN SLAB.
13. BOXES EXCEEDING 7' IN DEPTH MUST BE APPROVED BY THE CITY
14. A PERMANENT EASEMENT SHALL BE REQUIRED WHEN THE VAULT CANNOT BE LOCATED ENTIRELY ON R/W TO PREVENT FENCES OR OTHER OBSTRUCTIONS FROM BEING ERECTED AROUND THE VAULT
15. COVER OPENING AND STEPS TO BE PLACED NEAR THE METER REGISTER.
16. VAULTS ARE NOT TO BE INSTALLED IN TRAFFIC AREAS WITHOUT PRIOR PERMISSION FROM THE CITY.

WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	CONNECTIONS TO WATER MAIN	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W6

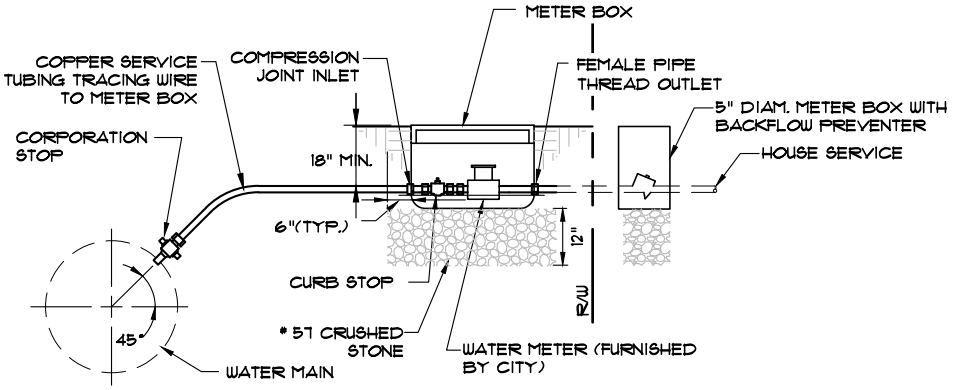


PLAN

LONG SIDE SERVICE



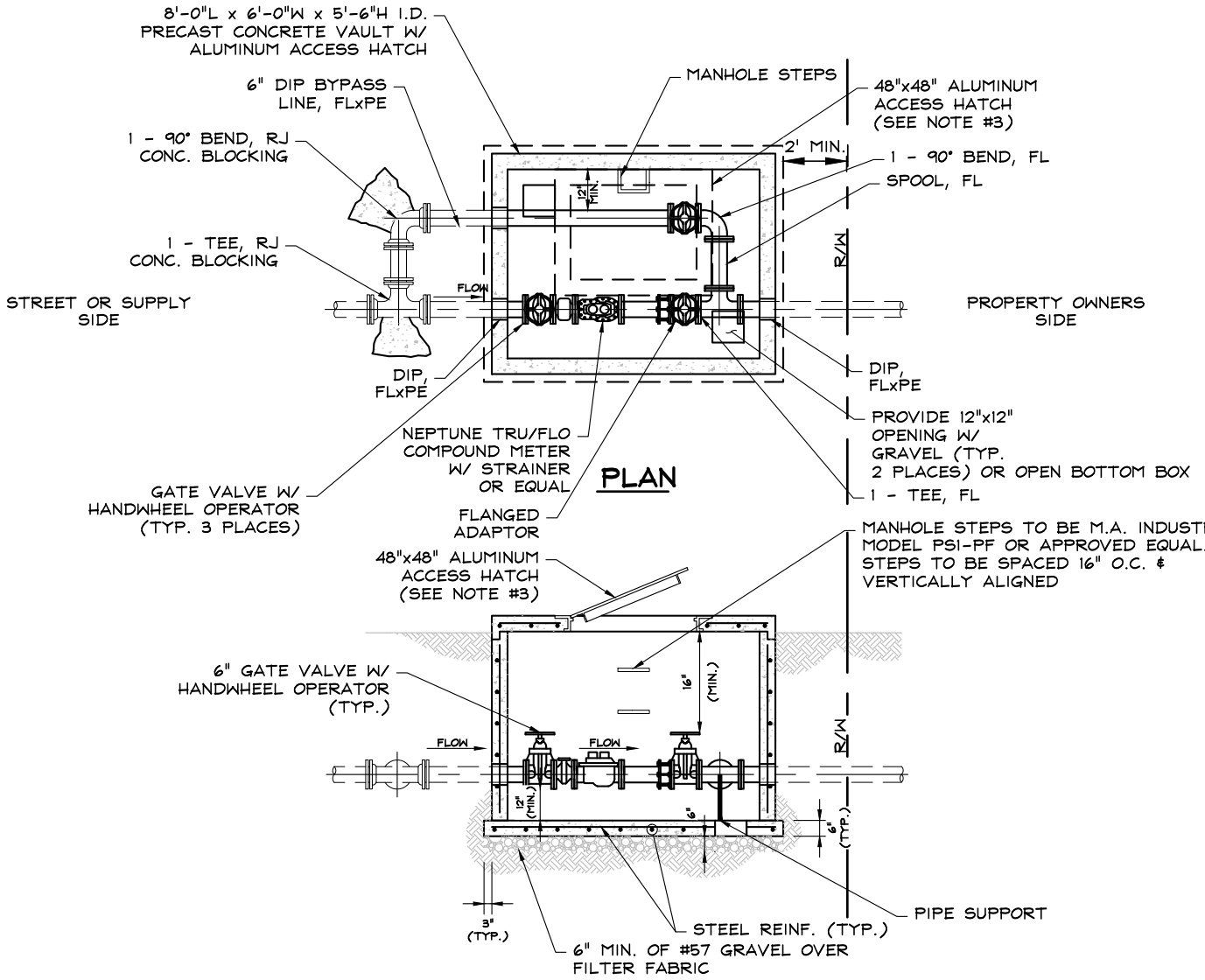
PLAN



ELEVATION

NOTE:
DOUBLE STRAP SADDLE REQUIRED ON ALL SIZE AND TYPES OF MAINS.

WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	3/4" OR 1" WATER SERVICE & METER CONNECTION	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W7



NOTES:

1. VAULT - 4,000 PSI REINFORCED PRECAST CONCRETE OR CAST-IN-PLACE, CONTRACTOR'S OPTION.
2. TOP OF VAULT ELEVATION TO BE AT LEAST 3" - 6" ABOVE FINISHED GRADE UNLESS OTHERWISE APPROVED BY CITY.
3. ALUMINUM HATCH EQUAL TO BILCO, 300 PSF, STAINLESS STEEL HARDWARE WITH RECESSED PADLOCK HASP.
4. VAULT MFR. SHALL CAST HATCH FLUSH IN TOP SLAB. DRAIN HATCH TO DAYLIGHT, NOT VAULT INTERIOR.
5. PROVIDE MIN. 4'-0" COVER OVER LINES OR PER APPROVED SITE DRAWINGS.
6. CLASS 350 DIP REQ'D; RESTRAIN MJ WITH MEGA-LUGS FOR BURIED SERVICE, FIELD-LOK OR TR-FLEX RJ FOR PUSH-ON JOINTS.
7. CLASS 125 FLANGE JOINTS INSIDE VAULT: FLANGE DIP = THICKNESS CLASS 53. ALL VALVES AND FITTINGS INSIDE THE VAULT SHALL BE FLANGED.
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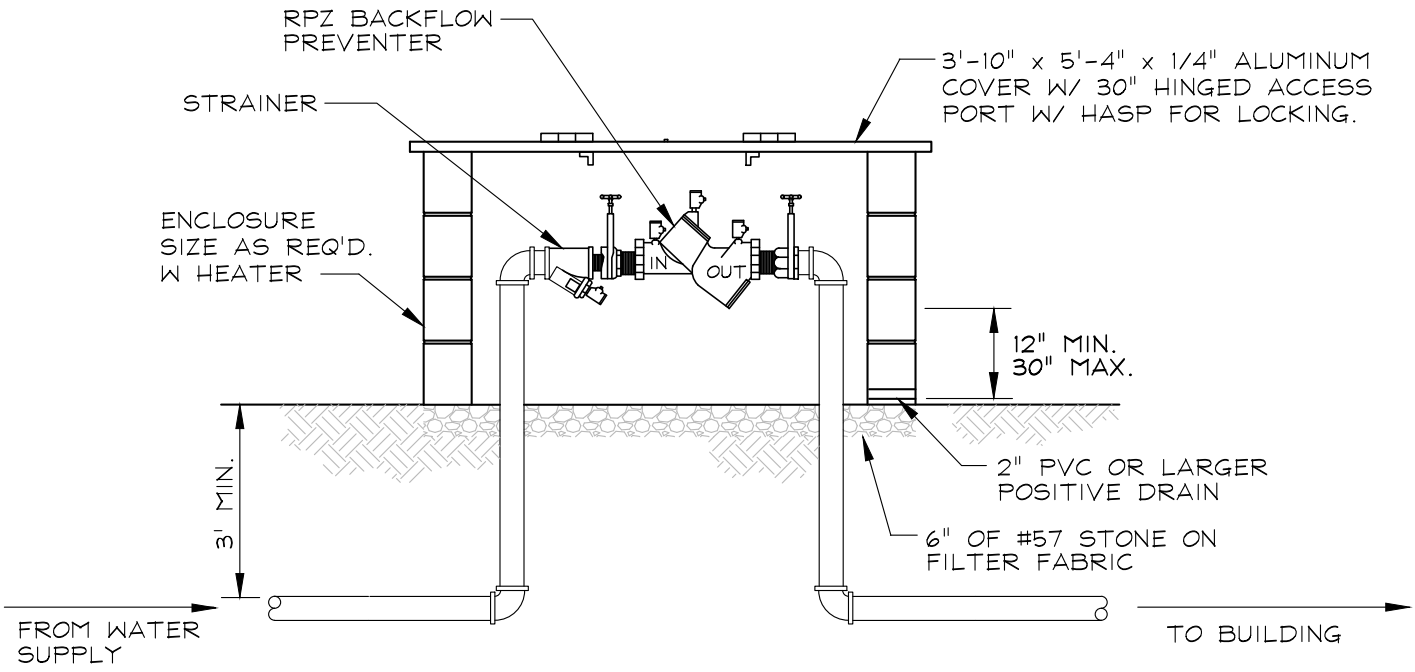
16. VAULTS ARE NOT TO BE INSTALLED IN TRAFFIC AREAS WITHOUT PRIOR PERMISSION FROM THE CITY.

WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	METERS 3" & LARGER	DATE: JANUARY 2020
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	SCALE: 3/6"=1'-0"
		STANDARD W8



NOTE:

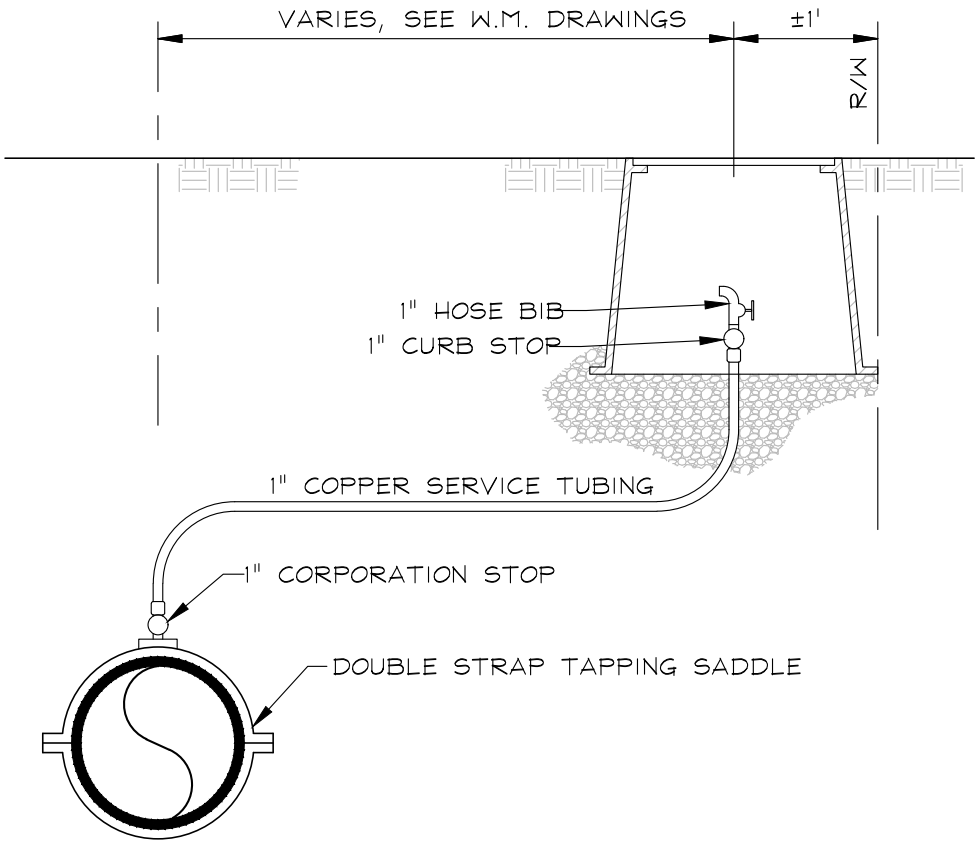
1) RPZ TO BE OWNER MAINTAINED

2) ENCLOSURE SHOULD BE HEATED OR INSULATED TO PROTECT FROM FREEZING

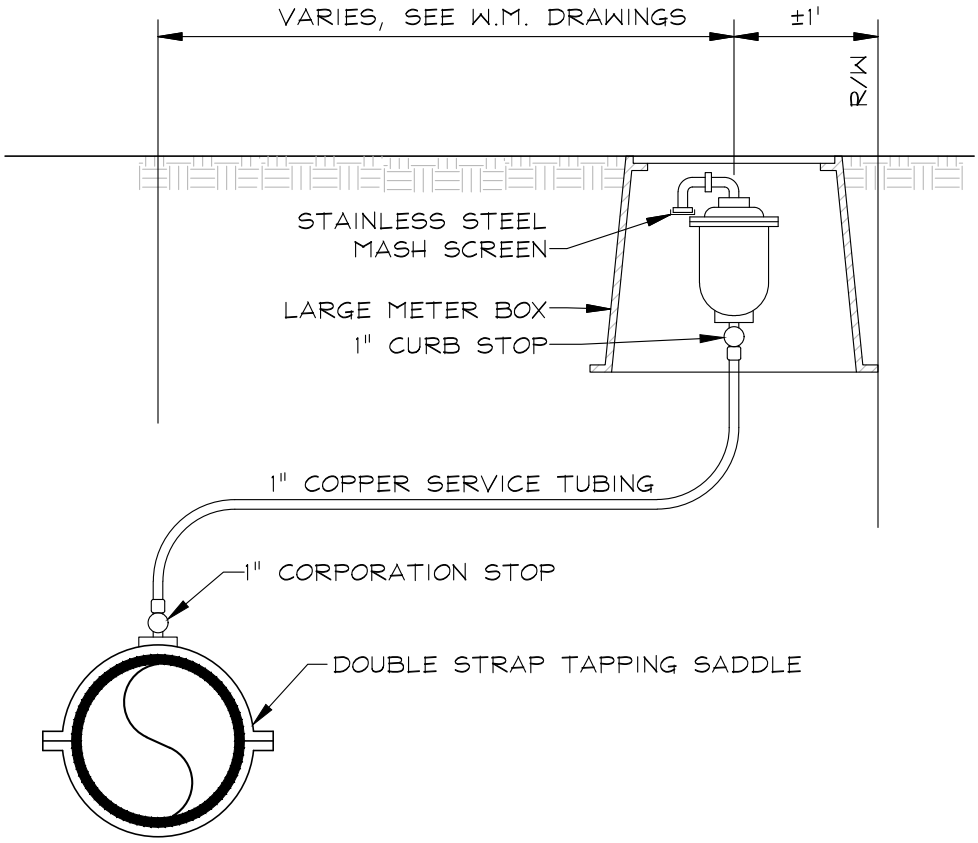
3) ENCLOSURE SHALL HAVE GROUND ANCHOR CAPABILITIES AND BE KEPT LOCKED AT ALL TIMES

4) AT OWNER'S OPTION, A BYPASS LINE MAY BE INSTALLED FOR SERVICING THE RPZ. BYPASS SHALL HAVE A VALVE THAT IS LOCKABLE BY THE CITY.

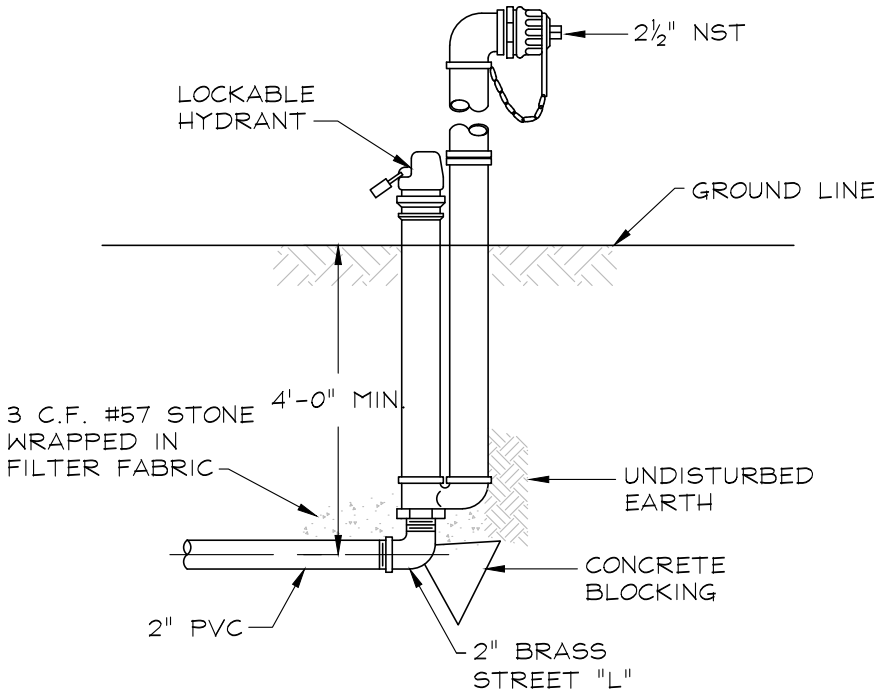
WINDER, GEORGIA EST. 1893 "CITY OF OPPORTUNITY"	RPZ BACKFLOW PREVENTER FOR 1 1/2" & GREATER SERVICES	DATE: JANUARY 2020
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	SCALE: N.T.S.
		STANDARD W9



WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	MANUAL AIR RELEASE / SAMPLE TAP	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W10

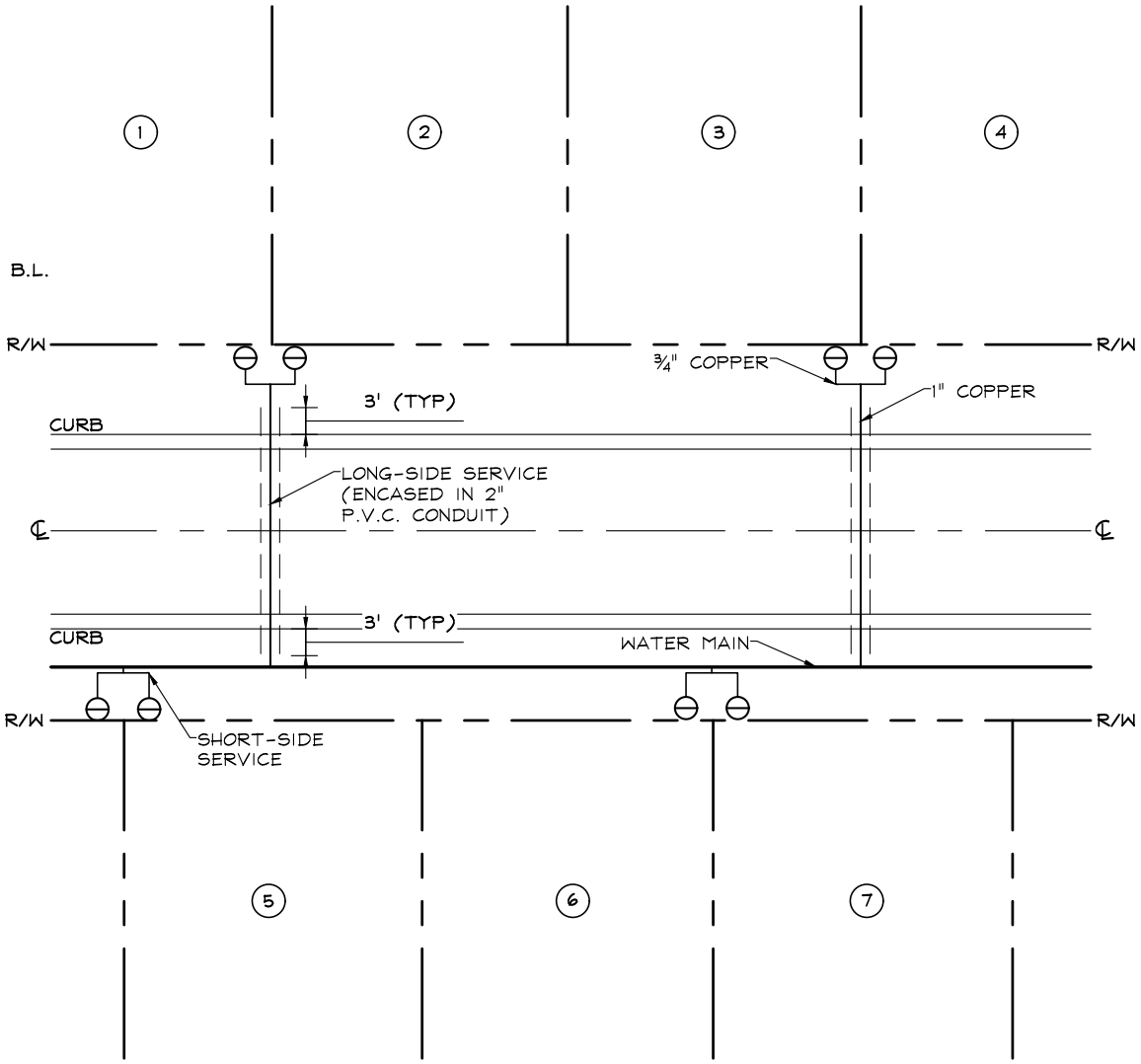


WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	AIR RELEASE VALVE	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W11

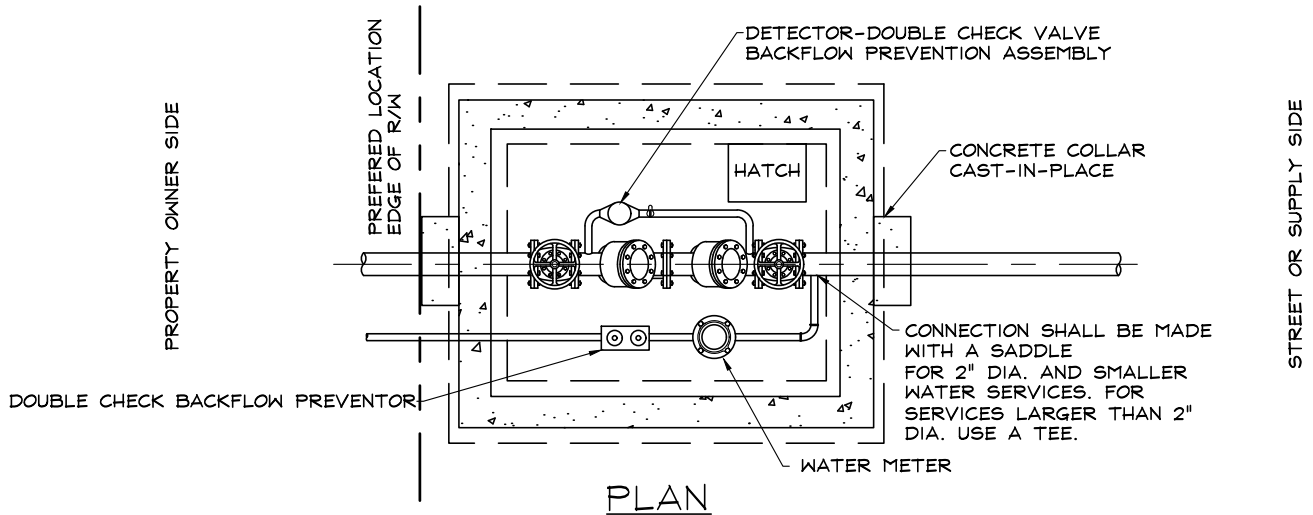


POST HYDRANTS SHALL BE NON-FREEZING, SELF DRAINING TYPE WITH 4' BURY. THESE HYDRANTS WILL BE FURNISHED WITH A 2" FIP INLET, A NON-TURNING OPERATING ROD, AND SHALL OPEN TO THE LEFT. ALL OF THE WORKING PARTS SHALL BE OF BRONZE-TO-BRONZE DESIGN, AND BE SERVICABLE FROM ABOVE GRADE WITH NO DIGGING. THE OUTLET SHALL ALSO BE BRONZE AND BE 2-1/2" NST. HYDRANTS SHALL BE LOCKABLE TO PREVENT UNAUTHORIZED USE AS MANUFACTURED BY ZURN Z-1385 OR APPROVED EQUAL.

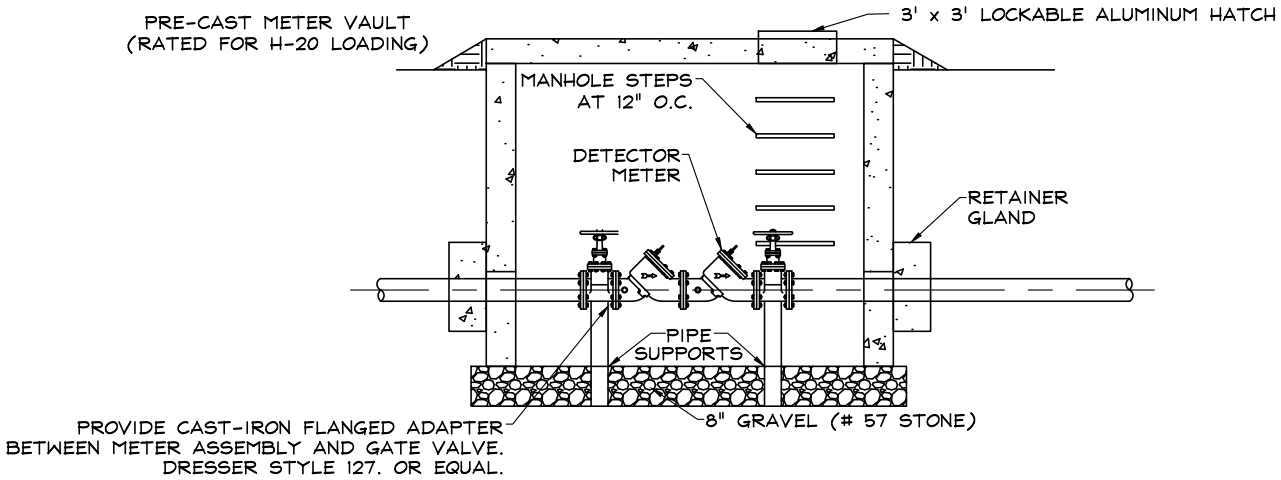
WINDER, GEORGIA EST. 1893 "CITY OF OPPORTUNITY"	FLUSHING HYDRANT	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W12



WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	3/4" WATER METER LOCATION FOR SUBDIVISIONS	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W13



PLAN



SECTION

NOTES:

1. VAULT - 4,000 PSI REINFORCED PRECAST CONCRETE OR CAST-IN-PLACE, CONTRACTOR'S OPTION.
2. TOP OF VAULT ELEVATION TO BE AT LEAST 3" - 6" ABOVE FINISHED GRADE UNLESS OTHERWISE APPROVED BY CITY.
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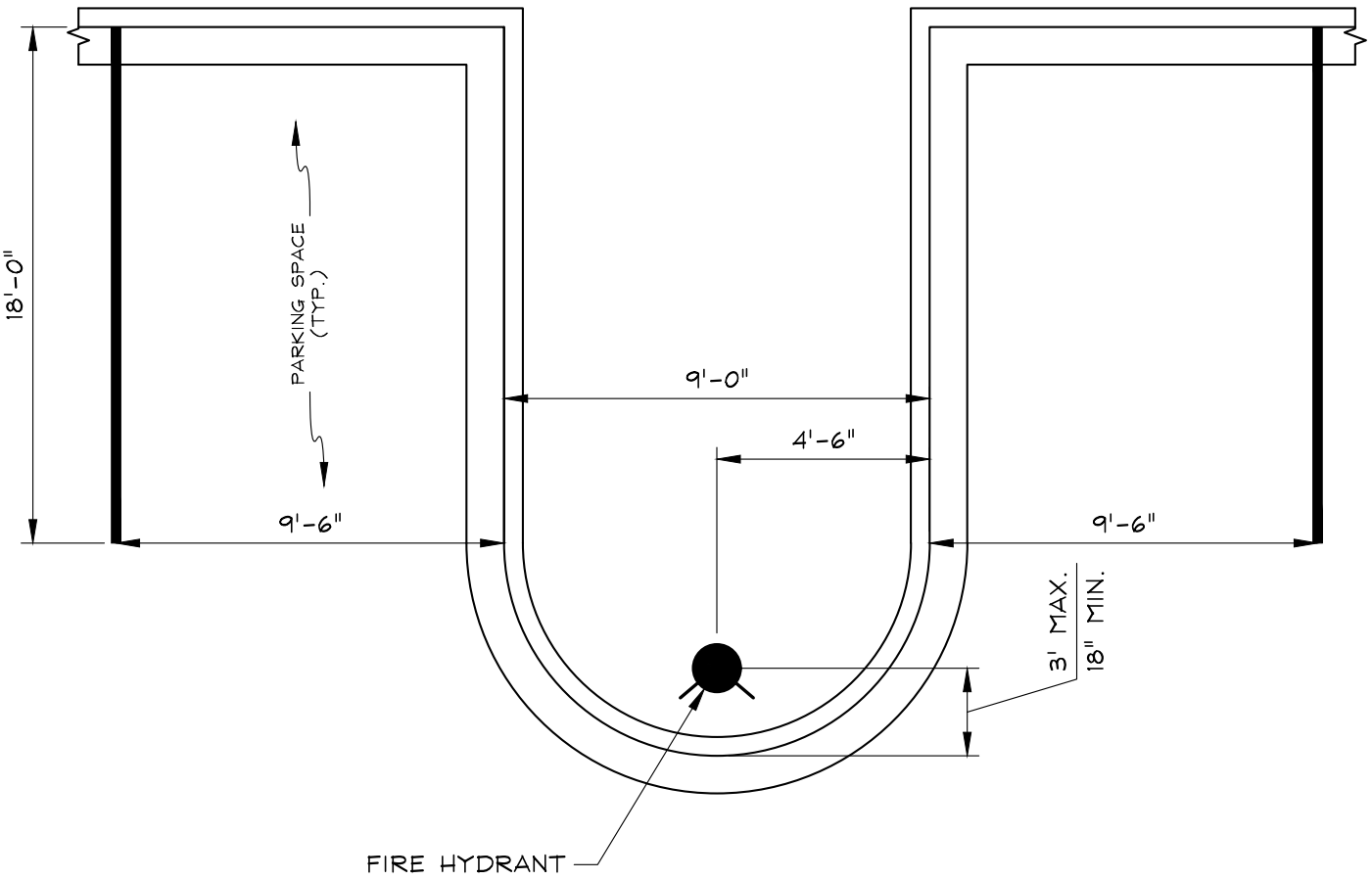
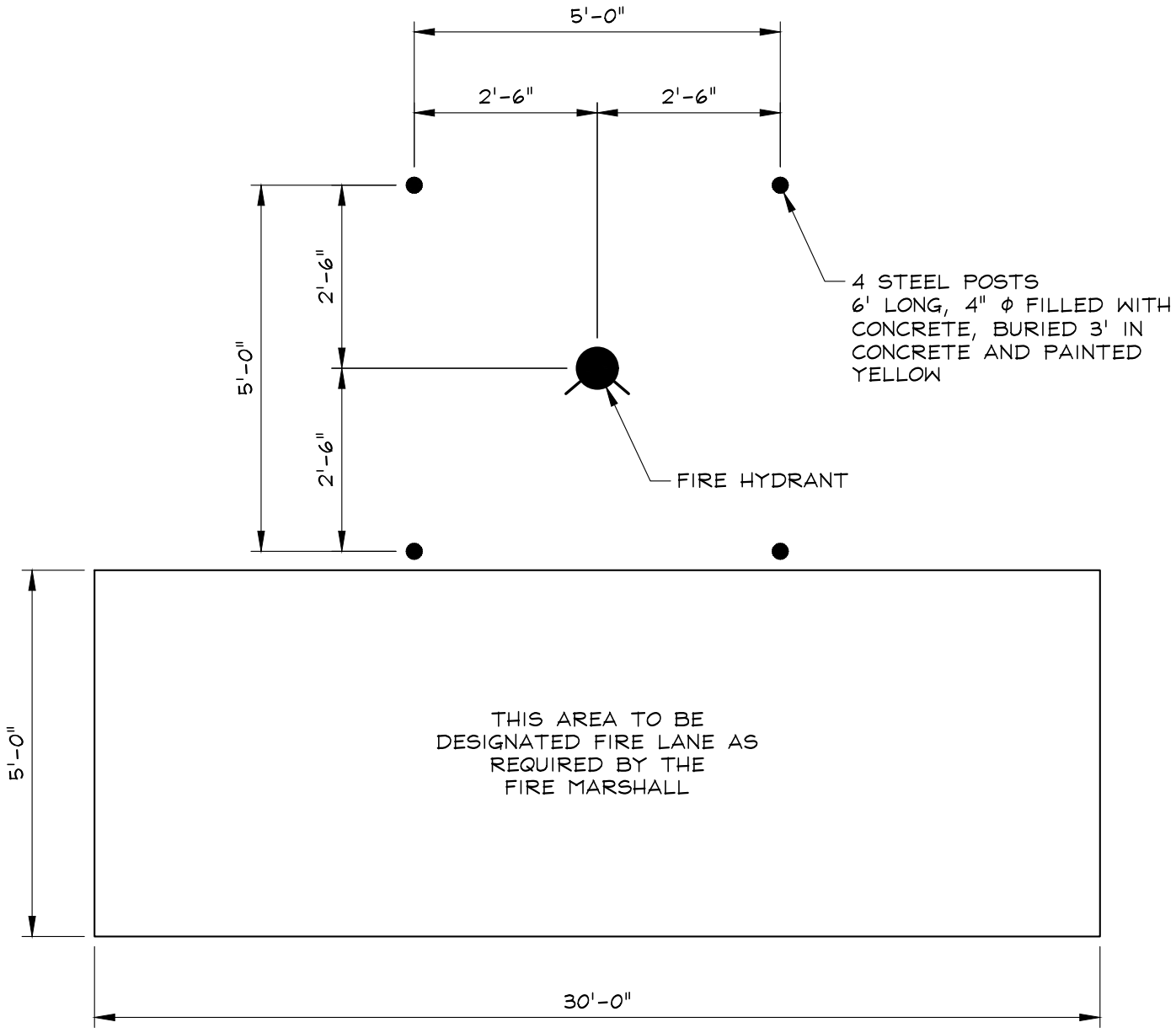
16. VAULTS ARE NOT TO BE INSTALLED IN TRAFFIC AREAS WITHOUT PRIOR PERMISSION FROM THE CITY.

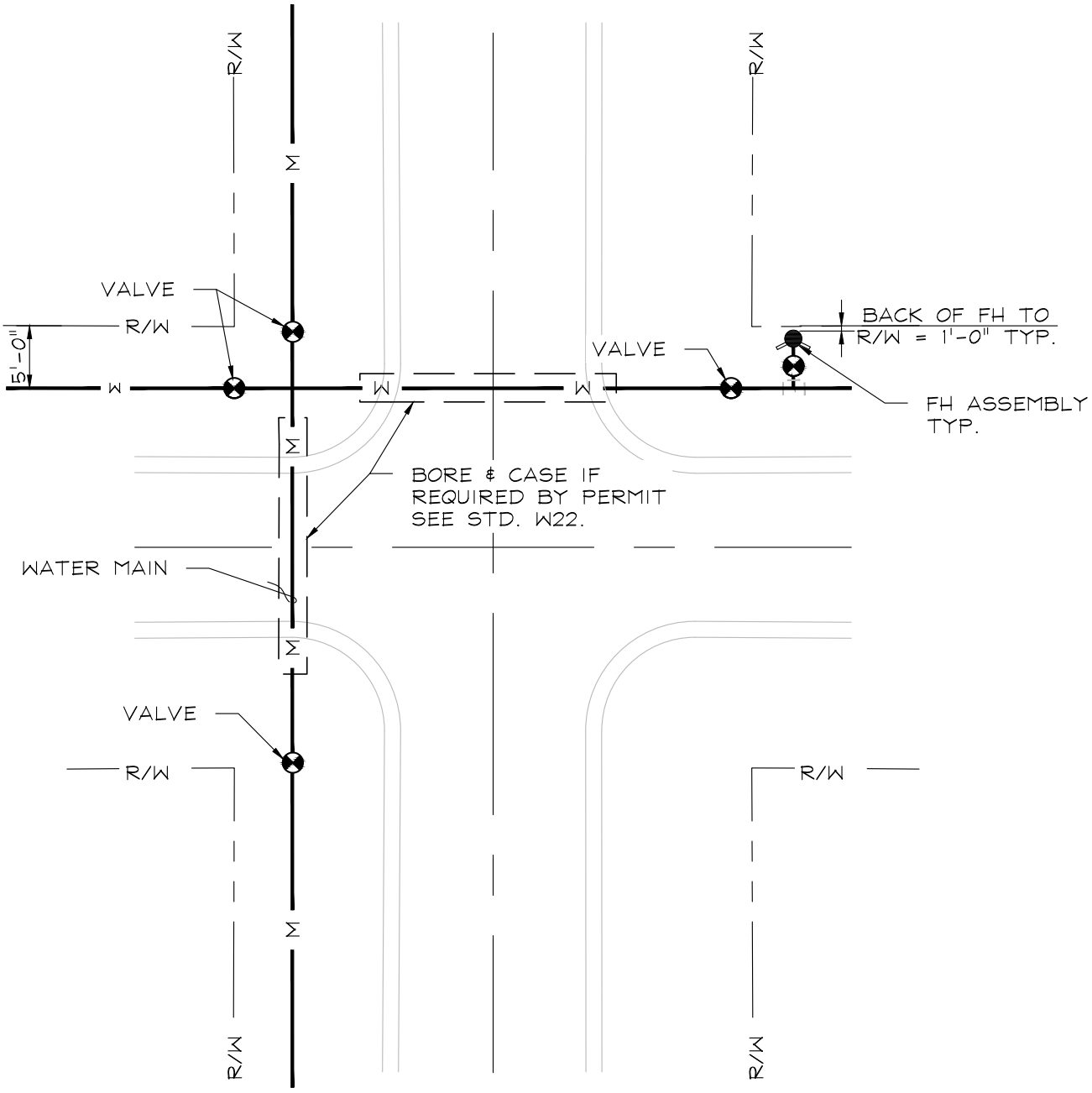
WINDER, GEORGIA EST. 1893 "CITY OF OPPORTUNITY"	DETECTOR/WATER METER AND VAULT	DATE: JANUARY 2020
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	SCALE: N.T.S.
		STANDARD W14



WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	TYPICAL FIRE HYDRANT ISLAND - PARKING AREA	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W15

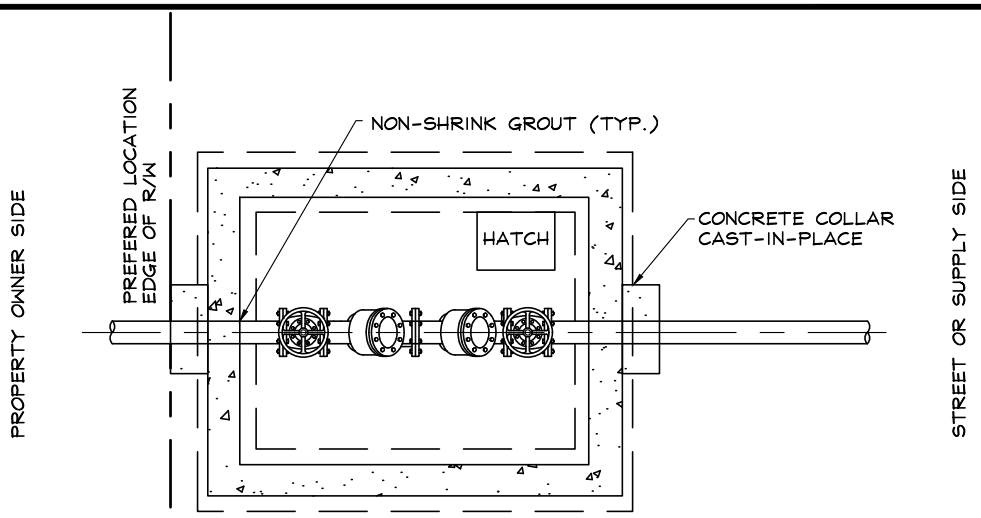


WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	TYPICAL FIRE HYDRANT - POST PROTECTION	DATE: JANUARY 2020
		SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W16

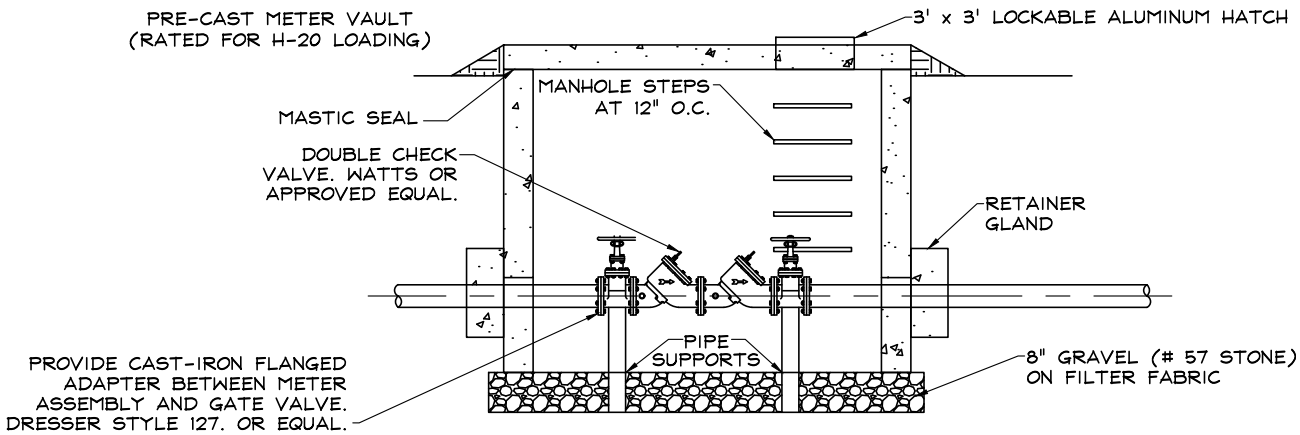


INTERSECTION

WINDER, GEORGIA EST. 1893 "CITY OF OPPORTUNITY"	WATER MAIN LOCATION GDOT & COUNTY ROAD	DATE: JANUARY 2020
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	SCALE: N.T.S.
		STANDARD W17



PLAN



SECTION

NOTES:

1. VAULT - 4,000 PSI REINFORCED PRECAST CONCRETE OR CAST-IN-PLACE, CONTRACTOR'S OPTION.
2. TOP OF VAULT ELEVATION TO BE AT LEAST 3" - 6" ABOVE FINISHED GRADE UNLESS OTHERWISE APPROVED BY CITY.
3. ALUMINUM HATCH EQUAL TO BILCO, 300 PSF, STAINLESS STEEL HARDWARE WITH RECESSED PADLOCK HASP.
4. VAULT MFR. SHALL CAST HATCH FLUSH IN TOP SLAB. DRAIN HATCH TO DAYLIGHT, NOT VAULT INTERIOR.
5. PROVIDE MIN. 4'-0" COVER OVER LINES OR PER APPROVED SITE DRAWINGS.
6. CLASS 350 DIP REQ'D; RESTRAIN MJ WITH MEGA-LUGS FOR BURIED SERVICE, FIELD-LOK OR TR-FLEX RJ FOR PUSH-ON JOINTS.
7. CLASS 125 FLANGE JOINTS INSIDE VAULT: FLANGE DIP = THICKNESS CLASS 53. ALL VALVES AND FITTINGS INSIDE THE VAULT SHALL BE FLANGED.
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12. IF GROUND WATER PRESENT, PROVIDE PERMANENT PUMP WITH POWER AND SEAL OPENING IN SLAB.
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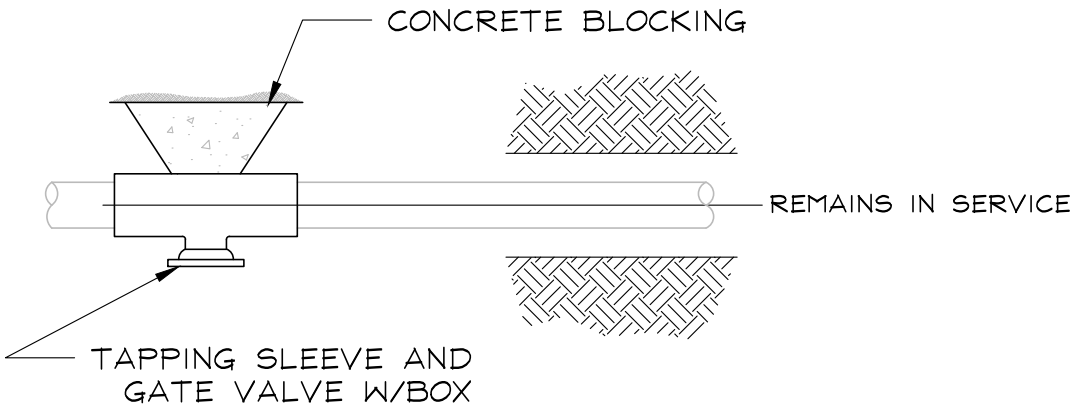
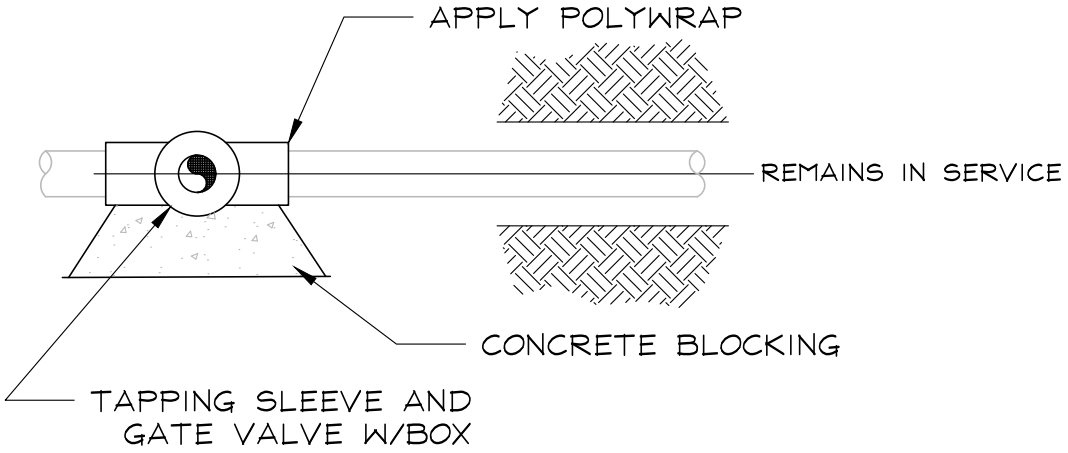
16. VAULTS ARE NOT TO BE INSTALLED IN TRAFFIC AREAS WITHOUT PRIOR PERMISSION FROM THE CITY.

WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	DOUBLE CHECK BACKFLOW PREVENTER DETAIL	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W18

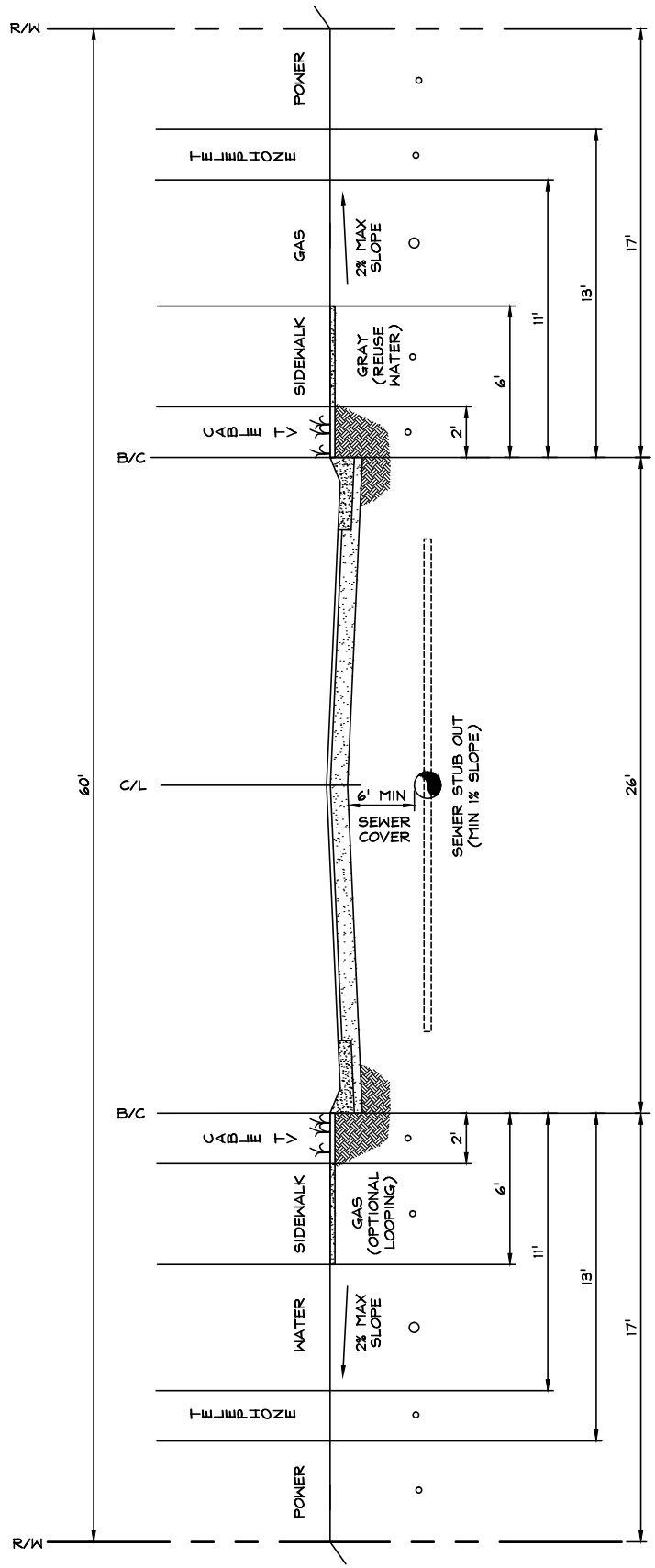


PLAN



SECTION

WINDER, GEORGIA EST. 1893 "CITY OF OPPORTUNITY"	TAPPING SLEEVE TIE-IN DETAIL	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W19



NOTES:

1. ALL DIMENSIONS AREA MEASURED FROM THE BACK OF CURB, REGARDLESS OF R/W WIDTH.
2. BEFORE ANY UTILITY IS INSTALLED, THE ENTIRE WIDTH OF THE R/W SHALL BE AT FINISHED GRADE, AND ALL CONCRETE CURBING SET AT FINAL GRADE.
3. THE FINISHED GRADE WITHIN THE R/W SHALL NOT EXCEED A 2% SLOPE.
4. IN GENERAL, THE DEEPEST UTILITIES SHOULD BE INSTALLED FIRST TO MINIMIZE ANY POSSIBLE INTERFERENCE WITH LATERALS OR SERVICE LINES.
5. STREET OPENING PERMITS ARE REQUIRED BEFORE ANY PAVEMENT CAN BE CUT FOR ANY PURPOSE.
6. IN CUL-DE-SAC STREETS, ALL DIMENSIONS SHALL REMAIN IDENTICAL TO STANDARD STREET SPACING.
7. EACH UTILITY SHALL BE RESPONSIBLE FOR REPAIR OF ANY DAMAGE THEY CREATE TO OTHER UTILITY LINES, OR TO THE STREET IMPROVEMENTS WITHIN THE R/W.
8. ALL STREET LIGHTS SHALL REMAIN WITHIN THE POWER UTILITY CORRIDOR.

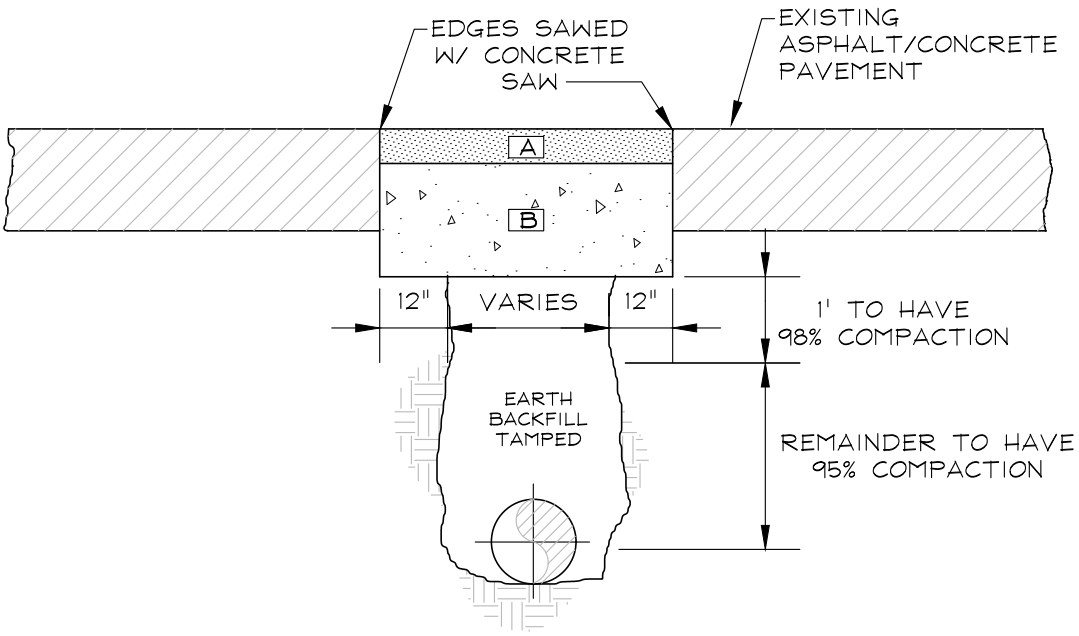
WINDER, GEORGIA
EST. 1893
"CITY OF OPPORTUNITY"

TYPICAL CROSS SECTION RESIDENTIAL STREET UTILITY LOCATION

STANDARD DETAILS WATER SYSTEM CONSTRUCTION

DATE: JANUARY 2020
SCALE: N.T.S.

STANDARD W20



GRAVEL DRIVEWAY

A: 6" CRUSHER-RUN

B: N/A

CONCRETE DRIVEWAY

A: 6" CLASS "B" CONCRETE PER GDOT SPEC 500

B: N/A

CONCRETE ROADWAY

A: 8" CLASS "B" CONCRETE PER GDOT SPEC 500

B: N/A

ASPHALT DRIVEWAY

A: 2" TYPE F ASPHALT

B: N/A

ASPHALT ROADWAY

A: TOP 2" OF PATCH TO BE REPLACED WITH SAME MATERIAL AS EXISTING SURFACE. BITUMINOUS TACK COAT OR PRIME APPLIED BEFORE PLACEMENT OF ASPHALTIC TOP.

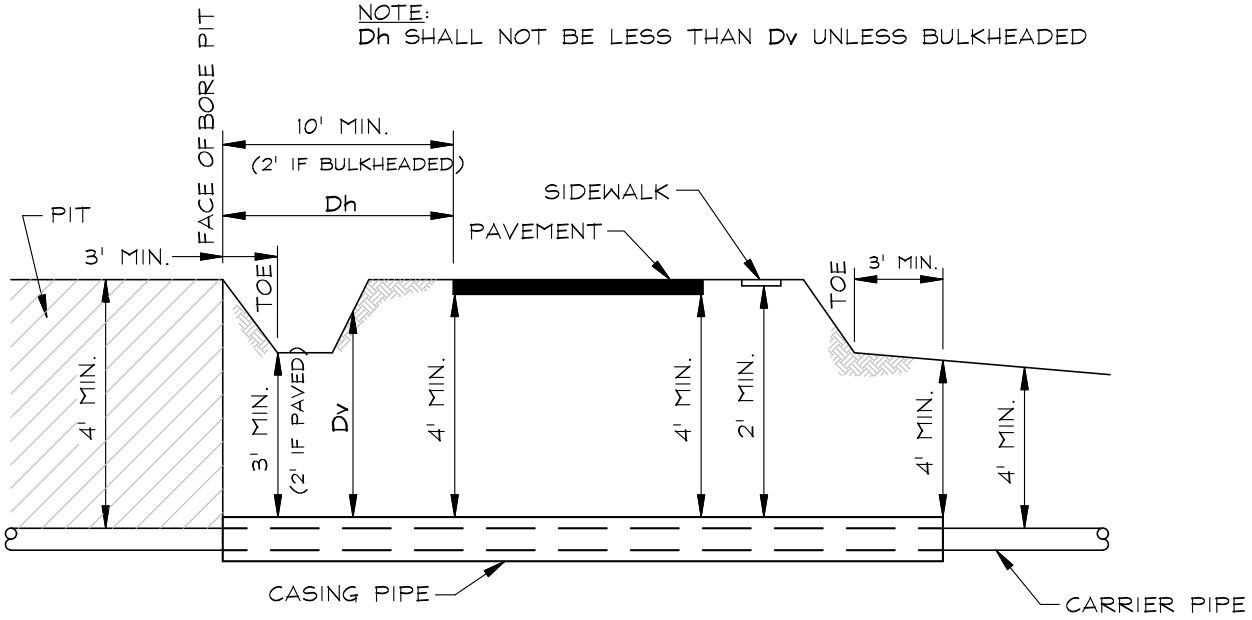
B: 8" CLASS "A" PORTLAND CEMENT CONCRETE

NOTE

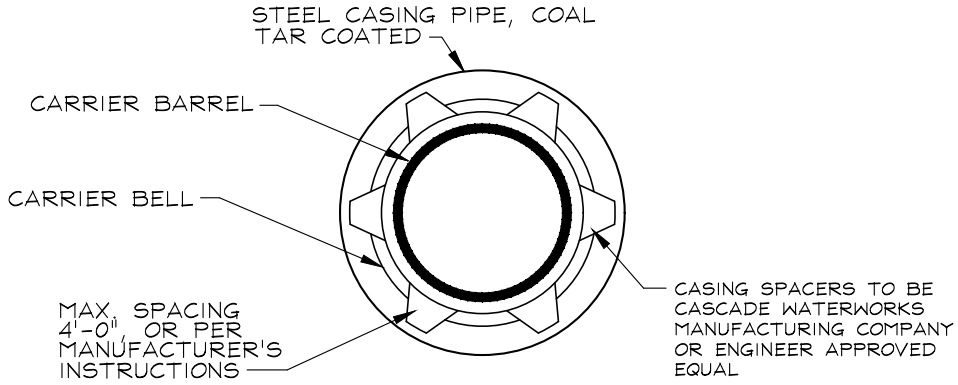
LENGTH OF REPAIR TO MATCH LENGTH OF MATERIALS REMOVED FROM EXISTING DRIVE.

WINDER, GEORGIA EST. 1893 "CITY OF OPPORTUNITY"	ROADWAY & DRIVEWAY REPAIR DETAIL	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W21

NOTE:
Dh SHALL NOT BE LESS THAN Dv UNLESS BULKHEADED



PROFILE



CROSS SECTION
CARRIER IN CASING

NOTE:
CONSTRUCTION IN GEORGIA DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY SHALL CONFORM TO D.O.T. STD. SPECIFICATIONS

WINDER, GEORGIA "CITY OF OPPORTUNITY" EST. 1893	HIGHWAY UTILITY CROSSING DETAIL	DATE: JANUARY 2020 SCALE: N.T.S.
	STANDARD DETAILS WATER SYSTEM CONSTRUCTION	STANDARD W22