

STANDARD CONSTRUCTION SPECIFICATIONS

FOR

**CARROLL COUNTY WATER AUTHORITY
CARROLL COUNTY, GEORGIA**



WATER DISTRIBUTION SYSTEMS

October 2006

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DIVISION I **POLICIES AND PROCEDURES**

SECTION 1: SCOPE AND INTENT

1.01 Purpose

The purpose of this document is to set forth the uniform policies, regulations and procedures governing the design, construction, use and operation of the water systems under the jurisdiction and control of the Carroll County Water Authority.

1.02 Delegation

The Carroll County Water Authority shall review and approve the design and inspect the installation of water distribution systems that will be owned and maintained by the Carroll County Water Authority to ensure compliance with the specifications.

1.03 Variance

Under special conditions, the Carroll County Water Authority may modify the specifications herein. The Executive Director of the Carroll County Water Authority shall authorize any variance in writing.

1.04 Exclusion

In the event, design, material or construction requirements necessary for the construction of a project or portion of a project are excluded from these specifications, the Carroll County Water Authority shall determine the applicable requirements, standards and specifications to complete the work.

1.05 Severability

In the event any article, section, subsection, sentence, clause or phrase of this document shall be declared or adjudged invalid or unconstitutional, such adjudication shall in no manner affect the other articles, sections, subsections, sentences, clauses or phrases of this document, which shall remain in full force

and effect, as if the article, section, subsection, sentence, clause, or phrase so declared or adjudged invalid or unconstitutional were not originally a part thereof. The governing authority hereby declares that it would have adopted the remaining parts of this document if it had known that such part or parts hereof would be declared or adjudged invalid or unconstitutional.

SECTION 2: DEFINITIONS

The listed works, phrases or acronyms are defined as follows:

ACI: American Concrete Institute.

ANSI: American National Standards Institute.

ASTM: American Society for Testing and Materials.

Authority: Carroll County Water Authority, its representatives and agents.

AWWA: American Water Works Association.

CCWA: Carroll County Water Authority.

CCWA Engineer: Carroll County Water Authority, Department Manager of Engineering or authorized representative (i.e. CCWA Project Inspector).

County: Carroll County.

Design Engineer: The engineer or surveyor under whose direction the development plans submitted for review were prepared. Design Engineer shall be a Georgia Licensed Professional Engineer or Georgia Licensed Registered Land Surveyor having knowledge and experience of water distribution system design.

Developer: Any person, individual, firm, partnership, association, corporation, estate, trust, or any other group or combination who undertakes or proposes to undertake the development of land or directs the development activities defined herein.

Diameter: Nominal inside diameter of pipe.

DIP: Ductile iron pipe.

Easement: Interest in land owned by another that entitles its holder to a specific limited use.

Executive Director: Chief executive officer of the Carroll County Water Authority.

Georgia EPD: State of Georgia, Department of Natural Resources, Environmental Protection Division.

GPM (gpm): Gallons per minute.

Land Disturbance Permit: An official authorization issued by Carroll County Community Development permitting clearing and/or grading of a site.

Mean Sea Level: The average height of the sea for all stages of the tide. It is used as a reference to establish elevations.

Pavement: Any asphalt, concrete, gravel or dirt surface including curbs and sidewalks used by vehicles and/or pedestrians.

Person: An individual, firm, partnership, corporation, joint venture, association, social club, fraternal organization, estate, trust, business trust, receiver, syndicate, or other group or combination acting singly or collectively for a common purpose, and the duly authorized agents thereof.

Preliminary Plat: A drawing showing proposed improvements on a parcel of land as outlined in Carroll County's Subdivision and Development Regulations.

PSF (psf): Pounds per square foot.

PSI (psi): Pounds per square inch.

PVC: Polyvinyl Chloride.

Rock: Any solid material being resistant to excavation as determined in the field by the CCWA Engineer.

Service Connection: Fitting(s) connecting a service line from a property (lot) to a water main.

Suitable Soil: Soil that is free of organic and/or deleterious material, expansive clay and rock fragments larger than one and a half (1.5) inches.

Utility Contractor: Georgia Licensed Utility Contractor in accordance with the Official Code of Georgia.

Water Distribution System: Pressurized pipes, valves and other components that convey potable water.

Water Main: Pressurized pipe used to convey potable water to a service line.

WTP: Water Treatment Plant.

SECTION 3: FEDERAL AND STATE REGULATIONS

The standards, regulations and requirements established by the Authority are not intended to supersede any Federal or State law regulating water, water supply or water treatment. All persons subject to the standards, regulations and requirements established herein are also subject to all federal and state laws and regulations governing such matters. In the event of a conflict between federal, state and local laws and regulations, the more stringent law and regulation shall apply.

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SECTION 4: INDUSTRY STANDARDS

Applicable construction industry standards are made a part of this document by reference. Where the date of issue of a referenced standard is not specified, comply with the standard in effect at the time of project commencement.

Installation guides provided by material suppliers are incorporated into these specifications by reference and they have the same force and effect as if bound or copied directly into this document.

Where compliance with two or more standards is specified, and they establish different or conflicting requirements, the CCWA Engineer will determine the applicable standard.

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SECTION 5: DESIGN APPROVAL

5.01 General

- A. The design of water distribution systems shall conform to the specifications herein.
- B. Concurrent with plan submittal, the Design Engineer shall provide a completed Water Distribution Addition Submittal Form. The Water Distribution Addition Submittal Form is included in Appendix A.
- C. Plan approval does not reserve water capacity for the proposed development.

5.02 Technical Review

- A. Proposed water distribution system plans shall be reviewed by the CCWA Engineer under the supervision of a Georgia Licensed Professional Engineer for technical adequacy and conformance to applicable requirements to determine that the system is suitable for construction.
- B. The CCWA shall perform a feasibility study to determine whether the existing CCWA water distribution system has sufficient capacity. The following review shall be completed.
 - 1. The latest 12 months of reported production from the supplying WTP shall be examined to determine an average monthly production rate. A proposed development, whose supply requirement would cause the WTP to exceed the Georgia EPD permitted production rate, shall not be connected to the CCWA system.
 - 2. Pressure and flow from the contributing water distribution system shall be examined to determine whether the additional supply requirement will adversely affect the surrounding system. A proposed development, whose supply requirement would adversely affect the surrounding system, shall not be connected to the CCWA system.
- C. CCWA review comments shall be marked and noted on development plans in the color red (Red Line Comments).

5.03 Plan Processing

- A. Upon submittal of a preliminary plan to local governing agencies for preliminary approval, submit two (2) copies of the preliminary plat to the CCWA for review. Include all current and future phases of the development and other information as requested by the CCWA Engineer.
- B. Upon completion of water distribution system construction plans submit two (2) sets of construction plans to the CCWA to start the CCWA review process. The construction plans shall including lot layout, grading plans, road plans, soils information, sewer plans, erosion control plans, etc.
- C. Upon completion of the review by the CCWA Engineer, one (1) set of redlined construction plans will be returned to the Design Engineer. All CCWA review comments should be addressed and corrected.
- D. When all redline comments have been appropriately addressed, the Design Engineer shall submit four (4) sets of construction plans to the CCWA for review.
- E. When the CCWA is in receipt of four (4) sets of construction plans meeting CCWA approval, the CCWA shall stamp the water distribution system construction plans “**CCWA APPROVED**”.
- F. Conditional plan approval may be granted, with approval of the water distribution system being contingent upon conditions being met as noted by the CCWA Engineer. These plans will be marked “**CCWA APPROVED With The Following Conditions:**”. The conditions of approval will be listed and are considered an integral part of the construction plans. The conditions of approval listed are required to be fulfilled for the CCWA to accept the water distribution system after construction.
- G. Soil Erosion and Sedimentation Control Plans pertaining to the overall development shall be reviewed and approved by Carroll County Community Development. Construction of any kind shall not begin on a project prior to the issuance of a Land Disturbance Activity permit by Carroll County Community Development.

5.04 Approval by Regulatory Agencies

- A. The Design Engineer shall address all deficiencies and resubmit plans as directed in Section 5.03. Plans shall not be approved until all deficiencies have been addressed to the satisfaction of the CCWA Engineer.
- B. Note that plan approval by the CCWA Engineer shall not be construed, in any manner, to relieve the Developer or Utility Contractor of his responsibility for strict compliance with the specifications herein and any applicable laws and regulations.
- C. One (1) copy of approved construction plans shall be kept in the CCWA's office has a record copy. Any discrepancies found on sets of approved construction plans shall be compared to the record copy for clarification by the CCWA Engineer.
- D. Installation of water distribution systems shall not commence on any development falling under the CCWA's authority until the CCWA has granted final approval of water distribution system plans and Carroll County Community Development has issued a Land Disturbance Activity permit.
- E. Note that other agencies may have regulatory authority and the Developer and/or Utility Contractor is responsible for obtaining other agency approval.

5.05 Period of Plan Approval

The approval period of water distribution system plans shall be for twelve (12) months. Approved plans or projects that are not initiated or are inactive for a twelve (12) month period shall become invalid. Should an approved plan or project become invalidated, the CCWA Engineer shall determine the validity of the plan or whether a new system design or submittals are required.

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SECTION 6: EASEMENTS

6.01 General

- A. Components of water distribution systems, to be owned by the CCWA, should be situated within road right-of-way or utility easement.
- B. The following water distribution system components, to be owned by the CCWA, shall be situated within an easement that is granted to the CCWA, when a street right-of-way is not available.
 - 1. Water main.
 - 2. Water meter/check valve assembly.
 - 3. Fire hydrant/flush assembly.
 - 4. Access road.
 - 5. Other components required by the CCWA.
- C. An easement shall not encroach into a structure's foundation.
- D. All easement documents must be received by the CCWA prior to Final Acceptance.

6.02 On-Site Easement

- A. "On-site" easements are those easements falling within the boundaries of the current phase of the development that are shown on the plan and are recorded through the process of recording the final plat.
- B. Developer shall grant to the CCWA, the exclusive right to construct, reconstruct, operate, maintain, repair, replace, improve, alter, remove, relocate and inspect water distribution systems that are situated over, across and under the land wherein the water distribution systems lie on the Developer's property.

6.03 Off-Site Easement

- A. "Off-site" easements are those easements falling outside the boundaries of the current phase of the development and must be provided and recorded by the Developer granting CCWA, the exclusive right to construct,

reconstruct, operate, maintain, repair, replace, improve, alter, remove, relocate and inspect water distribution systems that are situated over, across and under the land of each property owner. Easements through property owned by the developer, including water lines that will be included in later phases of the same project, must be treated as routine off-site easements.

- B. Off-site easements shall be negotiated and acquired by the Developer with the property owner.
- C. Construction of the off-site water distribution systems shall not begin until all off-site easements for system completion are acquired, recorded and received by the CCWA Engineer.

6.04 Size of Easement

- A. The minimum width of a permanent on-site/off-site easement associated with water distribution system components shall be 20 feet.
- B. The minimum size of an easement associated with a water meter/check valve assembly shall be 20 feet by 30 feet.
- C. Easement width or size may be increased at the discretion of the CCWA Engineer.

SECTION 7: INSTALLATION

7.01 General

- A. The installation of water distribution systems shall be in accordance with the approved plans, specifications and applicable AWWA standards.
- B. A set of plans stamped approved by the CCWA shall be present on the job site whenever work is being performed on the water distribution system.
- C. Approved plans or projects that are not initiated or are inactive for a twelve (12) month period shall become invalid. Should an approved plan or project become invalidated, the CCWA Engineer shall determine the validity of the plan or whether a new system design or submittals are required.

7.02 Utility Contractor

- A. Only Utility Contractors meeting requirements established by the CCWA will be allowed to install systems that are designated to be maintained by the CCWA or connect to any part of the existing CCWA's water system.
- B. A performance bond may be required from the Utility Contractor to ensure the project is completed in accordance with CCWA specifications and requirements.
- C. Utility Contractor Minimum Qualification Requirements:
 - 1. The firm must have a current and active Utility Contractor's License issued by the State of Georgia to accomplish public water and waste water projects.
 - 2. The firm must meet all requirements as required by the State of Georgia to perform public utility projects.
 - 3. The firm shall show sufficient experience to perform the required work.
 - 4. Qualifications submitted will be restricted to the firm submitting the application. References related to the performance of individuals

when working for other firms will not be considered sufficient for qualification of an applicant's firm.

5. Three letters of reference are required showing the ability of the applicant to complete similar jobs in scope and size.

6. The applicant firm must show proof of insurance coverage that meets or exceeds the current CCWA's requirements.

D. Subcontractor work on CCWA projects must not exceed 49% of the work completed on an individual project. Percentage of work will be determined by the linear footage of water main installed on the project.

E. Utility Contractors must maintain insurance coverage that meets or exceeds the current amounts as required by the CCWA. Current minimum insurance requirements are as follows:

1. General Liability \$1,000,000
Combined single limit per occurrence bodily injury, personal injury, and property.

2. Automobile Liability \$1,000,000
Combined single limit per accident, for bodily injury, and property damage.

3. Workers Compensation and Employers' Liability \$1,000,000
Limit per accident and worker's compensation as required by the Labor Code of the State of Georgia.

F. A Utility Contractor may be prevented from installing systems that are designated to be maintained by the CCWA or connect to any part of the existing CCWA's water system based on failure to perform satisfactory work, discovery of misrepresentation of contractor requirements, inability to meet requirements, poor workmanship, falsification of documents, failing to show interest in utility work, financial instability, non-compliance with specifications or for other reasons deemed to be sufficient and in the best interest of the CCWA.

G. Qualified Utility Contractors shall be placed on a probationary period for a duration of two (2) years and until the satisfactory completion and acceptance of four (4) projects inspected by the CCWA Engineer. While on the

probationary period the Utility Contractor may be removed for the Qualified Contractors List for reasons deemed sufficient by the CCWA Engineer.

- H. At no time will a Utility Contractor or any other individual operate valves or hydrants within the CCWA water distribution system without specific authorization from CCWA or under the direct supervision of CCWA.

7.03 Pre-construction Conference

- A. Prior to the commencement of work on the project, a pre-construction conference will be held at a mutually agreed upon time and place. The conference shall be attended by the CCWA Engineer, the Utility Contractor and the project superintendent; and may be attended by appropriate State Officials; and others as requested by the Utility Contractor, Developer or CCWA.
- B. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.
- C. The CCWA Engineer will preside at the pre-construction conference, and the meeting may be taped and/or video-taped.

7.04 Insurance Requirements

- A. Utility Contractors performing work on CCWA projects shall comply with current CCWA insurance and bonding requirements.
- B. Companies such as railroads, electric power suppliers, natural gas suppliers, etc. may require Utility Contractors to furnish insurance, in addition to CCWA requirements when crossing their respective easements. The Utility Contractor shall provide such insurance as required.

7.05 Inspection

- A. The CCWA shall inspect water distribution systems during all phases of construction to ensure the systems are being constructed in accordance with the plans approved by the CCWA and specifications herein.

- B. The Developer/Utility Contractor shall provide the CCWA Engineer with a minimum 48-hour notice prior to commencing construction on a water distribution system.
- C. At no time shall a Utility Contractor or any other individual operate, manipulate or alter valves, fire hydrants or other appurtenances of the CCWA water system with out direct authorization from the CCWA or supervision by the CCWA.
- D. The Developer/Utility Contractor shall, at all times, permit and facilitate inspection of work by the CCWA. The presence of the CCWA Engineer on the site of work shall not be construed to, in any manner, relieve the Developer/Utility Contractor of their responsibility for strict compliance with the approved plans and specifications herein.
- E. The CCWA Engineer shall inform the Utility Contractor when construction is deficient from the approved plans and specifications herein. Deficiencies shall be addressed in a timely manner as determined by the CCWA Engineer
- F. Deficiencies not addressed in a timely manner shall be justification for the CCWA to stop work on a project. The CCWA Engineer shall issue a Stop Work Order to the Utility Contractor in writing. Any work performed after the issuance of a Stop Work Order shall not be accepted by the CCWA. Continued work on a project after being issued a Stop Work Order shall be justification to inform the appropriate legal counsel or Carroll County government agency for necessary enforcement actions.

7.06 Testing

- A. Water distribution systems shall be subjected to all testing as outlined in the specifications. Testing shall be performed at the expense of the Utility Contractor.
- B. The CCWA Engineer shall be given a minimum 48-hour notice prior to any pressure testing, disinfection or bacteria testing of the water distribution system, so that the CCWA Engineer may witness testing, disinfection and sampling procedures.

- C. Testing the density of compacted soil may be required by the CCWA. If required, the testing shall be performed at the expense of the Utility Contractor by an approved geotechnical and material testing company. Materials not meeting required specification shall be removed, replaced and retested for compliance at the expense of the Utility Contractor.

- D. Bacteria testing of the water distribution system shall be performed at the expense of the Utility Contractor by a certified laboratory. The certified laboratory must be listed on the Georgia Environmental Protection Division List of Certified Microbiological and Chemical Drinking Water Analysis Laboratories.

- E. Results of tests performed by testing companies shall be provided to the CCWA Engineer in writing.

- F. The Utility Contractor shall be responsible for the cost of water to fill, purge and test all water lines and appurtenances. The volume of water used will be determined by the CCWA Engineer based on the number of times the water system had to be filled and flushed.

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SECTION 8: CONNECTION TO CCWA SYSTEMS

8.01 General

The Developer/Utility Contractor shall be allowed to connect a new system into the CCWA system provided the applicable fees and charges are paid, water capacity is available, CCWA's policies and procedures are met, and the installed water distribution system is in accordance with approved plans and specifications.

8.02 Connection to System

- A. The CCWA Engineer shall be notified at least 48-hours in advance of connecting to the CCWA system. A minimum of 24-hours notification shall be given to the affected public prior to any disruption in water service.
- B. Connections to CCWA water system shall not be made on Fridays, weekends or after 2 p.m., unless otherwise directed by the CCWA Engineer.
- C. The CCWA Engineer shall be present during connection of the new water distribution system to the CCWA water system. Prior to installation, the CCWA shall approve all materials supplied by the Utility Contractor to be used in making the connection.
- D. Upon completing a water distribution system connection, the Developer's water system shall be valved-off from the remainder of the CCWA water distribution system until satisfactory disinfection of the Developer's water system is achieved.
- E. Should an unauthorized connection or connection without the presence of the CCWA Engineer be made to the CCWA systems, the Developer/Utility Contractor shall be subject to a fine and/or refusal of service. Under any circumstance, the Developer/Utility Contractor shall expose and thoroughly clean all piping and components of the connection for inspection by the CCWA Engineer. Noncompliant connections and/or damage to the CCWA system shall be repaired/replaced in conformance with the approved plans and specifications herein at the expense of the Developer/Utility Contractor.

8.03 Placing Water Systems in Service

- A. Prior to placing a water distribution system in service, the CCWA must approve of all construction and testing of the system.
- B. No water distribution system shall be placed in service until the CCWA is in receipt of satisfactory disinfection and bacteria test results from a certified laboratory meeting the requirements set in Division I, Section 7.06 and Division IV, Section 10.
- C. Placement of a water distribution system into service shall not be made until directly authorized by the CCWA Engineer.

SECTION 9: SYSTEM ACCEPTANCE

9.01 General

Acceptance of the Developer's water distribution system shall be considered by the CCWA at such time as the Developer has met all terms and conditions of the specifications herein. CCWA is not responsible for water distribution systems which cannot be accepted by CCWA due to noncompliance with these specifications. All contractors and developers should be familiar with the current edition of CCWA Specifications prior to design and construction.

9.02 Final Inspection

Prior to Final Acceptance, the CCWA shall perform a final inspection of the water distribution system. Any deficiencies encountered shall be immediately addressed by the Developer/Utility Contractor and an additional inspection shall be required after correcting deficiencies.

9.03 Warranty

Water distribution systems installed by Developers\Utility Contractors which are accepted by the CCWA for ownership, operation and maintenance shall be warranted and guaranteed by the Developer for a period of one (1) year from the date of Acceptance. The completed system shall be free of all defects due to faulty products or workmanship, and the Developer shall be responsible for all corrections and repairs to the water system as required due to failure of the system or noncompliance with the specifications upon notice by the CCWA. During this period, the Developer shall be responsible for repairing the system, correction of noncompliance issues and for the payment of water lost due to failure of the system, as determined by the CCWA Engineer.

9.04 Maintenance Bond

A. Before Final Acceptance is granted, the Developer must submit a Maintenance Bond or Letter of Credit to the CCWA in accordance with these specifications. The standard Maintenance Bond Form is included in Appendix B. The Maintenance Bond shall have a life of one (1) year from the date of Final Acceptance as determined by the CCWA Engineer.

- B. The bond shall be twenty (20) percent of the cost of labor and materials to accomplish the subject project. The CCWA may require the Developer and/or Utility Contractor to submit contract information, bill of sales, invoices or other information to verify bond amount submitted to the CCWA is correct.
- C. Nine months after Final Acceptance, the project will be re-inspected to insure system compliance and acceptability. If any corrective measures are necessary, a letter stating the items to be corrected will be sent to the Developer. The Developer must correct all deficiencies found.
- D. Failure to correct any deficiencies in the system in a timely manner as determined by the CCWA may result in the execution of the Maintenance Bond or Letter of Credit to recover cost associated with the CCWA correcting deficiencies found in workmanship and/or materials.

9.05 Final Acceptance

- A. Final acceptance of the Developer's water distribution system by the CCWA shall be when written, signed and dated by the CCWA Engineer. The following requirements must be met before Final Acceptance can occur:
 - 1. All water mains and appurtenances to be owned and operated by CCWA are completed for the development and conform to CCWA specifications.
 - 2. As-built drawings are received and approved.
 - 3. Twenty (20) percent maintenance bond or letter of credit with a life of one (1) year from the date of Final Acceptance, as notified by CCWA in writing, is received.
 - 4. The CCWA has received an executed copy of the Waiver of Liens Form by the Developer. The standard Waiver of Liens Form is included in Appendix C.
 - 5. A copy of the recorded easements, where applicable, having CCWA as the grantee describing all related bearings, distances, and accompanied by an easement plat shall be on file at CCWA office.

B. Meters can be issued only after Final Acceptance of the project by CCWA.

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DIVISION II

DESIGN REQUIREMENTS

SECTION 1: DESIGN AND PLAN PREPARATION

1.01 General

The design and plan preparation of water distribution systems shall conform to the specifications herein.

1.02 Licensed Professionals

- A. Water distribution system design and plan preparation shall be performed by a Georgia Licensed Professional Engineer or Georgia Licensed Land Surveyor who has sufficient knowledge and experience to properly perform the design.
- B. The professional performing the design and preparing the plans shall seal each plan sheet with their stamp and sign their name across the stamp.

1.03 Reference Documents and Standards

General methods of design and construction shall conform to the specifications herein and the following. When standards conflict with one another, the CCWA Engineer shall determine the applicable standard.

- A. Georgia EPD, Minimum Standards for Public Water Systems, May 2000.
- B. Georgia EPD, Rules and Regulations for Water Quality Control, Chapter 391-3-6, latest effective date.
- C. Utility Accommodations Policy and Standards, Georgia Department of Transportation, Office of Utilities, latest edition.
- D. American Water Works Association Standards, latest editions.
- E. American Society for Testing and Materials Standards, latest editions.
- F. Occupational Safety and Health Administration regulations, latest editions.
- G. Georgia Department of Transportation specifications and regulations, latest editions.

1.04 Plan Requirements

- A. Water distribution system plans shall be prepared in accordance with and include as a minimum the information detailed in Appendix D.
- B. Concurrent with the initial submittal of water distribution system plans to the CCWA, a completed Water Distribution Addition Submittal form shall be submitted. The CCWA plan review process shall not commence until the Water Distribution Addition Submittal form is received. The Water Distribution Addition Submittal Form is included in Appendix A.

1.05 Modification of Plans

Water distribution system plans approved by the CCWA shall not be modified or deviated from during construction unless the CCWA Engineer approves modifications.

1.06 As-Built Drawings

- A. As-Built Drawings of the installed water distribution system shall be prepared and sealed in accordance with requirements set forth herein.
- B. As-Built Drawings shall be completed upon completion of the water distribution system.
- C. As-Built Drawings shall show all street names, right-of-way widths, edge of pavement, related easements, lot numbers and addresses, locations, sizes and materials of all water distribution system components.
- D. Detailed drawings of valve locations showing valve locations dimensioned to local monuments shall be included on As-Built drawings.
- E. As-Built Drawings shall be prepared using a survey that ties the development's water distribution system horizontally and vertically to the following state plane coordinate system or as amended by the CCWA.

Horizontal Control: NAD 83/94.

Vertical Control: NAVD 88.

Grid Zone: Georgia West 1002.

- F. As-Built Drawings shall include the Northing and Easting coordinates for all fire hydrants (operating nut), valves and other water system components in the development as directed by the CCWA Engineer.
- G. As-Built Drawings shall include meter sizes for each residential lot and show meter box locations. The drawings should also identify lots that require Residential Fire Sprinkler Systems.
- G. The following certification shall be included on the As-Built Drawings and signed by the Design Engineer:

“I certify that the water distribution system depicted by this As-Built Drawing was constructed in accordance with the plans approved by the CCWA. The information submitted on this As-Built Drawing is to the best of my knowledge and belief, true, accurate and complete.”

- H. The Developer’s water distribution system shall not be considered complete until the As-Built Drawings have been reviewed and approved by the CCWA Engineer. Note that three (3) sets of the approved As-Built Drawings shall be submitted to the CCWA Engineer. The approved As-Built Drawings shall also be submitted to the CCWA Engineer in digital format (AUTOCAD format).

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SECTION 2: WATER DISTRIBUTION

2.01 General

- A. The following section shall be used as a guideline for the design of water mains and service lines that will supply residential, commercial and industrial complexes.
- B. The CCWA may require projects to have multiple connection points to existing water mains.
- C. A minimum twelve (12) foot shoulder shall be provided on new streets as measured from the back of curb or edge of pavement for the installation of underground utilities.

2.02 Hydraulics

- A. Design flow shall be based on the following fire flow demands.
 - 1. Residential Area: As required by local ordinances and/or authorities.
 - 2. Commercial/Industrial Area: As required by local ordinances and/or authorities.
- B. The following range of supply pressures shall be assumed when sizing system components.

Pressure (min.): 20 psi residual pressure at full range of operational conditions.

- C. Minimum flow per residential service: 2 gpm.

2.03 Water Line Material and Size

- A. Water mains and associated fittings shall be ductile iron with a minimum diameter of six (6) inches, unless otherwise directed by CCWA.
- B. Water main pipe assembly shall be push-on joint unless indicated otherwise.

- C. Water main pipe assembly in a bore casing shall use restrained joint (locking gaskets) or prefabricated spacers. The CCWA at its own discretion may require both restrained joint and prefabricated spacers to be used.
- D. Service line supplying a single fire hydrant within the right-of way shall be a minimum diameter of six (6) inches.
- E. Service line serving one (1) residential lot shall be copper with a minimum diameter of three-quarter ($\frac{3}{4}$) inch.
- F. Service line serving two (2) residential lots shall be copper with a minimum diameter of one (1) inch. The service line shall be fitted with a copper wye. The wye and service lines, coming from the wye, shall have a minimum diameter of three-quarter ($\frac{3}{4}$) inch.
- G. Service line serving commercial/industrial buildings shall be sized as necessary for the demand. Service line material will be determined by the CCWA Engineer.

2.04 Water Line Location

- A. Situate water mains outside of pavement, within street right-of-way when possible, at five (5) feet beyond the back of curb or edge of pavement or at location approved by the CCWA Engineer.
- B. Situate water mains on the south and west sides of streets when possible.
- C. A service line supplying a single lot shall be located in-line with the lot's property boundary line or as directed by the CCWA Engineer.
- D. A service line serving two (2) lots, from the water main to the meter, shall be located in-line with the lots' common property boundary.
- E. No water main or service line shall be constructed on solid waste landfills.
- F. No water main or service line shall be constructed to serve a structure that is constructed on or to be constructed on a solid waste landfill.
- G. Each water main and service line shall be locatable.

- H. Water mains shall have a minimum of ten (10) feet horizontal separation from any sewer. In the event where the required separation can not be achieved, the water main must be laid in a separate trench from the sewer or laid in the same trench with the water main located at one side of the trench on a bench of undisturbed earth above the sewer. Maintain a vertical separation of at least eighteen (18) inches between the crown of sanitary sewers and the invert of existing or proposed water mains with the sewer located below the water main. If unable to achieve the separation, then the water and sewer mains shall be constructed of ductile iron pipe with mechanical joints meeting water main standards for a distance of ten (10) feet on each side of the crossing point. A section of water main pipe shall be centered at the point of all sewer crossings.
- I. Maximum of one (1) water main per each case bore without written approval by CCWA.
- J. Every effort will be made to avoid “dead end” water main configurations. If a proposed development abuts existing infrastructure, where an interconnection of water mains is possible, then the developer will be required to interconnect the existing water mains with the new water mains.

2.05 Water Line Depth

- A. Water mains and service lines to fire hydrants shall have a minimum suitable soil cover of four (4) feet. The depth of four (4) feet from finish grade to top of pipe shall be determined as follows.
 - 1. As measured from edge of pavement (top back-of-curb) when the finish grade elevation of the pipe route is equal to or greater than adjacent pavement elevation.
 - 2. As measured from finish grade elevation of the pipe route when the pipe route elevation is less than the adjacent pavement elevation.
- B. Water mains shall have a minimum eighteen (18) inch vertical separation from any sewer.
- C. Service lines shall have suitable soil cover as shown in the construction detail or as directed by the CCWA Engineer.

- D. Water mains eighteen (18) inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.
- E. Other depth as approved by the CCWA Engineer.

2.06 Fire Hydrant Location and Spacing

- A. Hydrants shall be situated within the street's right-of-way.
- B. Fire hydrants servicing residential areas shall be spaced a maximum of 1,000 feet as measured along the edge of pavement. No lot shall be greater than 500 feet from a fire hydrant. If local ordinances or authorities require more stringent spacing then they shall be enforced.
- C. Fire hydrants servicing commercial and industrial areas shall be spaced a maximum of 500 feet as measured along the edge of pavement. If local ordinances or authorities require more stringent spacing then they shall be enforced.
- D. Fire hydrants shall be situated in-line with property boundary lines, where practical.
- E. Fire hydrants may be required in other locations if deemed necessary by the CCWA Engineer.

2.07 Valve Size and Location

- A. Valves shall be of the same size as the pipe in which the valve is situated, unless noted otherwise.
- B. A corporation valve shall be situated at the tap location into a water main of a three-quarter (3/4) inch or one (1) inch service line.
- C. Gate valves shall be situated in-line with water mains as follows, unless noted otherwise. The placement of gate valves under pavement shall not be allowed.
 - 1. Attach tapping gate valve immediately downstream of tapping saddle or

tapping sleeve when tapping into water main with a water main or service line.

2. Situate gate valve immediately downstream of a tee when connecting into a water main.
 3. Situate gate valve on each immediate side of a three (3)-way connection or four (4)-way connection.
 4. Situate gate valve within street right-of-way when fire service extends beyond right-of-way.
 5. Situate gate valve in water mains at a maximum spacing of 2,000 feet, at every other fire hydrant or as directed by the CCWA Engineer.
 6. A slip type valve box shall be situated over each gate valve, unless otherwise directed by the CCWA Engineer.
- D. Gate valve shall be situated immediately upstream and downstream of two (2) inch and larger water meter/check valve assemblies and other appurtenances as directed by the CCWA.
- E. A curb stop shall be situated inside of meter box immediately upstream of three-quarter (3/4) inch through one (1) inch water meter/check valve assemblies.
- F. A gate valve shall be installed between each fire hydrant and water main.

2.08 Thrust Restraint

- A. Concrete blocking shall be designed using 2,500 psf soil bearing pressure and appropriate test pressure.
- B. Thrust restraint shall be installed at all fittings, hydrants, valves and other locations deemed necessary by the CCWA Engineer.
- C. Thrust restraints at hydrants and valves shall be accomplished by installing a minimum of two (2) eyebolts on the hydrant or valve and tying to an adjacent fitting or concrete tie-back using three-quarter (3/4) inch threaded rod. Hydrant tees may be used in conjunction with fire hydrants.

D. Thrust restraint at fittings shall be accomplished by using one of the following methods:

1. Cast-in-place concrete blocking installed to dimensions as shown on thrust block detail.
2. Restrained joint pipe and fittings installed upon approval by the CCWA Engineer.
3. Threaded rod between fittings to form a mechanical system.
4. Combination of above items or other requirements as directed by the CCWA Engineer.

2.09 Water Meters and Backflow Prevention

- A. All water usage including fire and irrigation shall be metered and have state approved backflow prevention devices.
- B. All water usage shall be metered using a single meter when possible.
- C. Meters shall be sized according to the AWWA Standard using the fixture count.
- D. Each meter shall have a backflow device consisting of dual check valve assembly or higher level of protection.
- E. Water meters and backflow devices shall be housed in boxes or vaults.
- F. Water meters and backflow devices shall be situated within the street right-of-way or easement area.

SECTION 3: MISCELLANEOUS

3.01 General

Design requirements not included in Division II, Design Requirements, shall be determined by the CCWA Engineer, on a case by case basis.

3.02 Fire Protection Systems

Sprinkler fire protection systems are considered special designs problems and will be reviewed by the local Fire Marshall. Plans and construction specifications must be approved by the CCWA and above mentioned regulatory agency prior to water main system construction.

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DIVISION III

MATERIAL REQUIREMENTS

SECTION 1: MATERIALS

1.01 Applicable Standards

The Utility Contractor shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), and American National Standards Institute (ANSI). Latest revisions of all standards are applicable.

1.02 Quality Assurance

- A. If requested by CCWA, the Utility Contractor shall submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least ten years.
- B. All materials must be first quality, have smooth exterior and interior surfaces as required, free of cracks, blisters and other imperfections. All materials must be true to theoretical shapes and forms throughout its entirety.

1.03 Substitutions

Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the Utility Contractor may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designated shall be considered a substitution. The Utility Contractor shall obtain prior approval from CCWA for all substitutions.

1.04 Acceptance

- A. Material acceptance will be on the basis of the CCWA Engineer and the manufacturer's written certification that the materials were manufactured and tested in accordance with the applicable standards.

- B. All materials are subject to inspection by the CCWA at the manufacturer's plant, trench or other location.
- C. Any material found to be out of compliance with CCWA specifications shall be removed from the project site. Repair of rejected materials is not permitted.

SECTION 2: POTABLE WATER PIPE AND FITTINGS

2.01 Ductile Iron Pipe Classification

- A. Ductile iron pipe shall be Pressure Class 350, unless noted otherwise, in accordance with ANSI/AWWA C151/A21.51, latest revisions.
- B. Ductile iron restrained-joint pipe shall be of the bolted joint type or pipe fitted with a fast-grip type gasket provided by manufacturer having a minimum pressure rating of 350 psi in accordance with ANSI/AWWA C110/A21.10 and C151/A21.51, latest revisions.
- C. All pipe shall be furnished in lengths of at least eighteen (18) feet.

2.02 PVC Pipe Classification

- A. PVC pipe must be covered during transportation and delivery to the project site to prevent exposure to diesel fumes or other harmful agents. Pipe not protected properly may be rejected by the CCWA Engineer.
- B. All PVC pipe is to be in accordance with ASTM D2241. PVC material shall conform to ASTM D1784. Pipe must be approved by the National Sanitation Foundation (NSF) and bear the NSF logo.
- C. PVC pipe shall have push-on joints with integral bell and locked in gasket and shall conform to ASTM D3139. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM 477. Pipe must have a Fluid-Tite integral bell joint with built-in expansion joint.
- D. PVC pipe two (2) inches in diameter shall be SDR 13.5, 315 psi.
- E. Two (2) inch PVC pipe shall be used as casing material for long side copper service lines.

2.03 Fitting Classification

- A. Ductile iron fittings for use with push-on joint pipe shall be standard mechanical with gland restraint with a minimum pressure rating of 350 psi in

accordance with ANSI/AWWA C110/A21.10 and C151/A21.51, latest revisions.

- B. Use of push-on joint type fittings and lugged restraining glands shall be permitted as directed by the CCWA Engineer.
- C. Ductile iron flanged fittings shall be in accordance with ANSI/AWWA C110/A21.10, latest revision and meet minimum pressure ratings as determined by the CCWA
- D. Ductile iron restrained-joint fittings shall be of the flex-ring type, Mega-Lug or fitted with a fast-grip type gasket having a minimum pressure rating of 350 psi in accordance with ANSI/AWWA C110/A21.10 and C153/A21.53, latest revisions.
- E. Fittings shall be furnished with a manufacturer applied coating of six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.

2.04 Gaskets and Bolted Connections

- A. Gaskets for push-on and standard mechanical joints shall be plain rubber (Styrene Butadiene Copolymer) in accordance with ANSI/AWWA C111/A21.11, latest revisions.
- B. Gaskets for restrained joints shall be plain rubber (Styrene Butadiene Copolymer) modified with ductile iron or stainless steel teeth in accordance with ANSI/AWWA C111/A21.11, latest revisions.
- C. Gaskets for flanged joints shall be 1/8-inch thick, full-faced, clothed reinforced rubber in accordance with ANSI/AWWA C110/A21.10 and C115/A21.15, latest revisions.
- D. Bolts and nuts used for flanged connections shall be hex type of low carbon steel, cadmium plated or zinc plated conforming to ASTM A307 in accordance with AWWA C110 and C115.
- E. The Utility Contractor is to provide the necessary bolts for mechanical connections. Bolt shall be steel with American regular unfinished square or hexagon heads. Nuts shall be steel with American Standard regular

hexagonal dimensions, all as specified in ANSI B 17.2, and AWWA CIII. All bolts and all nuts shall be treated in accordance with ANSI B 1.1, Coarse Thread Series, Class 2A and 2B fit.

2.05 Coatings and Linings

- A. Ductile iron fittings shall be coated and lined with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16. Fittings shall be listed by a certifying agency that the coating complies with ANSI/NSF 61.
- B. Ductile iron pipe and fittings placed above the ground surface shall have an exterior manufacturer applied epoxy coating six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16
- C. Ductile iron pipe that crosses or runs parallel to a gas transmission main, which is or may be cathodically protected, shall be encased in polyethylene tubing, eight (8) mil minimum thickness, and taped in accordance with ANSI/AWWA C105/A21.5.
- D. Ductile iron pipe and fittings used in the distribution of potable water shall be cement lined in accordance with ANSI/AWWA C104/A21.4, latest revisions, unless coated with fusion bonded epoxy in accordance with specifications of this section.

2.06 Pipe Marking

The following information shall be cast in or stamped on each pipe or as required by the governing ASTM Standard.

- 1. Weight, class or nominal thickness.
- 2. Casting period.
- 3. Manufacturer's identifying mark.
- 4. Date the pipe was manufactured.
- 5. Pipe size and material.

2.07 Acceptable Manufacturers

Ductile iron pipe shall be domestically manufactured by one of the following:

Acceptable Manufacturers:

1. American Cast Iron Pipe Company.
2. U.S. Pipe Company.
3. Griffin Pipe Company.
4. McWane Pipe Company (6-inch and 8-inch only).

PVC Pipe: 2-inch PVC pipe shall be domestically manufactured.

SECTION 3: COPPER PIPE AND FITTINGS

3.01 Pipe Classification

- A. Buried service three-quarter ($\frac{3}{4}$) inches in diameter to one (1) inch in diameter shall be seamless, annealed copper tube conforming to the requirements of ASTM B-88, Type “K”.
- B. Copper tubing shall be packed in coils or cartoons, when specified.

3.02 Fittings

- A. Fittings for annealed copper tube, Type “K”, shall be compression type brass.
- B. Meter couplings and tail pieces shall be cast brass threaded type.

Acceptable Manufacturers:

- 1. Ford Meter Company.
- 2. Other Approved.

3.03 Water Service Monuments

- A. Where curbing exists, cut the symbol “W” in the top of the curb at water service locations using an approved method of cutting the curb.

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SECTION 4: VALVES AND ACCESSORIES

4.01 Gate Valve

A. Valves two (2) inches in diameter shall be as follows:

1. Valves shall be cast iron construction.
2. Valves shall have resilient wedge gate, non-rising stem and square nut operated.
3. Valve end connections shall be threaded to match pipe material in which valve is installed.
4. Valves shall open in a counter-clockwise direction.

Approved Manufacturers

1. Clow.
2. American Darling.
3. M & H.
4. US Pipe.
5. Mueller.
6. Other Approved.

B. Valves four (4) inches to twelve (12) inches in diameter shall be as follows:

1. Water supply valves shall be in accordance with AWWA C509 for resilient seated valves.
2. Valves shall be bronze mounted, beveled geared, with a non-rising stem and O-ring stem seals.
3. Valves shall open in a counter-clockwise direction.
4. Valve end connections shall be flanged or standard mechanical as directed by CCWA.
5. Buried valves shall be nut operated; non-buried valves shall have hand wheel operators.

Approved Manufacturers

1. U.S.
2. American Darling.
3. Mueller.
4. M & H.

C. Gate valves used in conjunction with a tapping saddle shall be as follows:

1. Offset type that allows the tapping device to mount to the pipe and pass through the opened valve.
2. End connection to the tapping sleeve shall be flanged. End connection to accept pipe shall be mechanical joint.

D. Gate valves shall be coated as follows:

1. Valves shall be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.

E. The following information shall be cast in or stamped on each valve.

1. Manufacturer's identifying mark.
2. Pressure Class.
3. Valve size and material.
4. Place of Manufacturing.

4.02 Butterfly Valve

- A. Valves fourteen (14) inches in diameter and larger shall be butterfly type in accordance with AWWA C504.
- B. Materials used in the fabrication of the valve shall meet all related requirements of ASTM.
- C. Valve bodies shall be ductile iron with integrally cast flanged ends or standard mechanical ends as directed by CCWA. Flange drilling shall be in accordance with ANSI B16.1.

- D. Valves shall be bubble tight at rated pressures with flow in either direction and shall be capable of throttling service.
- E. Valve disc shall rotate 90° from full open position to tight shut position.
- F. Valves shall be tight closing, rubber seated with seats applied to the body or disc. Valve seats on 30 inch and larger diameter valves shall be field adjustable and replaceable without dismounting operator, disc or shaft and without removing valve from pipe. Mating seat shall be stainless steel or as approved by CCWA.
- G. Valves shall be fitted with sleeve type bearings contained in hubs of valve body. Bearings shall be corrosion resistant and self-lubricating.
- H. Valve operators shall hold valve in any intermediate position between full open and full close without creeping or fluttering.
 - 1. Manual operators shall be worm gear or traveling nut type and shall be fully enclosed.
 - 2. Valves for buried service shall be furnished with a ground level valve position indicator unless otherwise approved by the CCWA Engineer.
 - 3. Valves shall open when turning operator in a counter-clockwise direction.
- I. Valves shall be coated as follows:
 - 1. Valves shall be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.

Acceptable Manufacturers:

- 1. U.S.
- 2. American Darling.
- 3. Mueller.
- 4. M & H.
- 5. Other Approved.

4.03 Cross-Connection Control Devices

- A. Cross-connection control devices shall be installed as directed by the CCWA and in accordance with their cross-connection control program.

Acceptable Manufacturers

- 1. As Approved.

4.04 Pressure Reducing Valves

- A. Requirements for pressure reducing valves shall be determined at the time of submittal on a case by case basis by the CCWA Engineer.

Acceptable Manufacturers

- 1. As Approved.

4.05 Corporation Valve

- A. Corporation valves shall be of the Teflon ball valve type and manufactured of bronze in conformance with ASTM B61, ASTM B62 and NSF 61.
- B. Corporation valves shall withstand a working pressure of 300 psi or greater.
- C. Corporation valves shall have crosscut threading for connection to tapping saddle, outlet end suitable for compression type joint or other end styles if requested by the CCWA Engineer.
- D. Threaded ends for inlet and outlet shall conform to AWWA C800.

Acceptable Manufacturers

- 1. Ford Meter Box Co (FB 1000).
- 2. Other Approved.

4.06 Curb Stop

- A. Curb stops shall be of the Teflon ball valve type and manufactured of bronze in conformance with ASTM B61, ASTM B62 and NSF 61.
- B. Curb stops shall withstand a working pressure of 300 psi or greater.
- C. Curb stops shall be fitted with wing locks suitable to accept a keyed padlock.
- D. Ends shall be suitable for compression type joint.

Acceptable Manufacturers

- 1. Ford Meter Box Co (B43-232WQ).
- 2. Other Approved.

4.07 Valve Box

- A. All valves shall be equipped with heavy roadway type valve boxes.
- B. Valve boxes shall be of the adjustable two-piece screw type 24" X 36" high compaction and support under the main in order to prevent deflection of the water main and manufactured of cast iron.
- B. Valve boxes shall have an internal diameter of 5.25 inches.
- C. Valve boxes shall have a concrete pad around the top of the box at finished grade.
- D. Extension stems will be provided where required to provide flush with ground top or as directed by the CCWA Engineer.

Acceptable Manufacturers

- 1. Higgins Foundry.
- 2. U.S. Foundry.
- 3. Opelika.
- 4. Sigma.
- 5. Other Approved.

4.08 Valve Monuments

- A. Monuments and/or markings are required to identify valve locations in the field.
- B. Where curbing exists, cut the symbol “V” in the top of the curb at valve locations using an approved method of cutting the curb.
- C. Concrete valve monuments shall be installed for each valve excluding fire hydrant watch valves. The monuments shall be located adjacent to the valve or as directed by the CCWA Engineer.

SECTION 5: TAPPING SLEEVES

5.01 Tapping Sleeve

- A. Tapping sleeves shall be of the split type, mechanical joint type and manufactured of ductile iron or stainless steel (preferred). Stainless steel sleeve shall be used when tapping cast iron pipe. Ductile iron shall be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16. Stainless Steel shall be type 304 (18-8).
- B. Sleeve outlet shall be flanged and mechanical joint connection to the branch pipe.
- C. Prefabricated tapping sleeves may be used on PVC pipe, if authorized by the CCWA Engineer.
- D. Wet tapping of six (6) inch and larger subdivision mains to the existing CCWA distribution system shall be made using prefabricated tapping sleeves.
- E. Back taps and swing joints shall not be made unless specifically authorized by the CCWA Engineer.

5.02 Tapping Saddle

- A. Ford bronze tapping saddles shall be used for all taps on main sizes two (2) inch.
- B. Taps on six (6) inch and larger mains shall be made using double strap iron body tapping saddles with O-ring gaskets to fit against pipe.

Approved Manufacturers

- 1. Smith Blair.
- 2. Mueller.
- 3. Ford Meter Company.
- 4. Dresser.
- 5. Rockwell.
- 6. Other Approved.

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SECTION 6: WATER METERS AND METER BOXES

6.01 Water Meters

- A. After Final Acceptance, residential water meters shall be provided by the CCWA, upon receipt of applicable current fees as set by the CCWA.
- B. The CCWA must approve all commercial, industrial, fire service and combination meters.

6.02 Water Meter Boxes (Residential)

- A. Meter assemblies ranging in size from three-quarter (3/4) inch to one (1) inch shall be housed in meter boxes manufactured from high-density polyethylene.
- B. Standard meter boxes shall be twelve (12) inches in height and bottom of box shall measure a minimum of twenty-one (21) inches in length and fifteen three-quarter (15 3/4) inches in width.
- C. Cast iron lids with short legs shall be supplied with each meter box.

Acceptable Manufacturers - Model

- 1. DFW – D1200.
- 2. Brooks.
- 3. Carson.
- 4. Other Approved.

6.03 Water Meter Vaults (Commercial, Industrial, Fire Service and Combination)

- A. All vaults must be approved by the CCWA Engineer prior to installation.
- B. Vaults shall be constructed of pre-cast concrete.
- C. Vaults shall be able to support a concentrated wheel load of 2,500 lbs.
- D. Vaults shall be sized as directed by the CCWA Engineer.

- E. An aluminum access hatch shall be cast in the cover slab. The access hatch shall be sized and situated as directed by the CCWA Engineer.
- F. Pipe penetrations (annulus between concrete and outside face of pipe) shall be sealed with boot and clamps.
- G. Vault cover shall extend three (3) inches above finished grade.

Acceptable Manufacturers

- 1. As Approved.

6.04 Vault Access Hatches

- A. Vault access hatch size, material and configuration must be approved by the CCWA Engineer.
- B. Hatch shall be able to support a 150 psf live load.
- C. Access hatch shall have a manual locking arm device to prevent hatch lids from closing.
- D. Access hatch shall be capable of being secured using a keyed lock.

Acceptable Manufacturers

- 1. As Approved.

SECTION 7: HYDRANTS

7.01 Fire Hydrants

- A. Fire hydrants shall be of the compression type, closing with line pressure, complying with AWWA C502 for minimum 200 psi working pressure and NFPA, 1993 edition. Hydrant valve opening shall not be less than 4-1/2 inches.
- B. Hydrants shall have a non-freeze design and an automatic drain that closes fully when hydrant valve is opened.
- C. Minimum depth of hydrant burial shall be 4'-0" or as existing water main depth dictates. Deeper burying depths shall be accomplished using extension kits provided by same manufacturer.
- D. Hydrant standpipe, fittings and upper barrel shall be ductile iron. Parts designed to break away may be cast iron.
- E. Hydrants shall be furnished with a mechanical joint shoe connection to the spigot of the six (6) inch hydrant lead and have a valve at the connection with the water main.
- F. The means of attaching the barrel to the standpipe shall permit 360° rotation of the barrel.
- G. Hydrant barrels shall break away from the standpipe at an elevation above ground level without causing damage to the standpipe and stem. When barrel is broken away, internal valve shall function and repairs shall be permitted without excavating or turning off water supply.
- H. Hydrants shall be bronze mounted and all internal working parts shall be bronze. Valve seat ring shall be bronze and screw into a bronze retainer.
- I. Internal working parts shall be removable without disturbing the barrel.
- J. The operating nut situated atop the hydrant shall be hexagonal and constructed of ductile iron or cast iron and open in a counter clockwise direction. The threads shall be enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal lubricated by a grease or oil reservoir.

- K. Hydrant shall be equipped with two 2-1/2 inch threaded (7.5 threads per inch) hose connections and one 4-1/2 inch threaded (4 threads per inch) hose connection. Hose and pump connections shall be threaded and pinned to seal the connection to the barrel. Threads shall comply with National Standard Threads. Each connection shall be equipped with a cap and chain.

Acceptable Manufacturers – Product

1. American Darling – Mark-73.
2. Mueller – A-421.
3. M & H – 129T.
4. US – Metropolitan 250.
5. Clow – Medallion.

SECTION 8: CASING AND TUNNEL LINERS

8.01 Casing

- A. The Utility Contractor shall furnish all material and equipment to install steel pipe casing at the locations as shown on the construction plans or as directed by the CCWA Engineer.
- B. Materials shall be in accordance with AREA, ASSHO, Georgia Department of Transportation and other required applicable standards.
- C. Steel casing shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM A139, Grade B.
- D. All case bores with carrier pipes, six (6) inch and larger in diameter, shall have carrier pipes of either ductile iron with locking gaskets or prefabricated spacers.
- E. Ends of casing shall be sealed as directed by the CCWA Engineer.
- F. The minimum casing size and minimum wall thickness shall be as follows:

<u>Pipe Diameter (in.)</u>	<u>Casing Diameter (in.)</u>	<u>Wall Thickness (in.)</u>
4	8	0.330
6	12	0.330
8	16	0.375
10	16	0.375
12	18	0.375
14	24	0.562
16	36	0.625
18	36	0.625
20	36	0.625
24	36	0.625

- G. If more stringent requirements are required by local, state or federal agencies, then the more stringent regulations shall be required.
- H. The CCWA may allow 0.250" casing on a case by case basis for driveway and County road crossings. The Contractor must obtain approval from CCWA prior to ordering materials.

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SECTION 9: ENVIRONMENTAL COATINGS

9.01 Materials Requiring Coatings

- A. Materials for buried surface shall be coated as indicated in their respective section.

- B. The following materials shall have exterior coatings manufacturer applied.
 - 1. Piping and appurtenances
 - 2. Supports
 - 3. Pumps
 - 4. Valves
 - 5. Equipment and appurtenances

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SECTION 10: PAVEMENT

10.01 General

- A. All pavement materials including graded aggregate base, black base, surface course and concrete shall conform to the Georgia State Highway Department of Transportation Specifications or local regulatory agencies.

- B. All driveways, sidewalks and curbs shall be replaced with the same material as existing.

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SECTION 11: MISCELLANEOUS MATERIALS

Materials not covered in Division III, Material Requirements, shall be in accordance with the approved plans or as directed by the CCWA Engineer.

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DIVISION IV

CONSTRUCTION STANDARDS

SECTION 1: GENERAL

1.01 Contractor License

- A. A qualified licensed Utility Contractor meeting CCWA requirements shall install all water distribution system components.
- B. Prior to commencing construction activities on a CCWA approved project, the CCWA Engineer shall receive a copy of the Utility Contractor's state issued license.

1.02 Utility Notification

- A. The Official Code of Georgia, Title 25, Chapter 9 requires that utilities be located in the proposed work area prior to commencing any clearing, grading or excavation activity.
- B. The Utilities Protection Center can be reached at (770) 623-4344 or 1-800-282-7411.
- C. The Utilities Protection Center shall be notified at least three (3) business days prior to commencing work.

1.03 Work Commencement

- A. Clearing and grubbing activities shall not commence on any project until Carroll County Community Development has issued a Land Disturbance Activity permit.
- B. Work on a water distribution system shall not begin until the CCWA approves the water distribution system construction plans.
- C. The CCWA Engineer shall receive a 48-hour notice prior to commencing construction activities on a water distribution system.

- D. A set of construction plans approved by the CCWA shall be present on the job site during all phases of construction of the water distribution system.
- E. If construction plans require curb and gutter, then the installation of water distribution piping shall not begin until curb and gutter has been installed.

1.04 Traffic Control

The Utility Contractor is to provide and maintain suitable signs, barricades, and lights for protection of traffic in accordance with standard Ga. DOT requirements. All highway signs removed for construction shall be replaced at the end of each day. The contractor shall not close or block any highway, street, or roadway without first obtaining permission from the proper authorities. Experienced flagmen should be provided to direct and expedite the flow of traffic

1.05 Protection of Persons and Property

- A. Prior to commencing work, accurately locate above and below ground utilities and structures which may be affected by the work, using whatever means appropriate. Mark the location of existing utilities and structures, not otherwise readily visible, with flagging, stakes, barricades, or other suitable means.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damage caused by settlement, lateral movement, undermining, washout and other hazards. The Utility Contractor is responsible for any damage caused to existing infrastructure during construction.
- C. Maintain all streets, sidewalks, crossings, fire hydrants, water and gas valves, fire alarm boxes, and other utilities accessible for their intended use.
- D. Keep every drain, gutter, culvert, sewer, and surface drainage route encountered, open for both temporary and permanent flow unless other effective provision for drainage is made.
- E. Do not permit any hazardous condition to result from trenching and backfilling operations.

1.06 Protection of Existing Trees and Vegetation

- A. Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip lines, excess foot or vehicular traffic, or parking of vehicles or equipment within drip line. Provide temporary fences, barricades or guards as required to protect trees and vegetation to be left standing.
- B. Provide protection for ornamental tree roots over 1-1/2 inches diameter that are cut during any construction operation. Coat the cut faces with an emulsified asphalt, or other acceptable coating, especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots of ornamental trees with wet burlap to prevent roots from drying out; provide earth cover as soon as possible.
- C. Repair or replace unnecessarily damaged trees and vegetation, as determined by the CCWA Engineer, resulting from any construction operation, in a manner acceptable to the property owner and the Engineer. Tree damage repair shall be performed by a qualified nurseryman. Replace unnecessarily damaged trees which cannot be repaired and restored to full-growth status, as determined by the tree surgeon.

1.07 Use of Explosives

- A. The Utility Contractor shall provide experienced workmen to perform blasting. All blasting operations shall be conducted in accordance with all existing ordinances and regulations. The Utility Contractor shall protect all structures from the effects of the blast and repair any resulting damage. The Utility Contractor will secure the necessary permits and is solely responsible for any damage occurring as the result of the blasting. The Utility Contractor shall notify CCWA prior to any blasting operations.
- B. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction.
- C. Use explosives only as legally permitted and when other work methods are impractical.

- D. Do not permit explosives on the project site other than during the least practicable use period.
- E. The Utility Contractor assumes sole responsibility for handling, storage, and use of any explosive materials.

1.08 Miscellaneous Standards

Construction standards not covered in Division IV, Construction Standards, shall be in accordance with the approved plans or as directed by the CCWA Engineer.

SECTION 2: MATERIAL DISTRIBUTION

2.01 General

- A. Work covered by this section shall include all labor, equipment and accessories required to distribute material.
- B. All materials installed shall be new.

2.02 Delivery

- A. The Utility Contractor shall furnish equipment and facilities for unloading and distributing pipe, equipment and materials.
- B. The Utility Contractor shall notify the CCWA Engineer at least twenty-four (24) hours prior to the delivery of materials.
- C. PVC pipe must be covered during transportation and delivery to the project site to prevent exposure to diesel fumes or other harmful agents. Pipe not protected properly may be rejected by the CCWA Engineer.

2.03 Handling

- A. Pipe shall be handled by use of forklift or excavator using choker straps or cable.
- B. Any pipe, equipment or material dropped or dumped during handling procedures shall be subject to rejection by the CCWA without further justification.
- C. Materials shall be handled carefully to prevent shock or damage.

2.04 Distribution

- A. Materials shall be distributed and placed so as not to interfere with pedestrian access, traffic flow or drainage pathways or ditches.

- B. Materials will not be strung out more than 1,000 feet beyond the work area where pipe is currently being installed.

2.05 Storage

- A. Pipe shall not be strung more than 1,000 feet beyond the point where pipe is being installed.
- B. Drainage ditches shall not be obstructed.
- C. The Utility Contractor shall make necessary arrangements to store pipe, fittings, valves and accessories that cannot be distributed along the route.

2.06 Maintenance and Protection

- A. The contractor shall be responsible for maintenance and protection of all pipe, equipment and material.
- B. All equipment shall be boxed, crated or otherwise completely enclosed and protected during transportation, handling and storage.
- C. Equipment shall be stored above ground level and adequately supported on wood blocking or other approved support material.
- D. All equipment shall be protected from exposure to elements and shall be kept dry at all times.
- E. Pumps, motors, valves, control panels, instrumentation, electrical equipment and other equipment having anti-friction or sleeve bearings shall be stored in a weather-tight enclosure within temperature limits as specified by the manufacturer.
- F. Any pipe, equipment or material damaged by impact, vibration, abrasion, discoloration or other damage shall be repaired in accordance to manufacturer instructions or replaced at the discretion of the CCWA.

SECTION 3: EROSION AND SEDIMENT CONTROL

3.01 General

- A. The arrangement, location, and operating techniques relating to the erosion and sediment control measures necessary to accomplish the work and satisfy the requirements specified herein and by other local agencies is the sole responsibility of the Utility Contractor.
- B. Coordinate erosion control features to provide effective and continuous erosion control throughout the construction and post construction period.
- C. Maintain erosion control measures at all times. Install additional erosion and sediment control measures if deemed necessary after onsite inspection by the CCWA Engineer or regulatory agency.
- D. The Utility Contractor shall plan construction activities to minimize erosion of work site. The amount of open excavation shall be limited to the least practicable to minimize erosion.
- E. The Utility Contractor shall prevent sediment from leaving the work site.
- F. The Utility Contractor shall comply with industry standards and applicable Laws and Regulations of authorities having jurisdiction, including but not limited to the following which are included into this document by reference.
 - 1. Environmental protection regulations.
 - 2. Georgia Erosion and Sedimentation Control Act of 1975, including amendments.
 - 3. Manual for Erosion and Sediment Control in Georgia, latest edition.
 - 4. Carroll County Community Development and Code Enforcement regulations.
- G. The Utility Contractor is responsible for complying with the Corps of Engineers wetland protection regulations.

3.02 Stream and Ditch Crossings

- A. At all stream and ditch crossings, the Utility Contractor shall place rip-rap along entire area of disturbed ground as determined by the CCWA Engineer.
- B. Disturbed areas adjacent to streams and ditches may require rip-rap if deemed necessary by the CCWA Engineer.
- C. Stone rip-rap shall be composed of sound, tough durable stones resistant to erosion.
- D. Rip-rap size shall be as shown on the construction drawings or as determined by the CCWA Engineer.
- E. Rip-rap shall extend from one (1) foot below the stream or ditch bed to the top of the bank and shall be placed to conform to the natural slope of the area.
- F. The Utility Contractor shall embed the rip-rap to form a compact layer at least twelve (12) inches thick. The rip-rap will be placed so that the smaller stones are not segregated, but evenly distributed. Smaller stones shall be placed between the larger stones so that a dense, well graded rock mass is produced.

SECTION 4: SITE PREPARATION

4.01 Clearing and Grubbing

- A. Prior to commencing clearing activities, areas designated to be cleared shall be marked using survey ribbon, stakes or other suitable means.
- B. In areas to be cleared, all trees, stumps, buried logs, brush, grass and other unsatisfactory materials shall be removed.
- C. Trees to remain in or near work area shall be protected from clearing activities.
- D. All damaged trees shall be repaired in accordance with Division IV, Section 1.06.
- E. All holes remaining after grubbing activities shall be filled with suitable material and properly compacted in layers to density required for in-place backfill.
- F. All materials cleared and grubbed shall be disposed of in accordance with applicable local, state and federal codes and regulations.
- G. Prior to and upon completion of clearing and grubbing activities, install erosion control and sedimentation measures as identified on the Erosion Control and Sedimentation Plan prepared by the Design Engineer.
- H. Prior to excavating or trenching, all permanent easements shall be cleared unless otherwise directed by CCWA.
- I. Clearing of construction easements is permitted with care taken to adhere to requirements of this section and Division IV, Sections 1.05 and 1.06.
- J. Prior to commencing any other job site activity, installed erosion control and sedimentation measures as approved by Carroll County Community Development.

4.02 Topsoil Stockpiling

- A. Remove topsoil to full depth encountered in areas to be graded and stockpile

soil and install erosion control devices as indicated on drawings.

- B. Soil shall be placed such that the integrity of an excavation or proposed excavation is not jeopardized.

4.03 Removing Pavement

- A. Removal of pavement shall be performed so as not to endanger roadway activity. Work shall be coordinated and be in compliance with the appropriate road and highway agencies codes and regulations.
- B. Pavement shall be marked squarely and neatly to size of excavation.
- C. Pavement shall be scored and broke along the marked lines using a rotary saw and jackhammer. Pavement shall not be machine pulled for initial brake.
- D. Upon removal, pavement shall be loaded and disposed of off-site.
- E. Adjacent pavement damaged during construction shall be removed as described above. The contractor is responsible for removing and replacing damaged pavement.
- F. Curbs shall be removed for the entire length from control joint to control joint.

SECTION 5: EXCAVATION

5.01 General

- A. All excavation shall be performed in accordance with applicable federal, state and local regulations, including the Occupational Safety and Health Act of 1970 (PL 91-596), as amended.
- B. Excavation includes the removal and disposal of all materials encountered, including rock, necessary for the installation of the water distribution system as outlined within these specifications.

5.02 Soil Excavation

- A. Excavation shall include those measures necessary to establish grades indicated on drawings for utilities, structures and appurtenances.
- B. Excavated soil shall be placed in a location such that the integrity of the excavation is not jeopardized.
- C. Excavation walls shall be sloped or stepped in accordance with recognized industry standards.
- D. The Utility Contractor shall assume the responsibility for design and construction of excavation shoring and bracing capable of supporting excavations and construction loads.
- E. The excavation shall provide space for foundation work and inspection.
- F. Excavations shall be covered in accordance with applicable regulations and/or barricaded and roped-off with identifying tape during work progress.

5.03 Rock Excavation

- A. Excavation shall include those measures necessary to establish grades indicated on drawings for utilities, structures and appurtenances.

- B. Rock shall be excavated to a minimum depth of twelve (12) inches below required grade and minimum of six (6) inches around pipe and appurtenances.
- C. The Utility Contractor shall be responsible for determining methods required for removal of rock or hard materials.
- D. Perform blasting only after consulting with the CCWA and regulatory agencies. The Utility Contractor is responsible for obtaining all necessary permits.
- E. A licensed explosive contractor shall perform blasting operations.
- F. Blasting operations shall be conducted in accordance with all local, state and federal regulations.
- G. The contractor shall protect all structures from the effects of the blasting and repair any resulting damage.
- H. Excavated rock shall not be used as backfill in the pipe trench.

5.04 Pipe Trench Excavation

- A. Pipe trenching shall comply with excavation and rock excavation specifications.
- B. Trench should be excavated to natural undisturbed soil.
- C. Trenches shall be excavated to provide a minimum of four (4) feet of cover above the top of the pipe unless otherwise directed by the CCWA Engineer.
- D. Trenches shall be excavated wide enough to allow proper installation of pipe, fittings and other materials with not less than three (3) inches from the outside of the pipe, fitting or other material to the side of the trench at any point.
- E. Where unsuitable material is encountered, over excavate through unsuitable material and backfill to required grade with suitable material as determined by the CCWA Engineer.

- F. Where encountered, remove rock to a minimum of twelve (12) inches below required bottom of trench elevation and backfill to at least two (2) feet above top of pipe with suitable material as determined by the CCWA Engineer.
- G. Bottom of trenches shall be prepared so that the entire length of the pipe barrel is supported.
- H. Maintain trenches dry at all times using pumps, well points or other dewatering means.
- I. Limit trenching to not greater than 300 feet ahead of completely backfilled work.
- J. In populated areas, cover or barricade open trenches until completely backfilled.
- K. Open trenches shall be made safe at all times.
- L. The Utility Contractor shall excavate all materials encountered, including rock, and dispose of excess excavated material not required for backfilling. All excavation shall be performed in accordance with applicable local, state, and federal regulations, including the Occupational Safety and Health Act of 1970 (PL 91-596). The Utility Contractor shall maintain sides and slopes of excavations in a safe condition until completion of backfilling.
- M. At each joint, the Utility Contractor shall excavate bell holes of ample depth and width to permit the joint to be made properly and to relieve pipe bell of any load. At no time shall the bells of the pipe rest on the trench bottom.
- N. The Utility Contractor shall excavate and prepare the trench bottom to support the pipe uniformly throughout its length. For both ductile iron pipe and PVC pipe, the trench shall meet all requirements of Standard Laying Condition Type 2 in accordance with AWWA C151.

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SECTION 6: INSTALLATION

6.01 Pipe Bedding

- A. Pipe shall be laid in clean bedding material, free of rock, organics and other materials which, in the opinion of the CCWA Engineer, are unsuitable.

6.02 Pipe, Fitting, Valve and Fire Hydrant Installation

- A. Prior to placement, the interior of pipes, fittings and valves shall be cleaned free of dirt and debris. Care shall be taken to keep the pipeline clean at all times.
- B. Pipe, fittings, valves and accessories shall not be laid or jointed in water. The Utility Contractor is responsible for dewatering of trench.
- C. Pipe, fittings, valves and accessories shall be lowered into their respective positions by suitable means. The materials shall not be dumped or dropped into the trench. A slight hole shall be dug where pipes are to be jointed to relieve pipe bell of any load. Pipe barrel shall be supported for its entire length.
- D. Pipe alignment shall not be deflected greater than the manufacturer's recommended maximum deflection.
- E. Install compression type gaskets in accordance with manufacturer's instructions to ensure proper joint sealing.
- F. Pipe shall be jointed in accordance with manufacturer's instructions. The mating ends (bell and spigot) shall be thoroughly cleaned and soaped before jointing. The mating ends shall be aligned and brought together using a steady force.
- G. Connections of fittings, valves and fire hydrants shall be with bolts and nuts as supplied with the component.
- H. Retaining gland of mechanical joint shall be evenly spaced from the fitting or valve for its entire circumference upon installation.
- I. After jointing pipe, repair any damage to pipe's protective coating in

accordance with manufacturer's instructions or replace pipe.

- J. Place a plug in the open end of uncompleted laid piping at the end of each day. If necessary to backfill over the end of an uncompleted pipeline, the end shall be closed with a mechanical joint plug.
- K. The CCWA Engineer shall observe the water main construction before it is covered. Any covered construction not inspected shall be excavated and the pipe inspected and/or pipe removed before construction continues at the discretion of the CCWA Engineer.
- L. Pipe shall be laid in straight alignment of gradient or follow true curves as nearly as practical.
- M. The Utility Contractor shall excavate, install the pipe and backfill as closely together as possible. Pipe not installed shall not be left in the trench overnight.
- N. A 14 gauge solid wire shall be installed with the pipe. Wire nuts shall be used for all connections.
- O. All joints shall be made in accordance with applicable ASTM and ANSI/AWWA Standards.
- P. Fire hydrants shall be set atop a minimum of eighteen (18) inches of No. 57 stone. Stone shall extend up six (6) inches above drain holes. Stone shall extend eighteen (18) inches to the sides of the hydrant

6.03 Thrust Blocking

- A. Thrust blocking shall be installed at all bends, tees, valves, fire hydrants and points where thrust may develop in pressurized piping.
- B. Thrust blocking shall consist of cast-in-place concrete, tie rods, combinations thereof or other method approved by the CCWA Engineer.
- C. Cast-in-place concrete blocking shall be formed to the required dimensions and installed against undisturbed earth. Blocking size may be increased based on soil bearing capacity.

- D. Concrete shall have a minimum 3,000 psi compressive strength at 28 days. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94.
- E. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 40.
- F. The contractor shall form and pour concrete blockings and thrust restraints per CCWA standard details or as directed by the CCWA Engineer.
- G. Concrete Blocking shall be poured against undisturbed, suitable earth.
- H. Bolts and nuts shall be protected from concrete coverage.

6.04 Meter Box and Vault Installation

- A. Meter boxes shall be installed as follows.
 - 1. Meter box shall be set atop undisturbed or compacted soil. Backfill around box shall be compacted using a hand tamp.
 - 2. Top of meter box shall be set flush with finished grade. Meter box shall not be set in a depression.
 - 3. Soil level within meter box shall be to the bottom of the meter assembly and free of debris.
- B. Meter vaults shall be installed as follows.
 - 1. Meter vault shall be bedded atop undisturbed or compacted soil. Backfill around vault shall be compacted in accordance with these specifications.
 - 2. Vaults shall be set atop a minimum six (6) inch layer of No. 57 stone that extends a minimum of twelve (12) inches beyond the outside face of all walls.
 - 3. The bedding of No. 57 stone may be replaced with a six (6) inch layer of steel reinforced cast-in-place concrete.
 - 4. The stone filled sump beneath vault drain shall be fully encased in a geofabric membrane.

5. The bed shall be prepared so that vault is set level.
6. Annulus between pipe and wall openings shall be bricked and grouted with non-shrink grout prior to commencing backfill operations.
7. Prior to installing vault cover, tongue-and-grooved ends shall be cleaned free of dirt and debris.
8. Tongue-and-grooved ends shall be fitted with preformed gasket sealing compound.
9. Vault lid lifting holes shall be sealed using non-shrink grout throughout the entire depth of hole.
10. Vault shall be kept free of dirt and debris.
11. Top of vault lid shall be set three (3) inches above finished grade. Vault shall not be set in a depression.

6.05 Borings and Casings

- A. The Utility Contractor shall operate well points or drainage systems in the vicinity of the tunnel or casing construction to prevent the accumulation of water in the tunnel or casing and to maintain the groundwater table below the tunnel or casing invert.
- B. Construction shall be performed so as not to interfere with, interrupt or endanger roadway and railway surface and activity thereon, and minimize movement of the surface, structures and utilities above and in the vicinity of the casing.
- C. Work shall be coordinated and be in compliance with the appropriate highway and railroad agencies and their policies.
- D. Contractor shall monitor ground movement during construction. Contractor shall be responsible for all settlement or up heave resulting from casing operations and shall repair and restore moved or damaged property to its original condition.

- E. Work shall not interfere with storm water drainage devices. Storm water and/or groundwater shall be controlled and shall not enter any excavation or boring.
- F. Boring and jacking operations shall be performed from an excavation located at one end of the section to be bored. The excavation shall be kept dry at all times.
- G. Boring and jacking of casings shall be completed by dry auger boring without jetting, sluicing or wet boring. Free boring (boring without casing) shall be prohibited. The boring diameter shall be essentially the same as the outside diameter of the casing.
- H. Horizontal and vertical alignment of the casing shall be frequently checked. If bore is off alignment, then the CCWA Engineer may require the bore be abandoned and re-bored to proper alignment.
- I. When rock is encountered, the Utility Contractor shall continue to install the casing by removing the rock through the casing. If the rock cannot be removed through the casing then an alternate means of crossing shall be evaluated.
- J. Casings damaged during installation shall be repaired. Should the damaged casing prevent the installation of the pipe, then that boring and casing shall be abandoned.
- K. Casing lengths shall be as long as practical. Jointing shall be accomplished by single grooved butt welding for the entire circumference of the pipe.
- L. Casing shall be cleaned free of dirt and debris prior to installing pipe.
- M. After casing installation is complete, the proposed pipe can be installed. The pipe shall be installed to proper grade and alignment according to the contract documents.
- N. A minimum of two (2) spacers shall be provided for each nominal section of pipe. Casing spacers shall be attached to the pipe at a maximum of 18 to 20 foot intervals.
- O. The annulus between the pipe and casing, at each end, shall be sealed as directed by the CCWA Engineer.

- P. After installation the casing shall be cleaned using a cleaning plug if necessary.
- Q. The Utility Contractor shall provide all necessary bracing, bulkheads, shoring or other safety and construction equipment to safely complete the boring work without harming existing infrastructure.
- R. Any abandoned casings shall be filled with concrete grout throughout the casings entire length, in addition all spaces and voids around the casing must be filled with grout.

6.06 Pipe and Valve Identification

- A. Install a 14 gauge solid, detectable wire, during backfill operations. Use wire nuts for all wire connections.
- B. Service lines and valves shall be locatable via marked curbing or other CCWA approved method. Adjacent street curb to service line and valves shall be marked via saw-cut as follows. Curb markings shall be a minimum of four (4) inches in height.
 - 1. “W” for water service location.
 - 2. “V” for water valve location.

SECTION 7: BACKFILL AND COMPACTION

7.01 Backfill

- A. Excavations shall be backfilled using suitable material. Backfill filling of trenches with excavated rock material is not permitted. If necessary, the contractor shall furnish suitable material for backfilling. Suitable backfill material will be determined by the CCWA Engineer.
- B. Place no backfill on thrust blocking until any poured concrete has developed design compressive strength or directed by the CCWA Engineer.
- C. Place backfill in excavations as follows.
 - 1. Initial two (2) feet of backfill above pipe shall be in six (6) inch lifts.
 - 2. Remainder of backfill may proceed in loose lifts not exceeding 6 inches when compacting using manual tamping devices (jumping jack) or in loose lifts not exceeding 12 inches when compacting using vibrating/ramming devices (sheep-foot vibratory roller) or as directed by the CCWA Engineer.
- D. Any settlement shall be filled and compacted to conform with adjacent surfaces.
- E. Material remaining after completion of backfill operations shall be disposed offsite.
- F. Backfill shall commence only after inspection by the CCWA Engineer.

7.02 Compaction

- A. Backfill shall be compacted using devices or methods that in the opinion of the CCWA Engineer are not harmful to the water distribution system and appurtenances.
- B. Compaction requirements are as follows.
 - 1. Backfill, beneath and within 10 feet of the building line of any structure, proposed structure or other area determined by the CCWA, shall be compacted for the entire depth to a minimum of 100% of the maximum dry

density as determined by a Standard Proctor Analysis.

2. Backfill, beneath any road, walk, proposed improvement or area determined by the CCWA shall be compacted for the entire depth to a minimum of 95% of the maximum dry density as determined by a Standard Proctor Analysis. Final twelve (12) inches of backfill shall be crusher-run.

3. Backfill in road right-of-way and not described above shall be compacted the entire depth to a minimum of 90% of the maximum dry density as determined by a Standard Proctor Analysis.

4. Backfill not described above shall be compacted for the entire depth to a minimum of 90% of the maximum dry density as determined by a Standard Proctor Analysis.

C. If the trenches settle, the contractor shall refill and grade the top of the trench to conform to the adjacent surface.

SECTION 8: SITE COMPLETION

8.01 Grading

- A. Grade areas to lines and elevations indicated on drawings or to surrounding surface grades.
- B. Graded areas shall not permit ponding of water.
- C. In areas to receive grassing, redistribute stockpiled topsoil over graded areas to a minimum depth of four (4) inches. Provide additional topsoil to achieve required depth.
- D. Where finish grade meets or abuts curbs, walks or pavement, uphill grades shall be slightly higher than curb or pavement to permit drainage.
- E. Excess soil and debris shall be removed from the jobsite.
- F. Stabilize site in accordance with the approved soil erosion and sedimentation control plan.
- G. The Utility Contractor shall provide a minimum twelve (12) foot shoulder on new streets, as measured from the back of curb or edge of pavement for the installation of underground utilities.
- H. The Utility Contractor shall replace and repair yards to existing conditions or better.

8.02 Replacing Pavement

- A. Existing pavement shall be replaced in accordance to the standards required by Carroll County Roads Department and/or the Georgia Department of Transportation.
- B. Construction shall be performed so as not to endanger roadway activity. Work shall be coordinated and be in compliance with the appropriate road and highway agencies.
- C. Pavement shall be reinstalled immediately after completing backfill operations and compaction requirements.

- D. Curbs shall be replaced for the entire length from control joint to control joint.
- E. Removed pavement shall be disposed offsite.

8.03 Grassing

- A. The Utility Contractor shall replant grass removed or damaged during or due to construction activities.
- B. All grasses planted must be in compliance with the Manual for Erosion and Sediment Control in Georgia, latest edition.
- C. The Utility Contractor is responsible for providing a viable, permanent stand of grass covering a minimum of 95% of the ground.

SECTION 9: TESTING

9.01 General

- A. The following tests shall be performed at the expense of the Utility Contractor.
- B. The Utility Contractor shall provide all necessary materials and testing equipment required to perform required testing of water distribution systems.
- C. Water distribution systems failing the required tests shall be repaired at the expense of the Utility Contractor.
- D. Notify the CCWA Engineer a minimum of forty-eight (48) hours prior to start of testing process to schedule inspection of water distribution system testing.

9.02 Hydrostatic

- A. Water distribution piping shall be subjected to a hydrostatic pressure test.
- B. Pipe shall be flushed free of dirt and debris.
- C. A curb stop or fire hydrant shall be installed at the high point of elevation in the pipe line system to release air.
- D. Water pipe shall be filled with potable water to a minimum pressure of 150 psi or 50 psi above static pressure, which ever is greater. The static pressure shall be determined by the CCWA Engineer. The CCWA Engineer may require a higher pressure test if deemed necessary.
- E. Pressure shall be maintained, without leakage, for a minimum period of two (2) hours, longer testing periods may be required. CCWA may monitor and record hydrostatic pressure test.
- F. Test shall be considered acceptable when the required pressure is maintained for the required testing period.
- G. If leaks are detected, the Utility Contractor shall locate and repair all leaks and retest the water distribution system. Longer testing periods may be required during retesting of the water distribution system.

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SECTION 10: DISINFECTION

10.01 General

- A. All newly installed water distribution piping and piping affected during construction shall be disinfected in accordance with AWWA C651 and Georgia EPD requirements.
- B. The Utility Contractor is responsible for proper disinfection procedures and supplying an appropriate chlorine solution to complete disinfection of the water distribution system.
- C. No water piping system shall be placed in service until written approval is received from the CCWA Engineer.
- D. The Utility Contractor shall be responsible for preventing soil erosion associated with disinfecting procedures.
- E. Notify the CCWA Engineer a minimum of forty-eight (48) hours prior to start of disinfection process to schedule inspection of water distribution system disinfection.
- F. Certified laboratories must meet the requirements as stated in Division I, Section 7.06.

10.02 Initial Flushing

- A. Prior to disinfection, the Utility Contractor shall flush piping system with sufficient water to create a minimum velocity in the pipe of 2.5 ft/s.
- B. Piping shall be flushed until water sampled from the piping is free of dirt and flowing clear.
- C. All piping and components associated with service connections shall be thoroughly flushed with fresh potable water prior to installation.

10.03 Chlorination

- A. The Utility Contractor shall introduce a chlorine solution (Sodium Hypochlorite based) having a concentration sufficient to disinfect the water system. The minimum chlorine concentration shall be in compliance with AWWA C651. Disinfection of the water system shall be achieved using the liquid continuous feed method.
- B. Upon introducing chlorine solution, all valves associated with piping system shall be fully operated to ensure complete disinfection.
- C. The entire piping system shall have a minimum 10 mg/l chlorine residual after a 24-hour retention period.
- D. Disinfection of piping system shall be repeated until the minimum chlorine residual is obtained.
- E. All piping and components associated with service connections shall be thoroughly flushed and disinfected with a sufficient chlorine solution.
- F. The initial chlorine concentration and residual chlorine concentration after the 24-hour retention period shall be verified by the CCWA or other representative approved by the CCWA . Multiple samples shall be taken to ensure exposure of heavily chlorinated water to entire water system. A copy of the test results must be sent directly to the CCWA if other approved representative is used.

10.04 Final Flushing

- A. Final flushing shall be done in accordance with AWWA C651.
- B. After chlorination is complete, the Utility Contractor shall flush the piping system, while neutralizing the heavily chlorinated water, until the chlorine residual in water of the piping system is equal to the chlorine residual in the CCWA water distribution system.
- C. After chlorination is complete, all piping and components associated with service connections shall be thoroughly flushed with fresh potable water.

- D. The Utility Contractor is responsible for neutralizing the heavily chlorinated water used for sterilization and to ensure discharge of water does not harm the environment.

10.05 Bacteria Testing

- A. After final flushing, water samples shall be taken by the CCWA or other CCWA approved representative and analyzed by a certified laboratory for bacteria in the water sample.
- B. Minimum number of bacteria testing sample points shall be determined by the following:
 - 1. Minimum of one (1) sample per 1,200 LF of water main.
 - 2. One (1) sample at each end of water main.
 - 3. Minimum of one (1) sample per each water main branch.
 - 4. As directed by the CCWA Engineer.
- C. At least 24 hours after first set of bacteria tests are taken, a second set of samples shall be taken by the CCWA or other CCWA approved representative and analyzed by the certified laboratory for bacteria in the water sample.
- D. A copy of all test results must be sent directly to the CCWA from the certified laboratory stating results of the bacteria testing.
- E. If the initial disinfection fails to produce satisfactory bacteriological results, the new main may be re-flushed and re-sampled. If these samples also fail to produce acceptable results, the main shall be re-chlorinated and retested until satisfactory results are obtained.

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APPENDIX A

WATER DISTRIBUTION ADDITION SUBMITTAL FORM

General Information

1. Project name: _____
2. Developer's name: _____
3. Design Engineer or Surveyor: _____
State of Georgia License No.: _____ Expiration Date: _____
4. Will development be constructed in phases? Yes ___ No ___
If yes. Current Phase: _____ Total Phases in Development: _____
5. Size of Development (acres): Current Phase: _____ Ultimate: _____
6. Type of Development (Include percentage of total development):
Residential: _____ Commercial: _____ Industrial: _____ Other: _____
(If other, explain) _____
7. Estimated population to be served: _____ Density (pop./acre): _____
8. Proposed number of lots/households: _____
9. Wastewater system serving development:
Individual Septic Tanks ___ Central Sewer ___ Decentralized Sewer ___
If central sewer, provide name of municipal system that will receive development's
wastewater flow: _____
10. Other comments: _____

Water System Information

1. Design water usage (gallons/day): Average: _____ Peak: _____
2. List proposed pipe diameters, pipe material and pipe lengths:

3. Attach copy of fire flow test sheet provided by Carroll County Fire and Rescue.
4. Highest elevation in development (msl): _____
Lowest elevation in development (msl): _____
Elevation of tie-in to CCWA water system (msl): _____
5. Other comments: _____

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APPENDIX B

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____
as principal, hereinafter called Contractor, and

_____ as Surety, hereinafter called Surety, are firmly bound unto
CARROLL COUNTY WATER AUTHORITY
as Obligee, hereinafter called Owner, in the penal sum of

(\$ _____), for the payment whereof the Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has installed a water system and other improvements known as _____
in accordance with plans and specifications presented to the Owner (the "Improvements").

NOW, THEREFORE, the condition of this obligation is such that, if Contractor shall remedy all defects due to faulty materials or workmanship, and pay for such damage to other work resulting therefrom, which shall appear with a period of 1(One) years from the date of acceptance of the Improvements by Owner; then this obligation to be void, otherwise to remain in full force and effect.

The date of acceptance of the Improvements is _____,

PROVIDED, HOWEVER that Owner shall give Contractor and Surety notice of observed defects with reasonable promptness.

SIGNED and sealed this _____ day of _____, _____.

In the presence of:

Witness

Principal

(Seal)

By: _____

Title: _____

Witness

Surety

(Seal)

By: _____

Title: _____

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APPENDIX C

WAIVER AND SUBORDINATION OF LIEN

STATE OF GEORGIA
COUNTY OF CARROLL

WHEREAS, the undersigned, _____,
(hereinafter referred to as the "Undersigned") has furnished or has contracted to furnish labor, services and/or materials (hereinafter collectively referred to as the "Work") in connection with the improvements of certain real property located in _____ County, Georgia, (said real property being more particularly described in Exhibit "A" attached hereto and by reference made a part hereof, and being hereinafter referred to as the "Property") which property is owned by **CARROLL COUNTY WATER AUTHORITY**; and

NOW, THEREFORE, for and in consideration of the Authority's acceptance of the water system constructed on the Property, and other good and valuable consideration, the receipt and sufficiency whereof are hereby acknowledged, and in order to induce the acceptance by the Authority of the abovementioned improvements, the Undersigned does hereby:

(a) Waive and release any lien or right to lien to the Undersigned on or against said Property on account of Work furnished by the Undersigned for the improvements of said Property on or before the date hereof; and

(b) In the event of lender financing, subordinate any lien or right to lien of the Undersigned on or against said Property to the lien and title of any lender in and to said Property (as granted by lender by the documents evidencing and securing the abovementioned loan) on account of Work furnished by the Undersigned for the improvement of said Property after the date hereof; and

(c) Warrant and represent that any and all parties who have supplied Work to the Undersigned for the improvements of said Property have been paid in full and all amounts accrued by virtue of such Work though and including the date hereof; and

(d) Warrant and represent that the Undersigned (or the individual executing this instrument on behalf of the Undersigned) has personal knowledge of the matters herein stated, and is authorized and fully qualified to execute this instrument as or on behalf of the Undersigned; and

(e) Covenant and agree that this instrument is made in consideration of the payment of the aforesaid sums to the Undersigned, and pursuant to the statutes of the State of Georgia with respect to the liens of laborers and materialmen.

WITNESS the hand and seal of the Undersigned, this the _____ day of _____, 20____.

Undersigned:

(Seal)

Name:

Title

Signed, sealed, sworn to and
subscribed before the undersigned
unofficial witness and notary public

Unofficial Witness

Notary Public
My Commission Expires

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Appendix D

Water Plan Guidelines

As a minimum the following information should be used in preparing and shown on water distribution system construction plan submittals:

1. Project name and Professional Engineer or Registered Land Surveyor stamp on each sheet with their signature across stamp.
2. Developer/Owner name, address and telephone number.
3. Design Engineer/Surveyor name, address and telephone number.
4. Detailed project site location map with street names and North arrow.
5. Site plan showing streets, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow, and water system layout.
6. Detailed plans of the location and the construction of water mains, valves, fire hydrants and appurtenances.
7. Show existing and proposed ground elevations contours (2 foot intervals) in gray scale.
8. Existing water main route and sizes surrounding project.
9. Existing fire hydrants and valves surrounding project.
10. Proposed water main route, including material and size of mains.
11. Proposed water main tie-in location and details.
12. Show all proposed service connections and water meters, including size of service.
13. Water mains, valves, fire hydrants, meters and other appurtenances shall be located and shown as required by the specifications.
14. Thrust blocks at all bends and tees.
15. Show all utilities in the project area that are a potential for conflict with the water system.
16. Show all easements, sized as required by the specifications.
17. Show fire flow information on the plans as provided by the local fire department.
18. Proposed bore locations indicating casing size, material and length.

19. Show all appropriate CCWA Construction Details.
20. Construction plans shall be drawn at an appropriate engineering scale (min. 1" = 100') that shows details as required for proper review of plans.
21. Maximum sheet size: 24 inches x 36 inches (22 inches x 34 inches preferred)

The following notes should appear on the construction plans:

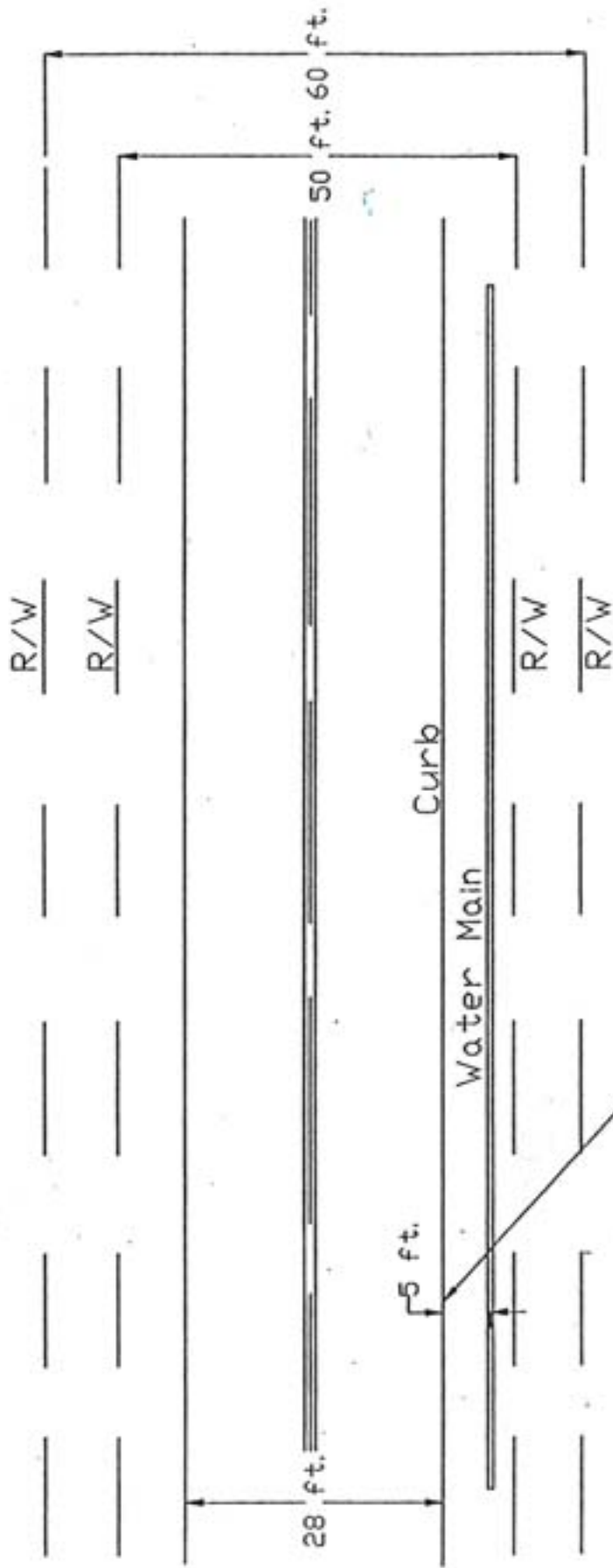
1. All materials and work shall be in accordance with CCWA Standards and Specifications.
2. Prior to the commencement of a project, the Developer and Utility Contractor shall attend a pre-construction conference.
3. CCWA Project Inspectors shall be notified a minimum of forty-eight (48) hours prior to the start of water system installation.
4. CCWA Project Inspectors shall be notified a minimum of twenty-four (24) hours prior to the delivery of any materials.
5. CCWA Project Inspectors shall be notified a minimum of forty-eight (48) hours prior to the disruption of water service. The Utility Contractor shall notify the affected public a minimum of twenty-four (24) hours prior to the disruption of water service. No connections are to be made to water mains after 2 p.m.
6. All fire hydrants shall have an isolation valve between the fire hydrant and water main.
7. All water mains shall be installed five (5) feet behind the back of curb or edge of pavement or as directed by the CCWA Engineer.
8. Water main piping shall not be installed until curb and gutter is installed.
9. All water lines shall have four (4) feet of cover unless directed otherwise by the CCWA Engineer.
10. Water mains larger than two (2) inches in diameter shall be ductile iron.
11. Two (2) inch PVC water mains shall be SDR 13.5, 315 psi.
12. Developer shall install all water services up to and including meter boxes.
13. All services lines shall be copper tubing and sized in accordance with CCWA specifications.
14. All long side water services shall be encased in two (2) inch PVC pipe.
15. All water mains crossing roads or drains shall be encased in steel casing in accordance with CCWA specifications.
16. All carrier pipes within casing shall use either restrained joint ductile iron pipe and/or utilize prefabricated spacers.
17. All ends of casing shall be sealed per CCWA specifications.
18. All service boxes and fire hydrants shall be set at property lines.
19. All service boxes shall be set ten (10) feet from the back of curb within residential subdivision developments.

20. No valve or fittings shall be installed under pavement, including curb and gutter.
21. Fourteen (14) gauge insulated wire shall be installed with water main for tracer wire. Use wire nuts to make all connections.
22. A chlorination tap shall be made within ten (10) feet of the connection point to the existing water system.

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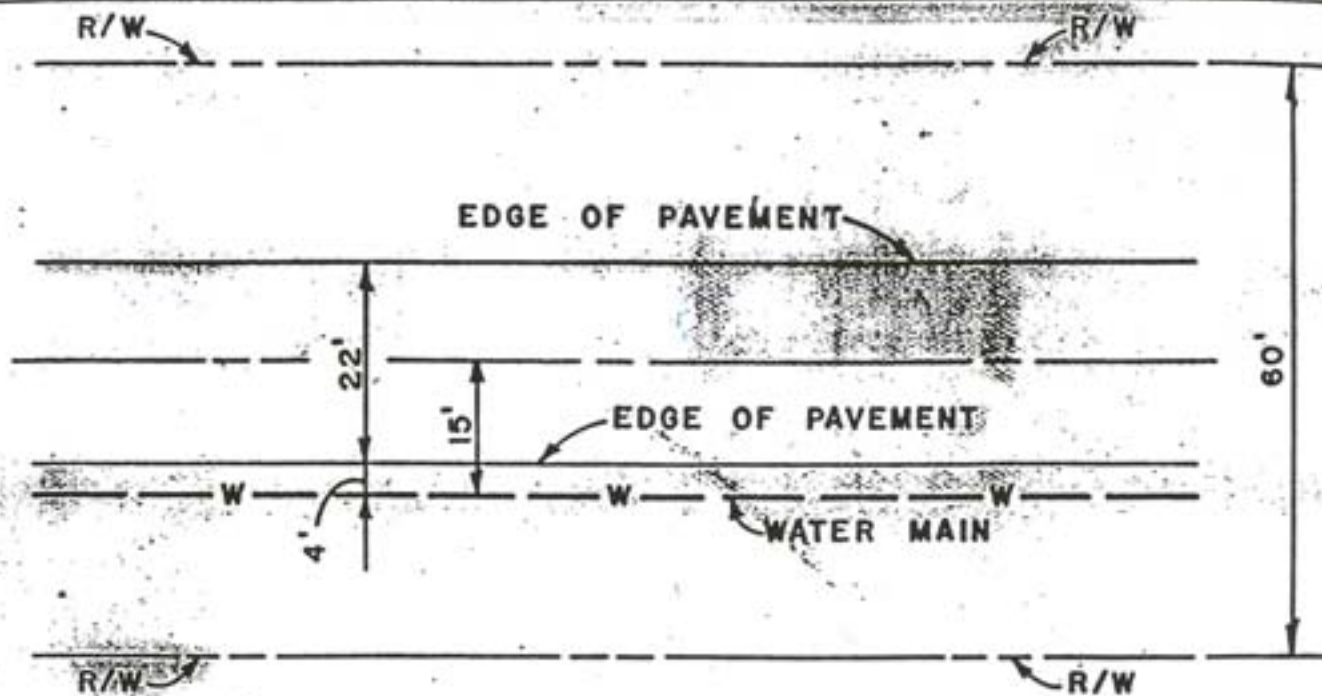
Water Main Location

(Roadway with curb and gutters)

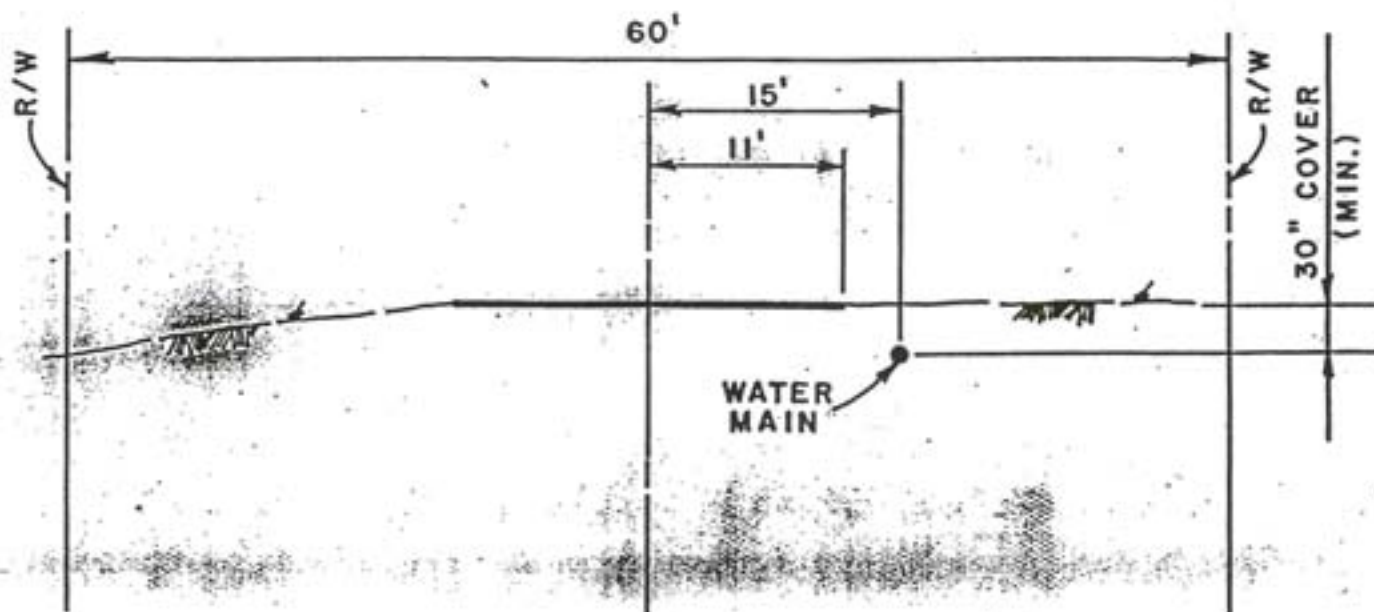


All measurements for main and services
measure from back of curb

NOTE: for 50 ft. or 60 ft. R/W
install main 5 ft. from back of curb

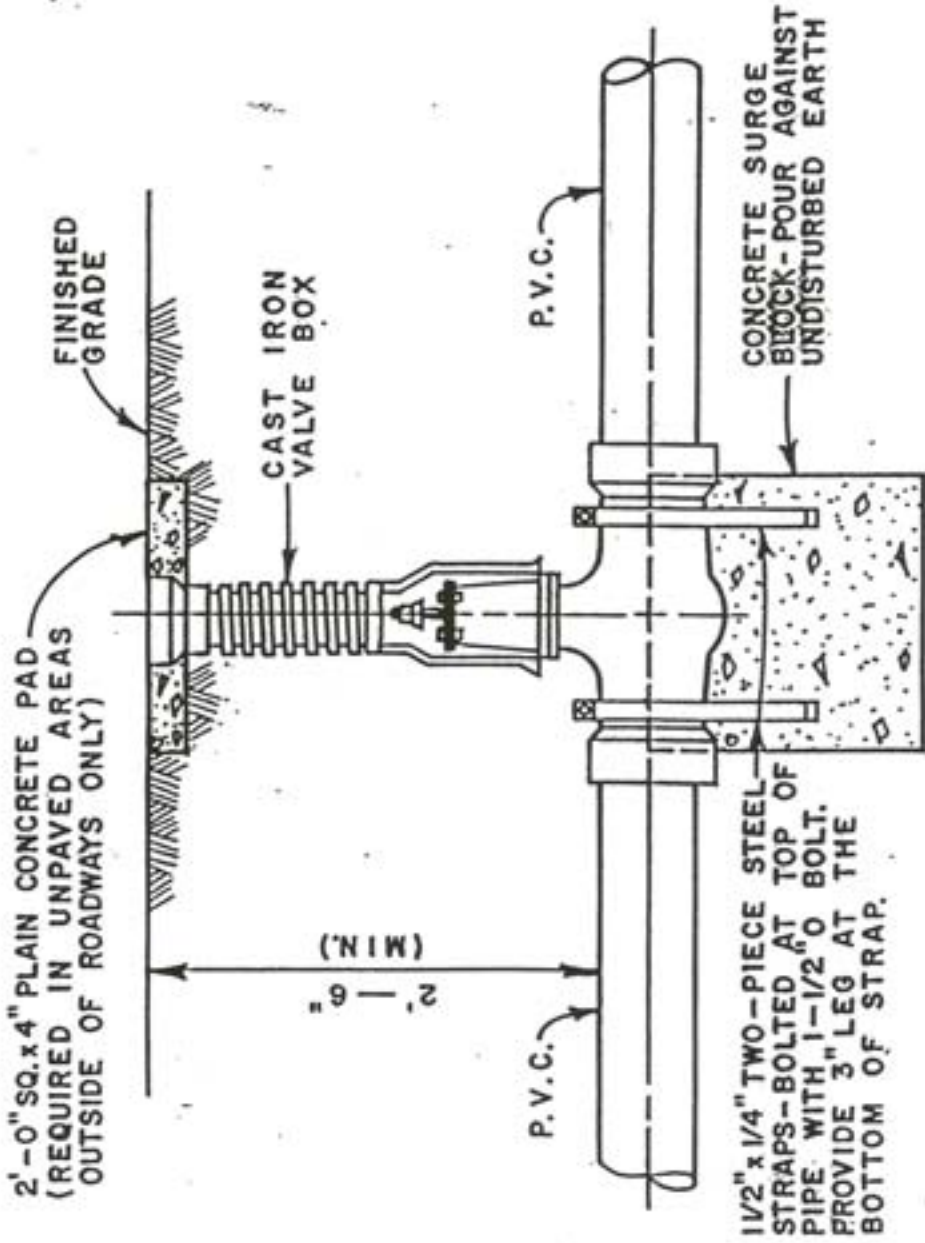


PLAN
1" = 20'-0"

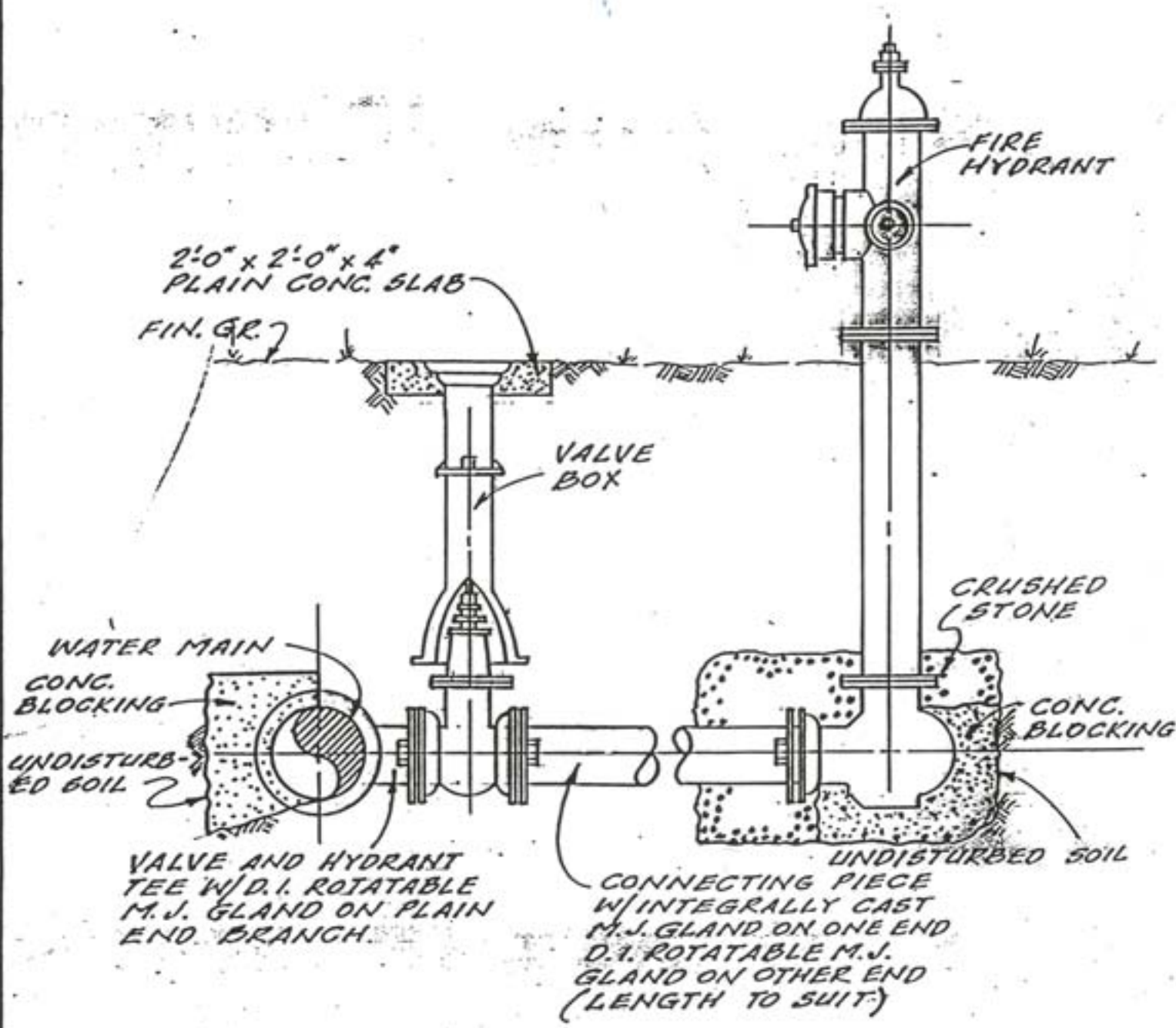


SECTION
1" = 10'-0"

WATER MAIN LOCATION
(ROADWAY WITHOUT CURB AND GUTTER)

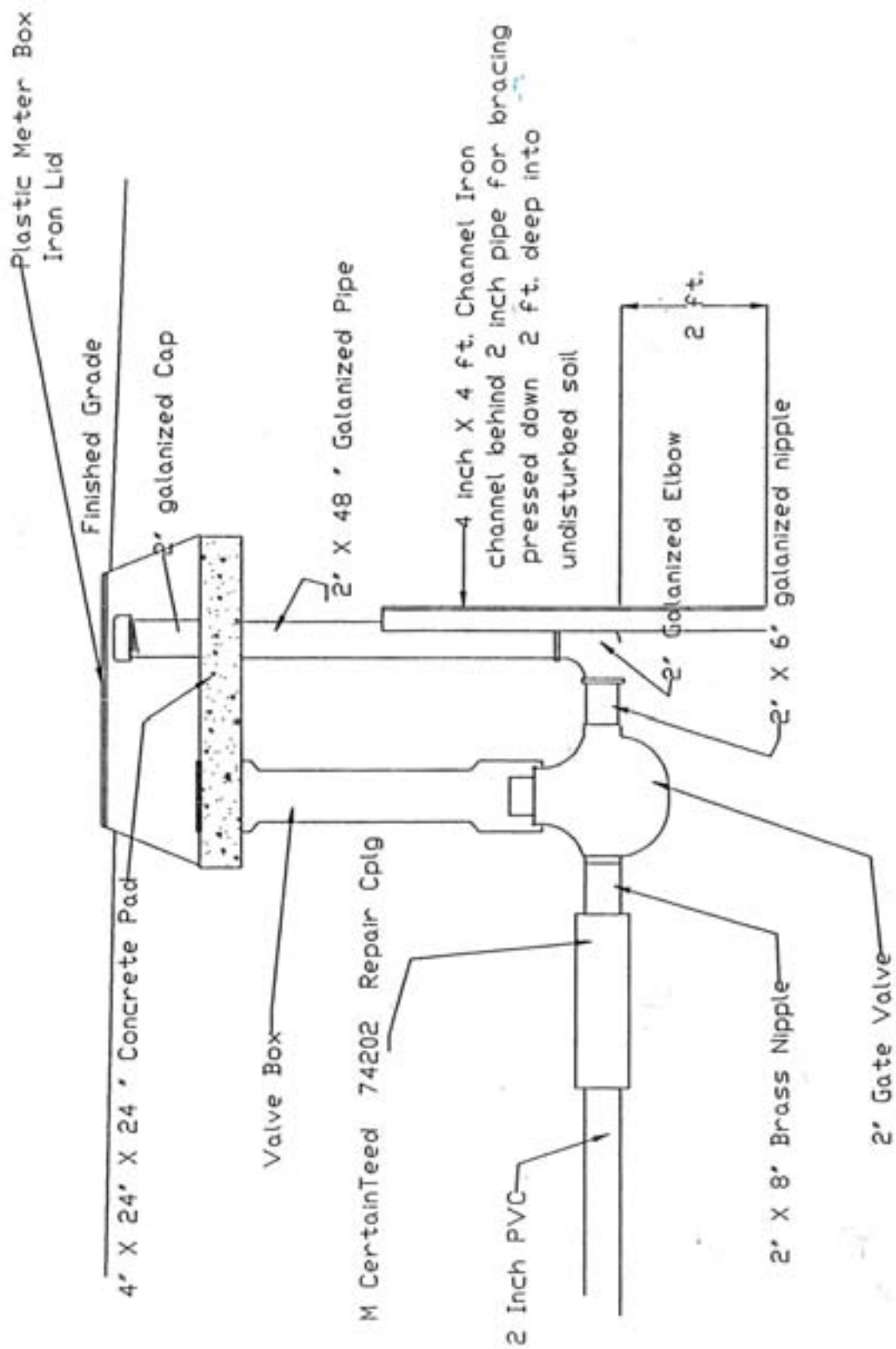


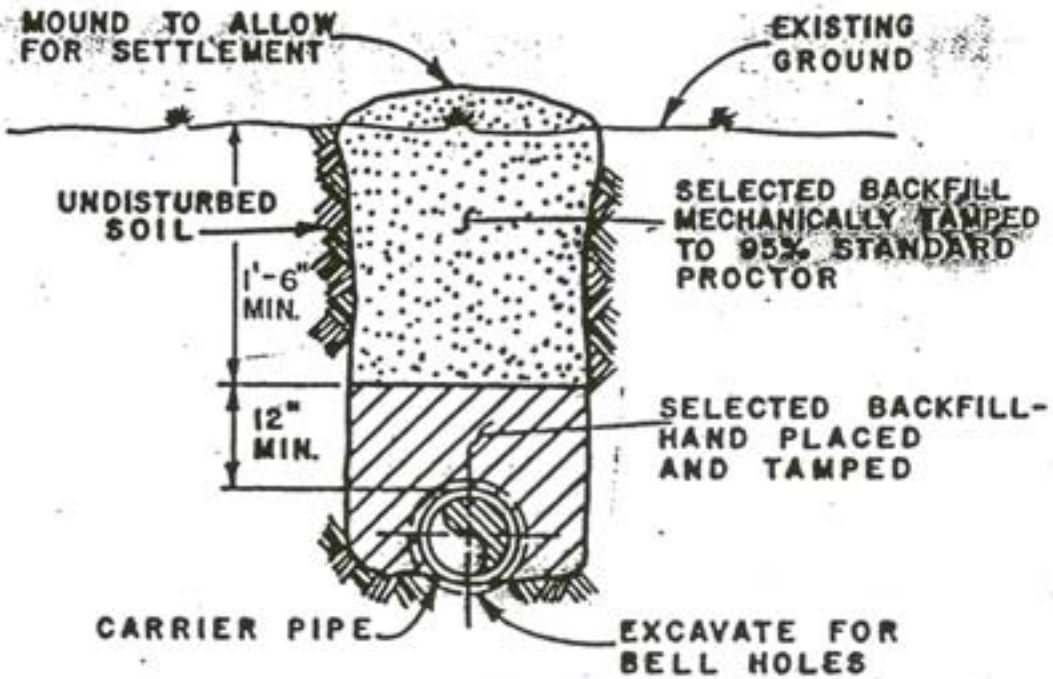
**TYPICAL GATE VALVE
INSTALLATION DETAIL**
N.T.S.



FIRE HYDRANT DETAIL

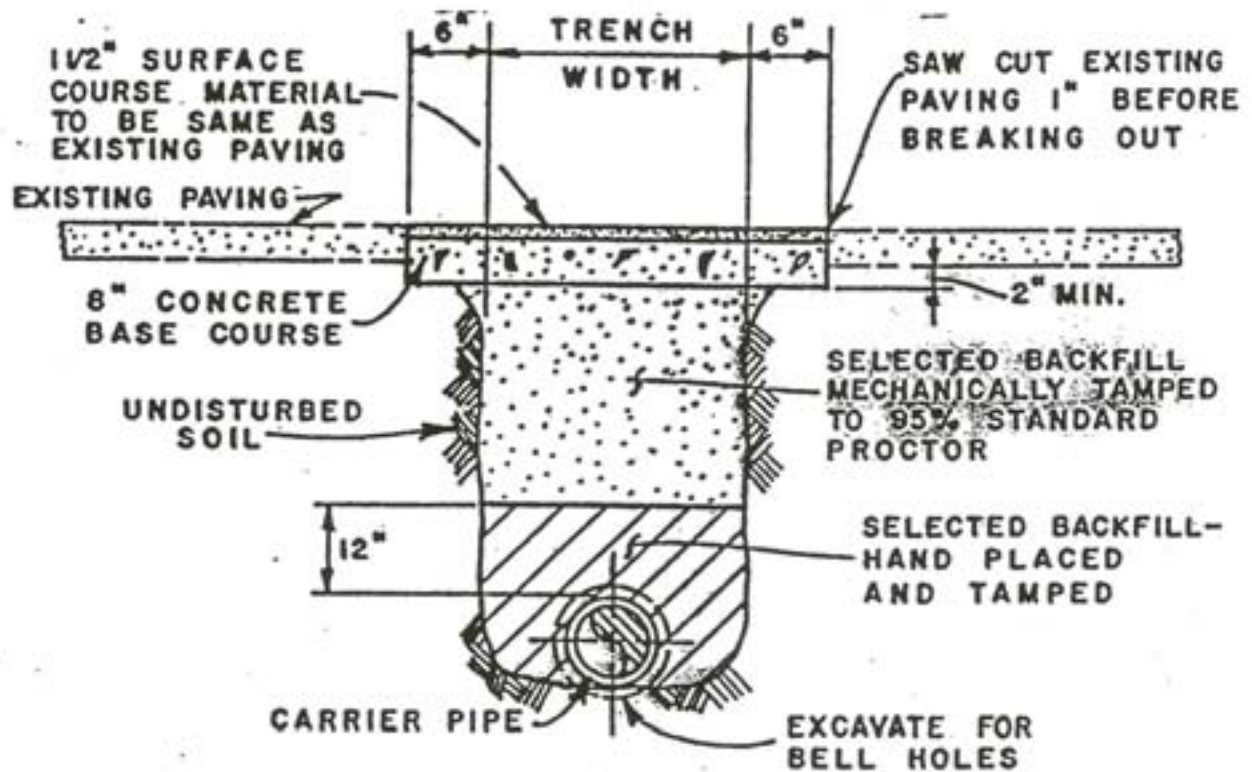
Flush Valve Assembly





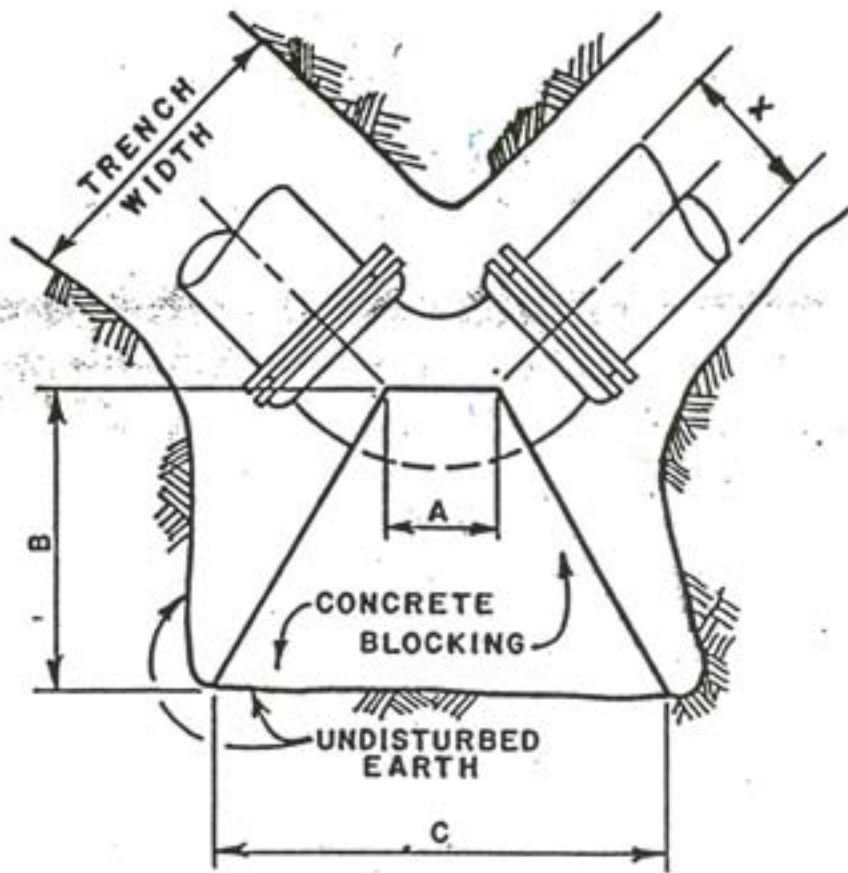
TYPICAL BEDDING DETAIL

N.T.S.

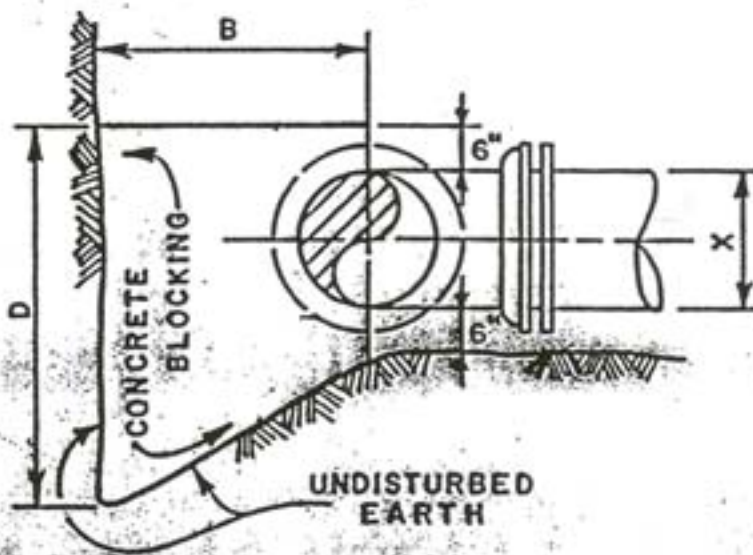


TYPICAL PAVEMENT PATCH

N.T.S.



BEND

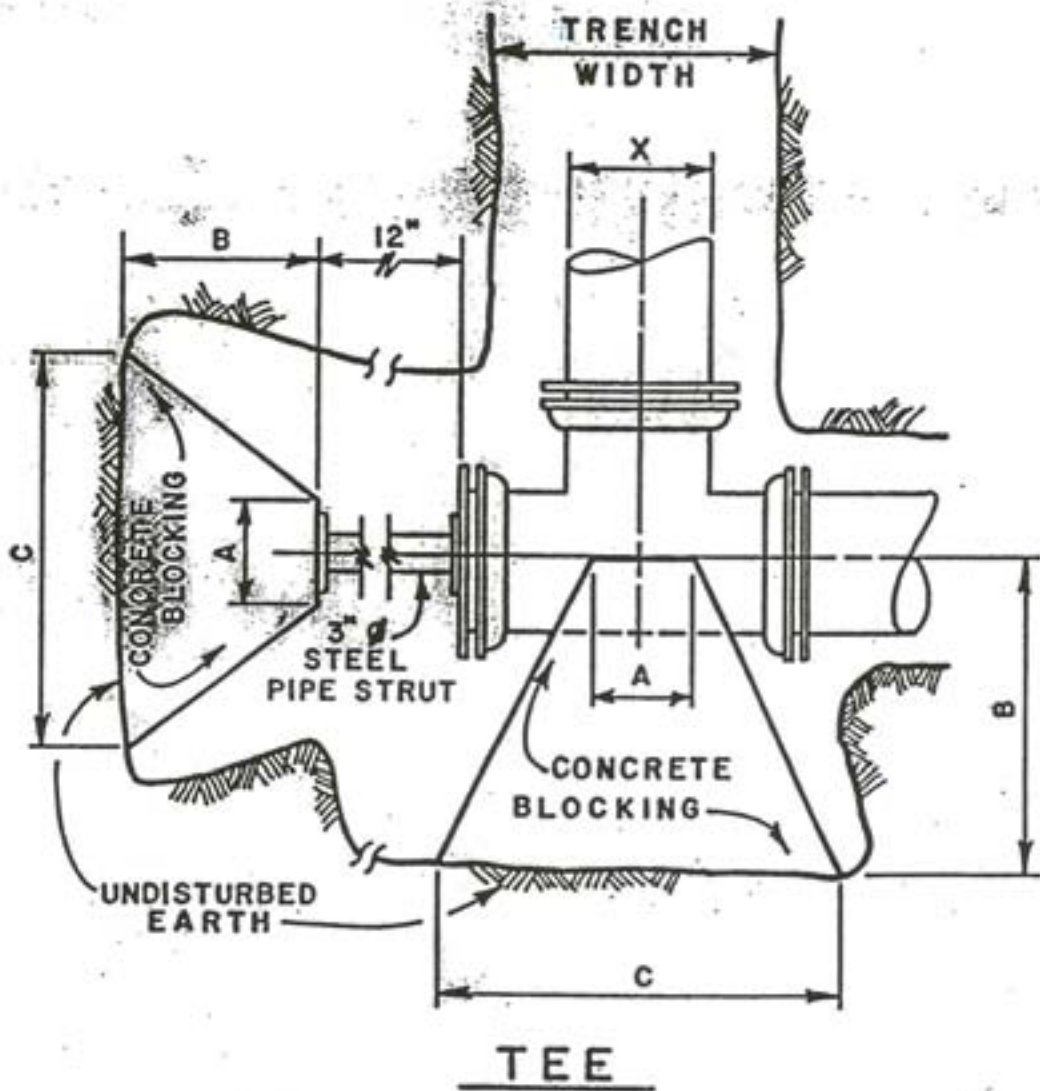


SECTION

CONCRETE BLOCKING DIMENSIONS

X	A	B	C	D
90° BENDS				
12"	1'-2"	2'-7"	4'-3"	3'-0"
10"	1'-0"	2'-0"	3'-2"	2'-10"
8"	8"	2'-5"	2'-2"	2'-8"
6"	6"	2'-4"	1'-4"	2'-6"
45° BENDS				
12"	6"	2'-6"	2'-4"	3'-0"
10"	5"	2'-5"	1'-9"	2'-10"
8"	4"	2'-4"	1'-2"	2'-8"
6"	3"	2'-3"	9"	2'-6"
22 1/2° BENDS				
12"	6"	2'-6"	1'-2"	3'-0"
10"	5"	2'-5"	10"	2'-10"
8"	4"	2'-4"	8"	2'-8"
6"	3"	2'-3"	4"	2'-6"
11 1/4° BENDS				
12"	6"	2'-6"	8"	3'-0"
10"	5"	2'-5"	5"	2'-10"
8"	4"	2'-4"	4"	2'-8"
6"	3"	2'-3"	3"	2'-6"
PLUGS				
12"	1'-0"	2'-6"	3'-10"	3'-0"
10"	1'-0"	2'-5"	2'-10"	2'-10"
8"	1'-0"	2'-4"	1'-10"	2'-8"
6"	1'-0"	2'-3"	1'-2"	2'-6"

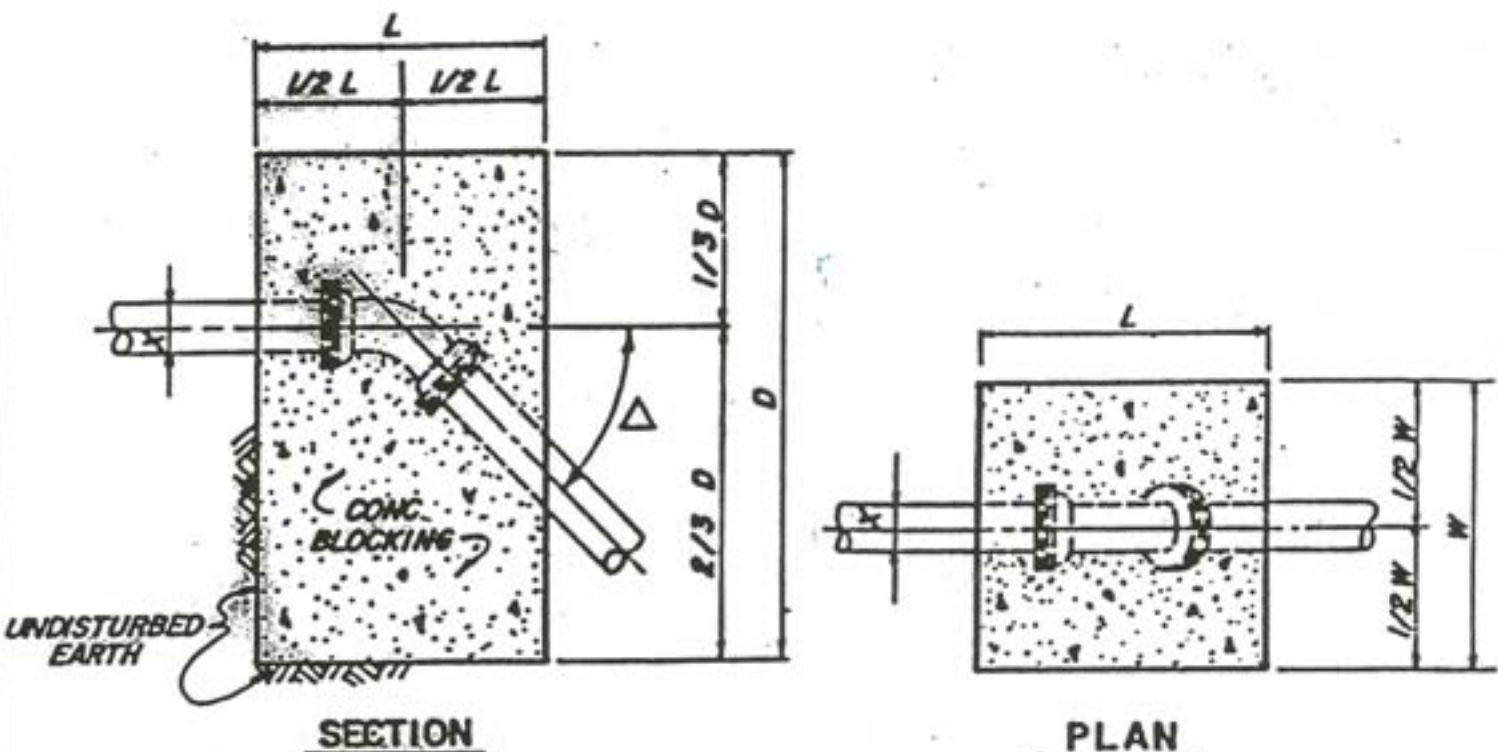
SOIL PRESSURE AT 2500 PSF
TEST PRESSURE 200 PSI



CONCRETE BLOCKING DIMENSIONS

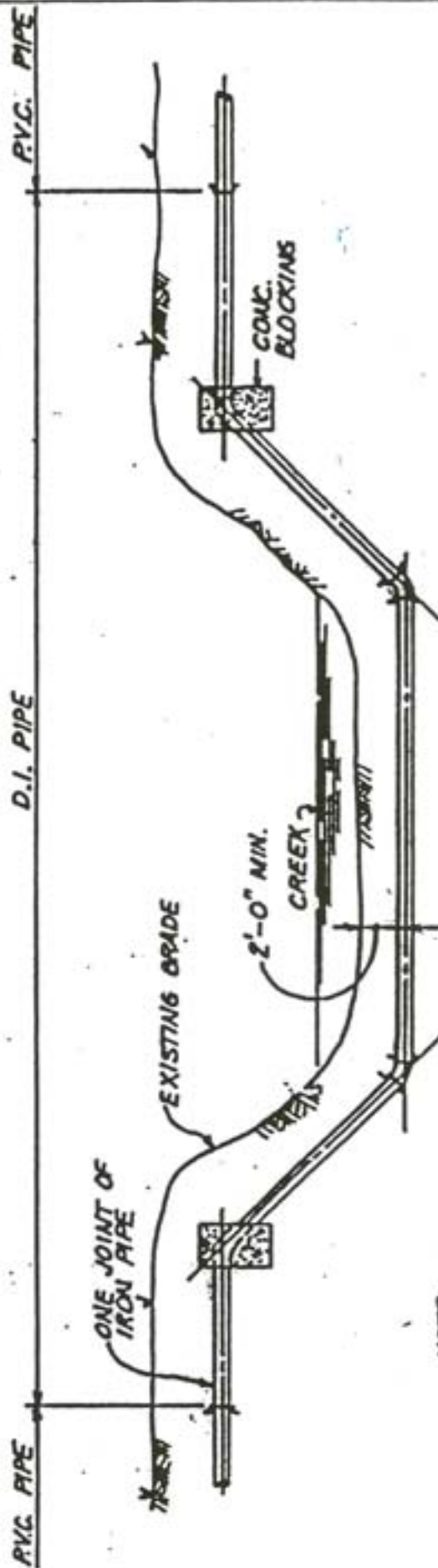
X	A	B	C	D
TEES — 12" RUN				
12"	1'-2"	2'-6"	3'-0"	3'-0"
10"	1'-0"	2'-5"	2'-3"	2'-10"
8"	10"	2'-4"	1'-6"	2'-8"
6"	8"	2'-3"	1'-0"	2'-6"
TEES — 10" RUN				
10"	1'-0"	2'-5"	2'-3"	2'-10"
8"	10"	2'-4"	1'-6"	2'-8"
6"	8"	2'-3"	1'-0"	2'-6"
TEES — 8" RUN				
8"	10"	2'-4"	1'-6"	2'-8"
6"	8"	2'-3"	1'-0"	2'-6"
TEES — 6" RUN				
6"	8"	2'-3"	1'-0"	2'-6"

SOIL PRESSURE AT 2500 PSF
 TEST PRESSURE 200 PSI



DETAILS OF
VERTICAL BLOCKING
N.T.S.

CONCRETE BLOCKING DIMENSION				
Δ	X	W	L	D
CLASS 250				
45°	6"	2'-6"	3'-0"	4'-0"
22 1/2°	6"	2'-0"	2'-6"	3'-3"
11 1/4°	6"	1'-9"	2'-0"	2'-6"
CLASS 200				
45°	6"	2'-0"	3'-0"	4'-0"
22 1/2°	6"	2'-0"	2'-3"	3'-0"
11 1/4°	6"	1'-6"	2'-0"	2'-6"
CLASS 160				
45°	6"	2'-0"	2'-6"	3'-9"
22 1/2°	6"	2'-0"	2'-0"	3'-0"
11 1/4°	6"	1'-6"	2'-0"	2'-0"



NOTE:

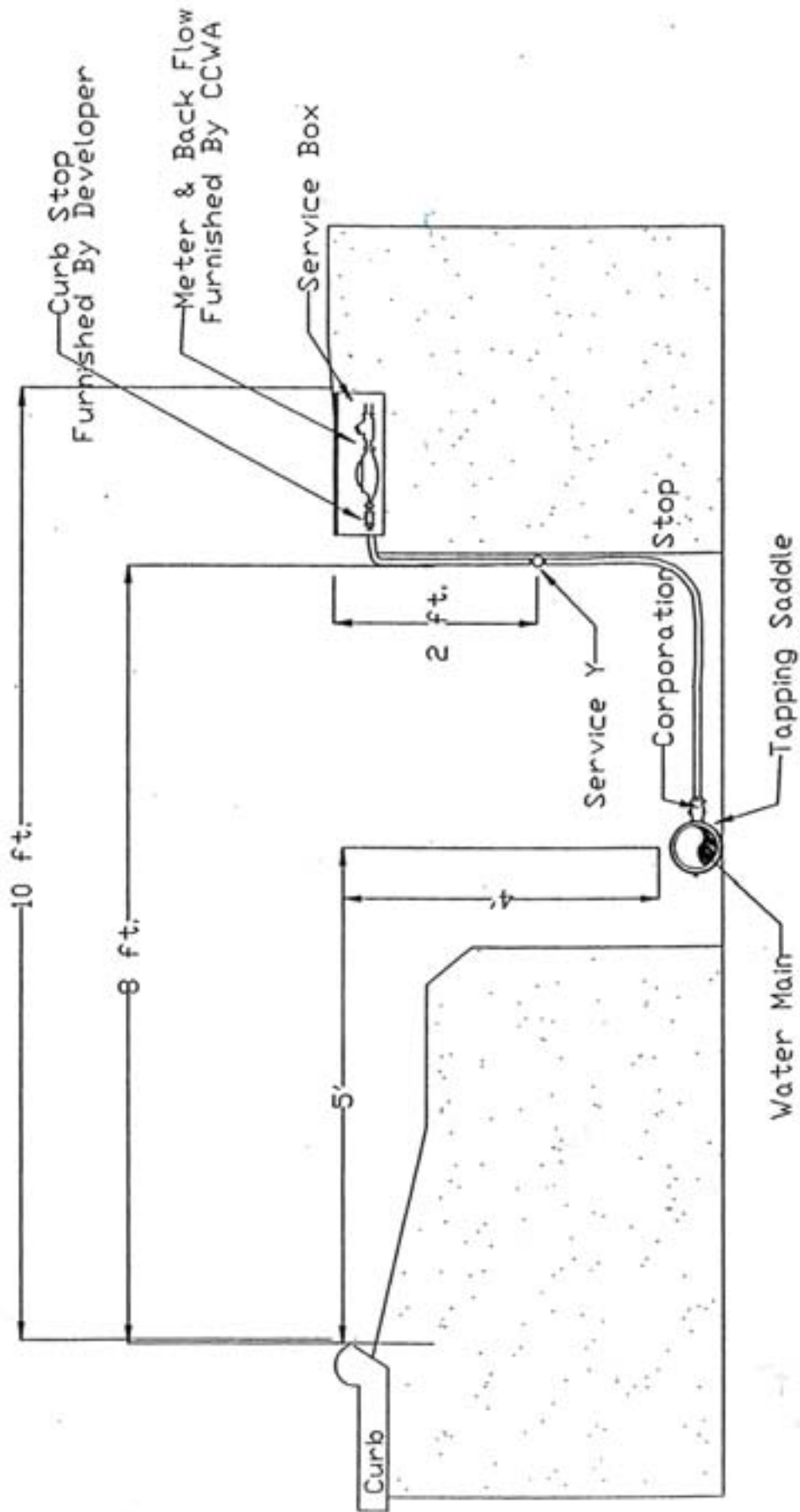
VERTICAL BENDS MAY BE OMITTED PROVIDED THAT THE PIPELINE CAN BE INSTALLED WITHOUT EXCEEDING THE MAXIMUM ALLOWABLE PIPE JOINT DEFLECTION AS RECOMMENDED BY MANUFACTURER. IN SUCH CASES DI PIPE WILL BE REQUIRED UNTIL THE NORMAL COVER CAN BE ATTAINED. LOCATIONS OF DI PIPE TO BE DETERMINED BY ENGINEER IN FIELD.
 PVC PIPE MAY BE INSTALLED IN STEEL CASING

TYPICAL CREEK CROSSING DETAIL

N-T-8

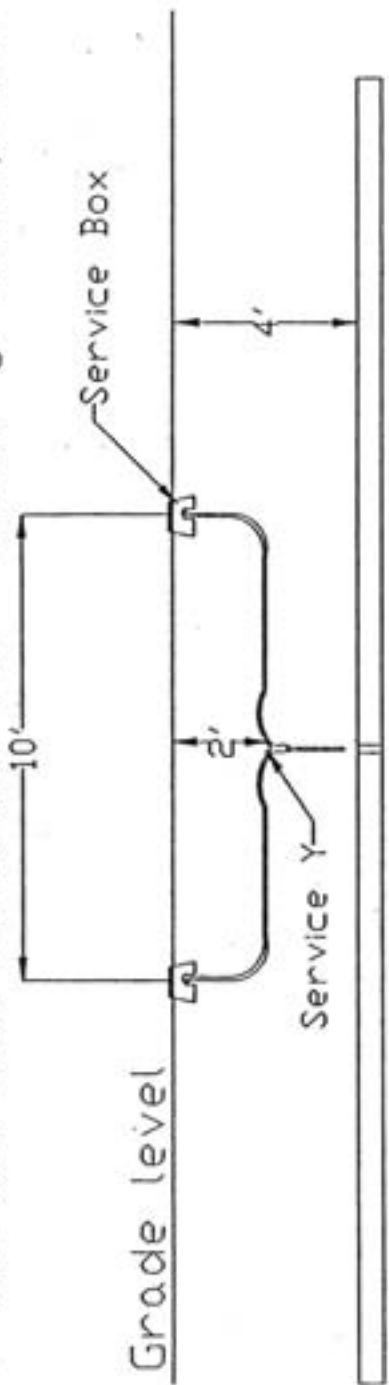
Service Connection

End View

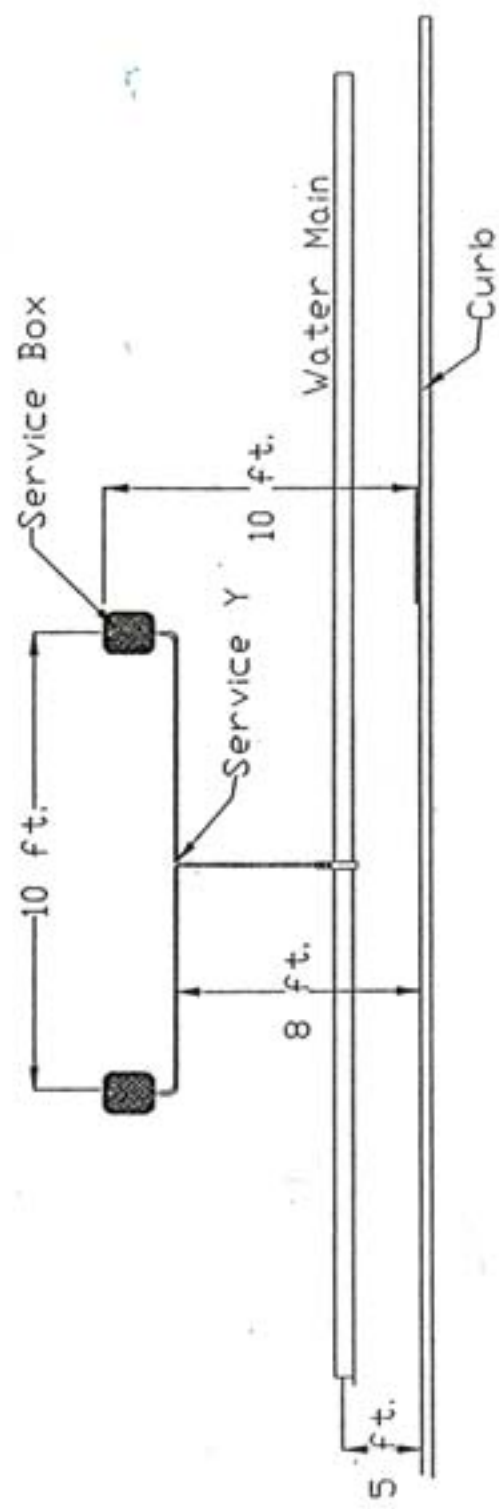


NOTE: services connection by developer
Meter by CCWA

Service Box Location for under ground power



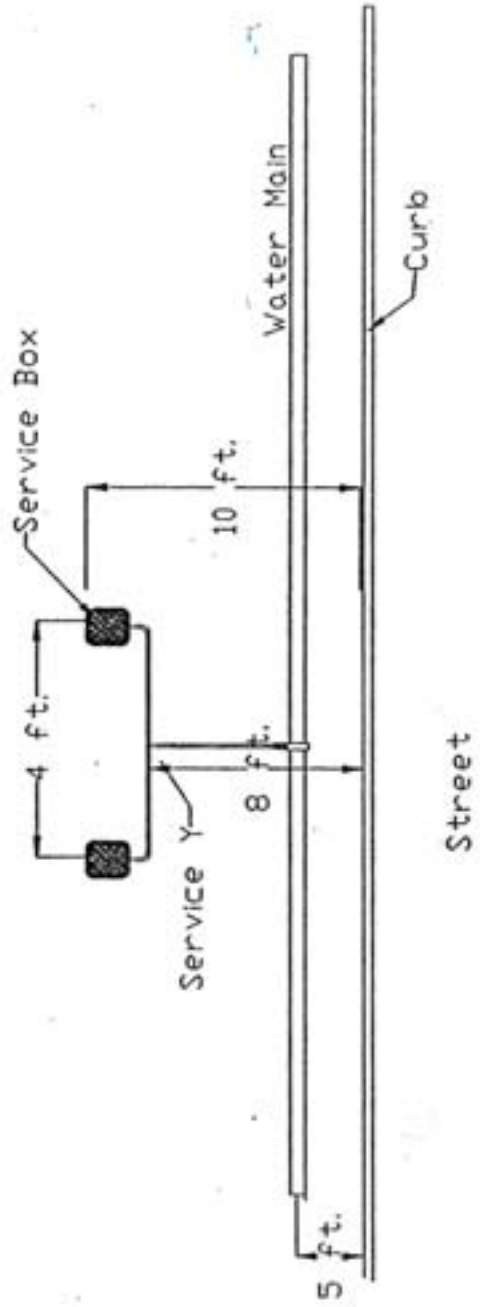
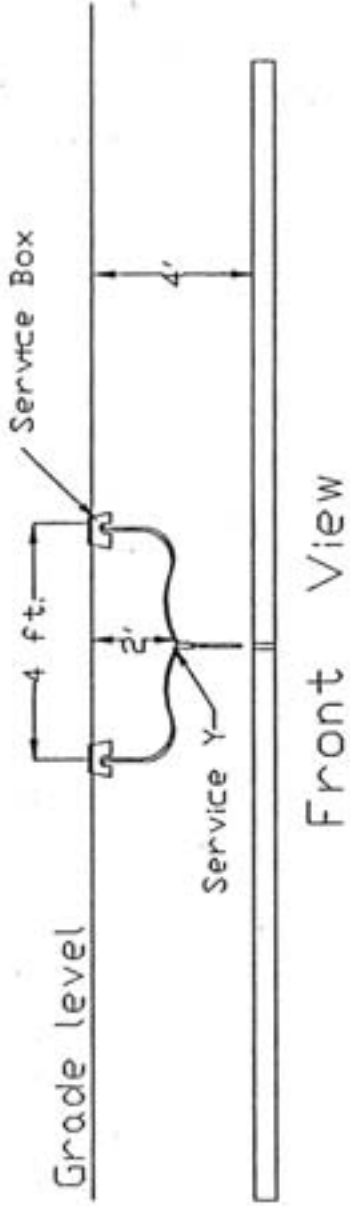
Front View

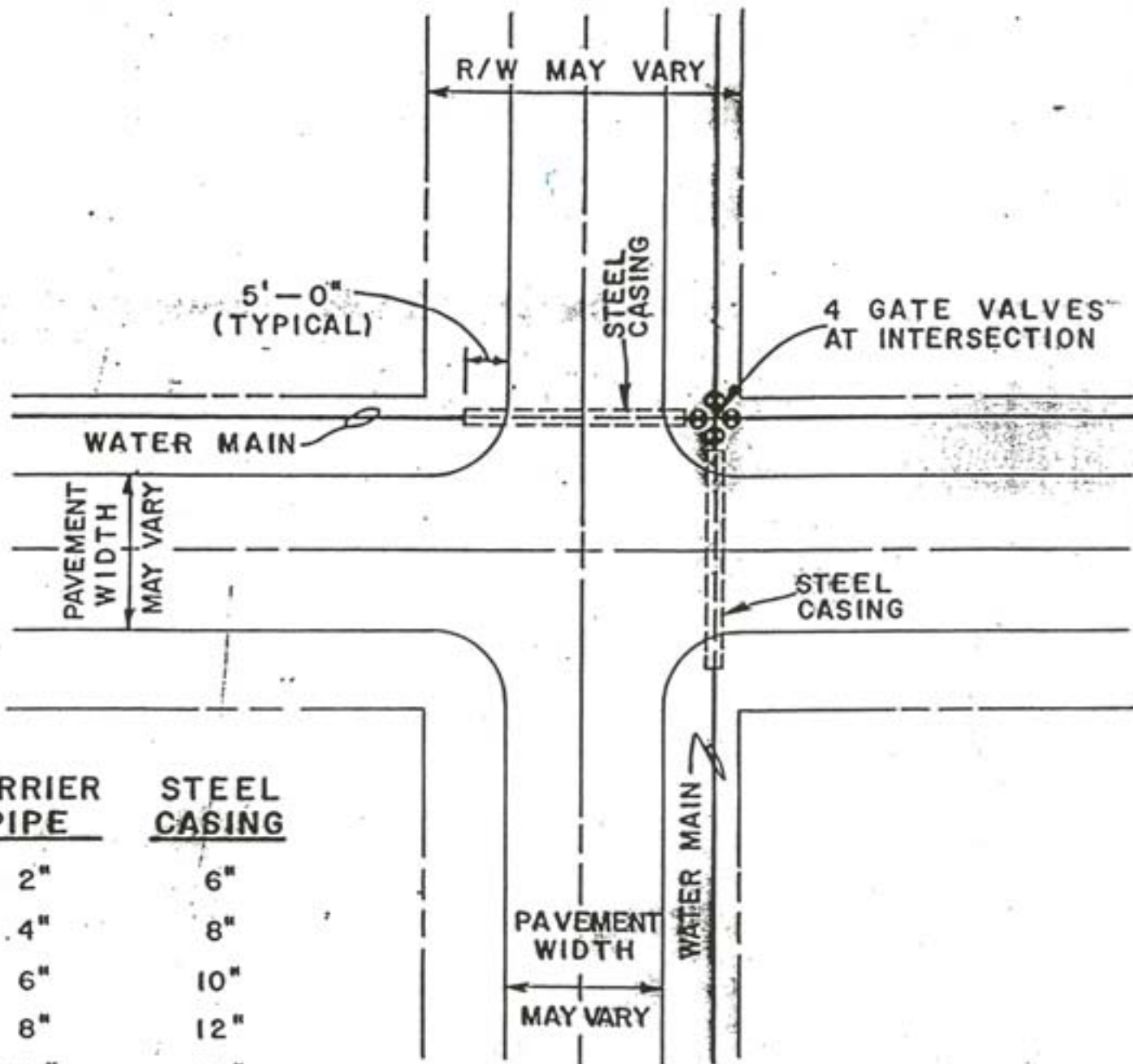


Street

Over Head View

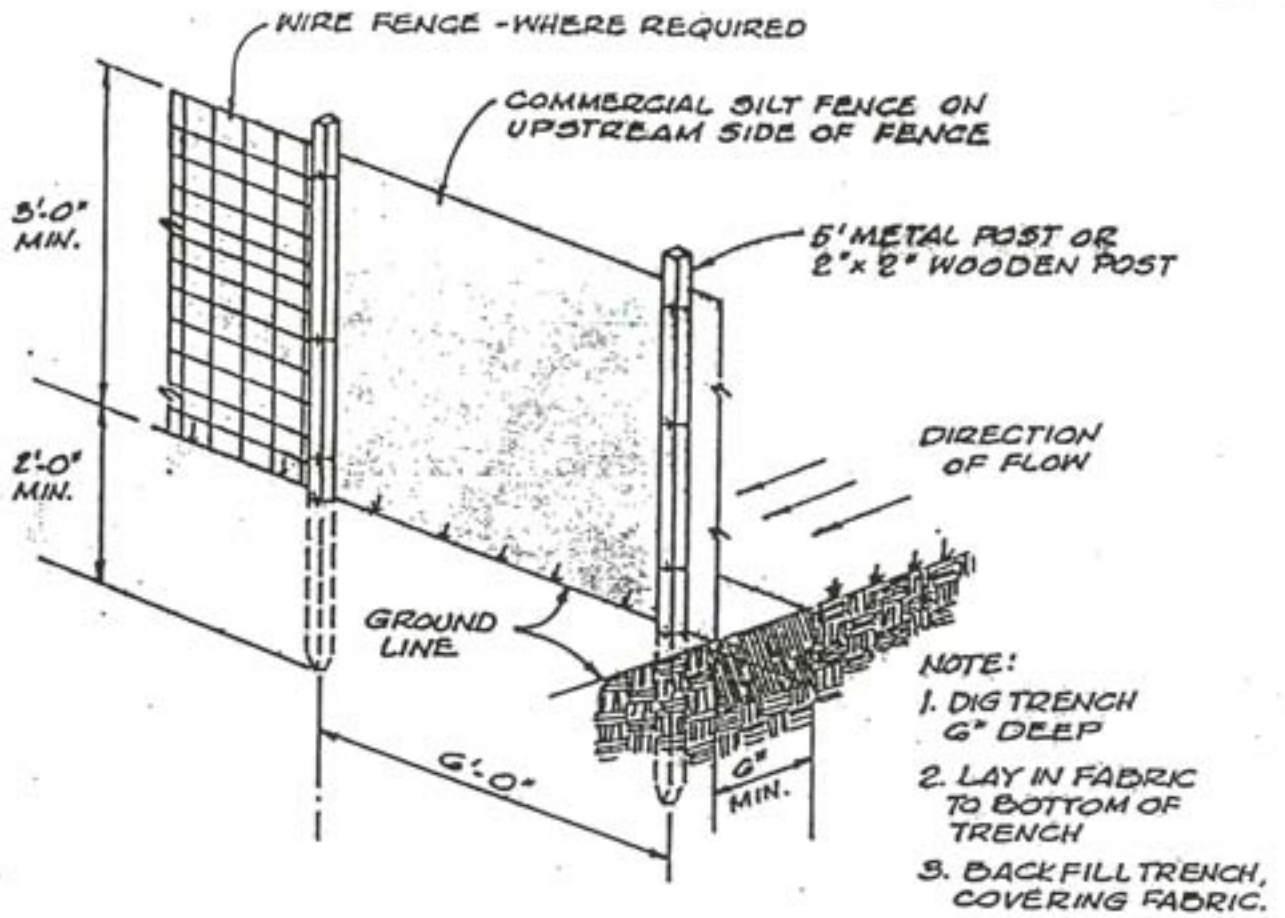
Service Box Location for above ground power



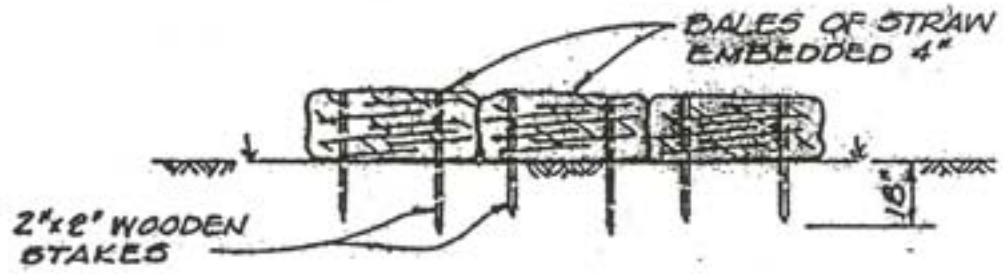


CARRIER PIPE	STEEL CASING
2"	6"
4"	8"
6"	10"
8"	12"
10"	16"
12"	18"

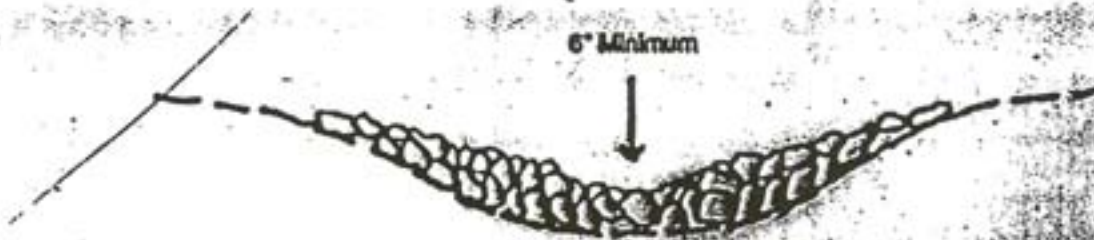
TYPICAL WATER MAIN
CROSSING PAVED STREETS



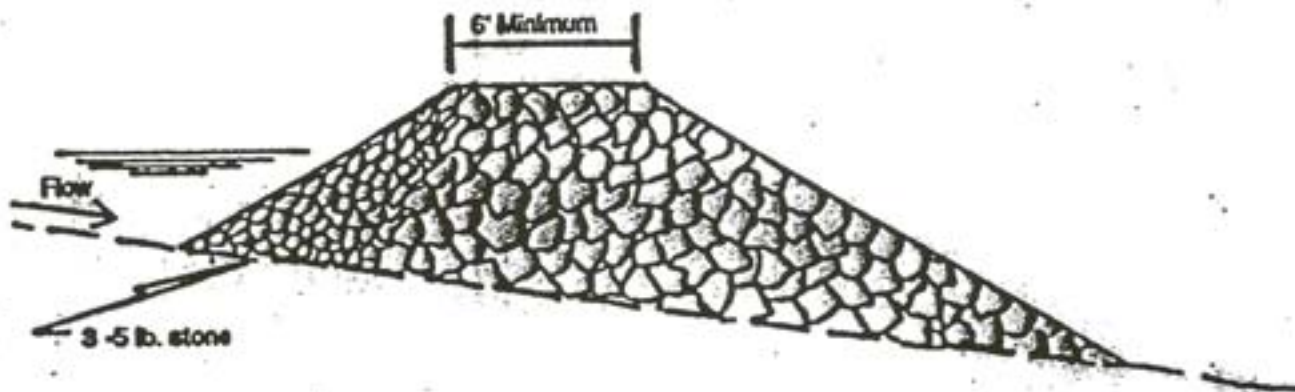
TYPE I (Sdl) **SILT FENCE DETAIL**
 PERSPECTIVE N.T.S.



TYPE 2 (Sdl) **BALE STAKING DETAIL**
 N.T.S.



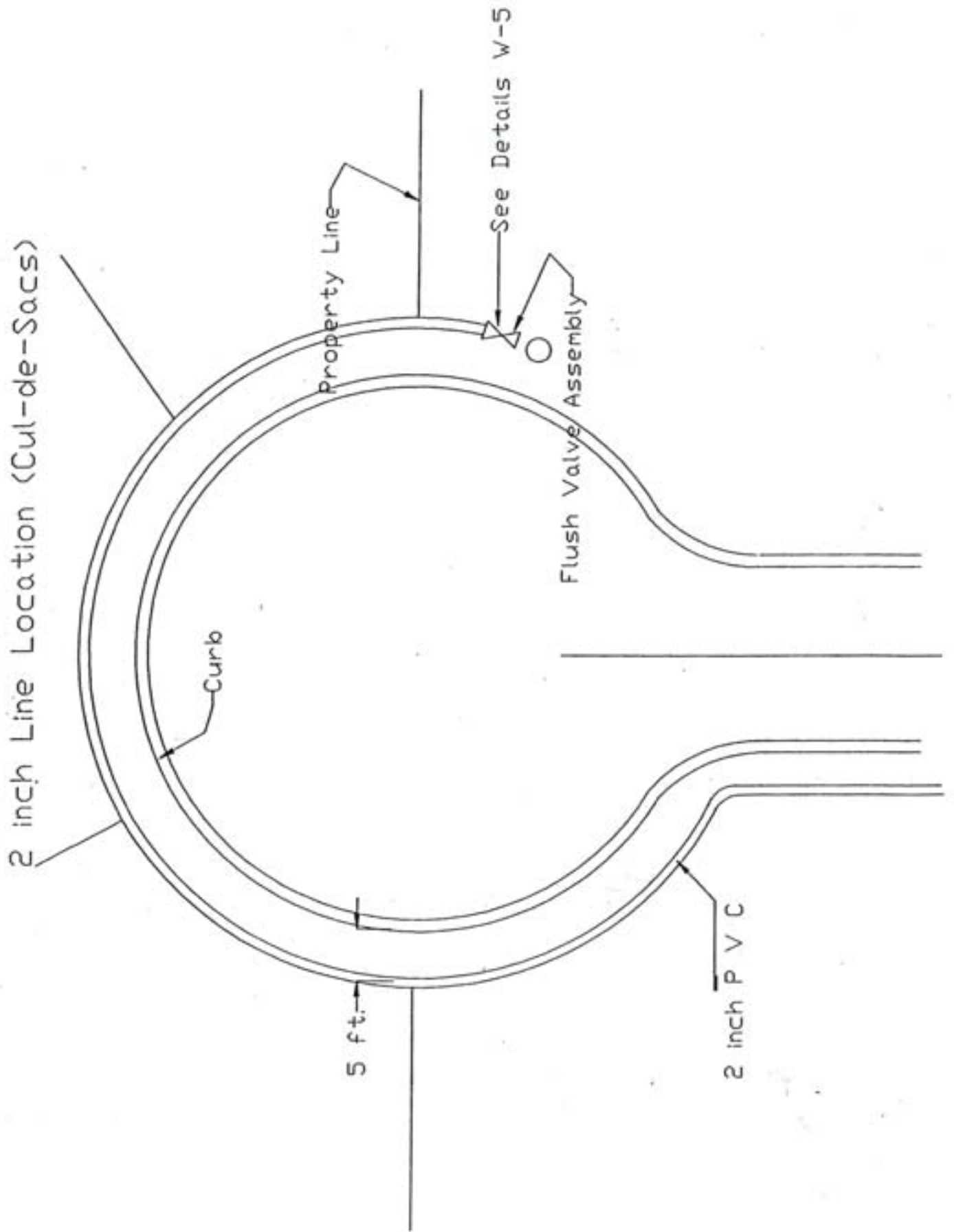
NOTE: Sediment Trap is to be cleaned out when volume becomes half full.



NOTE: Rock size determined according to specifications set forth in Appendix C.



ROCK DAM FOR SEDIMENT CONTROL



Meter Installation

