

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES
WATER MAIN AND SANITARY SEWER
DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

(f/k/a WATER SYSTEM DESIGN AND CONSTRUCTION STANDARDS for DEVELOPMENT PROJECTS and SANITARY SEWER INSTALLATION REGULATIONS AND SPECIFICATIONS for DEVELOPMENT PROJECTS)

APRIL 5, 2016

AUTHORITY AND SCOPE

The **Water Main and Sanitary Sewer Design and Construction Standards and Specifications** replaces WATER SYSTEM DESIGN AND CONSTRUCTION STANDARDS for DEVELOPMENT PROJECTS and SANITARY SEWER INSTALLATION REGULATIONS AND SPECIFICATIONS for DEVELOPMENT PROJECTS, and states current policy and procedures of the Gwinnett County Department of Water Resources for extensions of the water and sanitary sewer systems. Included herein are design standards, submittal policy, construction requirements, inspection, acceptance procedures, and other pertinent information relating to extensions and/or replacements to the water and/or sanitary sewer system.

These Standards are to be used by design professionals for design work, and construction professionals for construction work, that includes water mains and/or sanitary sewer mains. These water and sanitary sewer mains, easements, and appurtenances are dedicated to the Gwinnett Water and Sewerage Authority after construction and acceptance by the Gwinnett County Department of Water Resources.

The responsibility and authority to publish and periodically update these Standards are delegated to the Gwinnett County Board of Commissioners in accordance with Gwinnett County Code of Ordinances Section 114-90(d) and 114-29(d). Failure to comply with these Standards is subject to enforcement, including, but not limited to, cease-and-desist orders and administrative fines, as well as civil or criminal enforcement as stipulated by the Code of Ordinances.

The **Water Main and Sanitary Sewer Design and Construction Standards and Specifications** shall take effect and shall be in force upon its adoption by the Board of Commissioners of Gwinnett County, Georgia. Any subdivision or other project for which a valid and complete application for a Development Permit has been received prior to the adoption of the **Water Main and Sanitary Sewer Design and Construction Standards and Specifications** may, at the developer's option, proceed to completion, and building permits may be issued as though the **Water Main and Sanitary Sewer Design and Construction Standards and Specifications** had not been adopted, provided that the Development Permit is, or can be, issued within 60 days of the date of adoption, and all timeframes associated with said permit are observed.

Standards for sewage pump stations and force mains (found in DEVELOPER PUMP STATION STANDARDS) are not a part of these Standards and may be obtained separately.

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ARTICLE 1

GENERAL DESIGN PROCEDURES

1.1 GENERAL WATER AND SEWER

1.1.1 CONSTRUCTION DOCUMENTS

- a. It is the intention of Gwinnett County that water and sewer systems and improvements installed by a private entity should be substantially equal to those installed by Gwinnett County with respect to materials, installation, performance, and durability. While Gwinnett County strives to assure the quality of the final installed products, it is not the intention of Gwinnett County to direct the specific construction methods to be used during the implementation of the work performed on privately owned property. However, these specifications contain instances wherein limitations or qualifications may be applied to the Contractor's operations and methods when those activities extend to areas that are publicly accessible or when the construction interacts with publicly owned and maintained areas or systems. Such additional requirements or limitations to operations or methods shall be included into the plans submitted for approval and implemented by the Developer in such locations as appropriate.
- b. Construction documents must be submitted through the current plan review process to the Gwinnett County Department of Planning and Development (GCP&D).
- c. All water and sewer plans shall be sealed by either a Georgia Registered Professional Engineer or a Georgia Registered Professional Land Surveyor as per EPD Delegation dated December 2, 2006 and EPD rule 391-3-6-02.

1.1.2 All water and sewer design reviews and acceptance of water mains and sanitary sewerage systems will be administered by GCP&D.

1.1.3 Plans will be reviewed and written comments will be provided indicating required corrections and/or changes. A sample checklist containing specific plan requirements is available from GCP&D Plan Review Section or online at the Gwinnett County website. If a betterment or up-sizing of the pipe is required, GCP&D will coordinate with Gwinnett County Department of Water Resources (GCDWR) and will so indicate. The Engineer will be responsible for the design in accordance with GCDWR design criteria. Plans submitted for preliminary review will not be returned to the Engineer.

1.1.4 All construction on State right-of-way or any roadways under the jurisdiction of the Georgia Department of Transportation (GDOT) requires a GDOT permit or equivalent GDOT approval. GCDWR will process the necessary application during the plan review process. All documents necessary for said application must be provided by the Developer's Engineer.

1.1.5 The Director of GCDWR or designee in coordination with GCP&D is authorized to approve a variance for any significant deviation from the technical or procedural specifications of these standards, either before or after installation. The issuance of a variance is a formal written procedure more fully described in Article 5.14.

1.1.6 Prior to final approval of the design drawings, the Owner/Developer must enter a signed and notarized "Owner/Developer Agreement", blank copies of which are available from GCP&D or on the Gwinnett County website.

- 1.1.7 Any subdivision which is submitted and approved as one project must either be constructed as one project, or if subsequently phased out and constructed in multiple phases or units, must be resubmitted and receive approval from GCP&D for each phase or unit individually prior to any further construction. In the instance of multiple phases or units, separate construction permits and Owner/Developer agreements must be obtained for each phase or unit.
- 1.1.8 Five (5) or more copies of the design drawings shall then be submitted to GCP&D for final approval. If the plans are acceptable, they will be stamped by GCP&D and the Development Permit can be signed off. GCP&D will retain three (3) copies of the stamped plans; the others will be returned to the Engineer.
- 1.1.9 As-built Drawings for non-residential projects shall be submitted to GCP&D a minimum of 10 business days prior to request for Certificate of Occupancy. As-built Drawings for residential projects shall be included with the final plat submittal.
- 1.1.10 As-built Drawings must be sharp, clear, clean, legible, and suitable for scanning and filing.
- 1.1.11 As-built Drawings shall include a site plan and any supplemental or shop drawings as may be required by GCP&D. The checklist is available at the Gwinnett County website.
- 1.1.12 As-built Drawings must be stamped by a Professional Engineer or Registered Land Surveyor registered in the State of Georgia.

1.2 WATER MAIN DESIGN PROCEDURES

- 1.2.1 The design shall include horizontal alignment, all creek and bridge crossings, all tie-ins, future stubs, fire hydrants and valves, and abandonments of any existing water mains, if necessary. All appurtenances shall be stationed beginning at the tie-in to the existing water line. GCDWR's required location for water mains within private development/subdivisions is on the north side of east-west streets, and the west side of north-south streets.
- 1.2.2 If water sufficient to serve the proposed development does not exist at the project entrance, a water line shall be designed with GCDWR's approved size, from a source specified by GCDWR, in accordance with GCDWR design criteria.
- 1.2.3 A plan bearing the original signed approved GCP&D stamp must be presented by the approved Utility Contractor in order to obtain a water main construction permit.

1.3 SANITARY SEWER DESIGN PROCEDURES

- 1.3.1 All projects shall be required to connect to sewer where sewer is available.
 - a. "Available" shall be interpreted to mean within 2,000 feet of the proposed project. This distance can be increased or decreased by the GCDWR Director based upon actual field conditions and the size of the project involved.
 - b. Individual properties, when not part of a larger project, shall be required to connect to sewer when sewer is within 200 feet of any occupied domicile to be located on the property.
- 1.3.2 All water and sanitary sewer designs must comply with U.S. Army Corps of Engineers regulations. Design plans must show all jurisdictional wetland boundaries.

ARTICLE 2

DESIGN CRITERIA

2.1 GENERAL DESIGN CRITERIA

2.1.1 CONSTRUCTION PLANS

- a. All utilities including on site and off site water and sewer lines must be shown.
- b. Shall be legible, clear and concise.

2.1.2 All existing County road crossings shall be shown to be bored, and shall be noted as follows: "ALL COUNTY ROAD CROSSINGS TO BE BORED WITH STEEL CASING UNLESS OTHERWISE APPROVED BY THE GWINNETT COUNTY DEPARTMENT OF TRANSPORTATION PRIOR TO CONSTRUCTION". All Georgia DOT roads shall be bored with steel casing. Written permission must be obtained from the roadway owner (Gwinnett County, Georgia DOT, City, etc.) before any paving cut is made; compliance is mandatory for all requirements stipulated by roadway owner.

2.1.3 If any portion of a proposed project enters a State of Georgia controlled right-of-way, then a Georgia DOT permit application is required. This is to be submitted to GCDWR for processing by the Georgia DOT; plans shall be supplied in PDF format. Generally, portions of the project design can be reduced in size and match lined, if necessary, as long as the text is still legible. Compaction notes must be included on every page of the application drawings (see "Georgia DOT Utility Accommodation Policy and Standards"). Application must include one each of the following: plan, profile, traffic control plan, and section from DOT county map.

2.1.4 If any portion of the proposed project enters a railroad right-of-way, then a railroad utility encroachment permit will be required. The Developer's consultant shall prepare and submit all required permit documents necessary for processing the permit application with the applicable railroad owner. All costs including permit fee(s), license fee(s), insurance, etc. associated with the railroad utility encroachment permit shall be the responsibility of the Developer, except for projects initiated by GCDWR.

2.1.5 Contractor shall install continuous "Tree Save" fencing along both sides of an easement when working in easements.

2.2 WATER MAIN DESIGN CRITERIA

2.2.1 GCDWR's standard location for water line placement is on the north side of east-west streets, and on the west side of north-south streets.

2.2.2 For existing county roads, the proposed water line shall be generally located 5 feet inside the right-of-way. For existing Georgia DOT roads, the proposed water main **must** be located 5' inside the right-of-way. Unusual circumstances such as embankments, obstructions, other utilities, etc. may warrant deviation.

2.2.3 For private developments/subdivisions the water main shall be located 4' from the back of the curb (see Detail G7).

- 2.2.4 For non-subdivision streets, the proposed water main shall be located on the side of the road which best accommodates tie-ins to the existing mains at the beginning and/or end of the project.
- 2.2.5 For non-subdivision streets, the location of the water main may also be determined by existing rights-of-way, or lack thereof.
- 2.2.6 For non-subdivision streets, generally avoid designing the location on the same side of the road as the gas lines. In projects where any existing gas lines have active cathodic protection for corrosion prevention, the water main **must** be designed on the opposite side of the road. If main is placed in corrosive soils or areas of stray electrical current, water mains may require additional protective measures such as zinc coating the exterior with an asphaltic final coat, and/or polyethylene wrap, as specified by GCDWR.
- 2.2.7 For non-subdivision streets, if none of the above governs, then design the water line for the side of the road that has the fewest conflicts, i.e. rock outcroppings, trees, side roads, fences, structures, involved landscaping, embankments, prescriptive easements, etc. **NOTE: Water main location must maintain 10-foot horizontal separation from existing parallel sanitary sewer mains, and 18-inch vertical separation from any existing perpendicular crossing of sanitary sewer mains.**
- 2.2.8 The proposed water lines shall be shown on the plans as solid lines.
- 2.2.9 The existing water lines shall be shown as dashed lines.
- 2.2.10 All water mains shall be ductile iron pipe, and shall be in accordance with Article 3.4.
- 2.2.11 A minimum pipe size of 8" shall be installed in all residential developments/subdivisions, including connection to existing mains. A minimum pipe size of 12" shall be installed in all commercial developments/subdivisions, including connection to existing mains. If adequate volumes for fire flow requirements and pressures are not available at the point of connection, a larger water main and/or additional improvements may be required. Determination of volume or pressure inadequacy will be hydraulically modeled and calculated by GCDWR utilizing fire flow test results obtained from GCDWR and will be at the sole discretion of GCDWR.
- 2.2.12 Standard depth of cover is four (4) feet below the elevation of the edge of pavement of existing or proposed roadway surfaces. In the event the shoulder of the roadway is below the elevation of the edge of pavement, then a minimum of four (4) feet of earth cover is to be maintained at all times (see Detail G7).
- 2.2.13 A chlorination tap is to be indicated on the plan approximately 3 to 5 feet from the beginning of the project. Separate project phases must have chlorination taps indicated for each phase.
- 2.2.14 Design for all water lines attached to bridges shall be coordinated for approval with GCDWR and GCDOT or GDOT, whichever has jurisdiction.
- 2.2.15 FIRE HYDRANTS
- a. Fire hydrants shall be depicted on the plan.

- b. Fire hydrants, within residential developments or along existing Gwinnett County or state roads, are generally located every 400 feet, starting at the beginning of the project, or as dictated by existing fire hydrant locations. Hydrants can be spaced from a minimum of 350 feet to an **absolute maximum** of 450 feet, and shall be located on property lines where possible. For commercial developments, the fire hydrant spacing cannot exceed 300 feet, and location at property lines is preferred, but is not mandatory.
- c. Each fire hydrant shall be installed utilizing a fire hydrant tee and 6" isolation valve, and shall be so identified on the plan.
- d. Where possible, place a fire hydrant near the end of each main.
- e. All existing fire hydrants on mains to be abandoned as part of the submitted project are to be labeled as follows: "Existing fire hydrant to be salvaged and returned by Contractor to the GCDWR warehouse at the GCDWR Central Office, 684 Winder Hwy., Lawrenceville, Georgia 30045."

2.2.16 VALVES

- a. Valves shall be depicted on the plan.
- b. In-line valves are to be generally located every 1,000 feet, or every third fire hydrant, and are to be located at intersections in such a manner to enable isolation of various streets within the development without shutting down adjacent streets.
- c. For 8 inch mains within residential developments, in-line gate valves located at fire hydrants should be installed approximately 10 feet away from the hydrant on the side opposite the water source.
- d. For future stubs, the valve is to be located approximately 20 feet (one full joint of ductile iron pipe) from the plugged end (see Detail W8).
- e. All proposed valves smaller than twelve inches (<12") shall be resilient seated gate valves.
- f. All proposed valves twelve inches and larger (12">) may be either butterfly valves or resilient seated gate valves.

2.2.17 TIE-INS TO EXISTING MAINS

- a. Tie-ins are usually made as follows:
 1. Proposed main is tied straight into existing main using a solid sleeve or transition sleeve.
 2. Proposed main is tied straight into existing main using a reducer, or other fitting, and a solid sleeve.
 3. Proposed main is laid parallel to existing main and is tied in using smallest degree bends possible for conditions.
 4. Proposed main is laid parallel to existing main and is tied in using a tee on the proposed main and cutting a 90-degree bend into the existing main, thus leaving a future stub on the proposed main.

2.2.18 HOUSE SERVICE CONNECTIONS IN RESIDENTIAL CUL-DE-SACS

- a. Residential cul-de-sacs and/or eyebrows shall be designed to include live, 1-inch copper services to each lot not immediately adjacent to the water main at a location out from under any paved surfaces. Lots located at the neck of the cul-de-sac across the street from the point where the water main enters the paved area to cross the cul-de-sac shall be considered "long-side" lots, and shall not be required to have live service.
- b. 1-inch live copper services shall be located at the property lines to avoid conflict with driveway construction.
- c. Each live copper service shall end at the curb-line, and shall terminate in an approved 1-inch curb-stop which shall be located within a standard meter box. Meter boxes shall be left flush with finished grade.
- d. One-inch live copper services shall be installed utilizing materials and techniques described in Article 3.9.

2.2.19 EASEMENTS

It is the policy of GCDWR that water mains are to be installed only in dedicated rights-of-way. Decisions as to use of easements will be made by GCDWR on a project-specific basis. Generally, use of easements will only be permitted along existing Gwinnett County roads where there is no right-of-way, or there is a structural conflict within the right-of-way.

2.2.20 TEXT

- a. All proposed water mains shall be labeled for size and material.
- b. All existing water mains shall be labeled for size, material and GCDWR project reference number(s) under which they were installed. This information can be obtained through the GCDWR Data Management Section.
- c. Any existing water mains to be abandoned as part of the proposed project shall be so noted and reflect the required symbology.
- d. All fire hydrants shall reflect the required symbology, and shall be stationed.
- e. All valves shall reflect the required symbology, be labeled as to size and whether gate valve or butterfly valve (GV or BFV), and stationed.

2.3 SANITARY SEWER DESIGN CRITERIA

2.3.1 PROFILES

- a. For commercial projects the profile must include the 6" service line through the test manhole, to the building.
- b. Shall show all sewer lines beginning at the existing system including the length, slope, pipe size, and pipe type for each section of line.

- c. Shall show manhole numbers, station numbers, top elevations, and inverts in and out.
- d. Shall show any bores including the length of bore and the casing material and size.
- e. Shall show the existing and proposed surface grades.
- f. Shall indicate all other utility crossings.

2.3.2 EASEMENTS

a. Easements – General

1. On-site easements are those easements falling within the boundaries of the current phase of the project. For subdivisions, these are shown on the plat and are dedicated through the process of recording the final plat. If not dedicated by final plat, they must be dedicated by an easement document on a standard Gwinnett County Water and Sewerage Authority (GCW&SA) form.
2. Off-site easements are those easements falling outside the boundaries of the current phase of the project. Off-site easements which will be included in later phases of the same project and which cross property owned by and titled to the exact same entity as the one developing a subdivision may be dedicated by the final plat of the current phase of the project. All others must be dedicated by a separate easement document from each property owner on a standard GCW&SA form.
3. Optional rights-of-entry for off-site easements must be submitted to GCDWR prior to issuance of off-site construction permits by GCP&D. All easements shall be submitted and approved prior to permitting of the project.
4. All easements shall be in the approved format. Blank easement forms are available from GCP&D and GCDWR and on the Gwinnett County website.
5. Conditional easements or easements with special stipulations shall not be granted to or assigned to the GCW&SA.
6. Separate easement documents with plats and/or legal descriptions are required when obtaining easements from more than one land owner.
7. Construction of off-site lines shall not begin until all off-site easements are acquired and submitted to and approved by GCDWR. Construction of on-site lines, prior to acquiring off-site easements is at the Developer's own risk.
8. Off-site easements shall be negotiated by the Developer with the property owner. As a last resort, if the Developer is unable to acquire necessary easements through negotiation, GCDWR may request Board of Commissioner approval to assist acquisition through condemnation, at the Developer's expense. The final decision whether or not to condemn rests with the Board. Note that the County can only condemn property for easements if the sewer line to be installed is a gravity line eight inches in diameter or larger or a force main from a GCW&SA pump station and is to be dedicated to the GCW&SA.

- b. Sewer lines must be centered within the required permanent easement. Exceptions can be approved in advance of construction by GCDWR, but will only be approved in special circumstances and when GCDWR in coordination with GCP&D determines that future repairs and maintenance can be accomplished without unreasonable costs. A variance must be submitted.
- c. Easements Widths
 - 1. A minimum 20 foot wide permanent easement is required for 8" lines or larger.
 - 2. For lines deeper than 16 feet, the permanent easement width will be coordinated with GCDWR as part of the variance review process.
 - 3. A common easement for sanitary sewer and drainage purposes may be allowed, if the utilities are parallel and separated by at least 10 feet, measured center to center. The easement shall have a minimum width of 30 feet.
- d. Easement Documents: For any easement that is acquired for less than \$10,000, a release from lien holders is not required. Entities having ownership must sign the easement as stated below:
 - 1. CORPORATIONS – Georgia law requires that documents transferring interest in real property must be signed by the president or vice president of the corporation and be attested by the secretary or treasurer of the corporation or have the corporate seal affixed.
 - 2. LIMITED LIABILITY COMPANIES – Georgia law requires that documents must be signed by a member.
 - 3. LIMITED PARTNERSHIP – Georgia law requires that documents must be signed by the general partner. If the general partner is a corporation, set up the "by" signature block in accordance with laws for corporations.
 - 4. GENERAL PARTNERSHIP – Georgia law requires that documents must be signed by every partner.
 - 5. TRUSTS – Georgia law requires that documents must be signed by every trustee for the trust.
 - 6. INDIVIDUALS – Georgia law requires that documents must be signed by every individual holding title exactly as each took title.
 - 7. Every signature on a document must be witnessed by an unofficial witness and notarized. Notary's seal must be affixed. (Note: Examples of signature requirements are available from GCP&D).
- e. A plat (8 1/2" x 14" maximum) which shows the boundary of the easement area or a written legal description must be attached to each easement document and labeled as ATTACHMENT "A".
- f. New development projects on sewer are required to either provide an installed sewer main to the up gradient property for future use or they must provide access to sewer, either by a 20' permanent sewer easement and a 40' temporary construction easement or right-of-way, for future use.

- g. GCDWR reserves the right to require developments, including non-sewered projects, to include on the final plat a 20' permanent sanitary sewer easement and 40' temporary construction easement for future use paralleling any stream or drainage way.
- h. The discretion of alignment and location of sanitary sewer easements for up gradient properties shall be coordinated with GCDWR. Easements for future use shall comply with stream buffer and wetland requirements.
- i. No permanent structures or trees are allowed in permanent sewer easements, or within five feet of existing or proposed sewer laterals.

2.3.3 PARTICIPATION BY COUNTY

- a. Development projects situated other than at the highest part of the drainage basin may be required to install a larger sized sewer main to serve the entire basin. The extra cost associated with increasing the gravity main size beyond that required to serve the project may be paid by GCDWR under a County Participation Agreement. The conditions relating to method of payment will be negotiated by GCDWR on a case-by-case basis during the development review process.
- b. A development project situated in a sub-basin that drains to a sewage lift station designed to serve the project may be required to install a larger pump station and/or force main to serve the entire sub-basin. The extra cost associated with this may be paid by GCDWR under a County Participation Agreement. The conditions relating to method of payment will be negotiated by GCDWR on a case-by-case basis during the development review process.

2.3.4 SANITARY SEWER LINES

- a. Location
 - 1. Shall be located in center line of street, where applicable (see Detail G7).
 - 2. Shall be located a minimum of 20' from edge of building when running parallel to the building to allow for installation of grease traps and other utilities.
 - 3. Maximum distance between manholes for sewer lines 8 inches to 15 inches is 400 feet.
 - 4. Maximum distance between manholes for sewer lines 18 inches and larger is 500 feet.
 - 5. A variance shall be required for manhole spacing exceeding the stipulated requirements.
 - 6. Under the Official Code of Georgia Annotated (Volume 10, Title 12, Georgia Erosion and Sedimentation Act, 12-7-6-16) any sewer line parallel to a creek or lake must be designed to leave a minimum 25 foot undisturbed buffer along the edge of the bank as measured horizontally from the point where vegetation has been wrested by normal stream flow. Development within the Big Haynes Creek Basin must comply with buffer requirements as specified in the Big Haynes Watershed Protection Regulations. The Georgia Environmental Protection Division (EPD) requires undisturbed buffers of 100 feet adjacent to the Chattahoochee River and 35 feet adjacent to all tributaries of the Chattahoochee River within the 2000 foot corridor along the river. All buffers must be shown on plans. In addition, all land disturbing activities within the Chattahoochee River Corridor must comply with the Metropolitan

River Protection Act. Exceptions to the EPD buffer requirements can only be granted by the EPD through their formal variance process (391-3-7-.05).

7. The construction plan view shall indicate the deflection angle(s) between all sanitary sewer lines at each manhole.
- b. Minimum Cover from Finished Grade
1. Within paved area: 7 feet (cover less than 7 feet within paved area requires ductile iron pipe and will only be approved when site conditions dictate). A variance must be submitted.
 2. In non-paved area: 4 feet (cover less than 4 feet in non-paved areas requires ductile iron pipe and will only be approved when site conditions dictate.). A variance must be submitted.
 3. Sewer lines must avoid passing through a stormwater management pond whenever possible. Any sewer line that passes under a stormwater management pond must be ductile iron pipe and must have a minimum of 4 feet of cover. Any sewer line that passes under a stormwater management pond and unavoidably has less than 4 feet of cover must be ductile iron pipe and be encased in steel casing. Pipe shall not be located within or under the dam or outlet structure. All manholes must be located outside of the stormwater management pond.
 4. Any sewer line parallel to a creek or stream shall be designed such that the top of the proposed pipe is a minimum of 2 feet below the bottom of the creek bed. The elevation of the creek bed must be indicated on the design plans. Creek crossings shall be made only when absolutely necessary and should be nearly perpendicular. All creek crossings that are not bored shall be submitted for approval to the U.S. Army Corps of Engineers. Creek crossings shall be stabilized with rip-rap and/or other stabilizing material upon completion and in compliance with GA EPD and Federal Regulations. Sewer lines shall be designed to cause minimum water quality impact.
- c. Maximum Cover
1. Depth of cover for PVC pipe shall not exceed 16 feet.
 2. Depth of cover exceeding 16 feet shall require DIP.
 3. Depth of cover exceeding 20 feet shall require submittal of a sewer variance. GCDWR may grant exceptions on a case by case basis if there are no reasonable alternatives.
- d. Minimum sewer main size shall be 8 inches.
- e. Sewer service connection size shall be 6 inches.
- f. Slope requirements
1. Recommended minimum slopes can be submitted without design calculations.
 2. Recommended minimum slopes will be required if possible. Absolute minimum slopes will be allowed only with design calculations showing a velocity of not less than 2.0 feet per second. If design slope is less than the recommended minimum a sewer variance must be submitted.

SLOPE REQUIREMENTS

Pipe Diameter	Absolute Minimum	Recommended Minimum
8 inch	0.40%	0.70%
10 inch	0.29%	0.50%
12 inch	0.22%	0.40%
15 inch	0.15%	0.30%
16 inch	0.15%	0.30%
18 inch	0.12%	0.24%
21 inch	0.10%	0.20%
24 inch	0.08%	0.16%
27 inch	0.07%	0.14%
30 inch	0.06%	0.12%
36 inch	0.05%	0.10%

3. Maximum Slope 15.0%
4. When approved by GCDWR, ductile iron pipe may be used with slopes of 15% to 25% with the addition of concrete anchors (deadman) at each pipe joint. A variance must be submitted.

Minimum size of concrete deadman shall be:

Height	3x pipe diameter
Length (along pipe)	3x pipe diameter
Width (perpendicular to pipe)	2x trench widths

5. Whenever possible, designs for jack and bore installations should include a drop in the upstream manhole of not less than 6 inches and shall allow a slope through the bore three times as steep as the recommended minimum slope for that size pipe.
- g. All pipe materials specified shall comply with the requirements stipulated within Article 4.
- h. All lines (8 inch diameter and larger) shall terminate in a manhole.

2.3.5 SEWER SERVICE CONNECTION – RESIDENTIAL AND COMMERCIAL

- a. A sewer service connection is defined as a 6" pipe from the sewer main to 5 feet outside the Right of Way (ROW) of the street or sewer easement including a 6" clean out inside the ROW and outside the curb with a protective box with a lid around the top of the clean out for protection. The 5 feet of pipe outside the ROW is to allow the building owner to connect the sewer lateral line for the building to the sewer service connection outside the ROW (see Detail S14). Property owners are not authorized to dig in the ROW. See Detail S13 for materials to be used for a water tight and gas tight connection (injection molded adapter coupling).
- b. At design, the Developer shall be responsible for ensuring that all lots can be served by sewer in the development and that all lots have a sewer Service connection, as specified above.
 1. The Developer shall be responsible for the cost of the installation of the service connection including the clean out, the protective box and the 5 foot extension.

2. The Developer may install a complete wye or a tee in the new sewer main during construction or pay GCDWR to install a tap for an existing sewer.
 3. The Developer is not authorized to tap an existing sewer main.
 4. The sewer service connection shall be at an elevation low enough to serve the ground level floor and where grades and elevations allow, low enough to serve the basement, if any.
 5. The sewer service connection within the right-of-way and its clean-out become the property of Gwinnett County Water & Sewerage Authority and shall be maintained by GCDWR.
- c. Service connections may enter the system at a manhole, a “wye” or a “tee”.
 - d. A maximum of four (4) service connections are allowed into a manhole.
 - e. A minimum of 12 inches separation in all directions is required between all manhole cores.
 - f. Maximum length of service connections in road rights-of-way shall not exceed 75 feet. Longer service connections will not be allowed solely to avoid the cost of extending the main.
 - g. Sewer service connections shall have straight alignment. Sewer service connections shall be installed perpendicular to the main. Whenever possible the main shall extend near enough to the last property served such that the service connection is no more than 30 degrees from perpendicular to either the main or the edge of the right-of-way.
 - h. The minimum pipe size for tie-in to any manhole is 6” pipe.
 - i. Cover at finished grade (see Detail G7).
 1. At curb: Minimum 5 1/2 feet.
 2. At end of Sewer Service Connection: Minimum 5 feet.
 3. Cover less than 5 1/2 feet at the curb or under any pavement requires ductile iron pipe and will require a variance submitted to GCDWR.

2.3.6 SEWER LATERAL LINES

- a. Sewer Lateral Line is defined as the sewer service pipe from the building to the sewer service connection pipe.
- b. The sewer lateral line located on private property is owned by the parcel owner.
- b. The maintenance of the lateral line shall be the responsibility of the parcel owner.
- c. There is no maximum length limitation for privately owned and maintained lateral lines.
- d. A separate and independent building sewer shall be provided for every building except where one building stands at the rear of another and sewer is not available or cannot be constructed to the rear building through an adjoining alley, courtyard or driveway. In this situation the building sewer from the front building may be extended to the rear building and the whole considered as one (1) building sewer.

2.3.7 MANHOLES

- a. Location
 - 1. Shall have a minimum of 4 feet of clearance from drainage culverts and other underground utilities.
 - 2. Shall be along center line of sanitary sewer easements.
- b. New pipe entry shall be at no less than a 90 degree angle from the direction of flow of existing manhole, unless the minimum inside drop is equal to the diameter of the lower pipe. A variance must be submitted.
- c. Manholes may be installed with a 6 inch stub for future use. Refer to Article 4.4.
- d. Outside Drop Manholes
 - 1. An outside drop pipe shall be provided for any size sewer line (including 6") entering manholes at an elevation of more than 2.0 feet above the manhole invert.
 - 2. Outside drop manholes shall be indicated on the construction plans, profile section.
 - 3. The outside drop pipe shall be constructed of either ductile iron or PVC, whichever matches incoming pipe material.
 - 4. All outside 90 degree elbows shall have a thrust block poured below the elbow.
- e. Inside Drop Manholes - The maximum inside drop shall not be greater than 2.0 feet from the invert of the manhole.
- f. Doghouse Manholes
 - 1. New manholes on existing 8 and 10 inch lines shall be installed using a full base section, cored openings and transition couplings.
 - 2. The invert of the new line must be higher than the spring-line of the existing pipe, and shall be a minimum of 8" above the existing invert, whenever possible.
 - 3. Doghouse manholes are to be utilized on 12 inch or larger lines and may be authorized by GCDWR on 8 and 10 inch lines for existing high flow conditions.
 - 4. For doghouse manholes, the existing pipe shall not be cut without authorization of GCDWR.
 - 5. The GCDWR Inspector must be present when existing pipe is cut for the doghouse or cut-in manholes.
- g. Manhole sections that are cored in the wrong location or elevation shall be removed or a variance obtained from GCDWR.
- h. Manholes into which a force main discharges and the next two downstream manholes if part of a new gravity sewer must be made of a composite material approved by GCDWR. If the force main ties into an existing gravity line, the tie-in manhole and the next two

downstream manholes shall be lined or coated with a GCDWR approved corrosion inhibitor material.

2.3.8 REQUIRED USE OF DUCTILE IRON PIPE

- a. At all crossings above water mains or drainage pipes.
- b. For all crossings below water mains or drainage pipes UNLESS sewer main has more than 4 feet separation from the other pipe. Not required when crossing water pipes less than 2 inches in diameter.
- c. Crossing of any open stream, bodies of water or stormwater management ponds.
- d. When minimum or maximum cover limits have been exceeded (See Article 2.3.4).
- e. Inside the right-of-way of all State DOT highways, existing highways, commercial and/or industrial streets.
- f. Whenever ductile iron pipe (DIP) is required, and is within 36 feet of a manhole, it is required that DIP be extended to reach the manhole rather than utilizing a transition collar.
- g. Underneath the footing of any retaining wall up to 3' in height and shall also be encased in steel. (For walls over 3' in height a variance is required).
- h. Carrier pipe inside of jack and bore casing. At aerial crossings, except when the carrier pipe is steel pipe.
- i. Pipe segments supported by placed fill and other locations as may be required by GCDWR.

2.3.9 TEST MANHOLES

- a. Shall be required for all non-residential buildings and installed at locations specified by GCDWR.
- b. Shall generally be the same design and construction as other manholes.
- c. Depths of Test Manholes
 1. Minimum depth: 4 feet, unless approved by GCDWR.
 2. Maximum depth: 12 feet, unless approved by GCDWR.
- d. Location of Test Manholes
 1. In a non-traffic area approved by GCDWR.
 2. Within property limits of building parcel.
- e. Test manhole covers shall be bolt down style and shall NOT be stamped with "Gwinnett County Sewer".
- f. Inverts of test manholes for certain industrial users may require modification for flow measuring capability (See Pretreatment Ordinance).

- g. Inside or outside drops are not permitted at test manholes.
- h. Test manholes are on the 6 inch private lateral sewer system.

2.3.10 AERIAL LINES

- a. Steel or ductile iron carrier pipe shall be used for all installations. All ductile iron carrier pipe spanning greater than six horizontal feet (6') aerial (see detail S17), shall be enclosed within a steel casing pipe.
- b. The maximum spacing between piers shall be thirty (30) feet. Spacing larger than 30 feet shall require variance submittal.
- c. Provide aerial crossing detail drawings and pipe specifications on plans for review by GCDWR. Site conditions may dictate that designs be submitted utilizing more stringent requirements than indicated in the standard details. Alternate design, sealed by a Registered Professional Engineer, may be submitted. Aerial lines shall be designed to avoid or minimize stream blockage during normal high water events. When requested, the Engineer shall delineate on the plans, the two year flood level, as defined by the Gwinnett County Stormwater Division, for determination of the proposed elevations of the aerial span. All aerial crossings will require a variance.
- d. All aerial crossings must comply with U.S. Army Corps of Engineers and FEMA regulations.

2.3.11 PUMP STATIONS/FORCE MAINS

Pump Station and Force Main Standards for Gwinnett County maintained systems are available from GCDWR and on the Gwinnett County web site. They are not part of this document.

2.3.12 SPECIAL INTERCEPTORS

- a. Grease interceptors
 - 1. Shall be provided for all food services such as restaurants, markets, or any establishment with commercial kitchens, and/or three compartment sinks, etc. as mandated in the GCDWR Fats, Oils, and Grease Ordinance (FOG Ordinance).
 - 2. Grease interceptors are to be installed according to the current IBC plumbing code.
 - 3. All grease interceptors shall be sized by GCDWR as a gallon capacity requirement. All restaurants and commercial kitchens shall install a minimum of (1) 1500 gallon grease interceptor. If the required capacity is more than 1500 gallons, any additional capacity shall be obtained installing additional 1500 gallon grease interceptors in a series.
 - 4. Mechanical grease separators (skimmers) are prohibited.
 - 5. See Fats, Oils, and Grease Ordinance (FOG Ordinance) for additional requirements.
- b. Sand/oil separators are required for car washes, auto repair shops, and warehouses with floor drains as per current IBC plumbing code.

- c. Additional Pretreatment may be necessary for certain industries. These businesses may be allowed to operate under a Discharge Permit as directed by GCDWR. Refer to Sewer Use Ordinance.
- d. Commercial Car Wash operations are required to tie to the sanitary sewer system. No discharge is allowed to storm systems.
 - 1. A water recycled system and a GCDWR approved oil/water separator and sand interceptor are required.
 - 2. A contained wash area is required. This area must be roofed with a permanent structure made of a waterproof material.
 - 3. There must also be a berm/curb installed within the roofed area to prevent waste water from exiting and rain water from entering the contained area.

ARTICLE 3

WATER MAIN CONSTRUCTION

3.1 PRIOR TO CONSTRUCTION

- 3.1.1 At no time will any water main construction commence prior to approval of all plans, receipt of any required agreement documents, and issuance of a Water Main Construction Permit by GCP&D.
- 3.1.2 Only GCP&D Approved Utility Contractors may install water mains.
- 3.1.3 All easements, required fees, and other pertinent documents must be submitted prior to a construction permit being issued.
- 3.1.4 Engineered design plans must be stamped as approved by GCP&D Water and Sewer Plan Review.
- 3.1.5 The pipe Utility Contractor or Authorized Agent must bring these plans to GCP&D permitting prior to any pipe installation for a construction permit.
- 3.1.6 It shall be the Contractors' responsibility to understand and comply with all Gwinnett County specifications and requirements throughout the installation and inspection proceedings.
- 3.1.7 All water mains, valves, fire hydrants, and other appurtenances to be dedicated to or owned by GCW&SA shall be installed according to the approved design. **All** field changes **must be pre-approved** by GCDWR. The Contractor or Developer must have a set of the current approved design containing an original GCP&D stamp, and a copy of the current "Water Main and Sanitary Sewer Design and Construction Standards and Specifications" on site at all times.
- 3.1.8 The Contractor or Developer shall adhere to all Federal, State, County, and local laws, ordinances, and regulations which in any manner affect the conduct of work, including, but not limited to, initiating, maintaining, and supervising all safety precautions and programs in connection with the work.
- 3.1.9 The Contractor or Developer must comply with all requirements of the Gwinnett County Soil Erosion and Sediment Control Ordinance, the provisions of the Manual for Erosion and Sediment Control in Georgia, and any special conditions required by the EPD associated with any variances issued by the same and any special conditions required by the GCDWR Inspector. Refer to Article 5.3 Sediment Control.
- 3.1.10 During any phase of installation, GCDWR has the authority to order the construction stopped, call for any type of inspection of installed work, call for a test dig, request Engineer to revise design plans, or alter installation proceedings to ensure proper construction requirements.

3.2 EARTH EXCAVATION

3.2.1 WORK INCLUDED

The Contractor shall clear the site, make all pavement cuts, remove all trees and stumps, remove any fences or other structures which the removal thereof is necessitated by the work, excavate to the lines and grades indicated on the approved design, and complete the excavation required for the various pipe lines and structures, including any additional foundation work.

3.2.2 ADDITIONAL EXCAVATION

It is expected that satisfactory foundations will be found at the elevations indicated on the approved design, however, should it be found desirable or necessary to go to additional depth, the excavation shall be carried on to an additional depth as directed by GCDWR and backfilled as directed.

3.2.3 CLEARING AND CARE OF SURFACE MATERIALS

- a. The sites of all excavation and grading shall first be cleared of all paving, trees, walls, fences, sidewalks, stumps, brush, rubbish, and crops, which shall be removed and disposed of in a satisfactory manner. On all lawns and other improved grass areas, the sod shall be carefully removed, kept alive when possible, and replaced after the backfilling is completed. The Contractor shall also remove all spoil from such areas as quickly as possible after the excavation is backfilled, and shall leave the premises in as good a condition as before undertaking the work. Fences which have been removed, damaged, or broken down shall be replaced at or before completion of the work to pre-construction quality or better.
- b. Topsoil shall be removed to its entire depth from all areas to be excavated or graded. The topsoil shall be piled in designated or approved locations where it will not interfere with construction operations. Topsoil as stored shall be reasonably free of subsoil, debris, and stones larger than two (2) inches in diameter. The stored topsoil shall be left in piles to be used for finished grading.
- c. The removal of existing pavement shall be performed in accordance with the requirements of the authority within whose jurisdiction such pavement is located.
- d. Whenever the removal of pavements (other than gravel types) is required, the Contractor shall outline the area to be removed by making straight saw cuts, providing vertical kerfs in straight lines in order to permit removal in a straight line. Should pavement breakage occur beyond the original saw cut, the Contractor shall be required to make a new saw cut beyond the furthest point of breakage.

3.2.4 PROTECTION OF TREES AND SHRUBBERY

- a. The Contractor shall be responsible for the protection of tops, trunks, and roots of existing trees that are adjacent to, or are to remain within the construction boundaries of the project site, or in parks, lawns, or other improved areas. All trees shall remain and receive protection, if necessary, in areas where there is no excavation or embankment. Existing trees which may be subject to construction damage shall be boxed, fenced, or otherwise protected before any work is started. The protection shall be removed when directed, or at completion of the project. Heavy equipment or stockpiles will not be permitted within branch spread. Interfering branches shall be removed without damage to trunks.

- b. No tree shall be removed unless absolutely necessary for the construction. On areas beyond construction right-of-way or easements, no trees or shrubbery shall be removed without the written authorization of the property owners and approval of GCP&D. Copies of such written authorization are to be provided to GCP&D/GCDWR prior to any removal.

3.2.5 EXCAVATION METHODS

- a. All excavation shall be in open cut unless otherwise indicated on the approved design or directed by GCDWR. In general, topsoil may be removed by machine method. Excavation below topsoil may also be performed by machine, but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as directed by GCDWR. Material so removed shall be used in backfill, making embankments, filling low areas, or as otherwise directed. Hand tool excavation shall be used where necessary to protect existing utilities and structures.
- b. All slopes shall be carefully cut or graded by hand to grades required by GCDWR and shall be tamped or otherwise compacted to maintain the material in position. The final trimming of the bottoms and sides of excavations against which masonry is to be built, shall be performed just before concrete is placed.

3.2.6 REMOVAL OF WATER

- a. The Contractor shall pump out, or otherwise remove and properly dispose of any water (including stormwater), which may be found or may accumulate, as fast as it may collect in the excavation. The removal is required regardless of the source.
- b. All necessary precautions shall be taken to prevent disturbance of, and to properly drain, any areas upon which concrete is to be poured or pipe is to be laid.
- c. There shall be located at the work site at all times during construction, proper and approved equipment with such sufficient capacity for the removal of any water from the work and in such manner as not to withdraw sand or cement from any concrete. Contractor is also to ensure that removal of any liquids will not interfere with the proper laying of masonry or pipe, or execution of any required work for the complete construction of the project.
- d. The flow in storm drains, gutters, or water courses encountered during the construction shall be adequately provided for by the Contractor to ensure these flows do not interfere with the execution of the work, and are maintained in such a manner as to ensure continuity of flow at all times in accordance with the Gwinnett County Erosion and Sediment Control Ordinance.
- e. Unless otherwise permitted, ground water encountered within the limits of excavation shall be depressed to an elevation not less than twelve (12) inches below the bottom of such excavation. This depression is to be performed before pipe laying or concrete work is started and shall be so maintained until concrete and joint materials have attained initial set.
- f. Should sewage or any other odorous liquids be encountered during the work in the excavation, GCDWR shall be immediately notified. GCDWR will then determine if actions by the Contractor have caused the source of the odorous liquids to leak and will promptly notify the appropriate regulatory agencies, if necessary. In addition GCDWR will instruct the Contractor as to what actions, if any, the Contractor can and cannot perform prior to any directives which may be issued by the regulatory agencies. Any sewage will be pumped and hauled to a manhole, pump station, or water reclamation facility, as directed

by GCDWR. Any other liquids will be properly disposed of as directed by GCDWR and/or any regulatory agencies having jurisdiction.

3.2.7 SHEETING AND SHORING

- a. The Contractor shall be responsible for supporting and maintaining required excavations even to the extent of sheeting and shoring the sides and ends of excavations with timber or other supports. The requirement of sheeting or shoring, or the addition of supports, shall not relieve the Contractor of his responsibility of their sufficiency.
- b. The need and adequacy of sheeting, shoring, bracing, or other provisions to protect workmen and equipment in a trench or other excavation, and to meet local and OSHA safety requirements, shall be the sole and exclusive responsibility of the Contractor.

3.2.8 TRENCH EXCAVATION

- a. The minimum width of trench for an elevation of twelve (12) inches above the top of the pipe to the bottom of the trench shall be as indicated on Detail G3.
- b. Excavation of pipe trenches with sides sloping to the trench bottom will not be permitted.

3.2.9 LENGTH OF TRENCH TO BE OPENED

The length of trench to be opened, or the areas of the surface to be disturbed or unrestored at any one time, shall be limited by GCDWR with regard both to expeditious construction, and to the convenience, safety, and comfort of citizens directly or indirectly affected by the work. New trenches will not be permitted to be excavated if there are previously excavated trenches that require backfilling, or surface areas that require restoration. In any event, no additional work of any kind will be permitted if there are existing streets or roadways that require attention to return them to a safe and proper condition. IN GENERAL, NO TRENCH SHALL BE OPEN MORE THAN **500 FEET AHEAD OF PIPE LAYING AND BACKFILLING.**

3.2.10 STORAGE OF MATERIALS:

All salvageable materials which may be removed from the site, together with all materials taken from the trenches, shall be stored in an approved, suitable place, or as directed by GCDWR. The Contractor or Developer shall be responsible for any loss of or damage to salvageable materials through careless removal or neglectful or wasteful storage of such materials. In the storing of excavated material, which is to be used as backfill, the Contractor shall exercise care so as to avoid inconveniencing the public. If in the opinion of GCDWR, it is necessary to remove this excavated material from the streets, or lots, the Contractor shall be required to do so.

3.3 ROCK EXCAVATION

3.3.1 WORK INCLUDED

The Contractor shall make the lines and grades as shown on the drawings or as directed by GCDWR including excavation, removal and disposal of all rock and masonry as required.

3.3.2 REMOVING ROCK

- a. In removing rock for the placement of masonry, special care shall be taken to excavate it as closely as possible to the required shape and with no projection into the neat outside line of such masonry. The surfaces of all rock foundations shall be sufficiently rough to bond well with the masonry. Before any masonry is built on or against a rock surface, the latter shall be scrupulously freed from all dirt gravel, boulders, ice, snow, or other objectionable substances, including loose fragments of rock.
- b. Unless otherwise directed by GCDWR, rock shall be fully taken out at least twenty-five (25) feet in advance of pipe laying, at least 6" below the invert of the pipe, and to a trench width for the size of the pipe to be laid, as specified in Detail G3.
- c. All pipe installed within rock excavation shall be laid upon a minimum of six (6) inches of # 57 stone coarse aggregate.

3.3.3 BLASTING

- a. Blasting may be allowed for removing rock for excavation when properly permitted. When blasting, the Contractor must use all possible precautions against accidents or damages due to use or storage of explosives, and assumes all responsibility/liability associated with blasting activities. **ONLY LICENSED EMPLOYEES OR SUBCONTRACTORS WILL BE ALLOWED TO CONDUCT BLASTING ACTIVITIES – PROOF OF SUCH LICENSING MUST BE PROVIDED TO GCDWR PRIOR TO ENGAGING IN ANY BLASTING ACTIVITIES.**
- b. Explosives shall be used, handled, and stored as prescribed by the laws and regulations of the State of Georgia, and all applicable local laws and regulations pertaining to such. All explosives shall be stored in a safe place at a sufficient distance from the work so that no damage will occur to any portion of the work should an accident occur relating to the stored explosives.

3.4 DUCTILE IRON PIPE AND FITTINGS

3.4.1 WORK INCLUDED

- a. The Contractor shall furnish all materials for and shall properly install, adjust and test, and place in continuous operation at the location indicated on the approved plans, or as directed, all push-on ductile iron pipe and ductile iron fittings, all mechanical joint ductile iron pipe and mechanical joint ductile iron fittings, all flanged ductile iron pipe and flanged ductile iron fittings, and all steel carrier pipe and steel fittings, for the construction of the water mains as required for the proper completion of the work. The Contractor shall also furnish all labor and equipment necessary and sufficient to relocate existing pipelines where indicated on the approved construction drawings.
- b. No work may be started or continued if the Contractor's foreman or job-site representative does not have a complete set of the approved plans and specifications available at all times on the site for reference.
- c. Whenever the work disturbs existing conditions or work already completed, the same shall be restored to as good as or better than the original condition in every detail. All such replacement and repair shall meet with the approval of GCDWR.
- d. It is the intent and requirement of these Specifications to ensure an installation which is complete in every detail, whether or not indicated on the drawings, or specified herein.

- e. Attention is also called to the construction procedure required. The proposed water mains shall be constructed in complete sections. Each section shall terminate at a valve and shall be tested and sterilized. Upon receipt of a passed Inspection Report from the GCDWR Project Inspector, the Contractor shall place the section in service immediately. Water shall be carried forward with the construction.
- f. All ductile iron pipe and fittings shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Ductile iron pipe shall have cement mortar lining (standard thickness) in accordance with AWWA C104, and shall be as manufactured by American Cast Iron Company, U.S. Pipe, McWane Ductile, or approved equal. Fittings shall have cement mortar lining (double thickness) in accordance with AWWA C104.
- g. All ductile iron pipe shall be marked in accordance with AWWA C151 and ductile iron fittings shall be marked in accordance with AWWA C110.

3.4.2 PUSH-ON PIPE AND FITTINGS

All push-on ductile iron pipe shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51. Pipe shall be a minimum Pressure Class 350 for four (4) inch through twelve (12) inch, Pressure Class 250 for fourteen (14) inch through twenty (20) inch, and Pressure Class 200 for twenty-four (24) inch through sixty-four (64) inch. For locations where the system hydraulic pressure and/or depth of cover exceeds the rated pipe working pressure and/or maximum depth of cover in accordance with AWWA C151, a licensed Professional Engineer shall provide design calculations specifying the required pipe pressure class to be submitted to GCDWR for approval.

3.4.3 FLANGED DUCTILE IRON PIPE AND FITTINGS

- a. All flanged ductile iron pipe shall be manufactured in accordance with the latest requirements of AWWA C115.
- b. Wall thickness of pipe shall be as required for the pressure class specified under Article 3.4.2.
- c. All flanged ductile iron fittings shall be manufactured in accordance with the latest requirements of AWWA C110, 250 PSI pressure class standard. Design of flanged ductile iron fittings shall be as directed, indicated, or noted on the approved drawings. In general use flanged fittings with long radius elbows except where space limitations prohibit use of same. Design of special flanged fittings, including wall castings, shall conform to dimensions and details as directed, indicated, or noted on the approved drawings.

3.4.4 MECHANICAL JOINT DUCTILE IRON PIPE AND FITTINGS

- a. All mechanical joint ductile iron pipe shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51.
- b. Wall thickness of pipe shall be as required for the pressure class specified under Article 3.4.2.
- c. Mechanical Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to AWWA C110 or AWWA C153 and joints in accordance with AWWA C111.

3.4.5 FLANGES

- a. Flanged ductile iron pipe twelve inches or less in length (spool pieces), shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than twelve inches in length shall be screw type and attached to a threaded pipe section, and shall be factory fabricated. Pipe threads shall be of such length that, with flanges screwed home, the end of the pipe projects beyond the face of the flange. Flange and pipe to be faced to give a flush finish to the pipe and flange surface normal to the axis of the pipe. The flanges shall be of such design that flange neck completely covers the threaded portion of the pipe to protect same against corrosion. Flanges on ductile iron pipe and fittings are to be coated with coal tar pitch paint after machining.
- b. Flanged ductile iron pipe and fittings to be faced and drilled in accordance with the latest requirements of AWWA C115/A21.15, Class 125, unless special drilling is specified, or required. Where cap bolts or studs are required, flanges shall be drilled and tapped accordingly.
- c. Flanged bolt holes on each end of flanged ductile iron pipe and fittings shall accurately straddle the same horizontal and vertical center lines.

3.4.6 PUSH-ON AND MECHANICAL JOINT GASKETS

- a. Push on and mechanical joints shall be made with gaskets suitably formed of high-quality vulcanized rubber, made to exact dimensions, and in the form of solid rings. Gaskets shall have a durometer hardness of approximately 65 on the large end which enters the bell first, and approximately 85 on the other, smaller end. Composition of the rubber, its hardness, and other properties, and the design of the gasket recess shall be such that the joint is tight under all ranges from a vacuum up to a maximum rating of 350 pounds per square inch internal liquid pressure.
- b. Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on both the gasket and the spigot-end of the pipe. Lubricant shall be NSF 61 approved and shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather, and shall satisfactorily adhere to either wet or dry pipe. **ONLY LUBRICANT FURNISHED WITH THE PIPE BY THE PIPE MANUFACTURER SHALL BE USED.**

3.4.7 FLANGED JOINTS

- a. Form flanged joints with through, stud, or cap bolts, as required, of the size and length specified by the manufacturer to thoroughly make up the joint. Use only full face type, red rubber gaskets one-sixteenth inch thick, as manufactured by the U.S. Rubber Company, in all flanged joints.
- b. Except as otherwise specified or noted, machine bolts, stud bolts, and cap bolts shall be made from alloy steel, complying with the requirements of ASTM Des. A193-64, Grade B7, and nuts shall be made from alloy steel, complying with the requirements of ASTM Des. A194-64, Grade 2 or 2H.

- c. For bolts, nuts, and threads, conform to the latest requirements of the following ANSI Standards and ASTM Designations:

Semi-finished, hexagonal bolt heads and nuts
Heavy Series dimensions ANSI B18.2-60

Bolt threads after plating, Coarse Thread Series,
Class 2A, and nut threads after plating, Coarse
Thread Series, Class 2B ANSI B1.1-60

Galvanizing (if used) ASTM 153-61

Studs and nuts to be utilized underground or in
contact with liquids – alloy steel, Grade B8 ASTM A193-64

- d. Steel bolts and nuts shall be cadmium plated, Sherardized, or hot dip galvanized after the threads are cut. Threads shall be well fitting and sound after plating. Cadmium plating shall be 0.0003 to 0.0005 inches thick on the body, and 0.00015 inches thick on the threads. Connecting flanges shall be conformed to proper position and alignment without the use of external force to bring them properly together.

3.4.8 PIPE COATING AND LINING

- a. Piping system buried underground or submerged shall have a standard asphaltic outside coating as specified. Exposed pipe and fittings have an outside coating of universal primer.
- b. Where the pipe is located within 10 feet of a utility line that has cathodic protection, the pipe shall be exterior coated with zinc with an asphaltic final coat, or wrapped with polyethylene encasement in accordance with the manufacture recommendations to a minimum distance of 20 linear feet beyond such conditions. All elements of the piping system shall be wrapped entirely in polyethylene tubing and secured with polyethylene tape to completely prevent the entrance of foreign matter. Such encasement shall be carried out in accordance with ANSI/AWWA C105/A21.5.

3.4.9 STORING OF MATERIALS

All tools, materials, machinery, and equipment required for the work may be stored in a compact, neat, stock-piled manner adjacent to the work site, in a suitable location, and in such a manner as to cause the least inconvenience to the affected property owners, ensure traffic safety, and so as not to endanger the general public in any way. All active, existing fire hydrants must be kept unobstructed and accessible at all times. All water and gas valves, and underground power and telephone manholes must be left uncovered by such storing of materials.

3.4.10 CUTTING OF PIPE

Whenever the pipe requires cutting to fit into the line, or to fabricate joints, the work shall be performed in such a manner as to leave a smooth end at right angles to the axis of the pipe.

3.4.11 CONNECTIONS TO EXISTING LINES

- a. Connections to existing pipe lines shall generally be made by the use of tapping sleeves and valves, except as specifically indicated on the approved drawings to be otherwise, or as may be directed by GCDWR. In certain instances it may be specified or desirable to tap a dry line. In this circumstance a tapping sleeve and valve is required and the tap accomplished utilizing a standard tapping machine. **Under no circumstances will the Contractor be permitted to burn a hole in the main using oxyacetylene tools.**
- b. The closing of any existing mainline valves to isolate a particular pipe or a wet cut-in will be accomplished by the Contractor under the specific direction and presence of the GCDWR Project Inspector, and at such time as may be directed by GCDWR. All such shut downs must be approved in advance by GCDWR. The Contractor shall provide all labor and equipment sufficient to uncover valves and clean out valve boxes for access to any existing valves necessary to complete or repair work as part of the Project. GCDWR will provide all records and information available to assist in the locating of covered valves, and will also provide assistance in the form of electronic locating equipment. This assistance shall not relieve the Contractor of his responsibility to locate any necessary valve to accomplish the work.
- c. **THE CONTRACTOR WILL BE RESPONSIBLE FOR NOTIFYING, WITH THE ASSISTANCE OF GCDWR, ALL CUSTOMERS WHO WILL BE AFFECTED BY THE INTERRUPTION OF WATER SERVICE. SUCH NOTIFICATION MUST BE MADE AT LEAST 24 HOURS IN ADVANCE OF THE PLANNED SHUT-DOWN. NO SERVICE MAY BE INTERRUPTED WITHOUT GCDWR PRIOR APPROVAL.**

3.4.12 BUILT-IN PIPE AND FITTINGS

Where indicated on the approved drawings, specified, or as directed, pipe and fittings shall be carefully built in, connected to, or supported on concrete or brick masonry. In all instances such masonry work shall be performed so as to avoid covering or obstructing glands, bolts, nuts, retainers, etc., so that they cannot readily be operated after the masonry work has been completed.

3.4.13 THRUST RESTRAINT

- a. Where specified or as directed, plugs, caps, tees, and bends deflecting 22½ degrees or more shall be restrained. Restrained joint pipe and fittings shall be restrained to the minimum restraint lengths specified on the Drawings with one (1) of the following methods:
 1. Method 'A': Restrained joint pipe and fittings
 2. Method 'B': One (1) of the following dual (2) independent restraints:
 - A. Mega-Lugs plus Thrust Blocking
 - B. Mega-Lugs plus Rodding
- b. Where indicated or specified on the Drawings, 11¼ degree bends or less may be restrained with only one (1) method of restraint.

3.4.14 MARKING

- a. All ductile iron pipe shall be marked in accordance with the requirements of AWWA C151/A21.51. All ductile iron fittings shall be marked in accordance with the requirements, of AWWA C110/A21.10.

- b. When requested, the Contractor shall furnish GCDWR with lists, in duplicate, of all pieces of pipe and fittings received on the project, including copies of shipping documents from the manufacturer and/or supplier. Said lists shall indicate the serial or mark number, weight, class, length, size, and description of each typical piece received.

3.4.15 MATERIAL INSPECTION

- a. All ductile iron pipe and fittings will be subject to the inspection and approval by GCDWR after delivery of the material to the site. Broken, cracked, misshapen, imperfectly coated, unsatisfactory, or otherwise damaged ductile iron pipe or fittings are not permitted to be used in the work.
- b. Such inspection by GCDWR does not relieve the Contractor of full responsibility for the materials installed. FAILURE BY GCDWR TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS.

3.4.16 UNLOADING AND LAYING

- a. Unload ductile iron pipe, fittings, and accessories from the transport vehicle with hoists or by skidding. Do not skid or roll pipe handled on skidways against pipe already on the ground. Under no circumstances are said materials to be dropped off any delivery vehicle. Should any material be accidentally dropped, it shall be immediately set aside, and thoroughly inspected by GCDWR before any decision is made regarding its acceptability. If damage occurs to the lining, make repairs or replacement as directed by GCDWR. If there is any question regarding acceptability of said suspect materials by GCDWR, the Contractor shall remove and replace the questionable materials.
- b. Use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Take great care to prevent the coating and lining from being damaged.
- c. Pipe may not be strung along the project within existing highway rights-of-way, unless specifically directed to do so by GCDWR, and only then after receiving permission from the road authority which has jurisdiction.
- d. The Contractor shall carefully examine all pipe and fittings for defects just before laying and lay no pipe or fitting which is known to be defective. In the event that defective pipe or fittings are discovered after having been laid, the Contractor shall remove and replace with sound pipe or fittings in a manner satisfactory to GCDWR.
- e. It is the Contractor's responsibility to maintain a clean work site and clean materials throughout the project. All pipe and fittings shall be kept free from mud, dirt, and debris while stored on site, and shall be thoroughly cleaned before being laid. During any breaks in the laying of pipe, and when ending construction for the day, the Contractor shall install a mechanical or fitted plug in the open end of the pipe to prevent contamination of the pipeline. Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out, and inspected by GCDWR, before new or further pipe installation may commence.

3.5 SERVICE LINE CONDUITS

Where the drawings indicate, where rock is present, or in locations directed by the GCDWR Project Inspector, the Contractor shall install service line conduits across the proposed roadways for future water connections. Conduits shall be 2-inch rigid P.V.C. slip-joint pipe. Conduits shall be installed with a minimum of 4-feet of cover and shall be capped at each end to prevent entry of debris. Where conduits are installed across roadways which shall be constructed using curb and gutter, the Contractor shall saw-cut a “W” in the curb immediately above the conduit location.

3.6 VALVES & WET CUT-INS

3.6.1 WORK INCLUDED

The Contractor shall furnish all the materials for, and shall properly set in place – at the locations indicated on the drawings or as directed – all gate valves, butterfly valves, tapping sleeves and valves, and other valve-type assemblies of the size and type specified or directed, which are necessary for the completion of the work, including all excavations required for their installation.

3.6.2 WET CUT-INS

The Contractor shall provide all labor and equipment necessary to make a cut-in to an existing water main for the purpose of making a connection, installing a valve, fire hydrant assembly, or other fittings and appurtenances. A “wet cut-in” is defined to be the physical cutting into any existing water main which will result in the interruption of service to an existing customer, or which shall necessitate the removal of water contained within the existing main from the excavation which is caused by the cutting into the pipe. Wet cut-ins shall not be allowed to be performed on Fridays.

3.6.3 GATE VALVES

- a. Gate valves shall conform to AWWA C509 for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, Mueller, M & H, or approved equal.
- b. Gate valves shall be hand operated, non-rising stem, with cast or ductile iron bodies, and adapted for joints as indicated in the approved design drawings, or as directed.
- c. All gate valves shall open by turning the operating nut to the left (counter clockwise).
- d. Only gate valves shall be used in sizes 2” up to 12”, gate valves may be used in sizes 12” and larger (see Article 2).

3.6.4 BUTTERFLY VALVES

- a. Butterfly valves shall conform to the requirements of AWWA C504, and shall be as manufactured by American Flow Control, Henry Pratt, Mueller, Kennedy, or approved equal.
- b. Butterfly valves shall be hand operated with cast or ductile iron bodies, and adapted for joints as indicated in the approved design drawings, or as directed.
- c. All butterfly valves shall open by turning the operating nut to the left (counter clockwise).
- d. Butterfly valves shall only be used in sizes 12” and larger (see Article 2).

3.6.5 RESILIENT SEATED GATE VALVES

At the Contractor's option, 12" and larger resilient seated gate valves conforming to AWWA C-509, may be substituted for 12" and larger butterfly valves. GCDWR shall be informed of the proposed substitution prior to installation.

3.6.6 TAPPING SLEEVES AND VALVES

- a. The Contractor shall furnish and install tapping sleeves and valves suitable for connection to the existing water mains at locations indicated on the approved plans, or as directed. The Contractor shall also provide the tapping machine and competent supervision for the making of taps. It is the Contractor's responsibility to verify the type, size, O.D. and class of the existing pipe before ordering the tapping sleeve and valve.
- b. Prior to making the tap, the Contractor, in the presence of the GCDWR Project Inspector, shall hydrostatically pressure test the complete tapping sleeve and valve installation at a test pressure of 200 PSI (**PNEUMATIC, OR AIR-PRESSURE TESTING IS PROHIBITED**). The Contractor shall properly support the tapping sleeve and valve using bricks, blocks, wedges, or other substantial supporting materials, which will not permit the tapping valve or tapping machine to transfer any downward rotational force to the tapping sleeve. This support shall be provided before mounting the tapping machine.
- c. Tapping sleeves for size on size taps 16 x 16 and larger shall be ductile iron with mechanical joint ends equal to those manufactured by American Valve and Hydrant, or Mueller Company. Split Steel prefabricated Tapping Sleeves as manufactured by JCM or Smith-Blair may be used for size on size taps 12 x 12 and smaller, and for all taps smaller than "size on size". Outlets shall be sized to permit a tap to be made using a full size shell cutter. The existing pipe shall be thoroughly cleaned prior to the installation of the sleeve. The use of strap saddles for taps larger than 2" is not permitted. Shop drawings for split steel sleeves must be approved by GCDWR prior to use.
- d. For asbestos-cement pipe and Class 200 PVC pipe, the Contractor must use "Ford" stainless steel full circle tapping sleeve or approved equal, which contains a full gasketed surface within the sleeve body to allow for the variances in the manufactured O.D. of the asbestos-cement pipe.
- e. Tapping valves shall conform to the requirements for gate valves herein before stipulated, except for any modifications necessary to permit the use of full size shell cutters. Resilient seated tapping valves 16" and larger may be supplied without the bypass. When using resilient seated gate valves for making taps 16" and larger, it is the Contractor's responsibility to determine the finished depth of cover that shall remain over the operating nut of the valve after installation. If finished depth of cover in a standard vertical configuration is less than 2 feet, then the tapping valve shall be supplied in a horizontal configuration with differential operator.

3.6.7 BACKTAPS

Backtaps shall not be permitted unless specifically authorized by GCDWR. Any said authorized backtaps shall be constructed using MJ fittings and megalug retainer glands, and single joints of pipe. Threaded rod shall only be permitted from the steel casing to the first fitting. Welding eye bolts directly to the casing for the purpose of installing threaded rod is not permitted.

3.6.8 ACCESSORY EQUIPMENT

All valves which are buried in the ground shall be provided with a valve box and cover. Where the depth of cover is more than 5-feet, the Contractor shall provide suitable, permanently installed valve stem extensions and guides which have been approved by GCDWR prior to fabrication and placement.

3.6.9 VALVE MARKERS

Valve markers shall be furnished and installed with each valve on the proposed project, with the exception of fire hydrant valves. The markers shall be Class A concrete of DOT specifications, 4" square by 5-feet long, and shall be of the same construction as that of highway right-of-way markers. The words "Water Valve" shall be cast vertically into the marker beginning 2" from the top of the marker. There shall also be a 1 1/4" brass plug cast into the marker 1" below the letter "E" of the word "Valve", which shall be stamped in the field by the Contractor, after installation, with the distance, in feet, from the valve marker to the valve box. The markers shall be installed as close to the right-of-way line opposite the valve as is possible, with the brass plug facing the valve. The marker shall be located so as to avoid damage by traffic. The top of the marker shall generally be set 24 inches above finished grade. The marker may be somewhat lower in areas where it may be considered obtrusive, such as lawns, however, at no time shall the marker be installed at less than 18" above finished grade.

3.6.10 INSTALLATION AND PLACEMENT

- a. All valves shall be set accurately and carefully to the lines and grades given on the approved design, or as directed, and shall be joined to the pipe utilizing such approved joints as herein before specified for ductile iron water mains.
- b. Tapping sleeves and valves and insert valves shall be installed in accordance with the manufacturer's recommendation.
- c. Valve boxes shall be centered plumb over the operating nut of the valve with the cover flush with the surface of the finished pavement, finished grade after landscaping, or as directed. The valve box shall not be in direct contact with the bonnet of the valve, and shall be supported in such a manner as not to transmit shock, stress, or load directly to the valve. A formed or pre-cast collar shall be placed around the collar of the valve box in unmaintained areas. **VALVE BOXES ARE TO BE OF THE ADJUSTABLE SLIP-TYPE. SCREW ADJUSTING VALVE BOXES ARE NOT PERMITTED.**
- d. Where indicated on the approved design, or as directed, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves 24" and larger to prohibit movement of the pipe when the valve is closed.

3.6.11 TESTING

All valves shall be tested at the point of manufacture in accordance with the specific AWWA standard for that size and type of valve. After the valves have been set in place the Contractor shall hydrostatically field-test each valve as part of the hydrostatic test of the main. Any valve not proved to be bubble-tight shall either be repaired to make it so, or be removed from the line and replaced. Valves repaired or replaced shall be re-tested for leakage prior to acceptance by GCDWR.

3.6.12 SHOP DRAWINGS

If directed, the Contractor shall provide GCDWR copies of all shop drawings or “cut sheets” for the proposed valves, prior to their installation.

3.6.13 PAINTINGS AND OTHER COATINGS

All valves, where not constructed of brass or bronze, or of finished steel, shall be coated at the point of manufacture in accordance with the AWWA Standard Specifications for Painting Ductile or Cast Iron Water Pipes and Fittings. Resilient seated gate valves shall only be provided with a bonded epoxy coating. Machined surfaces shall be given a suitable coating of grease or other protective material.

3.7 FIRE HYDRANTS

3.7.1 WORK INCLUDED

The Contractor shall furnish and install at the locations indicated on the approved design, or as directed, all fire hydrants necessary or required for the proper completion of the work.

3.7.2 FIRE HYDRANT SPECIFICATIONS

Fire hydrants shall be manufactured in full compliance with the AWWA Standard for Dry-Barrel Fire Hydrants, AWWA C502, and as herein amended. **Only the following fire hydrants are approved for use by the Gwinnett County Department of Water Resources: American Flow Control B-62-B, M&H 129, Mueller IMP-PRT2, Clow Medallion, U.S. Metropolitan 250 M-94, or EJ 5CD250.**

1. Type – Three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.
2. Size – Internal main valve diameter shall be a minimum of 5 1/4".
3. Identification – Each hydrant shall have the name of the manufacturer, the year when made, and the nominal valve size in legible, raised letters cast on the barrel or bonnet.
4. Dry Top Bonnet – Each hydrant shall be constructed with a moisture-proof lubricant chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be comprised of a top “O” ring serving as a dirt and moisture barrier and a lower “O” ring which will serve as a pressure seal.
5. Operating Nut – The operating nut shall be of regular pentagon shape measuring 1 1/2” point to flat (National Standard), and shall open by turning counter-clockwise (left). Nozzle caps shall have the same cross-section as the operating nut, and shall come with heavy duty, non-kinking chains. Chains shall be securely affixed to the hydrant barrel and permit free turning of the nozzle caps.
6. Traffic Design – The hydrant barrel sections shall be connected at the ground line in a manner that will prevent damage to the hydrant when struck by a vehicle. The main valve rod sections shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.

7. Main Valve – The main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.
8. Main Valve Seat – The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement. Two “C” ring seals shall be provided as a positive pressure seal between the bronze set ring and the shoe. The valve assembly pressure seals shall be obtained without the employment of torque compressed gaskets. The hydrants shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single disassembly wrench without excavating.
9. Drain – The drain mechanism shall be designed to operate automatically with the operation of the main valve and shall allow momentary flushing of the drain ports. A minimum of two internal and two external bronze lined drain ports shall be required in the main valve assembly to drain the hydrant barrel.
10. Inlet connection – The cast iron inlet elbow shall have a 6” mechanical joint connection complete with accessories.
11. Extensions – Barrel extension sections shall be available in 6” increments complete with rod, extension coupling, and the necessary flanges, gaskets, and bolts so that extending the hydrant can be accomplished without excavating.
12. Nozzles – No lead will be allowed in nozzle construction as a component of the metallic content.
13. Testing – All fire hydrants shall be tested in strict accordance with AWWA C502-85 at the point of manufacture. Certificates of Compliance shall be provided to GCDWR upon request.

3.7.3 INSTALLING FIRE HYDRANTS

- a. Hydrants shall be installed at the locations indicated on the approved design in a manner to provide complete accessibility, and so that the possibility of damage from vehicles or injury to pedestrians will be minimized. The Contractor shall install the proper “bury” fire hydrant or shall use the proper length extensions to ensure that each fire hydrant is installed with the frangible couplings at the proper elevation above finished grade in accordance with the manufacturer’s recommendations (see Details W4, W5 and W6). Place gravel around the weep holes and base of hydrant as shown.
- b. The connection of the hydrant to the supply main must be through either a ductile iron hydrant tee or a tapping sleeve and shall include an outlet valve at the point of connection. In certain instances where long-side fire hydrants are specified, an additional branch valve may be required adjacent to the hydrant. If approved in advance, lengths of ductile iron pipe containing factory fabricated mechanical joint bosses may be utilized for fire hydrant connection to the main line, however, such approval will not be justification to install hydrants at locations other than as designed because the bosses do not fall within the original design location, unless otherwise approved by GCDWR.

3.7.4 PAINTING, COATING, AND LUBRICATING

- a. All iron parts of the hydrant inside and outside shall be thoroughly cleaned and all surfaces below the ground line shall be factory-coated or painted with an asphalt or bituminous base paint or coating.

- b. The outside of the hydrant above the ground line shall be thoroughly cleaned and painted in a factory with two coats of Koppers Primer 621 or approved equal. After installation, each hydrant shall be painted with two field coats of **silver** Glamortex Enamel as manufactured by the Inertol Company, or approved equal.
- c. All bronze, threaded and contact moving parts shall be lubricated during shop assembly, and protected by a coating of rust proof compound to prevent damage in shipment and storage.

3.8 RELOCATION AND RECONNECTION OF EXISTING HYDRANTS, VALVES, AND LARGE METERS

3.8.1 WORK INCLUDED

- a. The Contractor shall, where required, disconnect, relocate and reconnect existing hydrants, valves, and large meters. The work shall be performed as follows.
- b. Reconnecting and/or relocating existing hydrants shall include disconnection from existing mains, plugging and blocking openings in the mains, and reconnecting to the new mains in accordance with installation instructions shown on approved plans.
- c. Salvaging hydrants and valves shall include transporting and delivering such hydrants and valves for salvage to locations designated by GCDWR in coordination with GCDWR.
- d. Relocating existing 3" and larger water meters and double-check backflow preventers shall include removal of the existing metering and backflow prevention device and vault, and reinstallation of these items to locations identified on the approved design. If construction phasing requires such, existing devices and vaults shall be carefully removed and stored, and properly reinstalled in the work where indicated or required. If the existing vaults or backflow preventers do not meet current standards, these shall be replaced and retrofitted with vaults and devices that are recommended/required by the GCDWR Backflow Prevention Standards.
- e. If a wet cut-in is required for the relocation, the Contractor shall request the GCDWR Project Inspector to perform a trial shutdown to verify that an existing line is actually shutdown before the work is permitted to take place. **All shutdowns which affect any existing customer service must be authorized by GCDWR.**

3.8.2 EXISTING MATERIALS AND APPURTENANCES

- a. Existing valves and hydrants which, in the opinion of GCDWR, are suitable for re-use shall be thoroughly cleaned and, if necessary, shall have their internal parts reworked, and shall be properly placed in the work where indicated or required. Outlets on hydrants shall be re-oriented, if necessary.
- b. The Contractor shall perform the disconnecting, relocating, and reconnecting carefully so as to avoid damaging the materials or appurtenances. Materials or appurtenances damaged in the course of performing the relocation or reconnection shall be replaced or repaired by the Contractor or Developer at his own expense and to the satisfaction of GCDWR.

3.9 HOUSE SERVICE CONNECTIONS (House service connections are defined as the line between the water main and the water meter.)

NOTE: EXCEPT AS NOTED IN ARTICLE 2.2.18, HOUSE SERVICE CONNECTIONS SHALL NOT BE CONNECTED TO NEW MAINS UNTIL SUCH MAINS HAVE BEEN STERILIZED AND TWO "PASSED" BACTERIOLOGICAL SAMPLES HAVE BEEN OBTAINED, AS PROVIDED IN ARTICLE 3.13 OF THESE SPECIFICATIONS.

3.9.1 WORK INCLUDED

- a. The Contractor shall furnish all materials, labor, tools, and equipment for the proper installation, relocation or replacement of all water house service connections, service lines, water meters and meter boxes which are so indicated to be addressed on the approved plans. If in the process of conducting the work, the Contractor determines that additional house services or connections will be affected by the proposed design, or discovers house services which were hereto previously unknown, the Contractor shall immediately notify the GCDWR Project Inspector for direction concerning the services. New service connections to water mains shall be made in accordance with the approved design, or as directed by GCDWR after design. All house service connections shall be installed using copper service lines, compression fittings, and shall meet current GCDWR meter installation standards.
- b. The Contractor shall make all relocations of existing house services from existing mains to water mains constructed as part of the approved project, as indicated on the approved design, or as directed by GCDWR, whether or not the existing mains are to be abandoned as part of the project. When the existing mains are to remain in service, or when directed, the Contractor shall abandon all portions of the existing service by excavating the service connection at the existing main and closing the corporation stop for each service to be abandoned.

3.9.2 SPECIAL ATTENTION

All temporary relocations or replacements of house service connections necessary to execute the work shall be made at the Contractors expense. Any replacements made necessary due to negligent or careless operations by the Contractor shall be accomplished immediately if customer service is affected, shall be of first class workmanship, and shall be completed using only approved materials, as indicated elsewhere in these Standards, or as directed.

3.9.3. SPECIFIC REPLACEMENTS CONDITIONS

Where indicated on the approved design, or when directed, connection, relocation, or replacement of an existing water service line shall comply with the following:

If existing service line is 1" or less, and either galvanized or polybutylene pipe, or other material, the entire service line from the main to the meter shall be replaced with copper tubing as specified below.

If existing service line is 1-½" or 2" and is: galvanized pipe which is greater than 10 years old, pipe that shows evidence of significant corrosion internally or externally, is PVC pipe, or as directed by GCDWR, then the entire service line from the main to the meter shall be replaced with galvanized pipe, Municipex pipe or approved equal, as specified in Article 3.9.5.

3.9.4 NEW SERVICE INSTALLATIONS IN RESIDENTIAL CUL-DE-SACS

- a. Where indicated on the approved design, the Contractor shall install live 1-inch copper services within residential cul-de-sacs. Services shall be installed to all lots within the cul-de-sac not immediately adjacent to the water main out from under paved surfaces.
- b. Live 1-inch copper services shall be installed at the property lines to avoid conflict with driveway construction. Each service shall end at the curb line, and shall terminate in an approved curb stop, located within a standard meter box.
- c. After installation, the Contractor shall mark the location of the live services, by saw-cutting a "W" in the curb adjacent to each service.
- d. Live services shall have all corporation stops fully open at the time of pressure testing the main to ensure integrity of the service. The GCDWR Project Inspector will confirm by turning on each curb stop during the pressure test.

3.9.5 Materials

Service lines shall be constructed of copper pipe or galvanized steel pipe with fittings and appurtenances in accordance with the following:

Copper Pipe (or tubing) shall be manufactured and furnished in accordance with ASTM Specifications B88, Type K. Fittings shall be of the compression pack-joint coupling type.

Galvanized Steel Pipe (for 1-1/2" and 2" services only) shall be standard weight galvanized steel with screw joints conforming to ASTM A53. Fittings shall be galvanized, except that nipples and couplings shall be of the same material as the pipe. The galvanized pipe connection at the meter shall be constructed in such a manner as to create an approved "swing joint", and shall utilize a compression-type coupling immediately prior to the meter.

Municipex (or approved equal) shall be furnished in SDR 9 copper tube sizes (CTS) in accordance with ASTM F876 and AWWA C800. AWWA C904 compression joint brass valves and fittings (with stainless steel inserts) are for 1-1/2" and 2" services only, and shall be compatible with AWWA C800 tubing.

Appurtenances such as corporation stops, curb stops, and adapters for copper and galvanized steel service lines shall meet the requirements of ASTM Designation B-62 for bronze construction, and AWWA C800 for threads. Adapters shall be furnished as required for connecting copper and galvanized steel pipe. Corporation stops shall be Hays No. 5200, curb stops shall be Hays No. 5060, adapters shall be Hays No. 5600, No. 5605, or No. 5615. Double strap saddles, for the purpose of tapping the main shall be Dresser Style No. 91, or Smith-Blair Style No. 313 and shall be tapped for Mueller threads.

NOTE: THE USE OF SOLDERED JOINTS OR FLARE-JOINTS FOR COPPER PIPE AND FITTINGS IS PROHIBITED.

3.10 JACKED CASING

3.10.1 WORK INCLUDED

- a. The Contractor shall furnish all material, labor, tools, and equipment necessary for the complete installation of a jacked steel casing, free-bore, or installation of steel casing by open-cut method, as may be indicated on the approved plans, or as directed by GCDWR, including, but not limited to: bore pit excavation, sheeting, shoring, plating, and safety barriers for the protection of workers, traffic, and the general public. In general, the work shall include steel pipe casing, excavation, backfill, restoration of site, sheeting, grout, brickwork, earth augers, jacking machine, welder, and other accessories necessary for a complete installation as specified or directed.
- b. The Contractor shall be fully responsible for protecting against surface subsidence, damage or disturbance to adjacent property and facilities from his construction methods. If loose material is encountered and cave-ins occur or are anticipated, all jacking/augering will be suspended, shoring provided, and all voids filled or pressure grouted. Supplemental measures and alternative methods must receive GCDWR approval before jacking/augering operation re-commences. Any settlement or upheaval of the existing roadway pavements during the jacking and boring operation, and throughout the warranty period for the overall project, shall be repaired/restored by the Contractor immediately upon notification by GCDWR of the pavement failure.
- c. All jacking/augering operations must be performed in compliance with the rules and regulations of the Gwinnett County Department of Transportation, Georgia Department of Transportation, or other authorities having jurisdiction.
- d. Any sheeting placed for the jacking/augering operation must be completely removed by the Contractor prior to backfill.
- e. When the bore pit excavation and/or jacking/augering operation occurs along existing rights-of-way, care must be taken to ensure all work is performed within the right-of-way, or arrangements must be made with the owner of the affected private property to permit any encroachment on the private property. All such arrangements shall be made in writing and a copy provided to the GCDWR Inspector prior to beginning the excavation.

3.10.2 MAINTAINING TRAFFIC AND PUBLIC SAFETY

- a. All working operations of the Contractor or Developer, his subcontractors, and/or their agents or employees must be subordinated to the free and unobstructed use of the highway, and structures encountered in the execution of jacking and boring operations.
- b. The Contractor shall proceed with the work in such a manner as will permit regular transaction of business by commercial operations adjacent to the project site without delay or danger to persons or property, permit free access to and from private residences, and will allow the safe flow of traffic and pedestrians around the work site. The Contractor shall employ the use of barricades, barriers, warning signs, signals, lights, and if necessary, watchmen, for the protection of the general public. The Contractor, when directed by GCDWR, shall suspend all operations relating to jacking and boring until necessary safety precautions have been met.
- c. The Contractor shall submit for approval, when requested by GCDWR and/or highway departments, all working drawings and schedules of procedure proposed to be followed in the execution of jacking and boring operations.

- d. Schedules shall set forth the sequence of the various operations together with the time proposed to begin and complete the phases of the work.

3.10.3 JACK AND BORE/STEEL CASING

- a. The Contractor shall jack a steel casing pipe as indicated on the approved design, using a special earth auger machine. The wall thickness of the steel casing pipe up to 20 inches shall be a minimum .375 (3/8) inch, with the pipe having sufficient strength to withstand superimposed loads and jacking stresses. The casing shall be jacked to the line and grade indicated on the approved design. Casing pipe 24-inches and larger shall have a wall thickness of a minimum .500 (1/2) inch.
- b. Each joint of the casing pipe shall be **fully** welded around its entire circumference to the adjacent joint prior to being jacked.
- c. Following completion of the jacking operations, the water pipe shall be inserted within the casing and its invert supported by pre-fabricated casing spacers. The ends of the casing shall be sealed with brick bulkheads using brick and mortar.
- d. See Article 4.3.10 for additional requirements.

3.10.4 FREE BORE

- a. Where permitted or directed by GCDWR, the Contractor shall use a special earth auger machine to bore a hole to the line and grade as indicated on the approved design. Said hole shall be of a constant diameter, which shall not exceed more than four inches the bell diameter of the proposed carrier pipe to be inserted in the bore hole. If the annular space between the earthen hole and the carrier pipe exceeds six inches, then the Contractor shall fill such space either by pressure grouting or pumping in a flowable fill to eliminate possible settlement.
- b. At no time will free bores in excess of forty (40) feet be permitted.

3.10.5 STEEL CASING (OPEN-CUT INSTALLATION)

Where permitted or directed by GCDWR, the Contractor shall place the steel casing directly in an open cut ditch for subsequent installation of a carrier pipe after backfill. Except for the method of installation, all requirements of Article 3.10.3 relating to steel casing specification shall apply. Ditch preparation, backfill, and compaction shall be as required for direct-bury ductile iron pipe.

3.11 CONCRETE

3.11.1 WORK INCLUDED

- a. The Contractor shall furnish all materials for, and shall place all concrete masonry in the structures indicated on the approved design, and other such concrete masonry as may be found necessary for completion of the work.
- b. All concrete shall be Class "A" concrete in accordance with GDOT Specifications Section 500 (28 day compressive strength of 3,000 psi).
- c. Concrete shall be reinforced concrete where indicated on the construction plans and details. Steel reinforcement bars shall be in accordance with GDOT Specifications Section 853.

- d. Slump shall range from two to four inches.
- e. The Contractor shall provide a standard cone of metal for making slump tests, and a supply of suitable containers for making standard six inch by twelve inch cylinders for testing the compressive strength of the concrete.
- f. **No accelerating or set-retarding admixtures will be permitted unless specifically approved by GCDWR prior to placement.**
- g. The temperature of concrete measured at placement shall be between fifty and ninety degrees Fahrenheit.
- h. Bagged concrete will not be allowed.

3.11.2 PLACEMENT

- a. Provision shall be made by the Contractor for transporting the concrete rapidly from the place of mixing to the work, and with as little jiggling as possible so that the tendency of the water to rise to the top may be reduced to a minimum. The concrete shall be placed before it has had time to obtain its initial set, and under no circumstances shall it be re-tempered and used in the work.
- b. All concrete forms shall be wetted or sprayed with an approved releasing agent immediately prior to pouring concrete.

3.11.3 PLACEMENT IN WATER PROHIBITED

Concrete shall not be laid in water, nor shall water be allowed to rise on or flow over freshly placed concrete until the concrete has set for at least twenty-four hours.

3.11.4 FREEZING AND INCLEMENT WEATHER

Concrete placed in cold weather shall be heated with an approved device to a temperature that will permit it to be transported by standard conveyance on the work site and placed in the forms at a temperature of not less than fifty degrees Fahrenheit.

3.12 BACKFILLING

3.12.1 BACKFILLING STRUCTURES

Backfilling of structures shall proceed as various structures or parts of structures are completed. The Contractor shall refill the space outside and around the wall with material excavated from the site and stored for this purpose. Immediately adjacent to the structure, the backfill material shall be placed in eight inch layers and compacted to avoid future settlement. This filling shall be carried to such height as will bring the finished grade to the required elevations.

3.12.2 TRENCHES

- a. Initial backfill in trenches where pipe has been laid shall be placed continuously in layers not exceeding six (6) inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve (12) inches above the top of the pipe in accordance with details G1 through G3. This backfilling and compacting must be performed before any backfill material is deposited directly from a machine bucket, loaders, trucks, or other mechanical equipment. When utilizing a

machine bucket for backfilling, the bucket must be lowered into the trench to deposit the material in such a manner as to avoid the shock of falling earth which could injure or damage the pipe or structure. Under no circumstances should the material be allowed to fall from the machine or loader bucket directly onto the pipe or conduit in the trench.

- b. Except as otherwise ordered by GCDWR, all forms, bracing, and lumber shall be removed from the trench before backfilling.
- c. Bottoms of trenches in earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials, as directed, or where indicated on the approved design, to give full support to the lower segment of the pipe. This shall be performed in such a manner as to prevent any subsequent settlement of the pipe. Boulders or loose rock which might bear against the pipe will not be permitted in the trench bottom, or in the initial backfill within twelve (12) inches above the top of the pipe. Bottoms of excavations which are of loose granular soils shall be compacted by vibratory compactor prior to laying of pipe.
- d. Where foundation conditions are such that proper bedding cannot be provided, such as in quicksand, the Contractor may be directed by GCDWR to provide foundation cushion, concrete cradles, or other special provisions as may be required for the proper support of the pipe.
- e. Only after the backfill has been placed and compacted to twelve (12) inches above the top of the pipe, may the work proceed in the placement of the remaining backfill material, which must be carefully placed and compacted. Final backfill shall be placed in accordance with Details G4 through G6 for the applicable site condition. All precautions must be taken to avoid having any unincorporated material which may result in future settlement in these areas. Compaction shall be accomplished by approved mechanical tampers.
- f. When directed by GCDWR, the Contractor or Developer shall arrange to have compaction tests conducted by an independent testing firm.
- g. Materials used for backfilling shall be free from all organics or other objectionable materials, and shall contain no stones larger than four (4) inches in its longest dimension.
- h. If GCDWR determines the original excavated material is unsuitable for use as backfill, such as perishable matter, refuse, building materials, wire, brush, stumps, ashes, large stones, mulch, or other soft materials, the Contractor shall properly dispose of the objectionable materials, and shall furnish, haul, and place borrow material suitable for proper backfill.
- i. Backfilling shall not be performed in freezing weather, except by permission of GCDWR, and shall not be performed using frozen materials or upon frozen materials.
- j. All backfilling shall be left with smooth, even surfaces, properly graded, and shall be maintained in such condition until final completion and acceptance of the work, notwithstanding applicable warranty periods. Where directed by GCDWR, the Contractor shall mound the backfill slightly above the adjacent ground to allow for settlement.

3.12.3 EMBANKMENT OVER PIPES

- a. Where indicated on the approved design, or where authorized by GCDWR, for the crown of the pipe to come close to or extend above the surface of the ground, the Contractor shall cover and protect the pipe with an embankment. This embankment shall be at least three feet deep over the top of the pipe, at least four feet wide at the top, and with side

slopes not less than 3' horizontal to 1' vertical extending to the surface of the undisturbed ground. Provisions shall be made to allow for surface drainage.

- b. The materials of which embankments are to be constructed shall be the same as those permitted for backfill, and shall be free from objectionable materials. The earth shall be placed in layers not exceeding twelve inches in thickness, which shall be compacted by hand tamping, or by other methods approved or directed by GCDWR. The embankments shall neither be built during freezing weather nor with frozen materials. The surface shall be brought to the true lines and grades as indicated on the approved design, or as directed, and shall be raked smooth and left free from rubble, stones, dirt clods, or gravel. Placing of fill or embankment over and around structures shall be performed evenly on all sides to avoid unbalanced loading or overturning action.
- c. Concrete Protection Cap: Where indicated on the approved design, or where authorized by GCDWR, to permit less than three feet of cover over the top of the pipe, the Contractor shall construct a concrete cap over the top of the pipe for protection of the pipe for the entire length where the pipe has less than the minimum cover. The concrete cap shall be Class A concrete, a minimum of four feet wide, four inches thick, and shall be placed no less than one foot above the top of the pipe, but should not extend above the ground at any point. At no time shall a concrete cap be utilized as a substitution for an embankment.

3.12.4 DISPOSAL OF MATERIAL

The Contractor shall be required to remove from the site of the work all earth in excess of that required to backfill the excavation or to create necessary fill. This shall be performed immediately after the backfill is completed to the satisfaction of GCDWR. All material removed shall become the property of the Contractor or Developer, and he shall make his own arrangements for its disposition. All surplus material, shot rock, organics, clearing debris, stumps, and other such material deemed unfit for use as backfill, shall be disposed of by the Contractor, and shall be performed in such manner so as to give a minimum of inconvenience to the public.

3.12.5 BORROW

When acceptable excess material is not available from other parts of the Project for backfill, required fills, embankments, etc., the Contractor shall obtain the necessary "borrow" material at locations off the site of the work. Locating such acceptable "borrow" sites shall be the sole responsibility of the Contractor. All materials to be used as borrow shall be approved by GCDWR.

3.13 TESTING AND DISINFECTION

3.13.1 TESTING

- a. Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints water-tight. After the pipe is laid, each section, as may be determined or defined by GCDWR, shall be properly and adequately flushed, all air removed, and then tested under a hydrostatic pressure of 150 PSI as measured at the lowest elevation of the test section. Where static pressure of the existing water supply to the development exceeds 100 PSI, the test pressure, as measured at the lowest elevation of the test section shall equal to the static pressure plus 50 PSI.
- b. All stub-outs shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, all stub-out valves shall be left in the closed position.

- c. **All testing of water mains, fittings, and appurtenances shall be conducted in the presence of the GCDWR Project Inspector, and under his/her direction.** To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring pressure on the water main; 2) a corporation cock in the main for pressure pump connection; 3) suitable pump, piping, appliances, labor, and other items necessary to conduct the pressure test; 4) a valve wrench and labor to accompany the GCDWR Project Inspector to verify that all valves, including fire hydrant branch valves, are fully open during the pressure test. Each section of pipe shall be filled slowly with water and the specified test pressure shall be applied by means of pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. GCDWR will make water available for flushing and testing of water mains at the Developer's expense. The Contractor shall provide whatever means necessary to transport or convey the water from a designated source to the main.
- d. **NOTE: THE USE OF FIRE HYDRANTS AS A CONNECTION FOR EITHER HYDROSTATIC TESTING OR INJECTION OF CHLORINE SOLUTIONS FOR DISINFECTION IS EXPRESSLY PROHIBITED.**
- e. Before applying the specified test pressure, **all** air must be expelled from the pipe. To accomplish this, it may be necessary for the Contractor to install additional 3/4" service taps at the highest elevations, including any intermediate points, of the section of the pipe to be tested, or at locations directed by GCDWR. Any such taps installed must be removed by the Contractor prior to final acceptance of the main.
- f. The test pressure shall be maintained for a minimum of two hours to allow for thorough examination for leakage, and permit the GCDWR Project Inspector to confirm that all air has been removed, and that all valves within the test section of pipe are fully open.

3.13.2 CHLORINATION AND DISINFECTION OF PIPE LINES AND APPURTENANCES

- a. Before being placed in service all new water main pipe lines and accessories shall be disinfected by chlorination. All chlorinating equipment, materials, labor, and supplies shall be furnished by the Contractor.
- b. Prior to chlorination, all mud, dirt, debris, or other foreign matter shall be removed from the pipeline by a thorough flushing through fire hydrants or other approved means. Each valved section of newly laid pipe shall be flushed independently. This shall be performed prior to the pressure test to ensure removal of any trapped air within the pipe.
- c. The preferable point of application of the chlorinating agent should be at the beginning of the pipeline extension, or any valved section of it. Application shall be through a corporation stop tapped into the newly laid pipe by means of a tapping saddle.
- d. Back pressure, causing a reversal of flow in the pipe being treated, shall be prevented.
- e. During the process of chlorinating the newly laid pipe, all valves or other appurtenances shall be operated to ensure the chlorinating agent is equally distributed throughout the pipeline.
- f. Disinfection of water mains shall be performed in strict accordance with AWWA C651, latest edition, and the Georgia Environmental Protection Division's *Minimum Standards for Public Water Systems*, latest edition.

- g. The highly chlorinated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. After the chlorine treated water has been retained for the required time, the water shall be field tested for residual chlorine in the extremities.
- h. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremities. This process shall continue until water sampled throughout the newly laid pipe tests both bacteriologically and chemically to be the same water quality as the water being served to the public through the existing pipelines.
- i. After flushing, the GCDWR inspector shall notify GCDWR Environmental Laboratory that the main is ready for a bacteriological sample to be processed. Two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1200 feet of new water main, plus one set from the end of the line (dead end or cul-de-sac) and at least one set from each branch. Both sets of samples must receive passing tests in order for the line to receive a "Passed" certification.
- j. **FIRE HYDRANTS SHALL NOT BE USED AS SAMPLING POINTS. A SAMPLING TAP MUST BE INSTALLED AT ALL TEST POINTS.**
- k. **NOTE: WHEN THE ENVIRONMENTAL LABORATORY REPRESENTATIVE ATTEMPTS TO OBTAIN AN ACCEPTABLE SAMPLE, IF THEY OBSERVE AIR, DISCOLORED WATER, TRASH, DEBRIS, TOO HIGH CHLORINE RESIDUAL, OR NO CHLORINE RESIDUAL IN THE WATER, NO SAMPLE WILL BE TAKEN UNTIL THE MAIN IS RE-FLUSHED.**
- l. Due to the proximity of creeks, streams, ponds, or other bodies of water, the Contractor may be directed by GCDWR to de-chlorinate any water flushed from the main to prevent damage to aquatic organisms, plants, fish, etc. Method and system of de-chlorination must be pre-approved by GCDWR. Should the bacteriological test fail due to bacterial growth, the Contractor shall be directed to re-chlorinate the entire pipeline.
- m. Unless GCDWR directs otherwise, cuts made into existing lines for the insertion of valves or fittings, for repairs, or for any other purpose, shall be disinfected by thoroughly wetting the interior of the pipes, valve, fittings, etc. with a sprayed-on 1 percent hypochlorite solution.

3.14 RESTORING PAVEMENTS, SIDEWALKS, AND CURBS

3.14.1 WORK INCLUDED

The Contractor shall furnish all materials for, and properly restore all pavements, drives, sidewalks, and curbs, which may have been damaged, removed, or disturbed as a result of accomplishing the work. Restoration and replacement shall be made to the satisfaction of GCDWR. This shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, cinders, gravel, slag, asphalt, or other bituminous material necessary for the proper completion and restoration of the work as may be required, directed, or specified.

3.14.2 MATERIALS AND WORKMANSHIP

Materials to be used in the repair and restoration of pavements, drives, sidewalks, and curbs shall meet all Gwinnett County standards. No existing material may be reused in the work unless pre-approved by GCDWR. All concrete shall be Class "A" concrete in accordance with GDOT Specifications Section 500 (28 day compressive strength of 3,000 psi).

3.14.3 RESTORING PAVEMENTS

- a. After the pipe has been laid, appurtenant work constructed, and backfill completed, the Contractor shall furnish, place, restore, and maintain all pavements or roadway surfaces which have been removed or damaged by or in pursuit of the work. The form and degree of restoration shall be as specified on the approved design, as specified herein, or as directed by GCDWR.
- b. For backfilling roadway cuts, final backfill shall be placed in accordance with Details G4 thru G6 for the applicable site condition. GCDWR may require that compaction tests be conducted by an independent laboratory, at various locations to confirm the density of the compacted material. All costs associated with such testing shall be borne by the Contractor.
- c. All roadway restoration shall be performed in accordance with the lawful requirements of the authorities within whose jurisdiction such pavement is located. All highway utilities and traffic controls are to be maintained, and work shall conform to the rules and regulations of the authorities, including the use of standard signs. The Contractor shall furnish all such bonds or checks which may be required by the roadway authorities to ensure proper restoration of paved areas.
- d. Whenever the removal of pavements is required (other than gravel types), the Contractor shall outline the area to be removed by making straight saw-cuts, providing vertical kerfs to allow the removal of the paving material in straight lines. Should pavement breakage occur beyond the saw-cut, the Contractor shall make a new straight saw-cut beyond the furthest point of breakage.

3.14.4 ROADWAY PERMITS

- a. The Contractor or Developer is responsible for obtaining all road opening permits from the Gwinnett County Department of Transportation or roadway owner, including providing any required restoration bonds.
- b. GCDWR shall obtain all road opening permits required by the Georgia Department of Transportation. The Developer's Engineer shall provide all required drawings, specifications, sketches, forms, etc. as may be needed and/or requested by GCDWR. The Contractor is not permitted to make any type cuts on roadways requiring a permit from the Georgia DOT until such time as the permit is provided and prominently displayed on-site.

3.14.5 RESTORING DRIVEWAY PAVEMENTS

The Contractor shall repair or replace all driveway sections disturbed by the process of the work. Driveways shall be constructed of the same materials, and to the thickness of the adjoining wearing surface, or to the minimums indicated on Detail G6, whichever is greater. In restoring driveways, the subsoil and foundation material shall be well-compacted so as to prevent any future settlement or cracking of the driveway pavement. Where necessary to cut a concrete driveway, the cuts shall be made with a masonry saw, providing a smooth, straight line completely across the driveway. Partial cut-outs, crooked cuts, or cuts made by any other method other than masonry saw are not permitted. In general, where directed, concrete slab removal shall be made in entire pavement sections to the nearest existing expansion-joint.

3.14.6 RESTORING CURBS

The Contractor shall restore all curbs and combination curbs and gutters which have been removed or disturbed in the progress of the work. Curbing shall be made to conform accurately in size, line, grade, and materials with the adjoining curb. In restoring curbs, the subsoil and foundation material shall be well compacted so as to prevent any future settlement of the concrete curbing.

3.14.7 RESTORING SIDEWALKS

- a. The Contractor shall restore all sidewalks which have been removed or disturbed in the progress of the work. Sidewalks shall be constructed to the same dimensions and materials as the adjoining sections.
- b. Where necessary to cut a sidewalk, entire sections shall be removed and replaced unless otherwise directed by GCDWR.
- c. All concrete forms shall be wetted or sprayed with an approved releasing agent immediately prior to pouring concrete.

3.14.8 CONTRACTOR/DEVELOPER WARRANTY OF RESTORED PAVED SURFACES

- a. The Contractor shall make every provision to ensure compaction by properly tamping any backfill under areas to be paved. Any settlement which may occur during the warranty period as stipulated within the Owner/Developer Agreement shall be corrected by the Contractor or Developer at his expense, including removing, re-compacting, and replacing any paved surfaces which show signs of settlement, whether or not actual damage to the paved surface has occurred. This shall apply to all paved surfaces including streets, drives, sidewalks, and curbs and gutters.
- b. Should settlement, cracks, or other indications of failure, or impending failure, appear in the paved surface, the adjoining paving shall be removed to the extent necessary to secure a firm, undisturbed bearing. All removal, re-compaction, and replacement shall be in accordance with the specifications concerning these operations as stated elsewhere.

ARTICLE 4

SANITARY SEWER CONSTRUCTION

4.1 PRIOR TO CONSTRUCTION

- 4.1.1 All easements, required fees, and pertinent documents must be submitted prior to a construction permit being issued.
- 4.1.2 Engineered design plans must be stamped as approved by GCP&D Water and Sewer Plan Review.
- 4.1.3 The pipe Utility Contractor must bring these plans to GCP&D permitting prior to any pipe installation for a construction permit.
- 4.1.4 The Pipe Contractor is required to be listed on the approved Utility Contractors List by GCDWR to install manholes, tie-in commercial properties or install 8" or larger pipe. No Contractor shall be allowed to commence installation until an application for inclusion to the Approved Utility Contractors List has been received and approved by GCDWR. Appropriate construction permit(s) must also have been issued by GCP&D. See Article 5.15 for penalties for working without the appropriate permits.
- 4.1.5 Contractor must schedule an appointment with the GCDWR Inspector for a preconstruction conference, using approved plans (stamped by GCP&D Sewer Review Staff) only.
- 4.1.6 A set of approved plans, stamped by GCP&D Sewer Review, must remain on the job site at all times.
- 4.1.7 It shall be the Contractors responsibility to understand and comply with all GCDWR specifications and requirements throughout the installation and inspection proceedings.
- 4.1.8 Contractor is required to have a copy of the current Water Main and Sanitary Sewer Design and Construction Standards and Specifications in his possession during all phases of the project.

4.2 GENERAL CONSTRUCTION

- 4.2.1 All sewer lines, manholes and other appurtenances shall be installed according to approved plans and profiles. If a plan revision must occur, the redesigned area(s) must be submitted to GCP&D for approval prior to installation, in accordance with Georgia Environmental Protection Division's Rules and Regulations for Water Quality Control, Chapter 391-3-6.02 (1).
- 4.2.2 Contractor shall adhere to all Federal, State, County, and local laws, ordinances and regulations which in any manner affect the conduct of the work, including, but not limited to initiating, maintaining and supervising all safety precautions and programs in connection with the work.
- 4.2.3 Sewer construction shall be performed in open trenches and in a manner to protect lines, sewers or structures from unusual stresses.

- 4.2.4 The Contractor shall provide for the continuous flow of all sewers, drains, or creeks interrupted during the progress of the work and shall restore same to a pre-construction condition.
- 4.2.5 In the first newly installed manhole upstream of the existing tie-in manhole, Contractor shall install temporary mechanical plugs in the inflow and outflow inverts. Said mechanical plugs shall be tied to manhole step with steel cable and padlocked to prevent tampering and GCDWR shall install a locking cover (see Detail S15). Temporary mechanical plugs and locking manhole cover shall remain in place until Final Inspection is passed and approval is given by GCDWR as described in Article 5. Upon passing Final Inspection, GCDWR shall remove locking manhole cover, and Contractor shall remove temporary mechanical plugs. Contractor must exercise extreme caution to ensure that mechanical plugs and locking manhole cover are not tampered with, removed, or lost (see Article 5.15.7 Violation/Penalties).
- 4.2.6 The Contractor must comply with all requirements of the Gwinnett County Soil Erosion and Sediment Control Ordinance, the provisions of the Manual for Erosion and Sediment Control in Georgia, and any special conditions required by the EPD associated with any variances issued by the same and any special conditions required by the GCP&D or GCDWR Inspector.
- 4.2.7 During any phase of installation, GCDWR has the authority to order the construction stopped, call for any type of inspection of installed work, call for a test dig, request Engineer to revise design plans, or alter installation proceedings to ensure proper construction requirements.

4.3 SANITARY SEWER LINES

4.3.1 TRENCH EXCAVATION

- a. In order to limit loads on the pipe, the maximum width of the trench shall not be more than 36 inches wider than the outside diameter of the pipe. This trench width restriction applies to that portion of the trench 4 inches below the bottom of the pipe to 12 inches above the top of the pipe.
- b. In all cases the bucket must be lowered so that the shock of the falling earth will not damage or misalign the pipe.
- c. All excavations shall be adequately shored to ensure worker safety. All pipe laying operations shall comply with OSHA requirements for trench safety.

4.3.2 BEDDING

- a. Bedding requirements specified herein shall apply to sanitary sewer lines only. These requirements are to be considered minimum bedding requirements and as such, do not relieve the Engineer/Contractor of the responsibility to provide any additional bedding necessary for proper support of the sewer and construction.
- b. Bedding shall be carefully placed along the full width of the trench so that the pipe is true to line and grade of the pipe barrel. As used herein "carefully placed" means material that has been spaded or shovel-sliced so that the material fills and supports the haunch area and encases pipe to the limits specified herein.
- c. Bell holes shall be provided in all classes of bedding so as to relieve pipe bells of all load, but small enough to ensure that support is provided throughout the length of pipe barrel.

- d. Crushed stone embedment material shall conform to Georgia DOT Specification Section 800 Gradation #57 varying in sizes 1/4" through 3/4". Bedding material shall be carried up the sides of the pipe to the heights shown for the various classes of bedding.
- e. Class 'B' Bedding shall be installed by first undercutting the trench an adequate amount to provide bedding underneath the pipe bell as indicated. The trench shall then be brought to grade with compacted #57 Stone Coarse Aggregate placed the full width of the trench, as excavated, up to one-half the outside diameter of the pipe. The backfill shall then be completed with selected material, hand placed and tamped. At a minimum, Class 'B' Bedding shall be used for PVC pipe.
- f. Class 'C' Bedding shall be installed by first undercutting the trench an adequate amount to provide bedding underneath the pipe bell as indicated. The trench shall then be brought to grade with compacted #57 Stone Coarse Aggregate placed the full width of the trench, as excavated, up to one-fourth the outside diameter of the pipe. The backfill shall then be completed with selected material, hand placed and tamped. At a minimum, Class 'C' Bedding shall be used for DIP.
- g. Groundwater Flow Dams may be required under certain conditions. If there is a large volume of groundwater which might follow the crushed stone bedding downhill and due to the elevations involved, might build adequate pressure to create problems, flow dams will be required. Flow dams consist of red clay bedding typically about three feet long and spaced about 100 feet along pipeline.

4.3.3 PIPE HANDLING AND DISTRIBUTION

Pipe shall be carefully transported, stored and handled to prevent damage to the pipe or collar. Damaged pipe or collars or loose collars shall be cause for rejecting the pipe by the GCDWR Inspector. Pipe shall be stored in such a manner as to keep the interior free of dirt and other foreign matter. PVC pipe shall be stored in such a manner as to prevent bent or curved sections.

4.3.4 PIPE MARKING

- a. Sanitary sewer pipe and fittings shall be marked in accordance with ASTM/ANSI designations.
- b. As a minimum, marking for pipe shall include manufacturer's name or trademark, nominal pipe size, specification designation, and date of manufacture.
- c. Pipe markings shall appear at intervals of 5 feet or less on pipe barrel.

4.3.5. PIPE LAYING

- a. Pipe shall be installed straight in alignment, true to grade and exhibit a "full moon" configuration clearly visible between manholes.
- b. All pipes shall be thoroughly cleaned before being laid and shall be kept clean until final acceptance of the work.
- c. All trenches shall be kept free from water while pipe laying is in progress. Water shall not be allowed to rise to within 12 inches of the bottom of the pipe until jointing is completed.

- d. Pipe laying shall commence at the lowest manhole unless otherwise directed and pipe shall be laid so that the spigot ends (if any) point in the direction of flow to prevent bedding material from entering the joint.
- e. Suitable means shall be used to force the spigot end of the pipe into the bell without damage to the pipe and its jointing materials and without disturbing the previously laid pipe and joints.
- f. Pipe Cutting: Whenever a pipe requires cutting to fit the line or bring it to the required location, the work shall be performed in a manner so as to leave a smooth end at right angles to the axis of the pipe. Jointing of a field cut pipe shall be made in accordance with the manufacturers' instructions.
- g. The open end of uncompleted pipe lines shall be provided with a temporary stopper carefully fitted so as to keep dirt, animals, and other substances from entering. This stopper shall be maintained in position at all times when pipe laying is not actually in progress.

4.3.6 PIPE MATERIALS FOR GRAVITY SEWER LINES (all standards referred to shall be considered to mean the latest edition).

- a. Vitrified Clay Pipe (VCP) – NOT ALLOWED.
- b. Polyvinyl Chloride Pipe (PVC) up to 24 inches in diameter
 - 1. PVC pipe and fittings shall be made in conformance with ASTM D3034 SDR 35 for 6 inches through 24 inches. PVC pipe and fittings shall be Schedule 40 for 4 inches and smaller diameters.
 - 2. Standard pipe lengths not greater than 20 feet shall be used on all work.
 - 3. WYE and TEE fittings shall be utilized.
 - 4. Saddles are prohibited.
- c. Ductile Iron Pipe (DIP) – up to 64 inches in diameter.

Ductile Iron Pipe materials shall be in accordance with Article 3.4.

- 1. On any design with pipe having slopes less than the "RECOMMENDED MINIMUM", the Design Engineer must submit flow calculations.
- 2. On installations of 8" to 24" diameter, DIP shall be required when depths of cover exceed 16 feet. On installations over 24" diameter, DIP shall be used according to the approved plans including trench width. For locations where the depth of cover over DIP exceeds the rated pipe working pressure and maximum depth of cover in accordance with AWWA C151, a licensed Professional Engineer shall provide design calculations specifying the required pipe pressure class to be used to GCDWR for approval.
- d. PVC TRUSS – NOT ALLOWED.
- e. CONCRETE – NOT ALLOWED.

f. STEEL – (Casing and Aerial)

1. Steel pipe shall be utilized for aerial spans and where otherwise specified.
2. Pipe shall conform to AWWA C200.
3. The interior and exterior of the carrier pipe shall be coated with coal-tar enamel and the exterior shall be factory wrapped with bonded felt. Casing pipe may be uncoated and unlined.
4. Field welded joints of carrier pipe shall be field coated and wrapped.
5. Steel pipe shall be used for bored and jacked casing.
6. Minimum wall thickness for casing and carrier pipe shall be as follows:

<u>DIAMETER</u>	<u>THICKNESS (inches)</u>
6 inch	.375
8 inch	.375
10 inch	.375
12 inch	.375
15 or 16 inch	.375
18 inch	.375
20 inch	.375
24 inch and above	.500

7. Wall thickness for aerial spans exceeding 20 feet shall be as specified by GCDWR.

g. RIBBED PLASTIC PIPE – NOT ALLOWED.

4.3.7 ACCEPTABLE JOINT MATERIAL

a. Poly Vinyl Chloride (PVC)

1. Pipe shall be jointed with a rubber gasket and shall conform to ASTM F477.
2. Sewer Mains 8 inches and larger shall NOT be joined by solvent cement with which the pipe surfaces are fused together.
3. Service Connection at a depth less than 16 feet below finish surface shall be 6" SDR 35 and shall be connected to a 4" Schedule 40 lateral by an injection molded 6"x4" adapter coupling.

b. Ductile Iron Pipe (DIP)

1. DIP shall be of the bell and spigot type with push-on joints conforming to ANSI A21.11, or mechanical joints.

c. Joints Between Sewer Pipe of Different Materials

1. Only transitions between DIP and PVC are allowed. Transition shall be accomplished by transition collar utilizing HARCO C900 x SDR Adapter, meeting ASTM 1784 for material, ASTM D3212 for joints, ASTM F477 for gaskets, and ASTM D3034 and F1336 for fittings; or by utilizing a coated solid sleeve (see Detail S16)
2. Transition joints will not be allowed within 36 feet of a manhole, when the end result

would be 36 feet or less of PVC adjacent to a manhole.

4.3.8 BACKFILLING

- a. Backfilling shall include initial and final backfilling; re-grading of grounds; restoration of surface and sub-surface materials and structures, including resurfacing of paved areas damaged by the Contractor.
- b. Bottom of trenches in earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials when required, as indicated on the Drawings, to give a full support to the lower segment of the pipe and so that the pipe is firmly supported in the excavation throughout its entire length, in such manner as to prevent any subsequent settlement of the pipe. Boulders or loose rocks, which might bear against the pipe, will not be permitted in the trench bottom or in the initial backfill to a depth of twelve (12) inches above the pipe. Bottoms of excavations which are of loose granular soils shall be compacted prior to placing of bedding or pipe.
- c. Except as otherwise specified or directed, all forms, bracing, and lumber shall be removed before backfilling.
- d. Initial backfill in trenches where pipe has been laid shall be placed very carefully in layers not exceeding six (6) inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve (12) inches above the top of the pipe. Initial backfill material over PVC pipe shall be free of rocks larger than two (2) inches in the largest dimension. Initial backfill material over DIP pipe shall be free of rocks larger than four (4) inches in the largest dimension. Initial backfilling must be performed properly and before any filling is deposited in large quantities from a machine bucket or other vehicle. During initial backfill, dumping from a bucket must not be allowed to fall from a height of more than one foot upon a pipe, and in all cases the bucket must be lowered so that the shock of the falling earth will not injure the pipe or structure. Only after the initial backfill has been placed to a point twelve (12) inches above the top of the pipe, may work proceed in placing the final backfill, which must be carefully placed and compacted by tamping. The final backfill shall be placed in layers not to exceed eight (8) inches in thickness. All precautions must be taken to avoid future settlement in these areas. Tamping shall be done by approved mechanical tampers.
- e. Final backfill material under roadways and other paved areas shall be placed in layers not to exceed eight (8") in thickness and shall be compacted to a density of not less than 95 percent of maximum dry density as determined by ASTM D 698 – Standard Proctor. The top twelve inches (12") of sub-base shall be compacted to 98% of maximum dry density in accordance with ASTM D 698. Final backfill material under non-paved areas within the road right-of-way shall be placed in layers not to exceed eight inches (8") in thickness and shall be compacted to not less than 90 percent of maximum dry density as determined by ASTM D 698. Final backfill material in non-paved areas outside of road right-of-way shall be compacted to not less than 85 percent of maximum dry density as determined by ASTM D 698, or as directed by GCDWR. GCDWR may direct tests to be made to determine the density of the compacted material. Cost of the testing laboratory, fieldwork, and analysis will be paid for by the Contractor/Developer.
- f. Materials used for backfilling shall be free from all perishable and objectionable materials; no stones larger than four (4) inches in the longest dimension shall be placed directly above the pipe. All larger stones must be placed to the sides of the ditch such that the pipe can be excavated for repair without digging through them.

- g. Select compactable material shall be used in pipe trenches under roadways and other paved areas. When required on the plans, or required by GCDWR, graded aggregate base shall be used in pipe trenches under roadways.
- h. Backfilling shall not be performed in freezing weather (below 32 degrees F) except by permission of the GCDWR Project Inspector, and shall not be performed with frozen material or upon frozen materials.
- i. All backfilling shall be left with smooth, even surfaces; free of rock on the surface, properly graded and shall be maintained in this condition until final completion and acceptance of the work. Where directed by GCDWR, the backfill shall be mounded slightly above the adjacent ground to allow for settlement.

4.3.9 TRENCH SURFACE FINISH

- a. Trenches cut in pavement on public roads or in areas that will become under pavement in proposed public roads (such as typical subdivision developments) shall be compacted in accordance with Details G4 thru G6, as applicable. Such compaction shall be verified by an independent soils laboratory. The number, depth and location of such compaction test shall be as required by the GCDWR Inspector. Compaction tests will generally be required at approximately 400 foot intervals in existing roads and 800 foot intervals in proposed roads. Compaction tests shall be performed at the Contractors' expense. Trenches located perpendicular within existing public roads shall require an 8 inch thick concrete base course poured over the compacted backfill. The concrete base course shall extend the full width of the trench cut plus a minimum of 12 inches on either side of the trench. The existing pavement shall be neatly sawed along both sides of the trench. The concrete used shall be a minimum 3,000 PSI high early strength concrete. Once the concrete base course has properly set, the concrete surface shall be cleaned and a minimum 1-½ inch thick bituminous concrete pavement (to match existing pavement), shall be laid matching the level of the adjacent pavement.
- b. Trenches cut in driveways or private parking areas shall require a minimum 6 inch thick, fully compacted, graded aggregate base. The existing pavement shall be neatly sawed along both sides of the ditch. Material of the same type and thickness shall be laid matching the level of the adjacent drive surface. In restoring concrete drives, the base course shall be wetted prior to pouring new concrete. Concrete used shall be 3,000 PSI high early strength.
- c. Trenches cut through curbs and sidewalks shall be restored in such a manner as to conform in size, line, grade and materials with that adjoining. In restoring curbs and sidewalks, entire slabs or squares shall be removed and replaced. The subsoil and foundation material shall be well compacted. The sub-base shall be thoroughly rolled or tamped and shall be wet just before the concrete is placed, but shall show no pools of water.
- d. Should settlements, cracks, or other indications of failure appear in adjoining pavements, drives, curbs, or sidewalks, the adjoining surfaces shall be removed to the extent necessary to secure firm, undisturbed bearing and shall be re-laid in a satisfactory manner.
- e. Trenches cut in non-paved areas shall be thoroughly compacted to a level 4 inches below ground surface. Natural topsoil at least 4 inches thick and of a good condition and tillable structure shall be placed atop the compacted trench backfill. Topsoil shall be free of large stones, plant stumps, large roots, objectionable litter, or other substances potentially harmful to plant growth. Grass seed shall be of a properly proportioned mixture approved for use in Zone Two, as detailed in the Georgia Department of

Transportation Standard Specifications. Whenever possible, replace existing grassed areas with grass of similar characteristics and appearance, meeting at a minimum, the specification requirements included herein. All seeded areas shall be uniformly mulched immediately after seeding and within 10 days of construction work completion. Sediment control measures must remain in place and be maintained until a comprehensive vegetative cover is established.

- f. All easements shall be adequately re-grassed to prevent soil erosion.

4.3.10 JACK AND BORE/STEEL CASING

- a. Work drawings shall show the size and location of jack and bore pits together with all sheeting and shoring to be used. In addition, such drawings shall include large scale plan and profile of the proposed installation and affected structures if requested by GCDWR.
- b. Where pipe is required to be installed under railroads, highways, streets, or other facilities by jack and bore methods, all operations of the Contractor shall be subordinate to the free and unobstructed use of highway and structures, and shall not weaken the roadbed or structure.
- c. The Contractor shall proceed with the work in such a manner as will permit regular transaction of business by the roadway owner and/or property owner without delay or danger of life or property and shall place necessary barricades, warning signs, signal lights, and if necessary, watchmen for the protection of the public.
- d. Jacks for forcing the casing pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The pipe to be jacked shall be set on guides, braced together to properly support the section of the pipe and direct it to the proper line and grade. In general roadbed material shall be excavated just ahead of the pipe.
- e. Whenever possible, the pipe shall be jacked from the low or downstream end. At each end of the casing pipe, the void between the carrier pipe and casing shall be sealed with brick and mortar.
- f. Excavated material will be placed near the top of the working pit and disposed of as required. Use of water or other fluids will be permitted only to the extent necessary for lubrication. Jetting will not be permitted.
- g. The diameter of the excavation shall conform to the outside diameter and circumference of the casing pipe as closely as feasible. Any voids which develop during the installation operation shall be filled with pressure grout.
- h. After the steel casing pipe has been installed, the ductile iron pipe carrier pipe shall be installed in the casing pipe. Care shall be exercised at all times to maintain tight, full-seated joints in the carrier pipe. The carrier pipe shall be fully supported by pre-fabricated casing spacers when feasible (see Detail G8).
- i. Steel casing pipe shall have a minimum yield strength of 5,000 PSI and shall conform to the requirements of ASTM A139.
- j. The casing pipe diameter shall be sized as specified.
- k. All sheeting placed for the jacking/augering must be completely removed by the Contractor.

- l. All jack and bore designs shall include a manhole at or near each end of the jacked section.
- m. When site conditions dictate, conventional tunneling techniques may be utilized as an alternate to jacking and boring.
- n. If a paving cut is necessary, written permission must be obtained from the owner of the road and all requirements and stipulations must be complied with.

4.4 SEWER SERVICE CONNECTION

4.4.1 SEWER SERVICE CONNECTION TO THE SEWER MAIN

- a. Shall be installed at approximately forty-five degrees (45°) above the horizontal axis of the sewer line.
- b. All proposed taps on existing mains shall be installed by GCDWR. The Contractor is responsible for all excavation and backfill material. Excavation area must meet or exceed OSHA standards and be acceptable to GCDWR prior to scheduled time for installation. All appropriate fees must be paid prior to work being scheduled.
- c. When sewer main invert is at a depth of 16 feet and greater below finish surface, A Deep House Connection utilizing DIP shall be required (see Detail S10).
- d. Service Connections greater than 20 feet depth below finish surface shall require a variance submittal.
- e. During the warranty or bonded period, the Contractor may add a Service Connection that was omitted by cutting out a section of the main and installing a full wye.
- f. Under no circumstances shall service connections be made by knocking a hole in the main or manhole, inserting the lateral pipe and sealing with grout.
- g. Service Connections shall be plugged with mechanical plug for low pressure air testing.
- h. Service Connections shall be 6" and may enter the system either at a manhole, wye, or tee.
- i. All Service Connections entering a manhole must be cored and sealed with a rubber boot.
- j. Service Connection end locations shall be clearly marked by a minimum 6 foot length 4 x 4 post, painted safety day-glow green in conformance with OSHA Standards.
- k. The minimum pipe size for tie-in to any manhole is 6" pipe.
- l. Bedding for Service Connections shall be the same as the main line.

4.5. MANHOLES, FRAMES, COVERS

4.5.1 MANHOLES

- a. Dimensions: Minimum inside diameter: 48 Inches (4 feet)
 Minimum depth: 4 vertical feet
 Maximum depth: 20 vertical feet, unless a variance is granted

- b. Shall be pre-cast reinforced concrete construction made in conformance with ANSI/ASTM C478. (5 inch wall thickness).
- c. New pipe entry shall be at no less than a 90 degree angle from direction of flow of existing manhole. A variance must be submitted for any deviation from this requirement.
- d. All pipes entering a manhole must be sealed by a rubber boot such as a A-Lok, Z-Lok, or Kor-n-Seal.
- e. Manholes may be installed with a 6 inch stub for future use. Connection must be by core and flexible rubber boot.
- f. Future use 6 inch stub must have a mechanical joint plug.
- g. Barrel joints shall be tongue and groove with Kent-seal type gaskets. Joints shall be grouted smooth with cement grout on the inside.
- h. At no time shall fittings or pipe installations be allowed inside the manhole.

4.5.2 OUTSIDE DROP MANHOLES

- a. An outside drop pipe shall be provided for any size sewer line (including 6") entering manhole at an elevation of more than 2.0 feet above the manhole invert.
- b. Outside drop manholes shall be indicated on the construction plans, profile section.
- c. The outside drop pipe shall be constructed of either ductile iron or PVC, whichever matches incoming pipe material, and be of the same diameter size as the incoming line.
- d. All outside 90 degree elbows shall have a thrust block poured below the elbow.

4.5.3 INSIDE DROP MANHOLES

- a. Maximum inside drop shall not be greater than 2.0 feet from the invert of the manhole.

4.5.4 DOGHOUSE MANHOLES

- a. New manholes on existing 8 and 10 inch lines shall be installed using a full base section, cored openings and transition couplings.
- b. The invert of the new line must be higher than spring-line of existing pipe, if possible.
- c. Doghouse manholes are to be utilized on 12 inch or larger lines and may be authorized by GCDWR on 8 and 10 inch lines for existing high flow conditions.
- d. For doghouse manholes, the existing pipe shall not be cut without authorization of the GCDWR.
- e. The GCDWR Inspector must be present when existing pipe is cut for the doghouse or cut-in manholes.

4.5.5 MANHOLE CORES

- a. The Contractor shall be responsible for performing manhole cores.
- b. The core must not be backfilled until approved by GCDWR Inspector.

- c. Failure, for any reason, to have the GCDWR Inspector approve the core will cause all work to be halted until the cored manhole is excavated and the rubber boot exposed.
- d. Cores for future development or future tie-ins are only allowed when installed with a rubber boot, one full joint of 6" ductile iron or PVC pipe, based on bury depth conditions, and a mechanical joint plug.
- e. A mis-cored manhole section shall be replaced or a variance approved. A mis-core is defined as:
 - 1. Cored into the barrel section joint.
 - 2. Cored into the poured table.
 - 3. Offset or misdirection of core.
- f. A minimum of 12 inches separation is required between all manhole cores.

4.5.6 INVERTS (CHANNELS) AND TABLES

- a. Rowlock (brick) or pre-cast inverts are required.
- b. Mortared joints between bricks shall not be more than 3/8" thickness.
- c. Crushed stone filler may be utilized under the table. Earth filler will NOT be allowed.
- d. Inverts shall be constructed with the same radius as the effluent pipe.
- e. Invert walls shall be constructed to a height corresponding to the spring-line of the influent and effluent pipes with smooth rounded walls.
- f. Inverts shall be appropriately channeled for all stub connections to the manholes.
- g. The flow channel through manholes shall be made to conform in shape and slope to that of the sewers. Minimum drop across manhole inverts shall be 0.2 feet to prevent solids deposition. Drops of 0.1 feet across inverts will only be permitted when site topography will not allow drops of 0.2 feet. A variance must be submitted.
- h. Tables are to be gently sloped and troweled smooth from manhole wall to invert wall height and constructed of aggregate mix cement with smooth, veneer finish.
- i. Inverts of test manholes may require special modifications (see Article 2.3.9).
- j. All inverts must be grouted 360 degrees around rubber boots.
- k. All new channels at tie-in manholes must meet existing invert channel in a manner that provides proper hydraulic flow.
- l. Inverts formed with a half pipe are NOT allowed.

4.5.7 PRE-CAST BARREL

- a. All lift holes shall be fully sealed with grout and troweled smooth inside and out.
- b. All joints shall be grouted inside and out.

4.5.8 STEPS

- a. Shall be equal to M.A. Ind. Inc # PS-1 or #PS-1-PF.
- b. The uppermost step shall be built into the masonry not over 12 inches below the top of the manhole dome/cone and these steps shall be continued in alignment downward along the interior vertical side of the manhole to a point no lower than the crown of the largest sewer.
- c. Spacing of steps shall not exceed 12 vertical inches.
- d. Steps shall not descend over any pipe connection into the manhole, unless approved by GCDWR.

4.5.9 FRAMES AND COVERS

- a. The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry.
- b. Where manholes are constructed in paved areas, frames and covers are to be Vulcan #V-1357, or interchangeable (Detail S3). The top surface of the frame and cover shall conform to the crown and grade of the existing adjacent pavement. Adjustment to final grade in paved areas shall be provided by means of brick coursing not to exceed four (4) common brick (12 inches maximum) in height with Portland cement joints.
- c. Where manholes are constructed in non-pavement areas, frames and covers shall be Vulcan #V-2358, or interchangeable (Detail S4). The top surface of the frame and cover shall have bolt-down lids with a watertight gasket. Manholes in wooded or unmaintained areas shall be a minimum of 18 inches above ground level. The cast iron frame shall be factory cast into the concrete cone. Manholes in maintained grassy areas may be flush with the ground. Manholes on sloped ground in un-maintained areas shall be a minimum of 18 inches above ground level on the uphill side of the manhole.
- d. Manholes located inside rights of way, on the shoulder of the roadway may be flush with the ground, at the discretion of GCDWR.
- e. The manhole cover shall be factory imprinted to read: GWINNETT COUNTY SEWER.

4.5.10 All manholes shall have a minimum of 12 inches #57 stone bedding.

4.5.11 Eccentric manhole cones are required.

ARTICLE 5

CLOSEOUT AND ACCEPTANCE

5.1 CONTRACTOR RESPONSIBILITIES

- 5.1.1 All gravity sanitary sewers shall be air tested and Final Inspected upon completion of installation and have a "passed" Final Inspection report prior to paving.
- 5.1.2 Final approval of a project will not be granted by GCDWR until all inspections are conducted with no defects noted and all appropriate documents have been received and accepted by GCDWR.
- 5.1.3 A thorough clean-up of the entire project shall be made before final acceptance is given by GCDWR. All excess rock, clearing debris, stumps, roots, pipe, fittings, and materials shall be removed from the site. All public rights-of-way and private property shall be restored to as good as or better than original condition, to the satisfaction of GCDWR. In private developments, final plat approval or Certificates of Occupancy may be withheld until all clean-up is complete.

5.2 VISUAL INSPECTIONS

- 5.2.1 The GCDWR Inspector will make periodic job site visitations without advance notice to the Contractor. However, it is the responsibility of the Contractor to contact the Inspector during each phase of the installation for inspections and/or re-inspections.
- 5.2.2 The GCDWR Inspector will visually inspect the project for acceptable system installation, i.e. invert work, gravel, pipe type, grout, etc.

5.3 SEDIMENT CONTROL

- 5.3.1 All erosion control structures and/or appurtenances as shown on the approved plans or as required to comply with other ordinances shall be in place and operational, inspected and approved by the GCDWR Inspector prior to the beginning of construction and shall be maintained in operational condition until the phase or project has been completed.
- 5.3.2 Temporary and permanent ground covers are required on all disturbed areas and easements. Upon project completion, erosion control devices and temporary siltation control devices shall be maintained in place on the sewer easements while the individual lots are being developed, or until all disturbed areas are fully stabilized.
- 5.3.3 Erosion and sediment control devices shall be installed and maintained on each sanitary sewer easement, outfall line, and pump station during building construction and site development, as required by the Gwinnett County Soil Erosion and Sediment Control Ordinance and consistent with the provisions of the Manual for Erosion and Sediment Control in Georgia.
- 5.3.4 Where temporary construction roads cross a creek they shall be installed and removed so as to minimize impact to the stream water quality, in accordance with U.S. Army Corps of Engineers Regulations. Use of storm drain pipes, rip-rap and geotextile fabric is typically required.
- 5.3.5 Where construction dewatering pumps discharge, the water must be filtered to minimize stream siltation. As a minimum, geotextile filters or silting basins are required.

- 5.3.6 All Contractors must utilize Best Management Practices to minimize siltation and erosion consistent with the Manual for Erosion and Sediment Control in Georgia.
- 5.3.7 Two rows of type C silt fence must be installed and maintained when working adjacent to and uphill from any stream buffer.

5.4 WETLAND AND OTHER WATERS OF THE UNITED STATES

The design and construction must comply with all U.S. Army Corps of Engineers regulations pertaining to construction in waters of the United States.

5.5 AS-BUILT DRAWING SUBMITTAL

- 5.5.1 As-built Drawing must be submitted before a project can be finalized and before connection of service laterals or issuance of certificates of occupancy.
- 5.5.2 As-built Drawing must be sharp, clear, clean, legible, and suitable for filing and scanning.
- 5.5.3 As-built Drawings must include a site plan, plan and profile and any supplemental and shop drawings as required by GCDWR. Each As-built Drawing must show all permanent easements, a material list to include quantity, size and type of pipe, and number of manholes. The manufacturer's name for valves (and number of turns) and fire hydrants shall be shown. A copy of the current checklist is available on Gwinnett County's website.
- 5.5.4 As-built Drawings shall be sealed by a Georgia Registered Professional Engineer or Registered Land Surveyor as per EPD Delegation dated on December 2, 2006 and EPD rule 391-3-6-02.
- 5.5.5 One set of As-built Drawings must be submitted to GCP&D for review.
- 5.5.6 As-built Drawings for non-residential projects shall be submitted to GCP&D a minimum of 10 business days prior to request for Certificate of Occupancy.
- 5.5.7 As-built Drawings for residential projects shall be included with the final plat submittal to GCP&D.

5.6 CLEANING OF SANITARY SEWER COLLECTION SYSTEMS

- 5.6.1 Newly installed collection lines must be cleaned by the Contractor prior to approval.
- 5.6.2 Sections of line to be tested shall be thoroughly cleaned using a hydro-jet or similar sewer cleaning device, in a manner as not to impair or damage the existing collection system.
- 5.6.3 It is the Contractor's responsibility to maintain a clean system throughout all phases of testing.
- 5.6.4 All mechanical plugs at tie-ins to existing mains must remain in place at all times, including during cleaning, per GCDWR current plug policy. Any accumulated water must be pumped out of the mains and any debris manually removed from manholes and must not be permitted to flow into the existing system (see Article 5.15 Violation/Penalties).

5.7 LOW-PRESSURE AIR TESTING FOR SANITARY SEWER

- 5.7.1 All sewers shall be tested for leakage using low pressure air testing, as specified herein.
- 5.7.2 The line segment between two manholes shall be temporarily plugged using plugs having air tight fittings through which low pressure air can be introduced.
- 5.7.3 All wyes, and/or stubs shall be plugged in a manner acceptable to GCDWR. The plugs shall be securely fastened to withstand internal test pressures. Plugs shall be readily removable to provide a suitable lateral house connection or extension.
- 5.7.4 The procedure for determining the amount of leakage by low pressure air testing shall be stipulated by GCDWR.
- 5.7.5 Low pressure air will be introduced into the test pipe segment until the internal air pressure reaches 4.5 psig above ground water pressure, if any.
- 5.7.6 Where high ground water is known to exist, the height in feet of ground water above the invert of the sewer shall be divided by 2.31 to establish the pounds of pressure that will be added to the internal air pressure used for the air test.
- 5.7.7 At least two minutes will be allowed for air temperature in the test segment to stabilize, while internal air pressure remains no less than 3.5 psig above ground water pressure.
- 5.7.8 Internal air pressure will be deflated to exactly 3.5 psig above ground water pressure.
- 5.7.9 The elapsed time for internal pressure to drop to 2.5 psig above ground water pressure will be accurately determined. If it is obvious to the GCDWR Inspector that no leakage is occurring, he may terminate the air test early.
- 5.7.10 The air test is acceptable if elapsed time is no less than shown on the following table:

ELAPSED TIME	
PIPE DIAMETER	MINUTES/100 FEET
6-INCH	0.7
8-INCH	1.2
10-INCH	1.5
12-INCH	1.8
15-16 INCH	2.1
18 INCH	2.4
20-21 INCH	3.0
24 INCH	3.6
27 INCH	4.2
30 INCH	4.8

- 5.7.11 If the installation fails to meet the requirements of this air test, the Contractor shall determine the source of leakage. The Contractor shall repair or replace all defective materials and/or workmanship. The installation will then be re-tested for compliance with these specifications.

5.8 DEFLECTION TESTING (PVC PIPE FOR SANITARY SEWER)

- 5.8.1 If excessive deflection is noted during GCDWR Final Inspection, deflection tests shall be performed by GCDWR.

5.8.2 Maximum allowable deflection shall be 5% of the inside diameter when measured at least 30 days after installation.

5.8.3 All pipes failing to maintain the minimum deflection diameter shall be considered improperly installed and the Contractor shall re-lay the pipe.

5.9 FINAL INSPECTION FOR SANITARY SEWER

5.9.1 Upon completion and approval of all listed inspections, the sanitary sewer project will be scheduled for a GCDWR Final Inspection.

5.9.2 Final Inspection is performed on 8" or larger pipe only.

5.9.3 The Final Inspection will be performed by GCDWR at the Contractor/Developer's expense and kept by GCDWR records. Initial payment for Final Inspection fees shall be paid by the Developer or his assigns in advance at the time of project plan approval and at a rate as established by the GCDWR Director.

5.9.4 Any defective areas noted (such as sagging or dimpled pipe, broken pipes, joint separation, manhole defects, improper inverts, misaligned steps, missing grout, etc.) shall be corrected by the Contractor.

5.9.5 Internal grouting to repair new lines will not be allowed, nor will a "re-rounding" process to repair excessive deflection.

5.9.6 Following any corrections of discrepancies, the lines of manholes will be re-inspected. Additional fees, as determined by the GCDWR Director, will be assessed. These fees must be paid prior to the project being issued a "pass" Final Inspection report.

5.9.7 The Contractor/Developer shall allow up to 21 calendar days for Final Inspections after the project Final Inspection request is submitted by the GCDWR Inspector. In the event that GCDWR is unable to perform the Final Inspection within 21 calendar days, Contractor/Developer has the option to have CCTV inspection performed at Contractor's/Developer's expense by a firm listed on a Pre-Qualified CCTV Inspection Contractor list. Any defects discovered by GCDWR inspection of the CCTV recording must be corrected immediately in order to receive Final Inspection approval.

5.10 INFILTRATION

On newly installed sewers NO infiltration or leaks will be allowed. Any infiltration must be eliminated prior to approval.

5.11 SEEDING / SOD REPLACEMENT

The Contractor shall furnish all materials for, and properly restore to the satisfaction of GCDWR, all ground surfaces irrespective of type, which may be disturbed in the progress of the work. All restoration of ground cover shall be in accordance with all State and local laws, ordinances, and regulations.

5.12 AS-BUILT DRAWING APPROVAL

5.12.1 All corrections for defects of installation must be completed prior to final approvals.

5.12.2 Upon completion of all applicable tests and inspections, the As-built Drawing will be verified for accuracy and compliance to GCDWR specifications.

5.13 FINAL APPROVAL

- 5.13.1. Upon final approval of As-built Drawings, easements, and inspections, the Developer or his assigns may request final inspection.
- 5.13.2 Upon field verification by the GCDWR Inspector, final plat signature may be obtained or the Certificate of Occupancy may be released.

5.14 VARIANCE

- 5.14.1 Exceptions to current Standards may be granted in the form of a written variance by the GCDWR Director or designee when, in his/her opinion, undue hardship may result from strict compliance. Any such determination shall be based fundamentally on the fact that unusual topographical or other exceptional conditions require such variance and that the granting of the modifications will not adversely affect the general public welfare or nullify the intent of current Standards.
- 5.14.2 Requests for a variance from current Standards shall first be submitted in writing with supporting documentation, including plan and profile, and shall explain in detail the reasons and facts supporting the request. The request shall be submitted to the GCP&D Director or designee and reviewed by GCDWR. A response will be given within 10 working days.
- 5.14.3 If administrative approval cannot be granted consistent with the requirements of current Standards, the variance may be forwarded to the Board of Commissioners for final action in their normal course of business.

5.15 VIOLATION/PENALTIES

- 5.15.1 Any responsible party or other persons convicted by a court of competent jurisdiction of violating any provision of these Standards shall be guilty of violating a duly adopted Sanitary Sewer Use Ordinance of Gwinnett County and may be punished either by a fine or imprisonment, or both. The owner of any lands or part thereof, where anything in violation of these Standards shall be placed or shall exist, and each responsible party or other person assisting in the commission of any such violation, shall be guilty of a separate offense.
- 5.15.2 The court shall have the power and authority to place any person found guilty of violating these Standards on probation and to suspend or modify any fine or sentence. As a condition of said suspension, the court may require payment of restitution or impose other punishment allowed by law.
- 5.15.3 Each day a violation continues to exist shall constitute an independent and separate offense.
- 5.15.4 Any Contractor on the GCP&D Approved Utility Contractors List discovered violating the provision(s) of these Standards shall be removed from the list and subjected to penalties imposed by the court.
- 5.15.5 Any Utility Contractor discovered to be installing pipe without a proper construction permit may be fined as per the latest Resolution to Amend the Gwinnett County Land Development and Other Services Fee Schedule.
- 5.15.6 Any Contractor found responsible for causing sewerage overflow shall be fined.

5.15.7 Any Contractor found negligent by creating a condition likely to result in a sewerage overflow may be fined.

- a. Tampering with, removing, or causing loss of locking cover or temporary mechanical plugs shall be considered negligence.
- b. By-pass pumping without adequate standby pumps available shall be considered negligence.

5.15.8 The Contractor shall be held fully liable for all State and Federal Clean Water Act penalties or fines and costs incurred by GCDWR in the event of a sanitary sewer overflow caused by negligence on the Contractor's part. The Contractor may also be suspended from the GCDWR Approved Utility Contractors List.

5.16 GUARANTEE OF WORK COMPLETED

- a. The Contractor (and Developer in private developments) shall guarantee in accordance with GCP&D/GCDOT/GCDWR development standards, all water mains, sanitary sewers, appurtenances, trenches, roadway and surface restorations, landscaping, and any other areas disturbed by the construction of the project, to be free from defects, and to be installed in compliance with all regulations, specifications, plans, directions, and construction practices which govern said installations. In private developments, the conditions stated in the Owner/Developer Agreement shall govern.
- b. The Contractor shall be responsible for repairs to any defective or leaking pipe, fitting, etc. Should trenches settle during the warranty period, he shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any defects, leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement.
- c. The determination of the requirement for the Contractor to perform work under this guarantee shall be at the sole discretion of GCDWR.

APPENDIX “A”

DESIGN AND CONSTRUCTION STANDARD DETAILS

<u>STANDARD DETAIL NAME</u>	<u>DETAIL NUMBER</u>
Class “B” Bedding and Initial Backfill	G1
Class “C” Bedding and Initial Backfill	G2
Class “D” Bedding and Initial Backfill	G3
Perpendicular Roadway Cut – Final Backfill	G4
Longitudinal Roadway Cut – Final Backfill	G5
Outside of Roadway Cut – Final Backfill	G5A
Concrete or Gravel Pavement Cut – Final Backfill	G6
Typical Right-of-Way Water & Sewer Locations	G7
Augured Jacked Casing	G8
Typical Jack and Bore Installation	G9
Water Main Restraint at Jack & Bore Installation	G10
Typical Horizontal Thrust Block	G11
Typical Horizontal Thrust Restraint	G12
Thrust Restraint Collar	G13
Typical Tie Rod Restraint Installation	G14
Typical Water Main at Intersection	W1
Typical Branch Connection at Intersection	W2
Typical Cul-de-Sac Street	W3
Typical Dead End Street Termination	W4
Typical Type “A” Fire Hydrant Installation	W5
Typical Type “B” Fire Hydrant Installation	W6
Typical Tapping Sleeve and Valve Installation	W7
Typical Stub-Out Installation	W8
Typical Valve Box Installation	W9
Typical Back Tap Installation	W10

STANDARD DETAIL NAME

DETAIL NUMBER

Typical Dead Man Thrust Restraint Installation for A.C. Pipe W11

Typical Service Line Casing Installation..... W12

Typical Water Service Connections..... W13

Typical Residential Meter Box Installation..... W14

Typical Coupling W15

Typical Air Release Valve..... W16

Standard Precast Manhole S1

Standard Invert S2

Traffic Frame & Cover S3

Bolt Down Frame & Cover..... S4

Lid Grouting S5

Manhole Placed on Existing Line S6

Manhole Placed on Existing Line (Doghouse) S7

Outside Drop Manhole..... S8

Inside Drop Manhole S9

6" Service Connection S10

Service Connection Location..... S11

Service Connection Tap To Existing Main S12

4" Lateral to 6" Service Connection Installation..... S13

6" Clean-Out at R/W S14

New Sanitary Sewer Main Connection..... S15

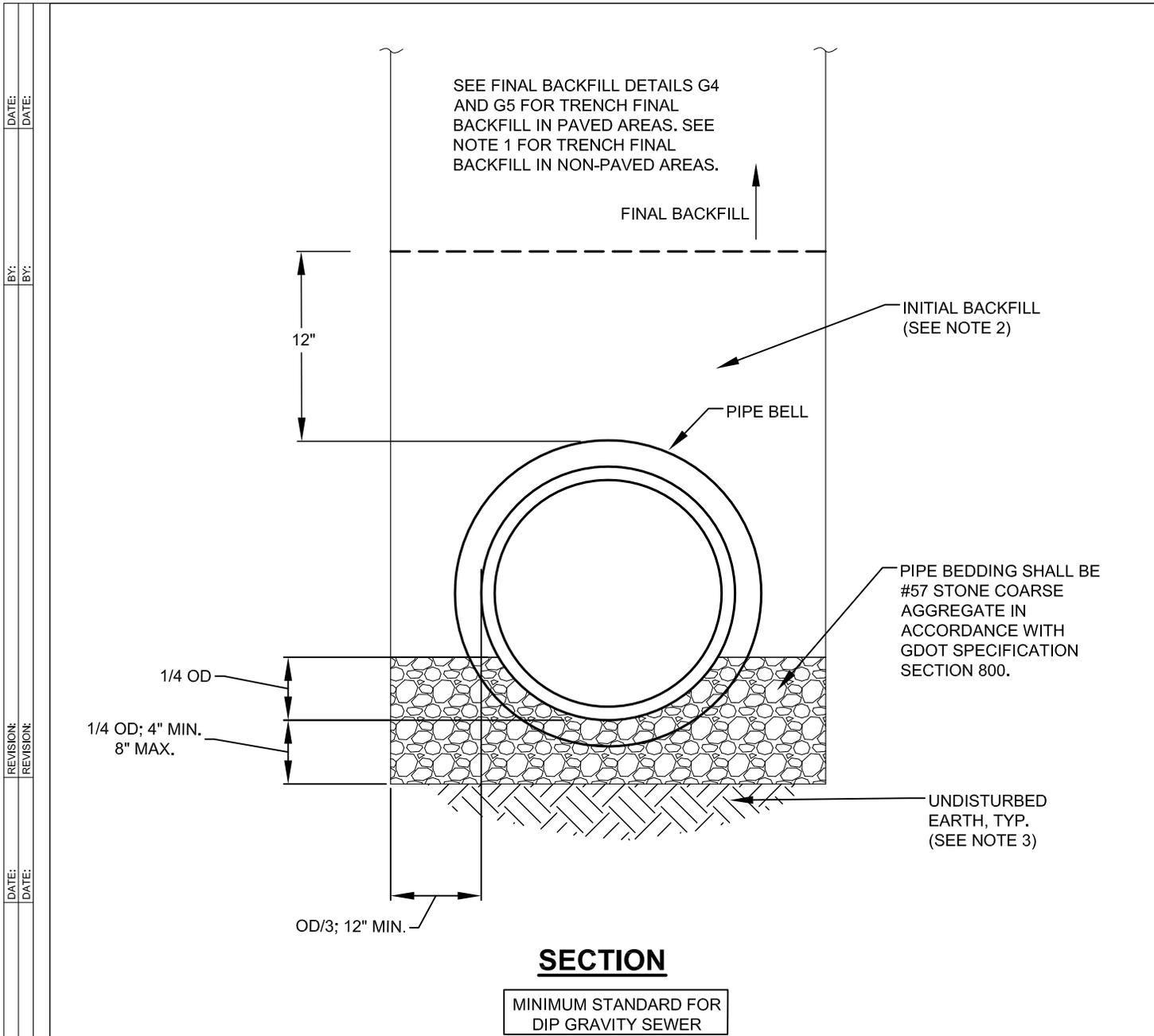
Transition Collar..... S16

Non-Pier Aerial D.I.P. Sewer Line S17

Aerial Steel or D.I.P. Pipe Crossing S18

Concrete Pier & Footing S19

Grease Trap..... S20



NOTES:

- FINAL BACKFILL UNDER NON-PAVED AREAS WITHIN ROAD RIGHT-OF-WAY SHALL BE PLACED IN LAYERS NOT TO EXCEED EIGHT INCHES (8") IN THICKNESS AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 STANDARD PROCTOR.

FINAL BACKFILL UNDER NON-PAVED AREAS OUTSIDE OF ROAD RIGHT-OF-WAY SHALL BE PLACED IN LAYERS AND COMPACTED TO 85% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 STANDARD PROCTOR, OR AS DIRECTED BY GCDWR.
- PLACE INITIAL BACKFILL IN LAYERS NOT EXCEEDING SIX (6) INCHES IN THICKNESS AND CONSOLIDATE BY TAMPING ON BOTH SIDES OF THE PIPE. INITIAL BACKFILL MATERIAL SHALL BE REUSED OR IMPORTED EARTH FREE OF STONES LARGER THAN 4" DIAMETER, CLOUDS, ORGANIC MATTER, RUBBISH, OR OTHER UNSUITABLE MATERIAL
- WHEN BOTTOM OF TRENCH IS INADVERTENTLY DISTURBED, REMOVE DISTURBED MATERIAL AND REPLACE WITH #57 STONE.

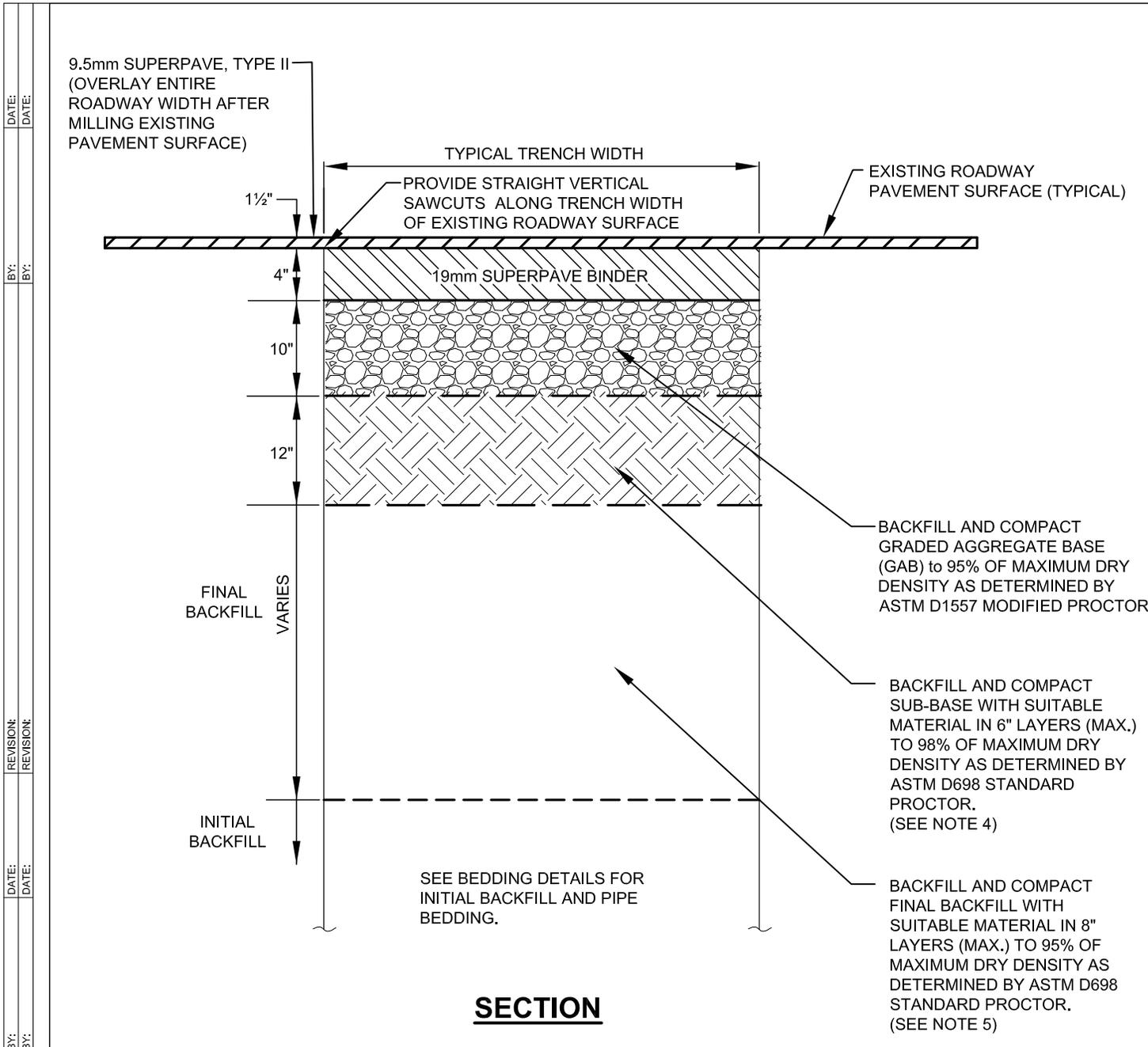
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

REVISION:	DESIGN BY: STD. COMMITTEE
REVISION:	DRAWN BY: GCDWR
REVISION:	CHECKED BY: PSB
REVISION:	APPROVED BY: ARS
REVISION:	SCALE: NONE

CLASS 'C' BEDDING AND INITIAL BACKFILL

DRAWING NO.
G2

REVISION: ORIGINAL ISSUE: 4-05-16



SECTION

NOTES:

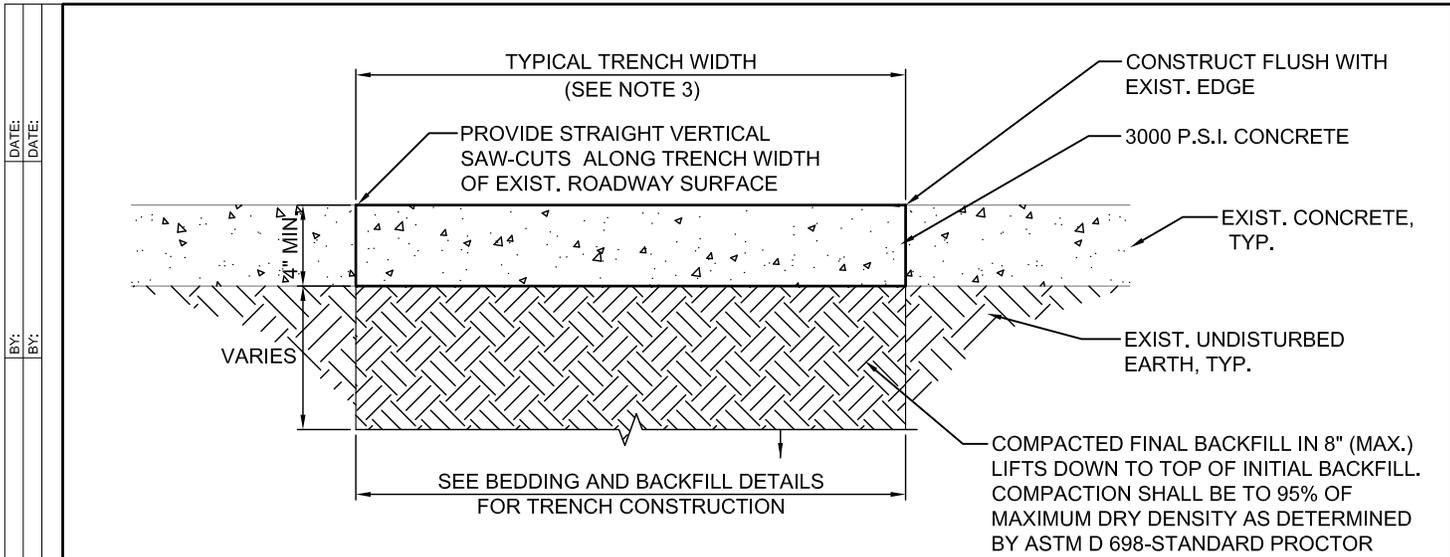
1. ALL MATERIALS AND METHODS OF INSTALLATION SHALL COMPLY WITH THE GA DOT "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" LATEST REVISION.
2. NEW ROADWAY PAVEMENT SHALL MATCH CROSS SLOPE AND GRADE OF EXISTING ROADWAY.
3. SEE DETAIL G6 FOR CONCRETE PAVEMENT AND GRAVEL REPAIR.
4. SUB-BASE MATERIAL SHALL BE REUSED OR IMPORTED EARTH FREE OF CLODS, ORGANIC MATTER, RUBBISH, STONES LARGER THAN 4" DIAMETER, OR OTHER UNSUITABLE MATERIAL.
5. FINAL BACKFILL MATERIAL SHALL BE REUSED OR IMPORTED EARTH FREE OF CLODS, ORGANIC MATTER, RUBBISH, OR OTHER UNSUITABLE MATERIAL. STONES LARGER THAN 4" DIAMETER MUST BE PLACED TO THE SIDES OF THE TRENCH.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

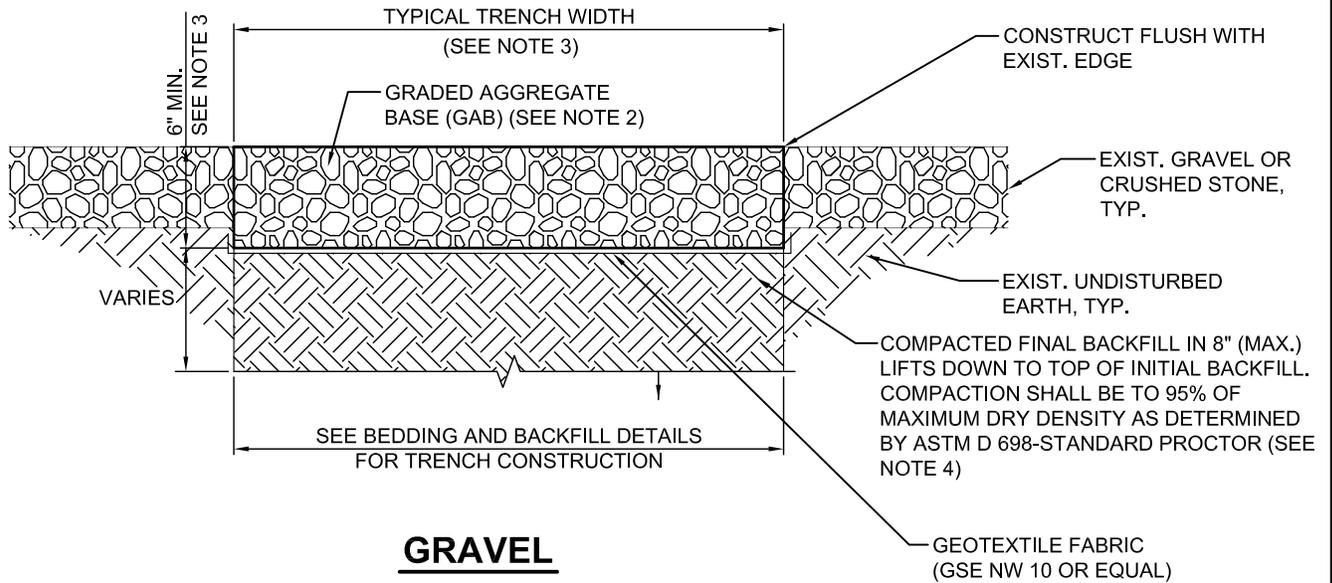
REVISION:	DATE:
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ORIGINAL ISSUE:	4-05-16
DESIGN BY:	STD. COMMITTEE
DRAWN BY:	GCDWR
CHECKED BY:	PSB
APPROVED BY:	ARS
SCALE:	NONE

**LONGITUDINAL ROADWAY CUT -
FINAL BACKFILL**

DRAWING NO.
G5



CONCRETE



GRAVEL

NOTES:

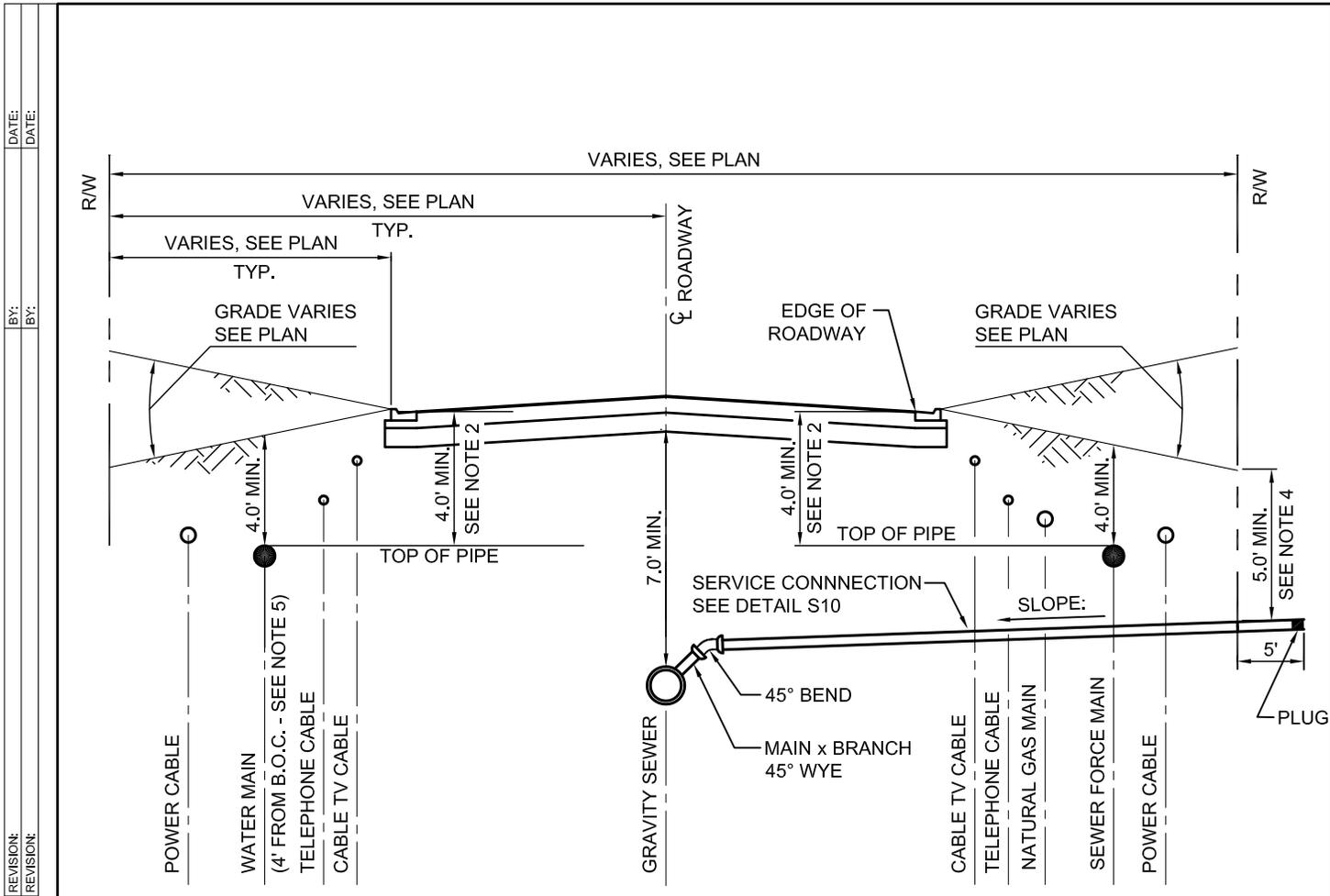
1. ALL MATERIALS AND METHODS OF INSTALLATION SHALL COMPLY WITH THE GA DOT "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" LATEST REVISION.
2. WHERE DEPTH OF EXISTING GRAVEL ROADWAY IS GREATER THEN 6" THEN NEW GAB STONE DEPTH SHALL MATCH EXISTING ROADWAY DEPTH.
3. NEW ROADWAY PAVEMENT SHALL MATCH CROSS SLOPE AND GRADE OF EXISTING ROADWAY.
4. CONCRETE OR GRAVEL FINAL BACKFILL SUB-BASE MATERIAL SHALL BE REUSED OR IMPORTED EARTH FREE OF STONES LARGER THAN 4" DIAMETER, CLODS, ORGANIC MATTER, RUBBISH, OR OTHER UNSUITABLE MATERIAL.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

REVISION:	DATE:
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BY:	BY:
ORIGINAL ISSUE:	4-05-16
DESIGN BY:	STD. COMMITTEE
DRAWN BY:	GCDWR
CHECKED BY:	PSB
APPROVED BY:	ARS
SCALE:	NONE

**CONCRETE OR GRAVEL PAVEMENT
CUT - FINAL BACKFILL**

DRAWING NO.
G6



SECTION

NOTES:

1. UNDER MULTIPLE UTILITY INSTALLATIONS OR RELOCATION'S THE DEEPEST UTILITY SHALL BE INSTALLED AND TESTED FIRST TO AVOID INTERFERENCE WITH SERVICE LATERALS OR LINES.
2. UNLESS OTHERWISE DIRECTED BY GCDWR, INSTALLATION OF SEWER FORCE MAIN AND WATER MAIN SHALL BE INSTALLED TO THE LOWER ELEVATION INDICATED.
3. EXCEPT FOR WATER AND SEWER MAINS, ALL UTILITIES SHOWN ARE FOR ILLUSTRATION ONLY.
4. WHERE GRADE IS ELEVATED ABOVE ROAD THEN THE DEPTH OF COVER SHALL BE MEASURED FROM EDGE OF PAVEMENT.
5. WATER MAIN SHALL BE LOCATED 4 FEET FROM BACK OF CURB IN NEW DEVELOPMENTS.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

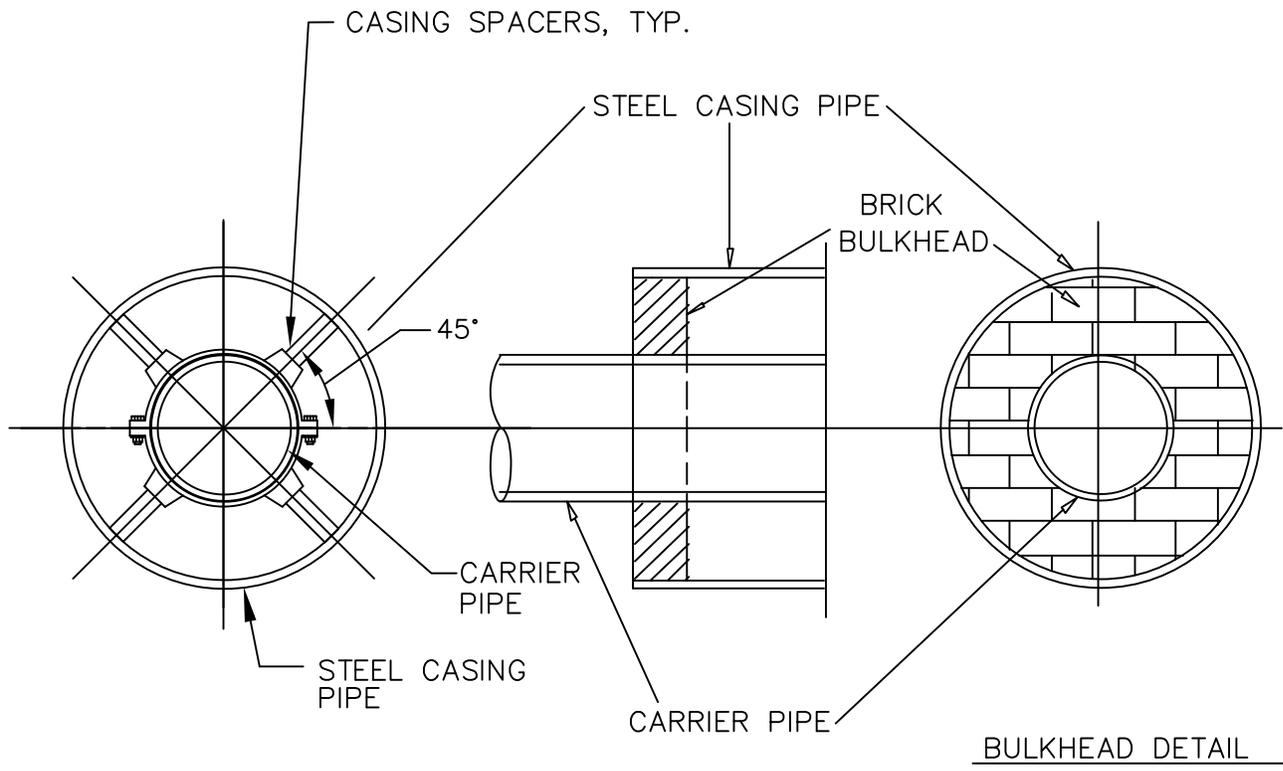
DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**TYPICAL RIGHT-OF WAY
WATER & SEWER
LOCATIONS**

DRAWING NO. G7

REVISION: ORIGINAL ISSUE: 4-05-16
 REVISION: BY: DATE: DATE:
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NOTES:

1. CASING PIPE UP TO 20" SHALL HAVE A THICKNESS OF .375 INCH.
2. CASING PIPE OVER 20" SHALL HAVE A THICKNESS OF .5 INCH.
3. CASING SPACERS SECURED AT BELL END OF EACH JOINT OF CARRIER PIPE, AND IN THE MIDDLE OF EACH JOINT OF PIPE WITH 10' MAXIMUM DISTANCE BETWEEN SPACERS.
4. TO REDUCE CORROSION POTENTIAL, AT NO TIME SHALL THE CARRIER PIPE TOUCH THE CASING PIPE. INSULATING SPACERS SHALL BE USED.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

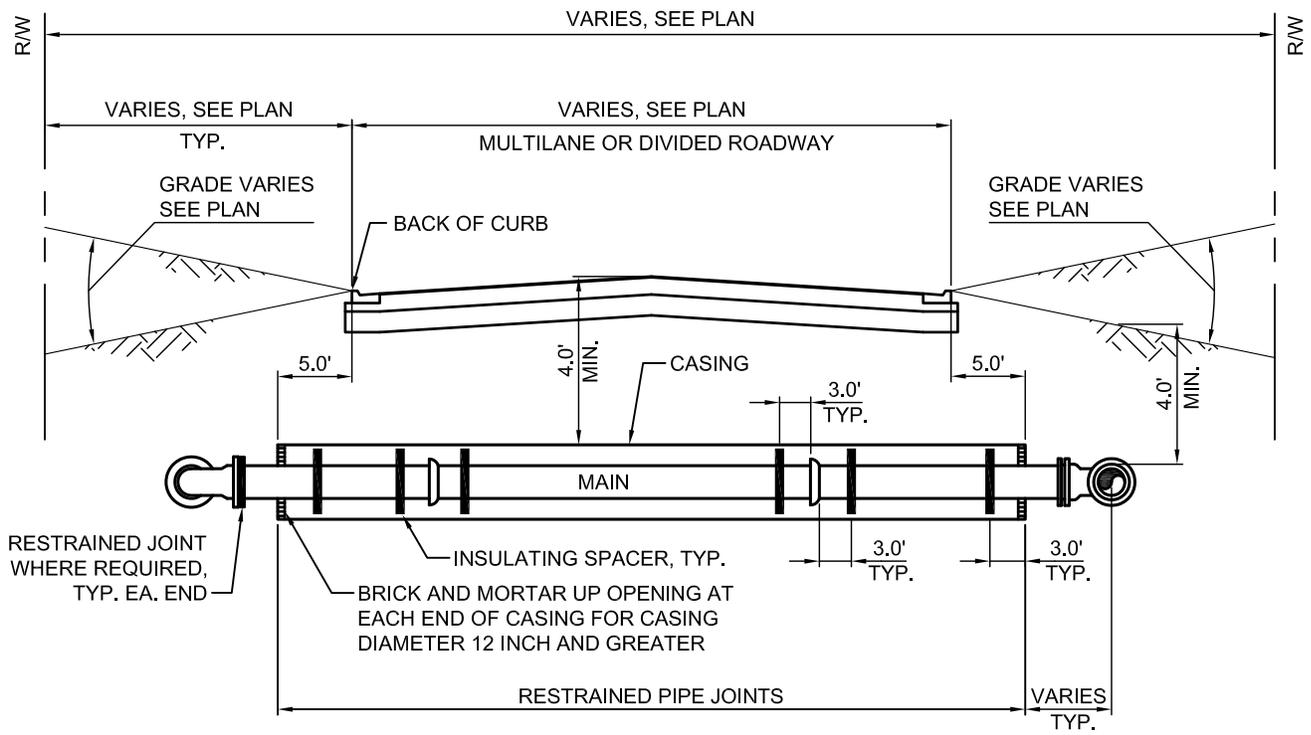
DESIGN BY: STD. COMMITTEE
 DRAWN BY: GCDWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

AUGERED JACKED CASING

DRAWING NO.

G8

REVISION: _____
 REVISION: _____
 ORIGINAL ISSUE: 4-05-16
 DATE: _____
 DATE: _____
 BY: _____
 BY: _____
 REVISION: _____
 REVISION: _____



PROFILE

MAIN DIAMETER (*INCHES)	4	6	8	10	12	14	16	20	24
CASING DIAMETER (*INCHES)	8	12	16	20	24	30	36	40	48

* NOMINAL SIZE

NOTES:

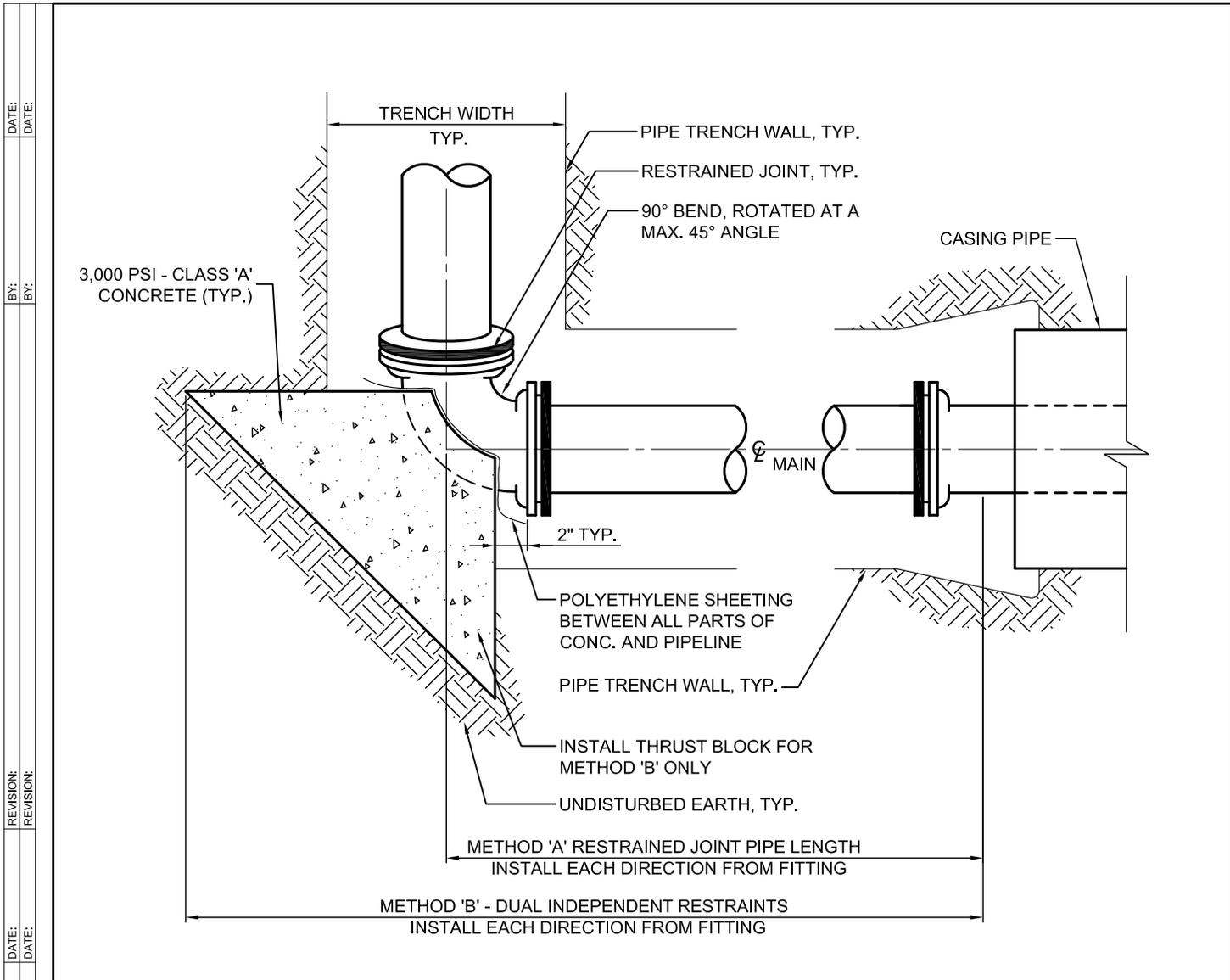
1. MAIN SIZES OF 6 INCH OR GREATER SHALL INSTALL INSULATING SPACERS IN CASING, AS INDICATED.
2. CASING SPACERS MUST BE ATTACHED AT BELL END AT EACH JOINT OF MAIN, AND ENDS OF CASING, AS INDICATED.
3. CASING SPACERS MUST BE SECURED AS PER MANUFACTURER'S SPECIFICATIONS.
4. CASING PIPE UP TO 20" DIAMETER, SHALL HAVE A THICKNESS OF 0.375".
5. CASING PIPE OVER 20" DIAMETER, SHALL HAVE A THICKNESS OF 0.50".
6. CASING, PIPING AND APPURTENANCES UNDER RAILROAD SHALL MEET THE LATEST REQUIREMENTS OF THE RAILROAD OWNER. WHERE THIS DETAIL DIFFERS FROM THE REQUIREMENTS OF THE RAILROAD OWNER, THE MORE STRINGENT REQUIREMENTS SHALL GOVERN.
7. REFER TO TYPICAL HORIZONTAL THRUST RESTRAINT DRAWING G12 AND TYPICAL HORIZONTAL THRUST BLOCK DRAWING G11 FOR ADDITIONAL DETAILS.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**TYPICAL JACK AND BORE
INSTALLATION**

DRAWING NO.
G9



PLAN

NOTES:

1. SEE TYPICAL HORIZONTAL THRUST RESTRAINT DRAWING G12 FOR METHOD 'A'.
2. IN LIEU OF THRUST BLOCK AND MEG-A-LUGS SHOWN FOR METHOD 'B', TIE-RODS AND MEG-A-LUGS MAY BE USED.
3. REFER TO TYPICAL HORIZONTAL THRUST BLOCK DRAWING G11 AND TYPICAL HORIZONTAL THRUST RESTRAINT DRAWING G12 FOR ADDITIONAL DETAILS.
4. WELDING OF EYE BOLTS TO CASING IS PROHIBITED.
5. RESTRAINED JOINT METHOD A: RESTRAINT JOINT PIPE AND FITTINGS.
6. RESTRAINED JOINT METHOD B: ONE (1) OF THE FOLLOWING DUAL (2) INDEPENDENT RESTRAINTS:
 - A. MEGA-LUGS PLUS THRUST BLOCKING.
 - B. MEGA-LUGS PLUS RODDING.

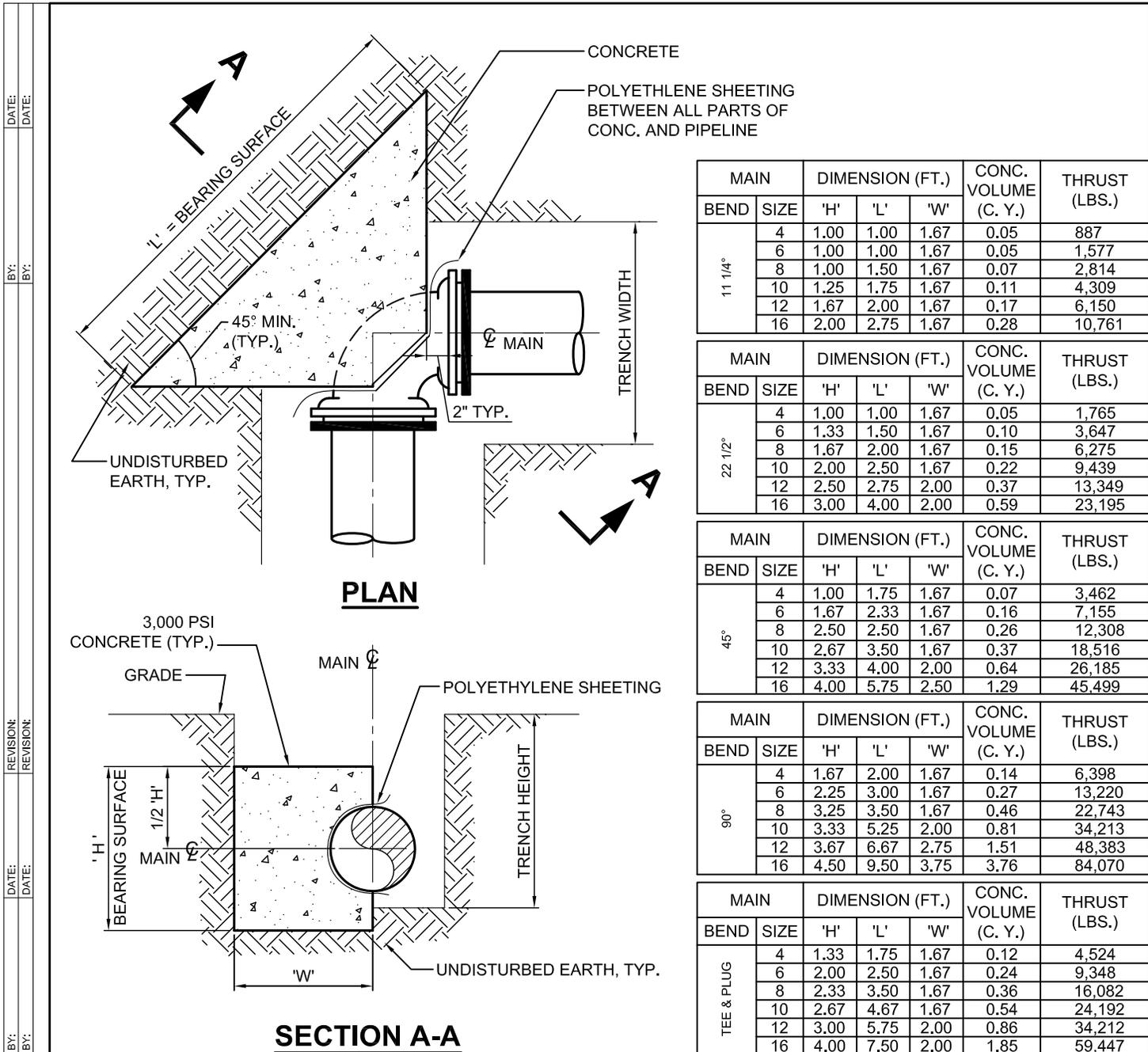
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

REVISION:	DESIGN BY: STD. COMMITTEE
REVISION:	DRAWN BY: GCDWR
REVISION:	CHECKED BY: PSB
REVISION:	APPROVED BY: ARS
REVISION:	SCALE: NONE

**RESTRAINT AT JACK & BORE
INSTALLATION**

DRAWING NO.
G10

REVISION: ORIGINAL ISSUE: 4-05-16



MAIN		DIMENSION (FT.)			CONC. VOLUME (C. Y.)	THRUST (LBS.)
BEND	SIZE	'H'	'L'	'W'		
11 1/4°	4	1.00	1.00	1.67	0.05	887
	6	1.00	1.00	1.67	0.05	1,577
	8	1.00	1.50	1.67	0.07	2,814
	10	1.25	1.75	1.67	0.11	4,309
	12	1.67	2.00	1.67	0.17	6,150
16	2.00	2.75	1.67	0.28	10,761	

MAIN		DIMENSION (FT.)			CONC. VOLUME (C. Y.)	THRUST (LBS.)
BEND	SIZE	'H'	'L'	'W'		
22 1/2°	4	1.00	1.00	1.67	0.05	1,765
	6	1.33	1.50	1.67	0.10	3,647
	8	1.67	2.00	1.67	0.15	6,275
	10	2.00	2.50	1.67	0.22	9,439
	12	2.50	2.75	2.00	0.37	13,349
16	3.00	4.00	2.00	0.59	23,195	

MAIN		DIMENSION (FT.)			CONC. VOLUME (C. Y.)	THRUST (LBS.)
BEND	SIZE	'H'	'L'	'W'		
45°	4	1.00	1.75	1.67	0.07	3,462
	6	1.67	2.33	1.67	0.16	7,155
	8	2.50	2.50	1.67	0.26	12,308
	10	2.67	3.50	1.67	0.37	18,516
	12	3.33	4.00	2.00	0.64	26,185
16	4.00	5.75	2.50	1.29	45,499	

MAIN		DIMENSION (FT.)			CONC. VOLUME (C. Y.)	THRUST (LBS.)
BEND	SIZE	'H'	'L'	'W'		
90°	4	1.67	2.00	1.67	0.14	6,398
	6	2.25	3.00	1.67	0.27	13,220
	8	3.25	3.50	1.67	0.46	22,743
	10	3.33	5.25	2.00	0.81	34,213
	12	3.67	6.67	2.75	1.51	48,383
16	4.50	9.50	3.75	3.76	84,070	

MAIN		DIMENSION (FT.)			CONC. VOLUME (C. Y.)	THRUST (LBS.)
BEND	SIZE	'H'	'L'	'W'		
TEE & PLUG	4	1.33	1.75	1.67	0.12	4,524
	6	2.00	2.50	1.67	0.24	9,348
	8	2.33	3.50	1.67	0.36	16,082
	10	2.67	4.67	1.67	0.54	24,192
	12	3.00	5.75	2.00	0.86	34,212
16	4.00	7.50	2.00	1.85	59,447	

NOTE: SIZE IN TABLE DENOTES NOMINAL PIPE SIZE IN INCHES

- NOTES:**
1. SOIL PREPARATION SHALL BE APPROVED BY GCDWR PRIOR TO POURING CONCRETE.
 2. REFER TO TYPICAL HORIZONTAL THRUST RESTRAINT DRAWING G12 FOR ADDITIONAL DETAILS.

- DESIGN CRITERIA:**
1. THRUST RESTRAINT DIMENSIONS ARE BASED ON PRESSURE CLASS DUCTILE IRON PIPE WITH BITUMASTIC EXTERIOR COATING, MINIMUM SOIL BEARING PRESSURE OF 2,000 PSF, A COHESIVE GRANULAR SOIL, TEST PRESSURE OF 250 PSI, WITH A SAFETY FACTOR OF 1.0.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

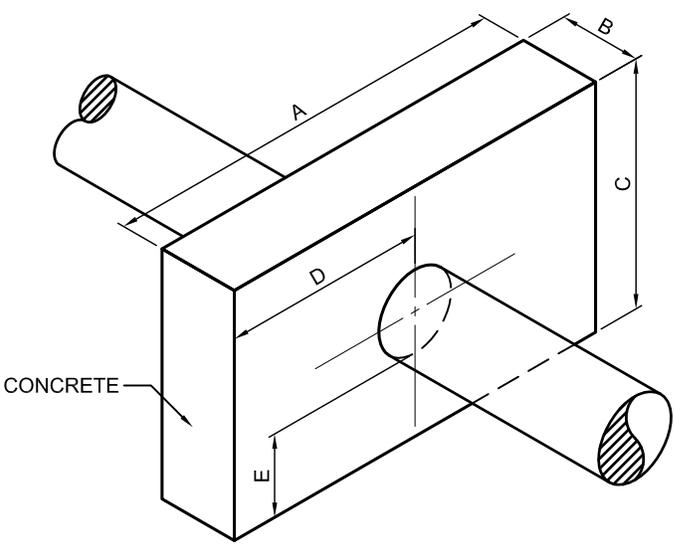
DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

TYPICAL HORIZONTAL THRUST BLOCK

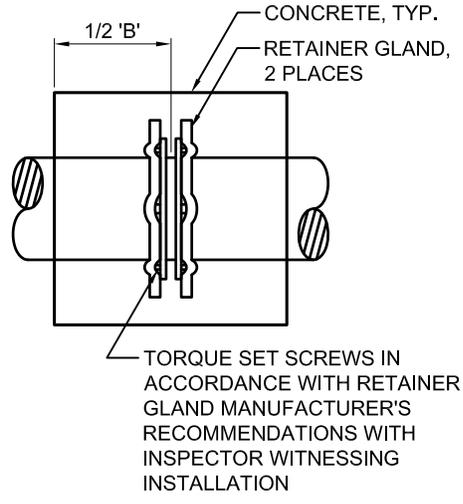
DRAWING NO.
G11

REVISION: ORIGINAL ISSUE: 4-05-16

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ISOMETRIC



ELEVATION

PIPE SIZE	A	B	C	D	E	VOLUME CU.YDS.	CONC.. WT. (LB)	THRUST (LB)
4"	2'-6"	12"	2'-6"	1'-3"	1'-0"	0.23	919	4,524
6"	2'-9"	12"	2'-9"	1'-4 1/2"	1'-1"	0.27	1,095	9,348
8"	3'-0"	18"	3'-0"	1'-6"	1'-2"	0.47	1,924	16,082
10"	4'-0"	18"	3'-6"	2'-0"	1'-4"	0.74	2,999	24,192
12"	4'-6"	24"	4'-6"	2'-3"	1'-9"	1.43	5,790	34,212
14"	5'-6"	24"	4'-6"	2'-9"	1'-8"	1.74	7,042	45,963
16"	6'-6"	24"	5'-0"	3'-3"	1'-10"	2.29	9,255	59,447

NOTES:

- CONCRETE SHALL BE POURED AGAINST UNDISTURBED EARTH EXCEPT WHERE FORMWORK IS A MUST. AFTER CONCRETE IS CURED THE FORMWORK SHALL BE REMOVED.
- MAINS GREATER THEN 16" DIAMETER SHALL BE INDIVIDUALLY CALCULATED.
- SOIL CONDITIONS SHALL BE VERIFIED BEFORE THRUST RESTRAINT DESIGN IS IMPLEMENTED.
- PIPE MUST BE DUCTILE IRON.

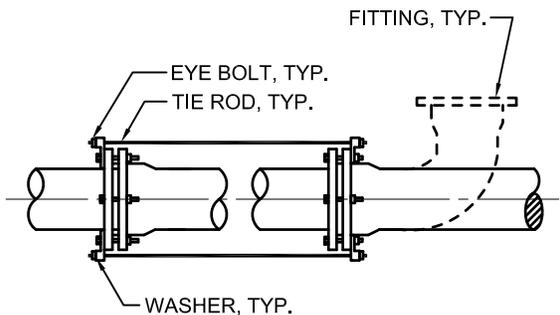
DESIGN CRITERIA:

- COLLAR DIMENSIONS ARE BASED ON A SOIL BEARING CAPACITY OF 2000 PSF, A RATED TEST PRESSURE OF 250 PSI, AND 3000 PSI CLASS 'A' CONCRETE.
- UNDER ADVERSE CONSTRUCTION CONDITIONS, CONCRETE SHALL BE 'HIGH EARLY' TYPE.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

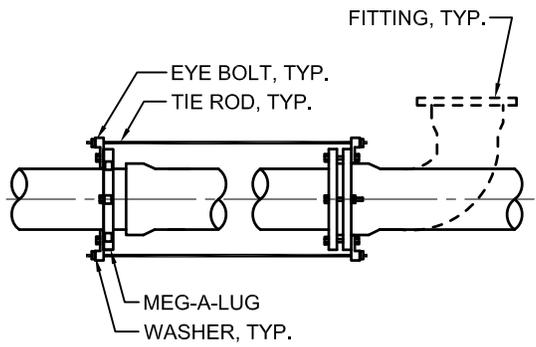
DESIGN BY: STD. COMMITTEE DRAWN BY: GCDWR CHECKED BY: PSB APPROVED BY: ARS SCALE: NONE	<h2 style="margin: 0;">THRUST RESTRAINT COLLAR</h2>	DRAWING NO. <h1 style="margin: 0;">G13</h1>
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 ORIGINAL ISSUE: 4-05-16



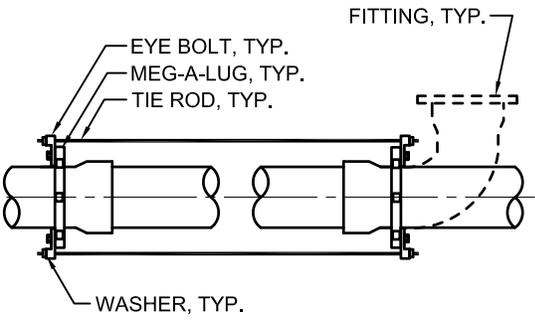
EYE BOLT TO EYE BOLT

**TYPE 1
FITTING RESTRAINT**



EYE BOLT TO MEG-A-LUG

**TYPE 2
FITTING RESTRAINT**



MEG-A-LUG TO MEG-A-LUG

**TYPE 3
FITTING RESTRAINT**

PIPE SIZE (IN.)	ROD SIZE (IN.)	NO. OF RODS (TEES, PLUGS, AND VALVES)	NO. OF RODS (11-1/4° - 22-1/2° BENDS)	NO. OF RODS (45° - 90° BENDS)
6	3/4	3	2	3
8	3/4	3	3	3
10	3/4	4	4	4
12	3/4	4	4	6
14	3/4	6	4	6
16	3/4	6	6	6
20	3/4	6	6	6
24	3/4	8	8	8
30	1	6	6	6
36	1	6	6	6

THRUST RESTRAINT

TIE ROD CHART

NOTES:

1. RODS SHALL BE A MINIMUM 304 S.S. ALL THREAD RODS WITH A MINIMUM YIELD STRENGTH OF 50,000 PSI.
2. USE LISTED NUMBER OF RODS AS SHOWN ON TIE ROD CHART (MINIMUM NUMBER SHOWN).
3. RODS MUST HAVE A MINIMUM 6" OF THREAD ON EACH END.
4. ALL STEEL MUST BE CLEANED AND COATED WITH ROYSTON ROSKOTE, KOPPERS SUPER SERVICE BLACK OR APPROVED EQUAL.
5. ALL NUTS USED ON TIE RODS MUST HAVE A WASHER.

DESIGN CRITERIA:

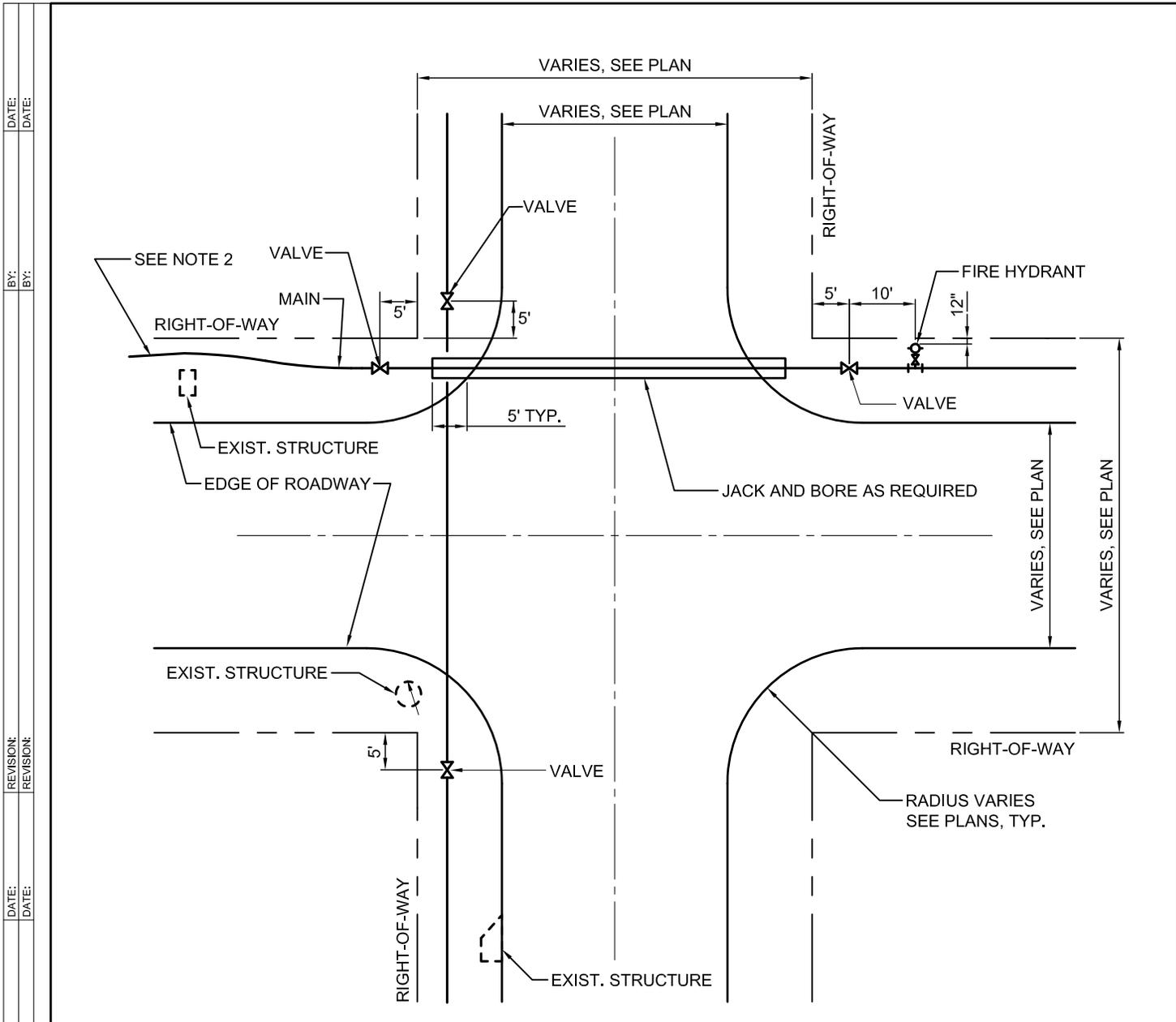
1. FITTING SHOWN IS REPRESENTATIVE FOR ALL FITTINGS, VALVES, DEAD ENDS AND PLUGS.
2. FOR WATER MAINS AT A RATED TEST PRESSURE OF 250 PSI.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**TYPICAL TIE ROD RESTRAINT
INSTALLATION**

DRAWING NO. G14



PLAN

NOTE:

1. DEPTH OF COVER OVER WATER MAINS SHALL BE 4', (SEE DETAIL G7).
2. WHEN GOING AROUND STRUCTURES, ROUTE WATER MAIN AROUND STRUCTURES BY PIPE JOINT DEFLECTION, AND WHERE NECESSARY, INSTALL 45° BENDS OR LESS.
3. VALVES SHALL BE MARKED IN THE CURB WITH A SAW CUT "V" AND PAINT.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

REVISION:	DESIGN BY: STD. COMMITTEE
REVISION:	DRAWN BY: DWR
REVISION:	CHECKED BY: PSB
REVISION:	APPROVED BY: ARS
REVISION:	SCALE: NONE

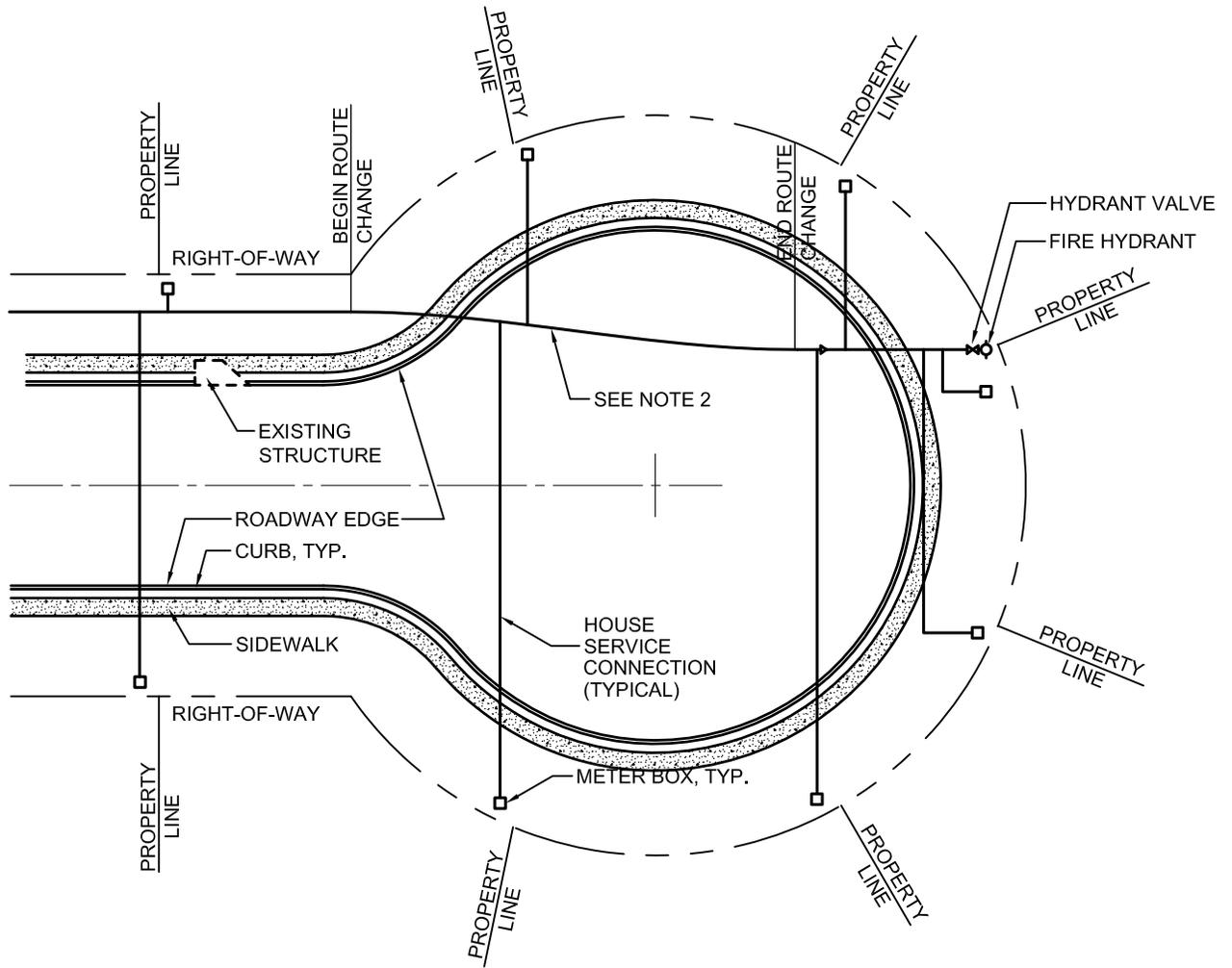
TYPICAL WATER MAIN AT INTERSECTION

DRAWING NO.	W1
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PLAN

NOTES:

1. REFER TO TYPICAL DEAD END STREET TERMINATION DETAIL W4 FOR ADDITIONAL DETAILS.
2. ROUTE MAIN WITHIN LIMITS INDICATED TO ALIGN CENTERLINE OF FIRE HYDRANT TO PROPERTY LINE EXTENDED, SEE TYPICAL DEAD END STREET TERMINATION SECTION FOR ADDITIONAL DETAILS
3. SERVICE CONNECTION SHALL COME DIRECTLY OFF MAIN, IN LINE WITH EACH METER CONNECTION

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

TYPICAL CUL-DE-SAC STREET

DRAWING NO.
W3

DATE: DATE:

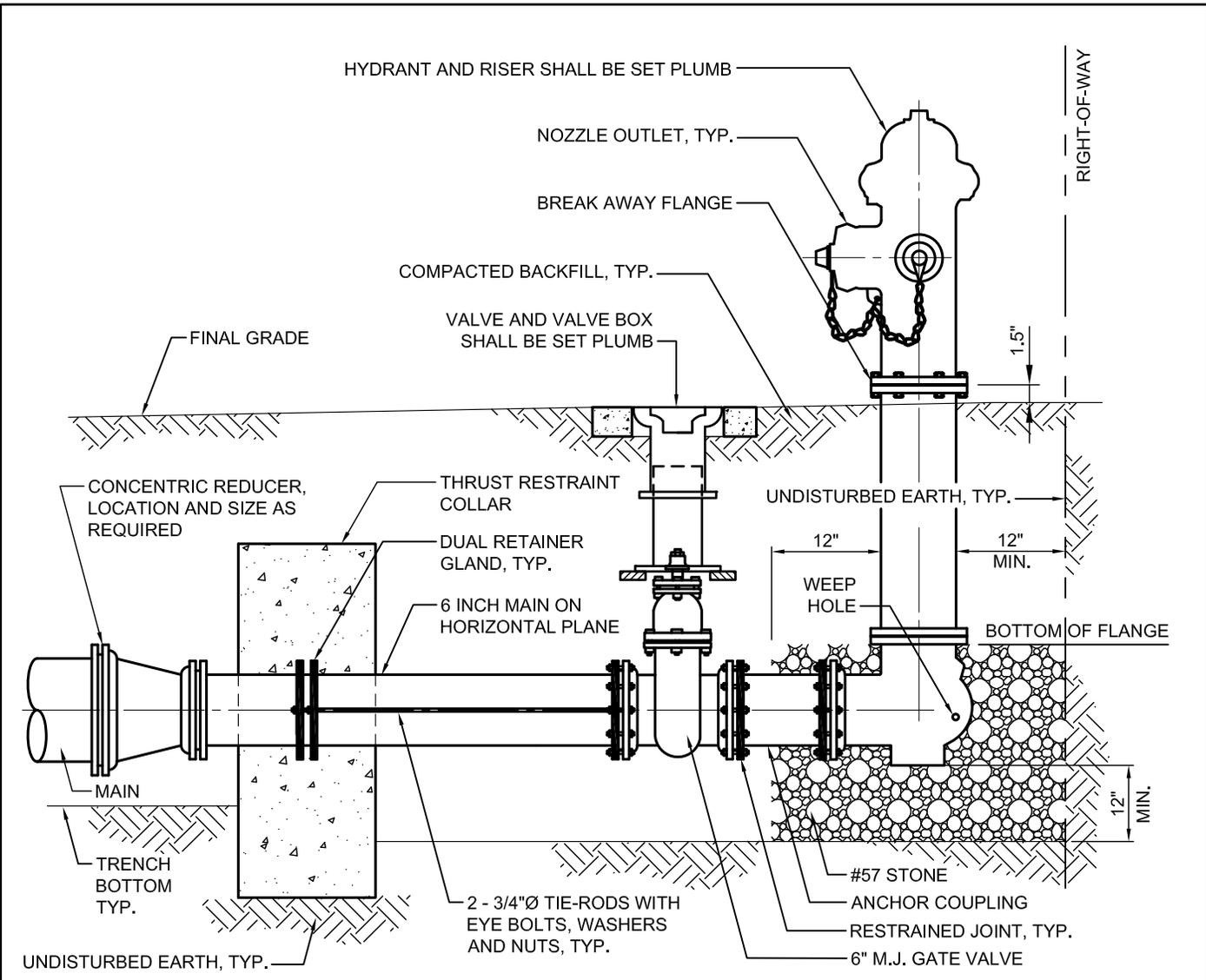
BY: BY:

REVISION: REVISION:

DATE: DATE:

BY: BY:

REVISION: ORIGINAL ISSUE: 4-05-16



SECTION

NOTES:

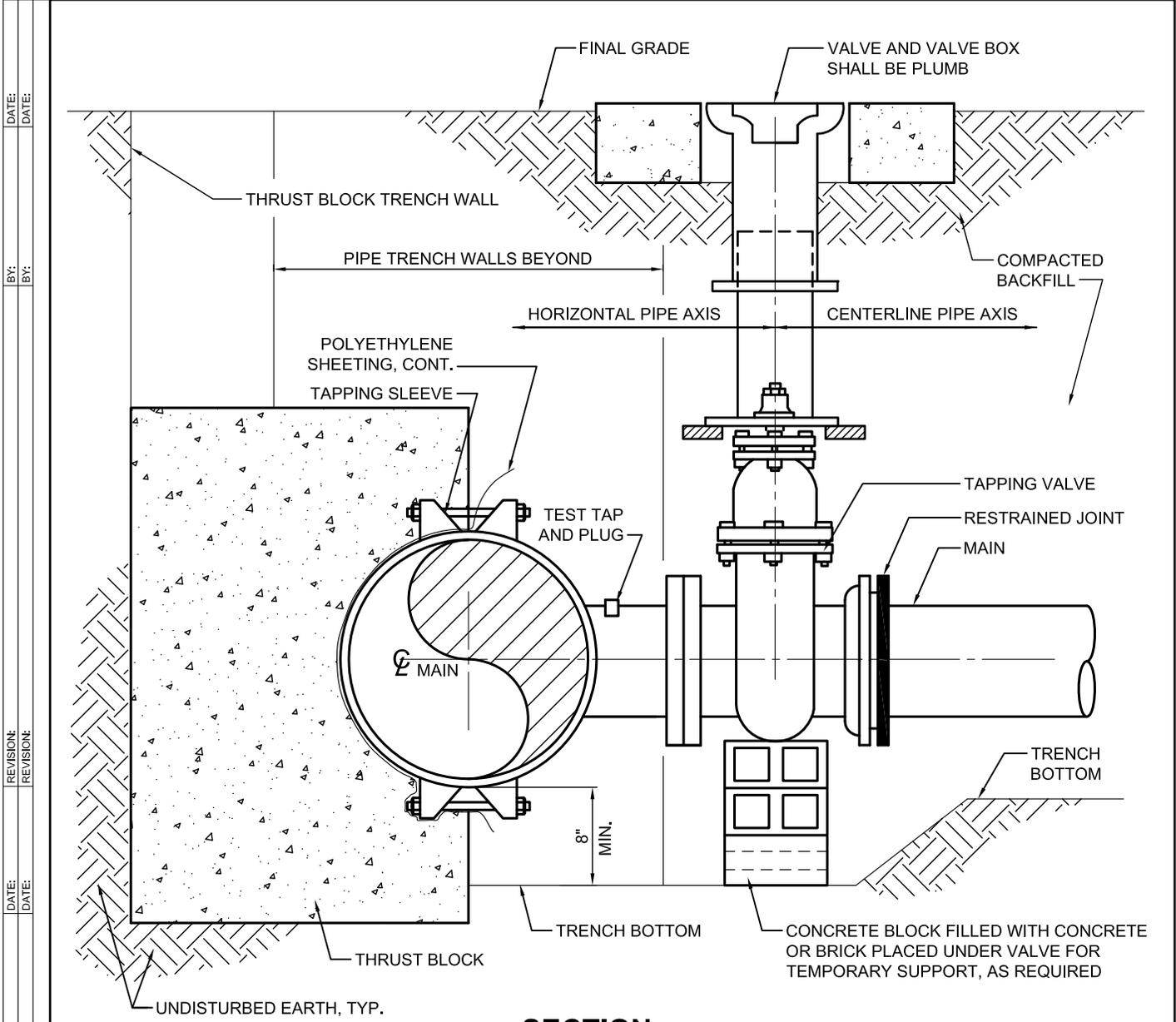
- 1. REFER TO TYPICAL TIE-ROD THRUST RESTRAINT DRAWING G14 FOR ADDITIONAL DETAILS.
- 2. REFER TO TYPICAL THRUST RESTRAINT COLLAR G13 DRAWING FOR ADDITIONAL DETAILS.
- 3. REFER TO TYPICAL CUL-DE-SAC STREET PLAN W3 FOR ORIENTATION.
- 4. REFER TO TYPICAL VALVE BOX DRAWING W9 FOR ADDITIONAL DETAILS.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

TYPICAL DEAD END STREET TERMINATION

DRAWING NO.
W4



SECTION

NOTES:

1. TEMPORARILY SUPPORT TAPPING SLEEVE AND VALVE PRIOR TO HYDROSTATIC TESTING AND UPON ACCEPTANCE OF TEST THEN CONCRETE MAY BE INSTALLED AS SHOWN.
2. REFER TO TYPICAL HORIZONTAL THRUST BLOCK DRAWING G11 FOR ADDITIONAL DETAILS.
3. REFER TO TYPICAL VALVE BOX INSTALLATION DRAWING W9 FOR ADDITIONAL DETAILS.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

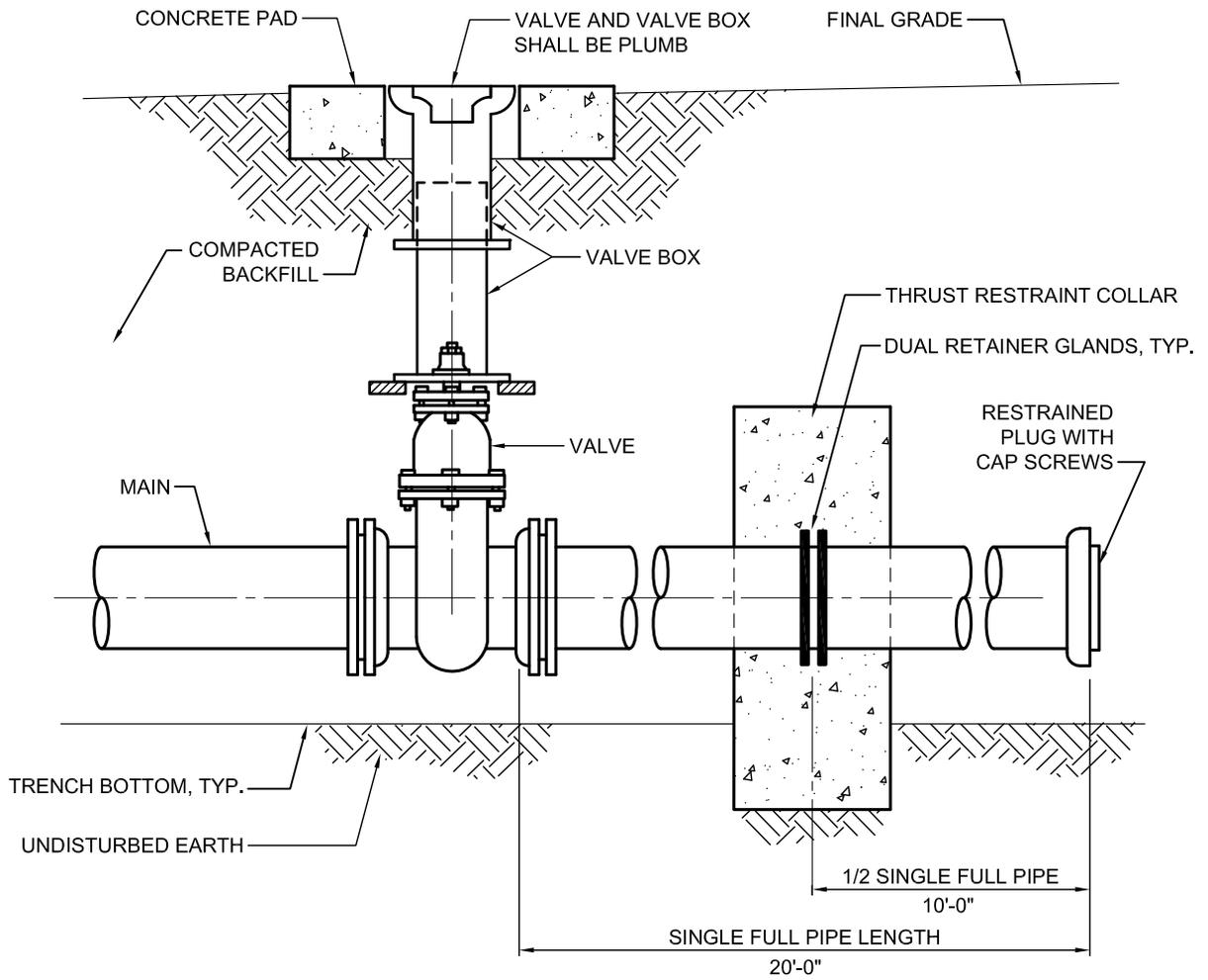
DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**TYPICAL TAPPING SLEEVE
AND VALVE INSTALLATION**

DRAWING NO.
W7

REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 BY: _____ BY: _____
 BY: _____ BY: _____
 ORIGINAL ISSUE: 4-05-16

REVISION: _____
 REVISION: _____
 ORIGINAL ISSUE: 4-05-16
 DATE: _____
 DATE: _____
 BY: _____
 BY: _____
 BY: _____
 BY: _____



SECTION

NOTES:

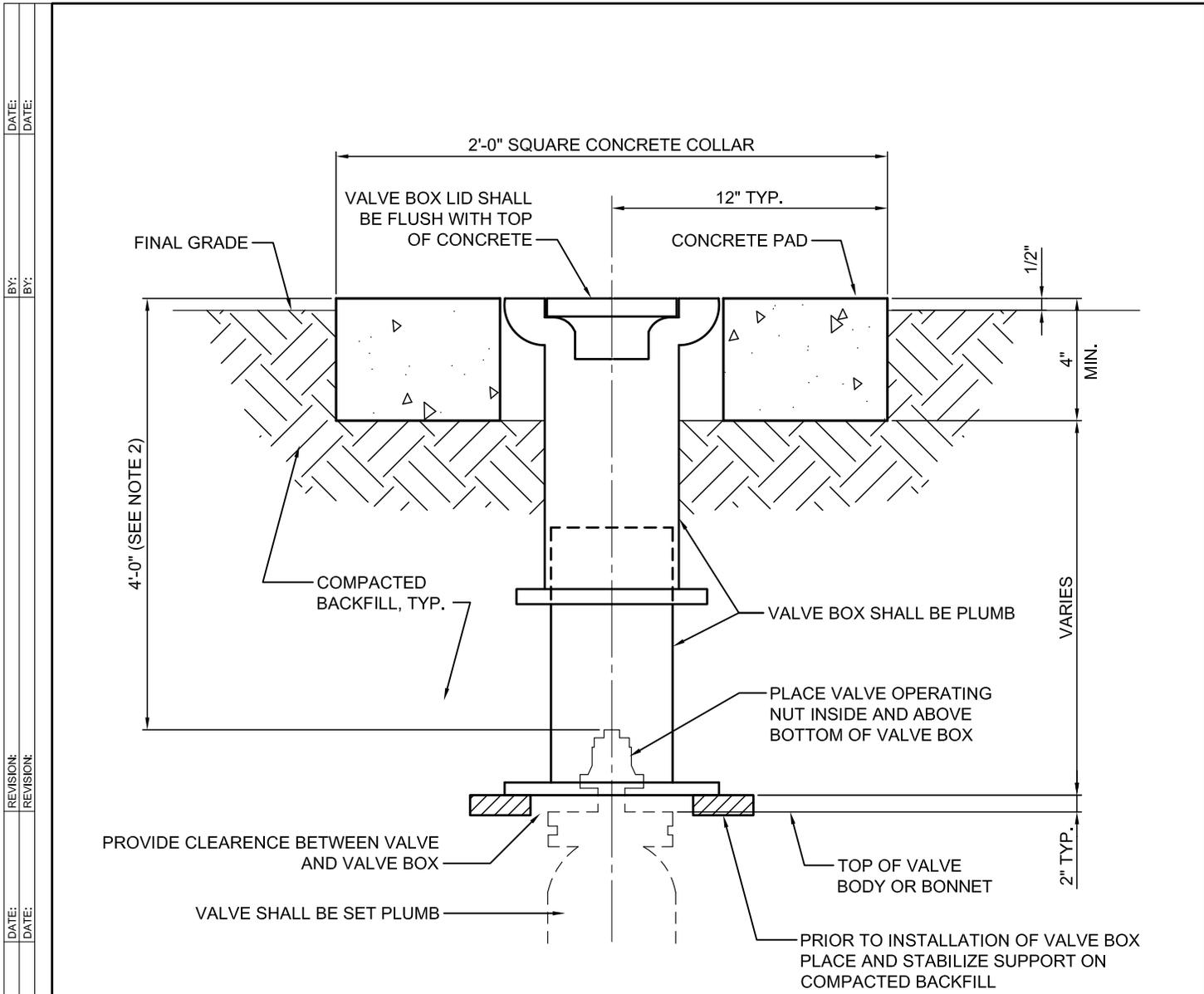
1. STUB-OUT SHALL BE TESTED WITH THE WATER MAIN.
2. REFER TO TYPICAL THRUST RESTRAINT COLLAR DRAWING G13 FOR ADDITIONAL DETAILS.
3. REFER TO TYPICAL VALVE BOX INSTALLATION DRAWING W9 FOR ADDITIONAL DETAILS.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: DWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

**TYPICAL STUB-OUT
INSTALLATION**

DRAWING NO.
W8



SECTION

1. SLIP-TYPE VALVE BOXES **ONLY (NO EXCEPTIONS)**.
2. WHERE DEPTH OF COVER IS MORE THAN 5 FEET, CONTRACTOR SHALL PROVIDE SUITABLE, PERMANENTLY INSTALLED VALVE STEM EXTENSION AND GUIDE AT NO EXTRA COST TO GCDWR.
3. USE 6" SDR 35 PVC PIPE FOR DEEP EXTENSIONS.

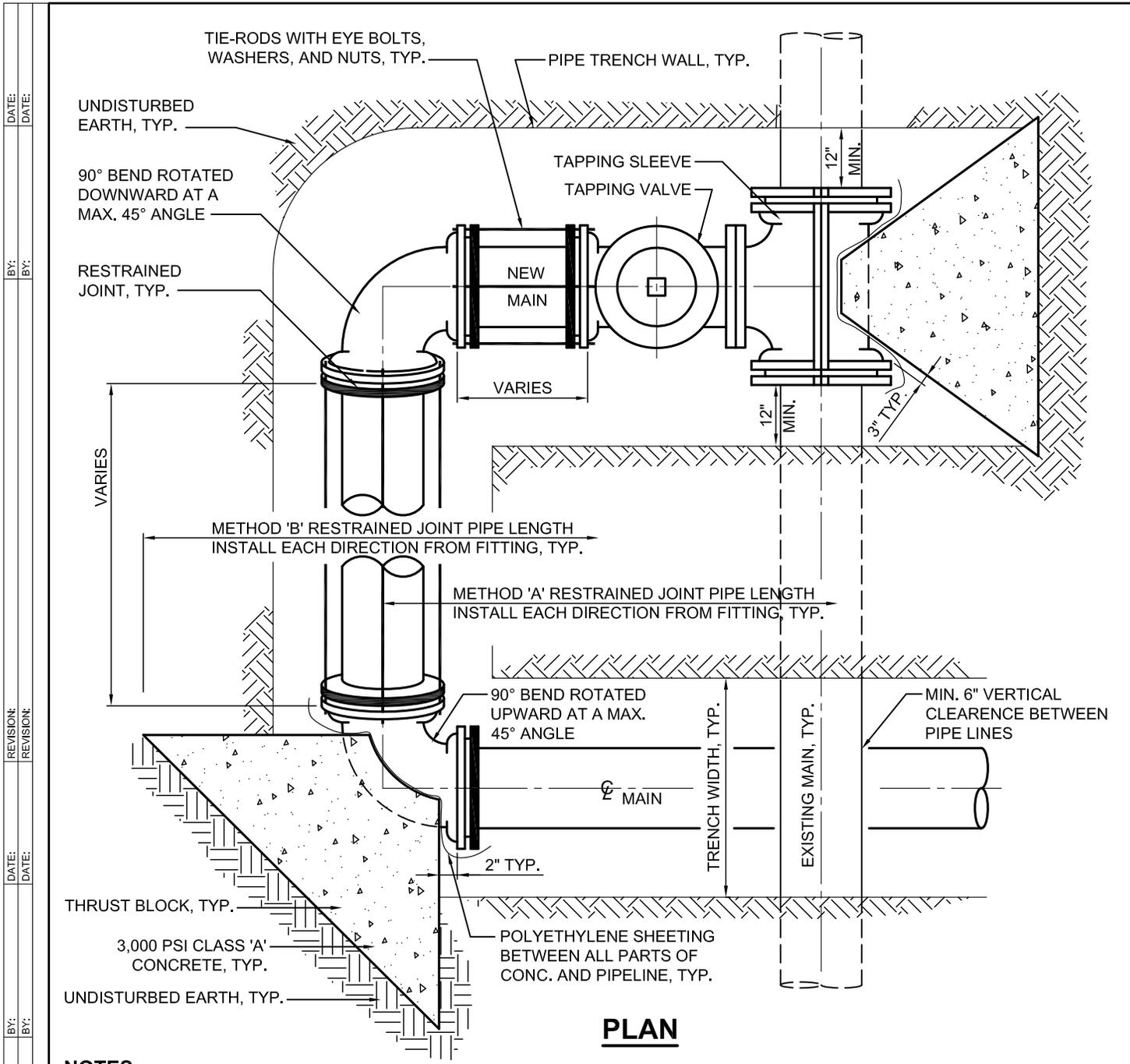
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

REVISION:	DESIGN BY: STD. COMMITTEE
REVISION:	DRAWN BY: DWR
REVISION:	CHECKED BY: PSB
REVISION:	APPROVED BY: ARS
REVISION:	SCALE: NONE

TYPICAL VALVE BOX INSTALLATION

DRAWING NO.
W9

REVISION: ORIGINAL ISSUE: 4-05-16



PLAN

NOTES:

1. REFER TO TYPICAL HORIZONTAL THRUST BLOCK DRAWINGS G11 AND G12 FOR ADDITIONAL DETAILS.
2. REFER TO TYPICAL TAPPING SLEEVE AND VALVE INSTALLATION DRAWING W7 FOR ADDITIONAL DETAILS.
3. RESTRAINED JOINT PIPE MAY BE USED IN LIEU OF THRUST BLOCKING AND TIE-RODS INDICATED, AS APPLICABLE.
4. RESTRAINED JOINT METHOD A: RESTRAINT JOINT PIPE AND FITTINGS.
5. RESTRAINED JOINT METHOD B: ONE (1) OF THE FOLLOWING DUAL (2) INDEPENDENT RESTRAINTS:
 - A. MEGA-LUGS PLUS THRUST BLOCKING.
 - B. MEGA-LUGS PLUS RODDING.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

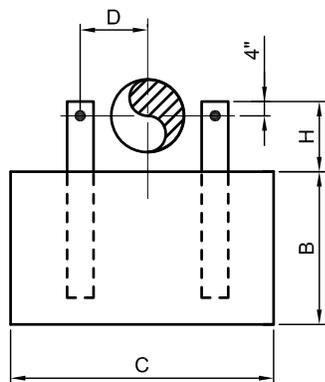
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REVISION:	DATE:
BY:	BY:
BY:	BY:
ORIGINAL ISSUE:	4-05-16
DESIGN BY:	STD. COMMITTEE
DRAWN BY:	DWR
CHECKED BY:	PSB
APPROVED BY:	ARS
SCALE:	NONE

TYPICAL BACK TAP INSTALLATION

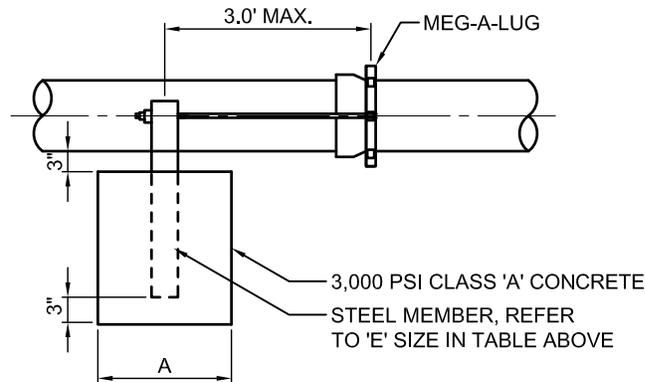
DRAWING NO.
W10

DATE: DATE: REVISION: REVISION: BY: BY: DATE: DATE: REVISION: REVISION: ORIGINAL ISSUE: 4-05-16

BEND	SIZE	A	B	C	D	VOL. YDS ³	H	T	ROD DIA	E (IN)
TEES PLUGS AND VALVES	6"	2'	3'	3'	1'	0.67	10"	5700	3/4"	6X6X3/8
	8"	3'	3'	5'	1'1"	1.67	11"	10,000	3/4"	6X6X3/8
	10"	4'	3'	5'	1'2"	2.67	1'	16,000	3/4"	6X6X3/8
	12"	5'	4'	6'	1'5"	4.44	1'1"	22,650	3/4"	10X10X1/2
	14"	6'	4'	7'	1'6"	6.22	1'2"	31,000	3/4"	10X10X1/2
	16"	7'	4'	8'	1'8"	8.3	1'3"	40,250	3/4"	10X10X1/2
20"	9'	4'8"	9'	1'11"	13.5	1'5"	62,850	3/4"	W12X190	
11 1/4°	6"	2'	3'	3'	1'	0.67	10"	1,110	3/4"	6X6X3/8
	8"	2'	3'	3'	1'1"	0.67	11"	2,000	3/4"	6X6X3/8
	10"	2'	3'	3'	1'2"	0.67	1'	3,100	3/4"	6X6X3/8
	12"	2'	3'	3'6"	1'5"	0.78	1'1"	4,450	3/4"	10X10X1/2
	14"	2'	3'	3'6"	1'6"	0.78	1'2"	6,050	3/4"	10X10X1/2
	16"	3'6"	3'	4'	1'8"	1.56	1'3"	7,900	3/4"	10X10X1/2
20"	4'	3'	5'6"	1'11"	2.44	1'5"	12,350	3/4"	W12X190	
22 1/2°	6"	2'	3'	3'	1'	0.67	10"	2,250	3/4"	6X6X3/8
	8"	2'	3'	3'	1'1"	0.67	11"	4,000	3/4"	6X6X3/8
	10"	2'	3'	3'6"	1'2"	0.78	1'	6,150	3/4"	6X6X3/8
	12"	3'6"	3'	4'	1'5"	1.56	1'1"	8,850	3/4"	10X10X1/2
	14"	4'	3'	5'	1'6"	2.22	1'2"	12,050	3/4"	10X10X1/2
	16"	4'	3'6"	6'	1'8"	3.11	1'3"	15,700	3/4"	10X10X1/2
20"	5'	4'	7'	1'11"	5.19	1'5"	24,550	3/4"	W12X190	
45°	6"	2'	3'	3'	1'	0.67	10"	4,350	3/4"	6X6X3/8
	8"	2'	3'	4'	1'1"	0.89	11"	7,700	3/4"	6X6X3/8
	10"	4'	3'	5'	1'2"	2.22	1'	12,050	3/4"	6X6X3/8
	12"	4'	4'	5'6"	1'5"	3.26	1'1"	17,350	3/4"	10X10X1/2
	14"	5'6"	4'	6'	1'6"	4.89	1'2"	23,600	3/4"	10X10X1/2
	16"	6'	4'	7'6"	1'8"	6.67	1'3"	30,000	3/4"	10X10X1/2
20"	7'	4'6"	9'	1'11"	10.50	1'5"	48,100	3/4"	W12X190	
90°	6"	2'6"	3'	4'	1'	1.11	10"	8,000	3/4"	6X6X3/8
	8"	4'	3'	5'6"	1'1"	2.44	11"	14,250	3/4"	6X6X3/8
	10"	5'	3'	7'6"	1'2"	4.17	1'	22,250	3/4"	6X6X3/8
	12"	6'	3'	8'	1'5"	5.33	1'1"	32,000	3/4"	10X10X1/2
	14"	7'6"	3'	9'	1'6"	7.5	1'2"	43,550	3/4"	10X10X1/2
	16"	9'	3'6"	9'	1'8"	10.50	1'3"	56,900	3/4"	10X10X1/2
20"	12'	3'6"	9'	1'11"	14.00	1'5"	88,900	3/4"	W12X190	



SECTION



ELEVATION

NOTES:

1. REFER TO TYPICAL TIE ROD RESTRAINT FOR FURTHER DETAILS AND COAT ALL STEEL WITH APPROVED COATING.
2. FOR PIPE SIZES OF 20 INCH OR LESS, OTHER SIZES SHALL REQUIRE GCDWR RESTRAINT DESIGN.
3. CONCRETE MUST BE POURED AGAINST UNDISTURBED EARTH, NO FORM WORK SHALL BE ALLOWED.
4. FOR EXISTING A.C. OR PVC PIPE INSTALL ONE JOINT OF DIP.

DESIGN CRITERIA:

1. FOR WATER MAINS AT A RATED TEST PRESSURE OF 250 PSI.

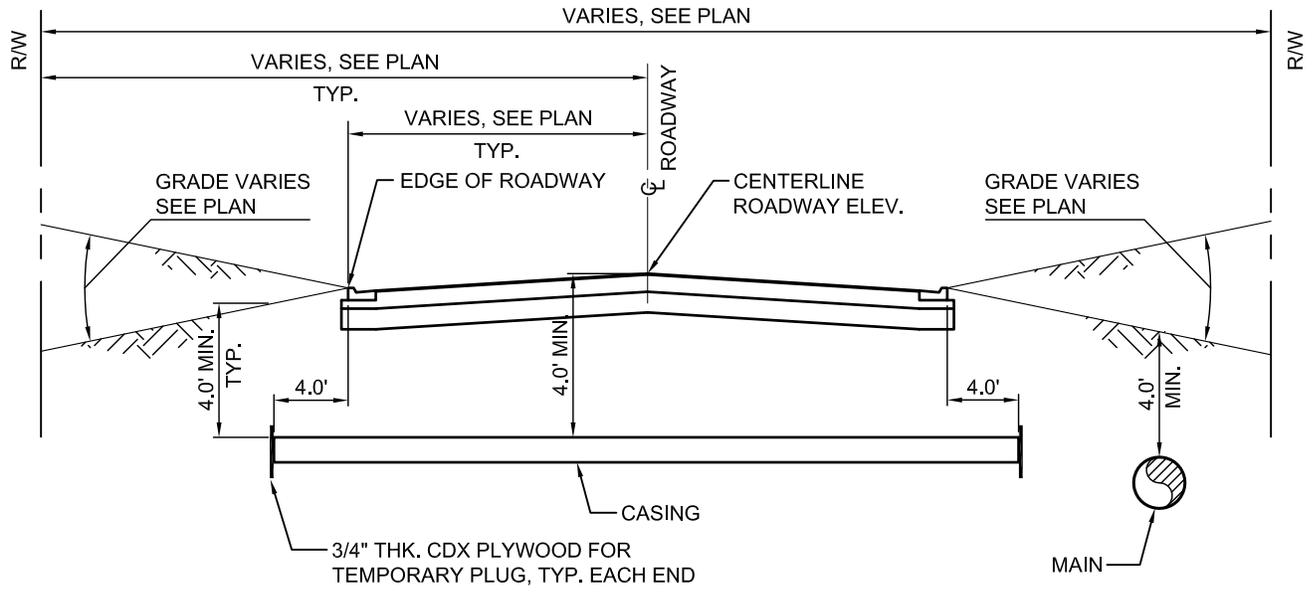
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**TYPICAL DEAD MAN THRUST
RESTRAINT INSTALLATION
FOR A.C. PIPE**

DRAWING NO.
W11

REVISION: _____
 REVISION: _____
 ORIGINAL ISSUE: 4-05-16
 DATE: _____
 DATE: _____
 BY: _____
 BY: _____
 REVISION: _____
 REVISION: _____
 DATE: _____
 DATE: _____
 BY: _____
 BY: _____



PROFILE

LONG SERVICE LATERAL (*INCHES)	3/4	1	1 1/2	2	2 1/2
CASING DIAMETER (*INCHES)	1 1/2	1 1/2	2	3	3

* NOMINAL SIZE

NOTES:

- CASING SHALL BE INSTALLED AT CENTER OF EACH LONG SIDE LOT, UNLESS OTHERWISE DIRECTED BY GCDWR.

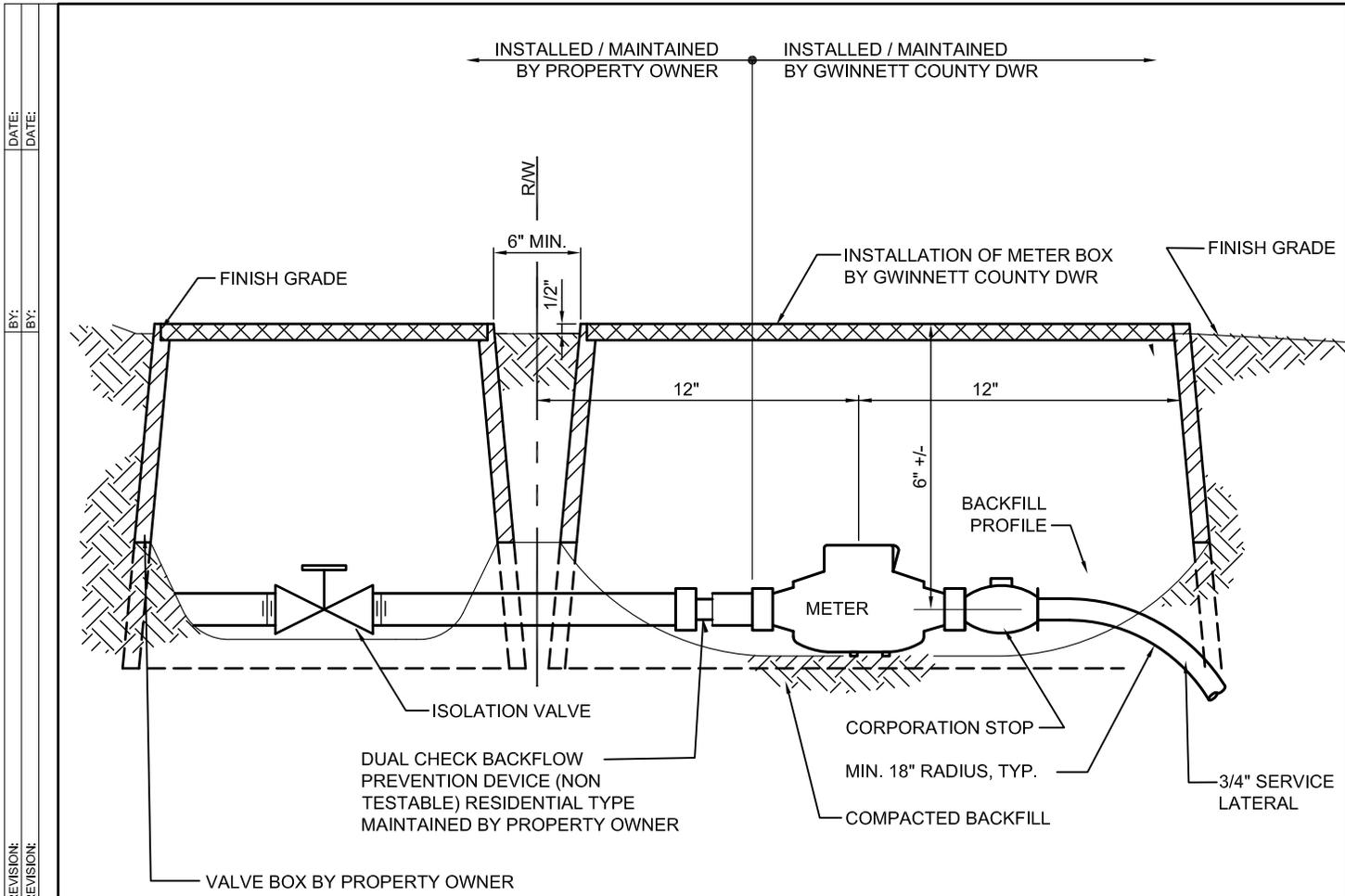
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: DWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

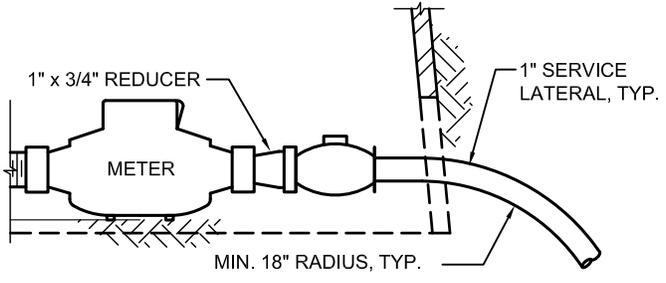
TYPICAL SERVICE LINE CASING INSTALLATION

DRAWING NO.

W12



SECTION



ALTERNATE SECTION

NOTES:

1. WHEN CONDITIONS ARE SUCH THAT METER INSTALLATION WITHIN THE RIGHT-OF-WAY IS DIFFICULT OR IMPOSSIBLE, WITH PROPERTY OWNERS PERMISSION, THE METER MAY BE LOCATED ON PRIVATE PROPERTY.
2. WHERE A 1" SERVICE LATERAL EXISTS, INSTALL A 1" TO 3/4" REDUCER BETWEEN CORPORATION STOP AND METER.
3. CENTER WATER METER IN METER BOX.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

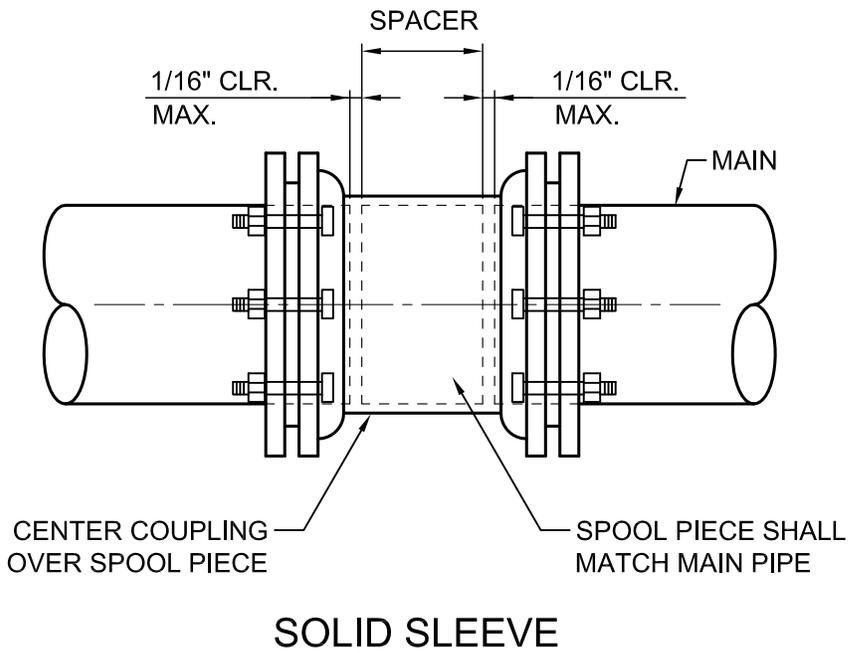
REVISION:	DESIGN BY: STD. COMMITTEE
REVISION:	DRAWN BY: DWR
REVISION:	CHECKED BY: PSB
REVISION:	APPROVED BY: ARS
REVISION:	SCALE: NONE

**TYPICAL RESIDENTIAL
METER BOX INSTALLATION**

DRAWING NO.
W14

DATE: _____ BY: _____
 REVISION: _____ DATE: _____ BY: _____
 ORIGINAL ISSUE: 4-05-16

REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 BY: _____ BY: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 BY: _____ BY: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 BY: _____ BY: _____
 ORIGINAL ISSUE: 4-05-16



1. SOLID SLEEVE SHALL BE STEEL AND PROPERLY COATED BEFORE BACKFILL.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: DWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

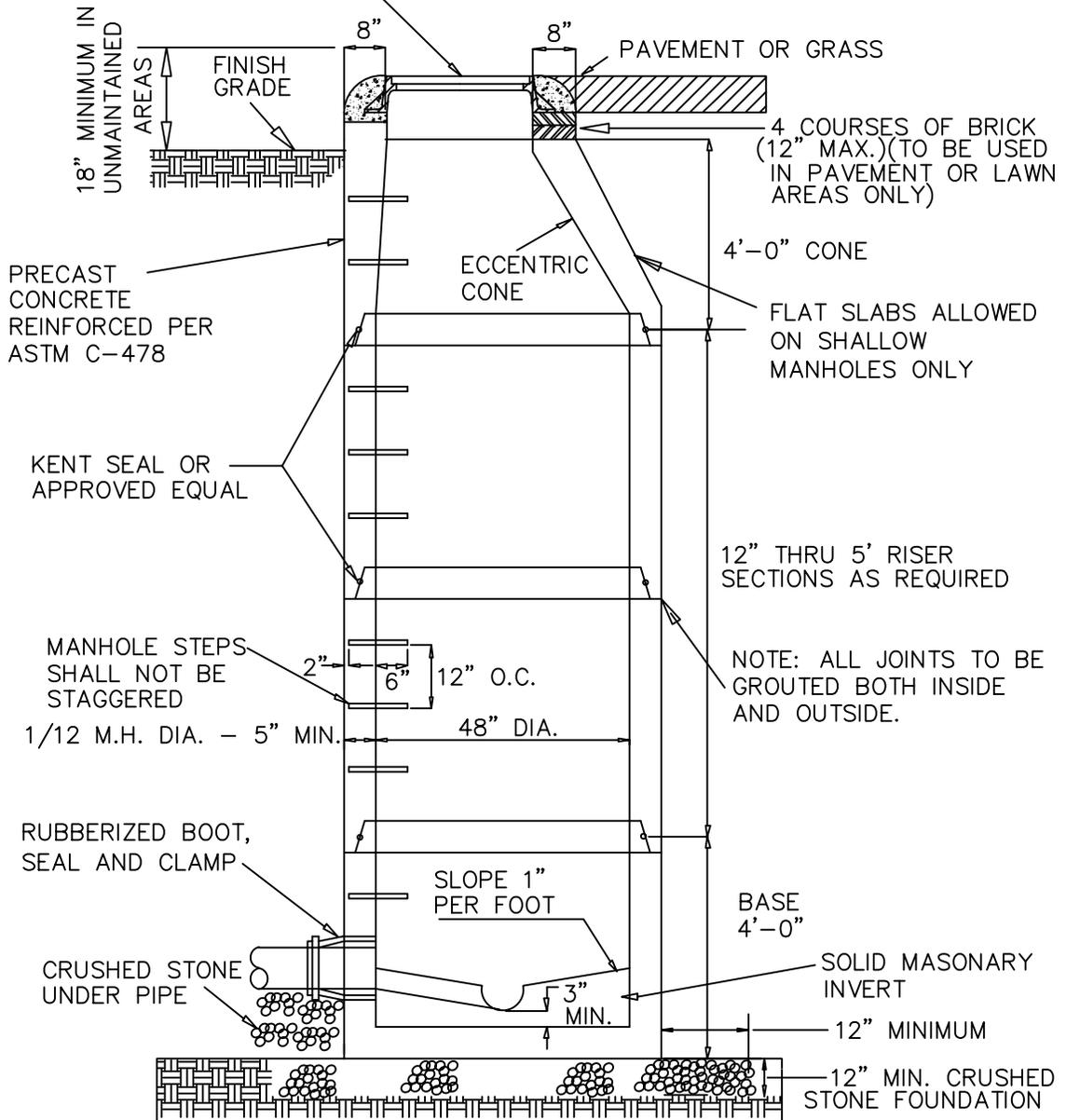
TYPICAL COUPLING

DRAWING NO.

W15

DATE: _____ BY: _____
 DATE: _____ BY: _____
 REVISION: _____ REVISION: _____
 DATE: _____ DATE: _____
 BY: _____ BY: _____
 REVISION: _____ ORIGINAL ISSUE: 4-05-16

STANDARD C.I. FRAME & COVER



NOTES:

1. TABLES ARE TO BE GENTLY SLOPED AND TROWELED SMOOTH FROM M.H. WALL TO INVERT WALL AND CONSTRUCTED OF SOLID MASONRY.
2. BASES LARGER THAN 48" (INCH) MUST USE TRANSITION SLAB AND 48" (INCH) RISER SECTIONS.
3. CONES WITH CAST IN PLACE FRAMES ARE REQUIRED ON OUTFALL SEWERS IN UNMAINTAINED AREAS.
4. BOLT DOWN RING & COVER REQUIRED OUTSIDE OF PAVEMENT.
5. ALL MANHOLES RECEIVING A FORCE MAIN DISCHARGE SHALL BE POLYMER CONCRETE MANHOLES AS MANUFACTURED BY US COMPOSITE PIPE, INC. OR GCDWR APPROVED EQUAL.
6. USE OF T-BASE MANHOLES IS PROHIBITED.

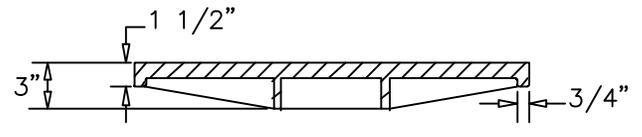
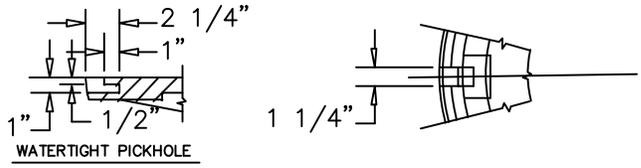
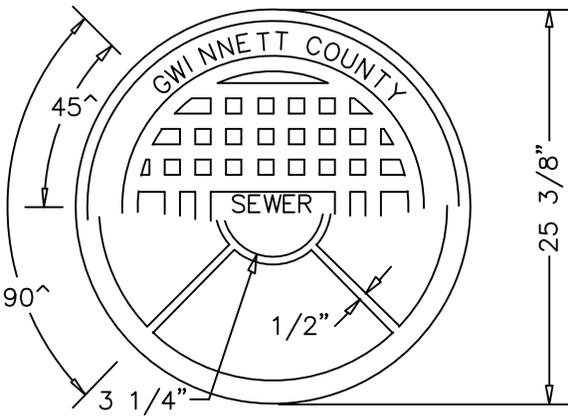
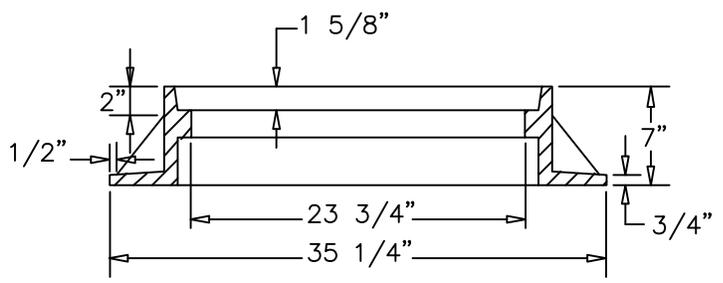
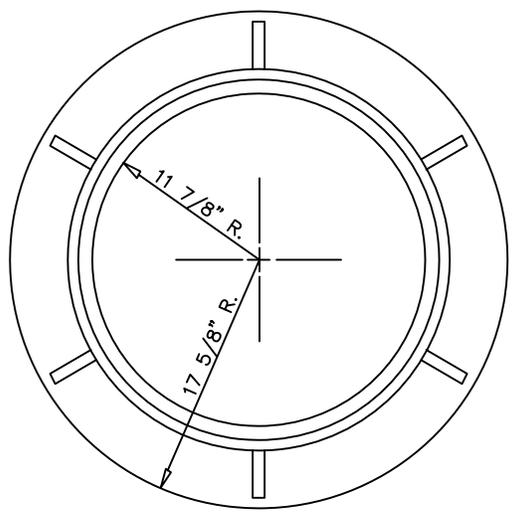
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**STANDARD PRECAST MANHOLE
 (PIPE SIZES LESS THAN 36")**

DRAWING NO.
S1

REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 ORIGINAL ISSUE: 4-05-16
 BY: _____
 BY: _____
 BY: _____
 BY: _____



NOTE: EAST JORDAN IRON WORKS V-1357 OR INTERCHANGEABLE

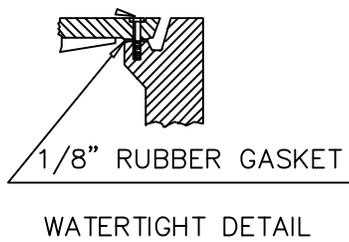
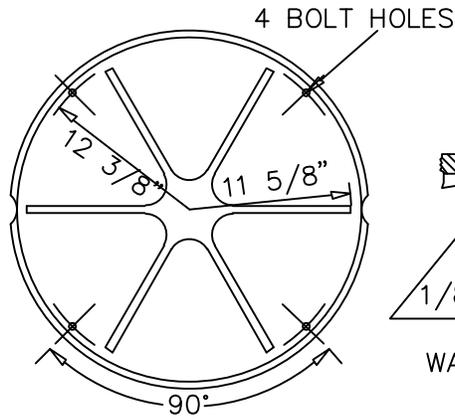
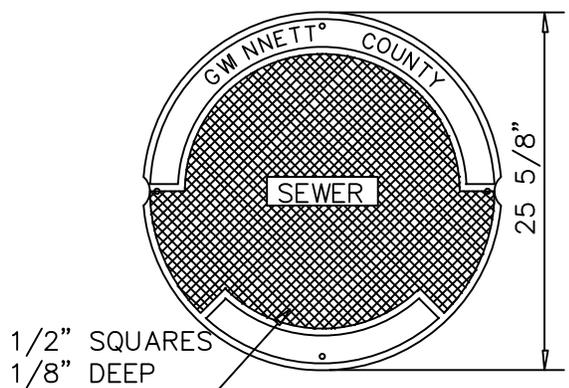
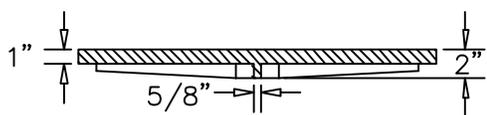
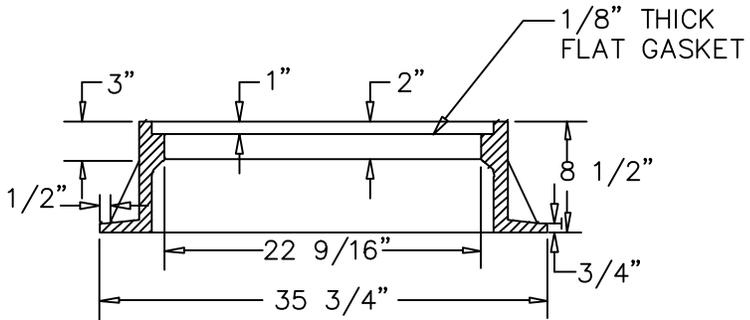
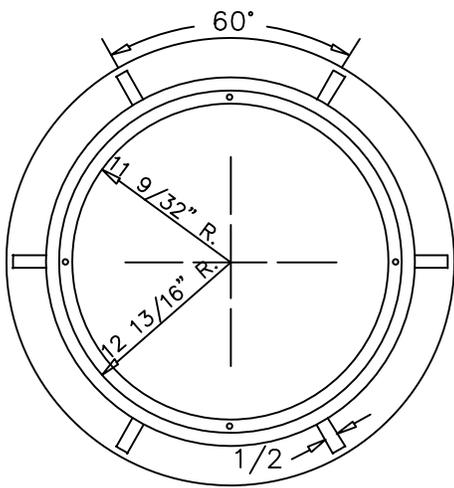
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**TRAFFIC
FRAME & COVER**

DRAWING NO.
S3

REVISION: _____
 ORIGINAL ISSUE: 4-05-16
 DATE: _____
 BY: _____
 REVISION: _____
 DATE: _____
 BY: _____
 REVISION: _____
 DATE: _____
 BY: _____



NOTE: EAST JORDAN IRON WORKS V-2358 OR INTERCHANGEABLE

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

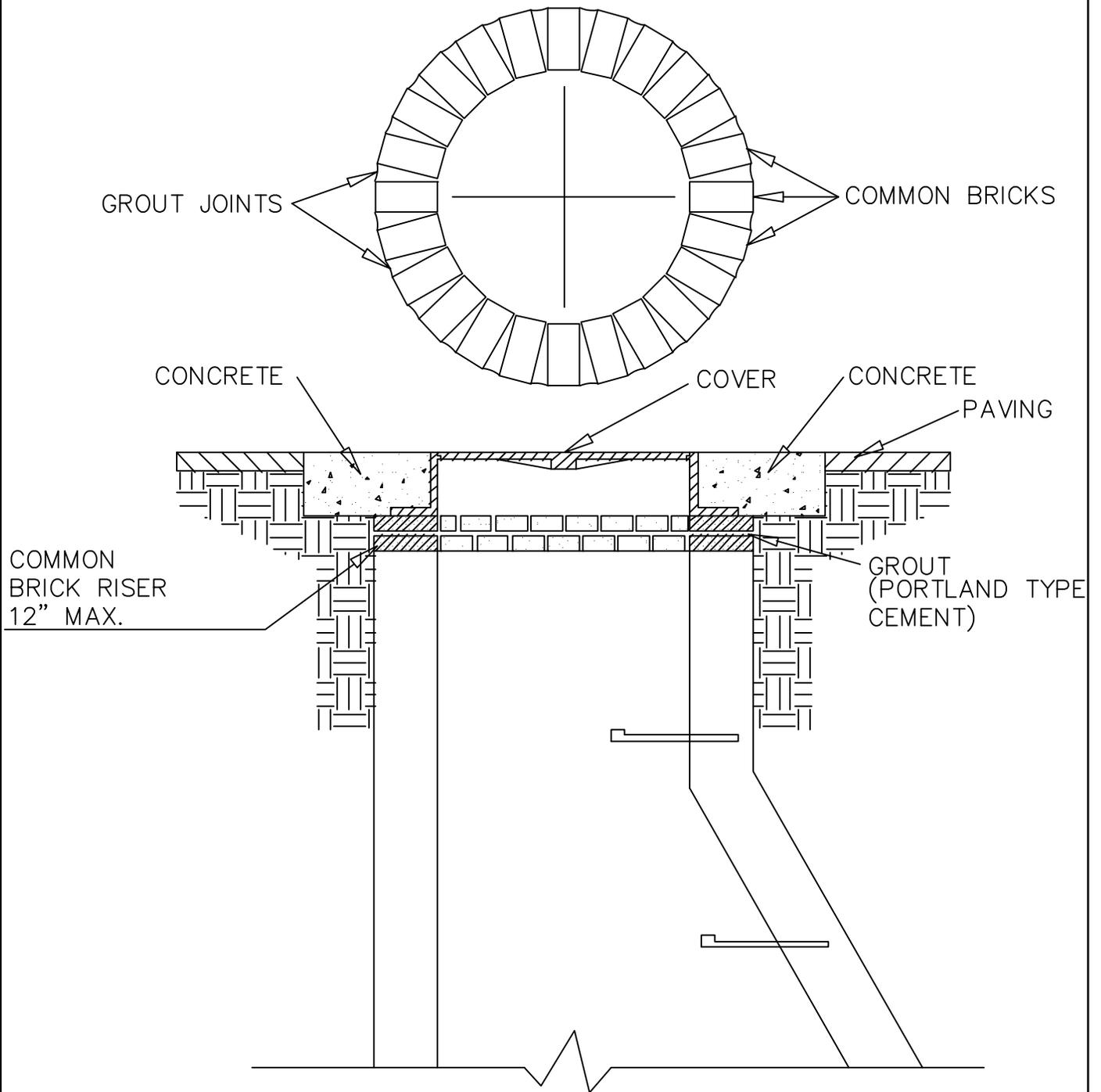
DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**BOLT DOWN
FRAME & COVER**

DRAWING NO.
S4

REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 ORIGINAL ISSUE: 4-05-16

TOP VIEW OF BRICK RISER
RISER DETAIL



NOTE :
 BRICK SHALL BE USED WHEN UPWARD
 ADJUSTMENTS TO FINISHED GRADE ARE REQUIRED.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: DWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

LID GROUTING

DRAWING NO.
S5

DATE: DATE:

BY: BY:

REVISION: REVISION:

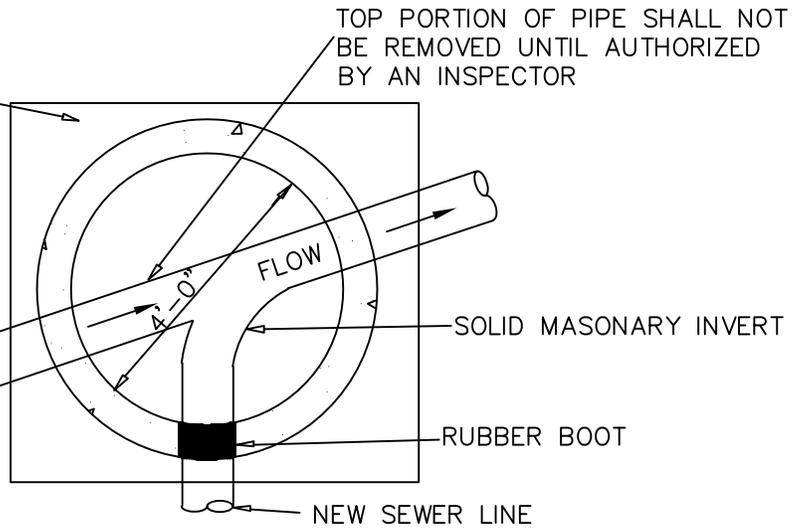
DATE: DATE:

BY: BY:

NOTE:
DOGHOUSE MANHOLES TO BE INSTALLED ONLY WHEN AUTHORIZED BY GCDWR.

CONCRETE BASE UNDER EXISTING SEWER
3,000 PSI CLASS 'A' CONCRETE

EXISTING SEWER LINE

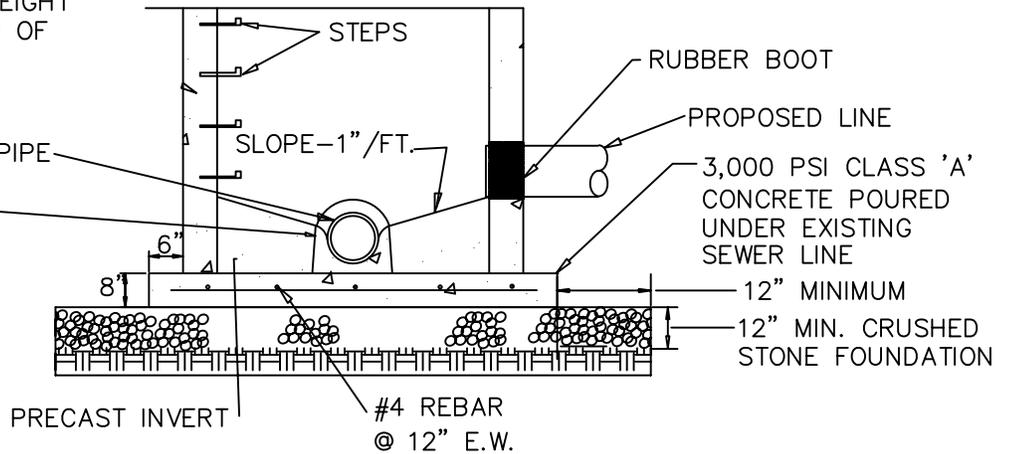


PROVIDE PRECAST MANHOLE RISER COMPLETE WITH UP-SIDE DOWN U-SHAPED OPENING TO SUIT EXISTING LINES

CORED AND BOOTED OPENING TO SUIT PROPOSED PIPELINES.

NOTE:
TABLES ARE TO BE GENTLY SLOPED AND TROWELED SMOOTH FROM MANHOLE WALL TO INVERT WALL HEIGHT AND CONSTRUCTED OF SOLID MASONRY

DOGHOUSE OPENING CAREFULLY GROUTED WITH NON-SHRINK CEMENT



NEW PIPE SHALL HAVE A MINIMUM 8" DROP INTO MANHOLE WHENEVER POSSIBLE

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

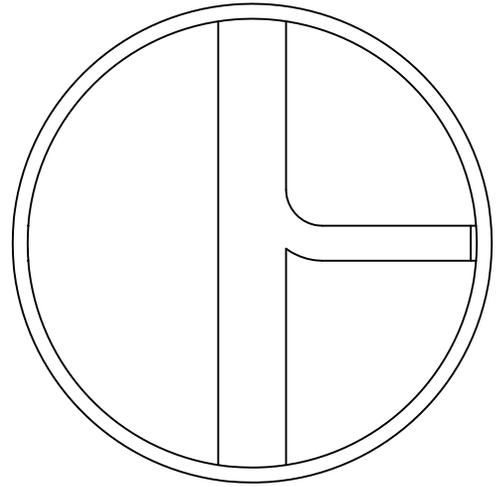
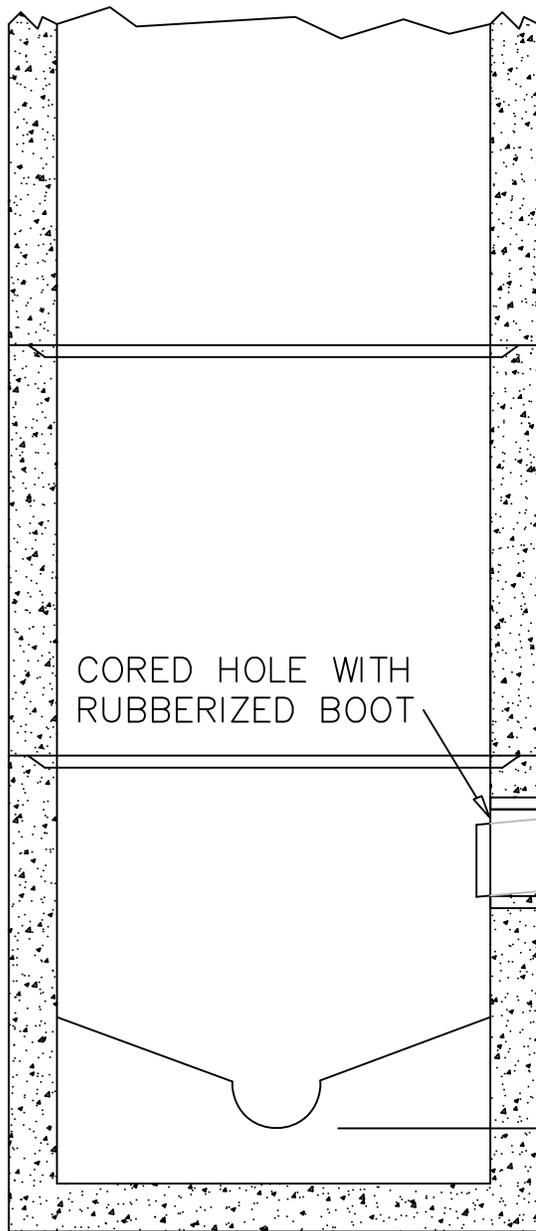
MANHOLE PLACED ON EXISTING LINE (DOGHOUSE)

DRAWING NO.

S7

REVISION: ORIGINAL ISSUE: 4-05-16

REVISION: _____ DATE: _____
 REVISION: _____ DATE: _____
 BY: _____ BY: _____
 REVISION: _____ DATE: _____
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 BY: _____ BY: _____
 REVISION: _____ DATE: _____
 ORIGINAL ISSUE: 4-05-16



SECTION A-A

CORED HOLE WITH RUBBERIZED BOOT

DIP or PVC

A

A
24" Max

NOTE

1. CORES SHALL BE AWAY FROM BARREL JOINTS.
2. MAXIMUM ALLOWABLE INSIDE DROP MANHOLES SHALL BE 2' (FEET), INCLUDING 6" PIPES.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

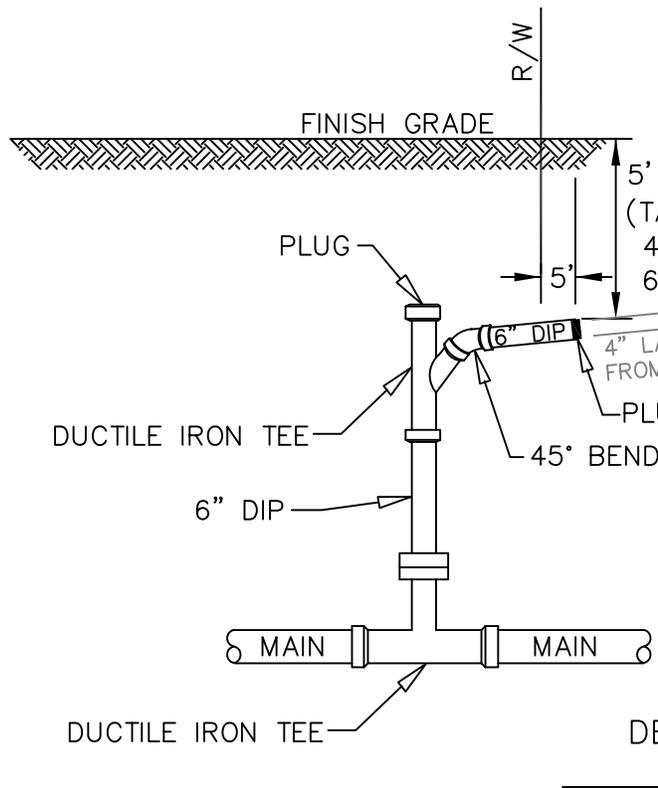
DESIGN BY: STD. COMMITTEE
 DRAWN BY: DWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

**INSIDE DROP
MANHOLE**

DRAWING NO.

S9

DATE: _____ BY: _____
 DATE: _____ BY: _____
 REVISION: _____ REVISION: _____
 DATE: _____ DATE: _____
 BY: _____ BY: _____
 REVISION: _____ REVISION: _____
 ORIGINAL ISSUE: 4-05-16

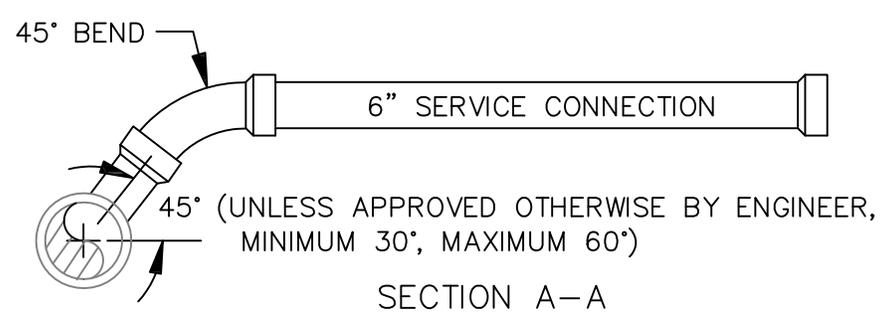


5' MINIMUM, (SEE DETAIL G7, NOTE 4)
 (TAKE INTO ACCOUNT MINIMUM 1.00% SLOPE FROM
 4" BUILDING LATERAL ELEVATION TO
 6" SERVICE CONNECTION ELEVATION)

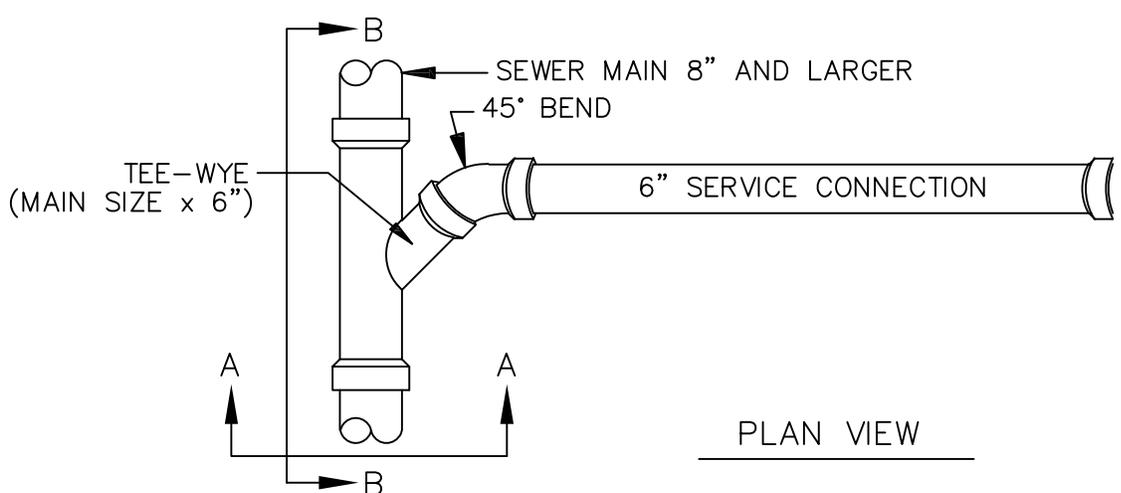
NOTE:
 USE DEEP HOUSE CONNECTIONS WHEN
 SEWER MAIN INVERT IS AS FOLLOWS:

DEPTH	REQUIREMENT
12.00' TO 15.99'	OPTIONAL
16.00' AND GREATER	REQUIRED

DEEP CONNECTION
 SECTION B-B



SECTION A-A



PLAN VIEW

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: DWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

6" SERVICE CONNECTION

DRAWING NO.
S10

DATE:

BY:

REVISION:

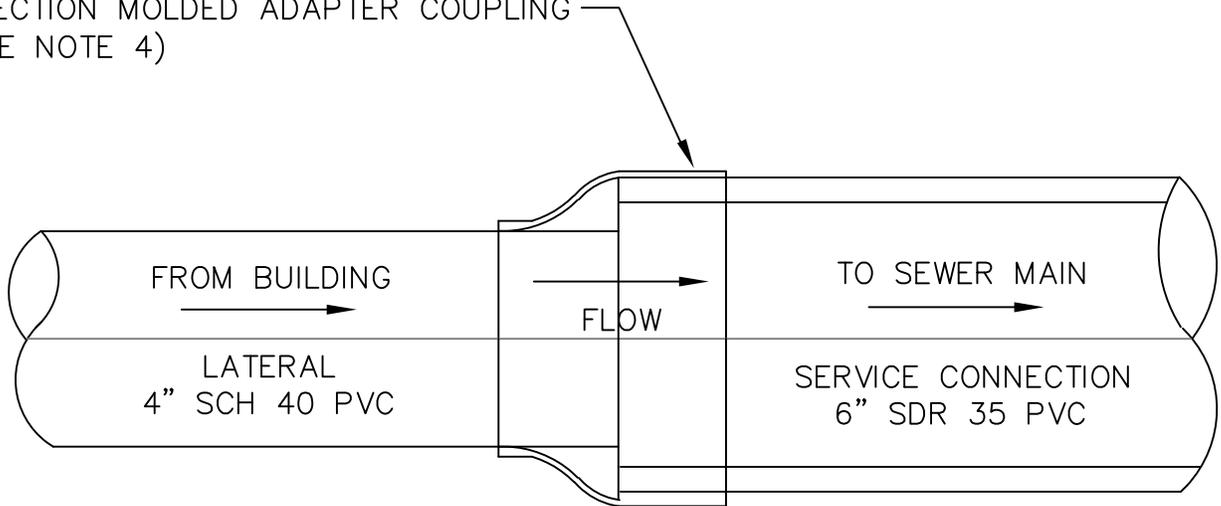
DATE:

BY:

REVISION:

ORIGINAL ISSUE: 4-05-16

6" X 4" SDR TO SCHEDULE 40 PVC
INJECTION MOLDED ADAPTER COUPLING
(SEE NOTE 4)



NOTE:

1. CONCRETE GROUT WILL NOT BE PERMITTED.
2. BELL MUST BE REMOVED FROM 6" SERVICE CONNECTION.
3. DAMAGED END OF 6" SERVICE CONNECTION PIPE SHALL BE CUT STRAIGHT.
4. EACH INSTALLATION MUST UTILIZE INJECTION MOLDED 6"x4" SDR TO SCH 40 ADAPTER COUPLING (Multi Fittings OR EQUAL).

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**4" LATERAL TO
6" SERVICE CONNECTION
INSTALLATION**

DRAWING NO.

S13

DATE:
DATE:

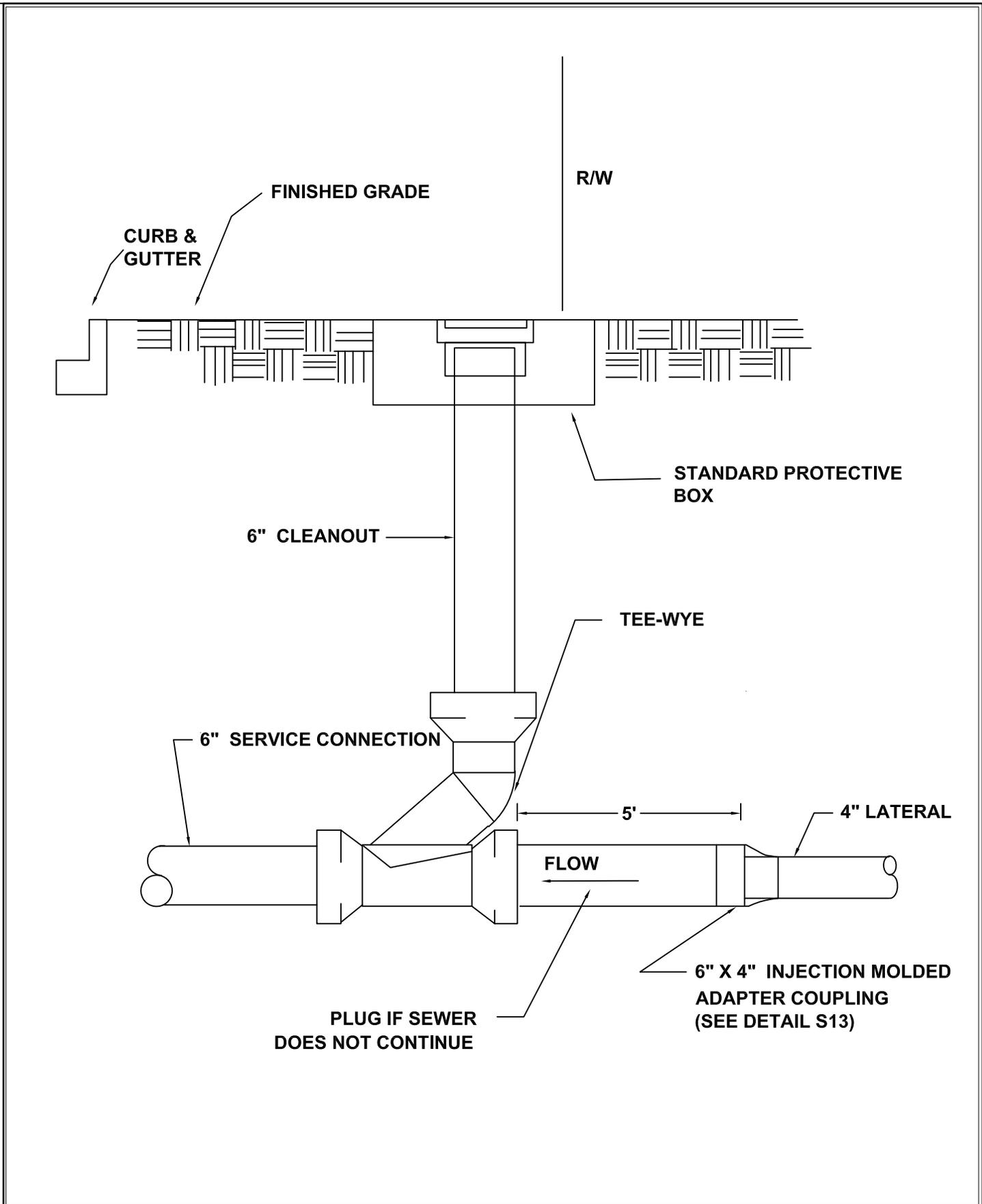
BY:
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ORIGINAL ISSUE: 4-05-16



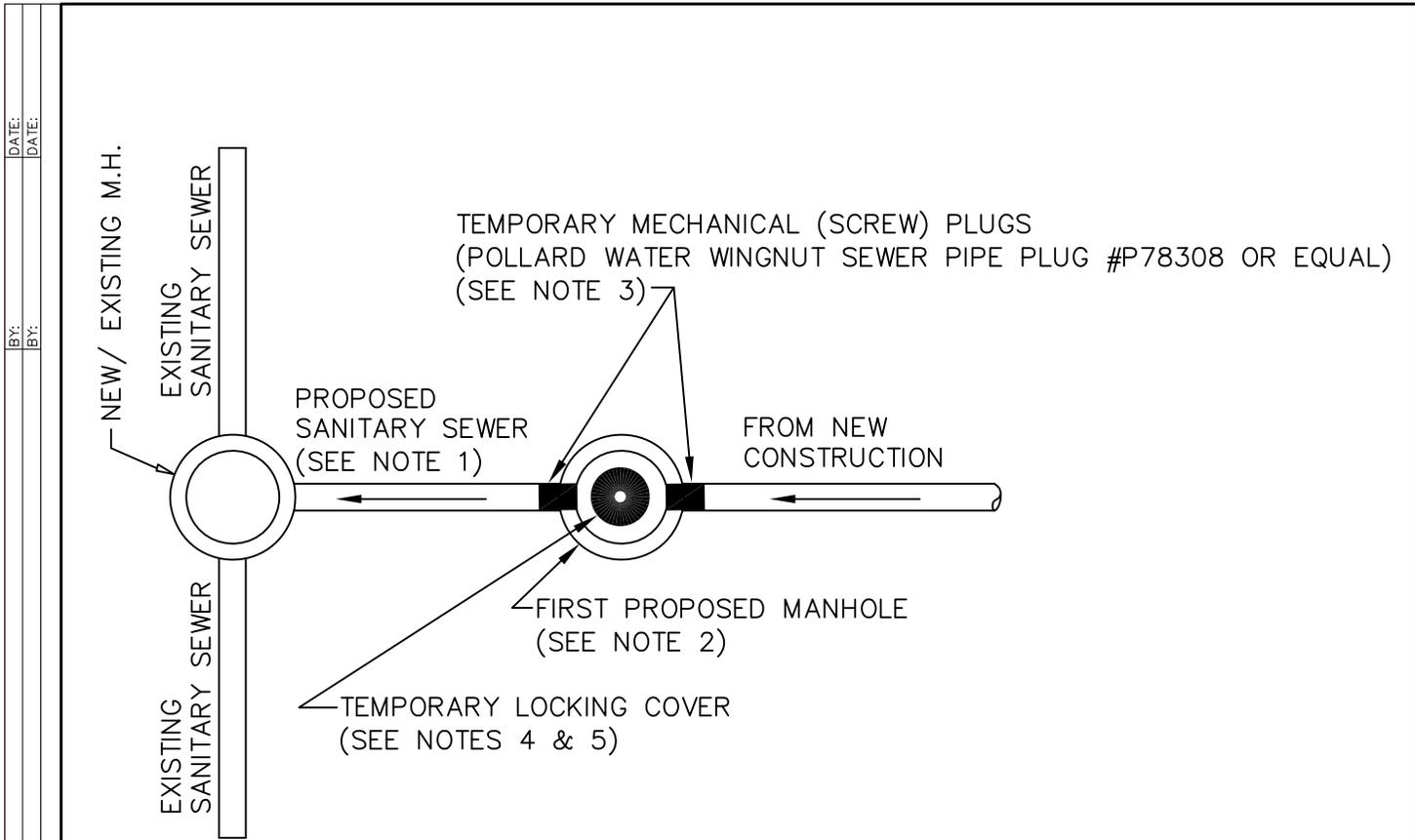
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

**6" CLEAN-OUT
AT RIGHT-OF-WAY**

DRAWING NO.

S14



NOTE:

1. FIRST SECTION OF NEW SEWER LINE SHALL BE ISOLATED FROM THE REST OF THE PROPOSED SYSTEM.
2. THE FIRST MANHOLE OF THE PROPOSED SYSTEM SHALL BE USED TO FLUSH AND PUMP OUT THE PROPOSED SANITARY SEWER.
3. TEMPORARY MECHANICAL (SCREW) PLUGS TO BE INSTALLED AS PART OF NEW SEWER INSTALLATION. PLUGS TO BE TIED TO MANHOLE STEP WITH A CABLE AND PADLOCKED TO PREVENT TAMPERING. PLUGS TO REMAIN IN PLACE UNTIL PASSING FINAL INSPECTION.
4. AFTER INSTALLATION OF NEW MANHOLE BY CONTRACTOR (INCLUDING INSTALLING TEMPORARY MECHANICAL PLUGS), GCDWR TO INSTALL LOCKING MANHOLE COVER. LOCKING MANHOLE COVER TO REMAIN IN PLACE UNTIL PASSING FINAL INSPECTION.
5. UPON PASSING FINAL INSPECTION, GCDWR WILL REMOVE LOCKING MANHOLE COVER, AND INSTRUCT CONTRACTOR TO REMOVE TEMPORARY MECHANICAL PLUGS.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

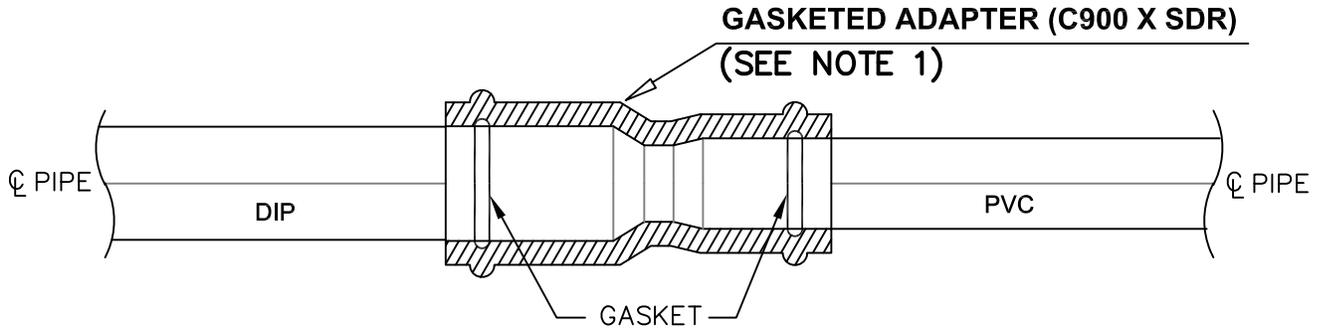
DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

NEW SANITARY SEWER MAIN CONNECTION

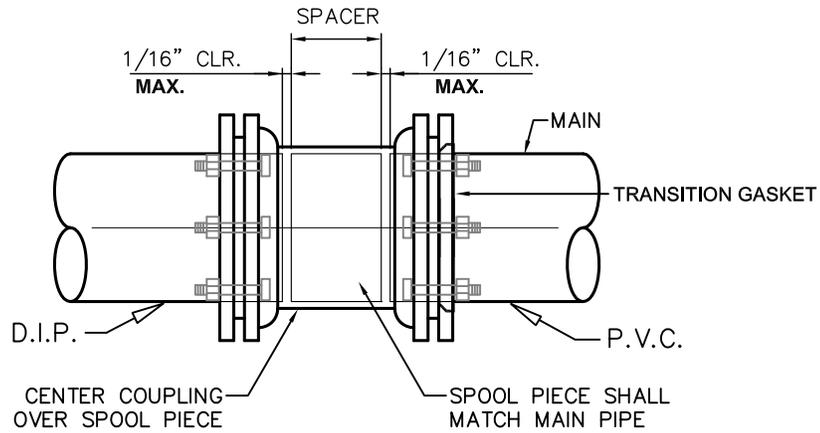
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S15

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REVISION: 9-16-15
 ORIGINAL ISSUE: 4-05-16
 DATE: _____
 BY: _____
 REVISION: _____
 DATE: _____
 BY: _____



OR



TRANSITION JOINT NOTES:

ONE OF THE FOLLOWING TRANSITION METHODS SHALL BE UTILIZED WHEN TRANSITIONING FROM DUCTILE IRON TO PVC PIPE:

1. GASKETED ADAPTER SHALL BE TYPE C900 X SDR (Harco OR EQUAL), AND MEET FOLLOWING STANDARDS:

MATERIAL: ASTM 1784
 JOINTS: ASTM D3212
 GASKETS: F477
 FITTINGS: D3034 AND F1336

2. SOLID SLEEVE ADAPTER SHALL BE STEEL AND PROPERLY COATED BEFORE BACKFILL.

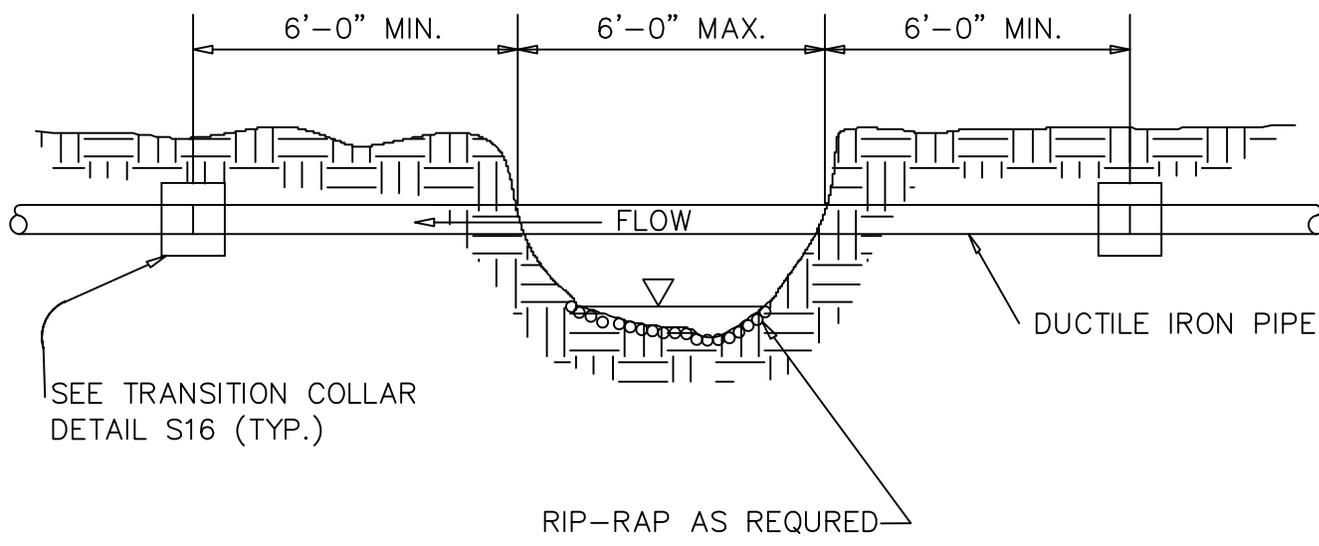
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

TRANSITION COLLAR

DRAWING NO.
S16

REVISION: _____ DATE: _____
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 ORIGINAL ISSUE: 4-05-16



GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: GCDWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

**NON-PIER AERIAL
 D.I.P. SEWER LINE**

DRAWING NO.
S17

DATE:
DATE:

BY:
BY:

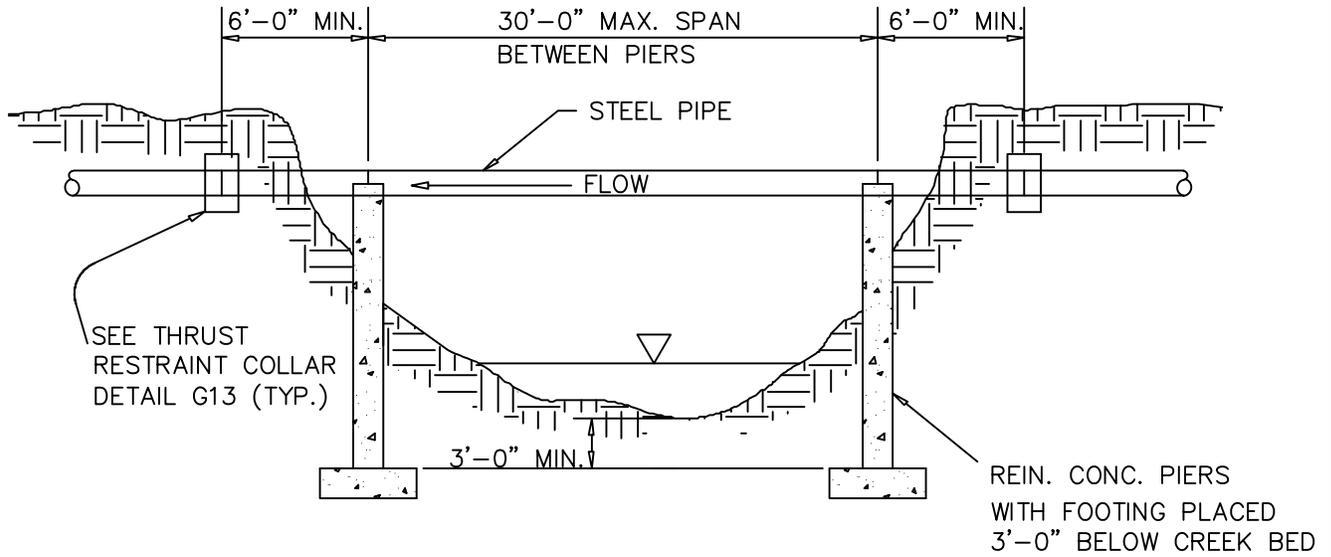
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REVISION:
REVISION:

ORIGINAL ISSUE: 4-05-16



NOTE:

1. WHENEVER POSSIBLE NO PIERS SHALL BE PLACED IN NORMAL FLOW OF CREEK.
2. ALL AERIAL CROSSINGS MUST BE APPROVED BY GCDWR.
3. ANY SPAN EXCEEDING 30 FEET REQUIRES SUBMITTAL OF DESIGN CALCULATIONS.
4. ALL AERIAL CROSSINGS AT MINIMUM MUST HAVE STEEL CASING PIPE.
5. ALL PIER FOUNDATIONS SHALL CONFORM TO THE RECOMMENDATIONS OF A LICENSED GEOTECHNICAL ENGINEER.

NOTE: PIERS ARE NOT NEEDED UNLESS AERIAL SPAN IS OVER 20'-0" IN LENGTH.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
DRAWN BY: GCDWR
CHECKED BY: PSB
APPROVED BY: ARS
SCALE: NONE

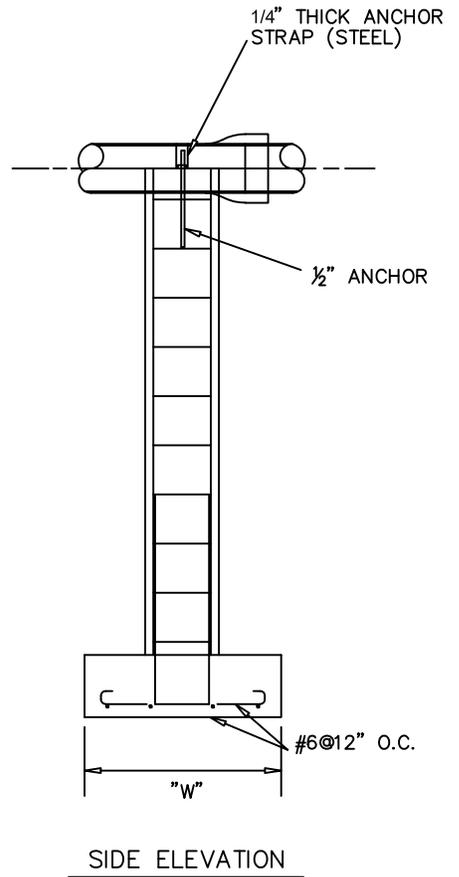
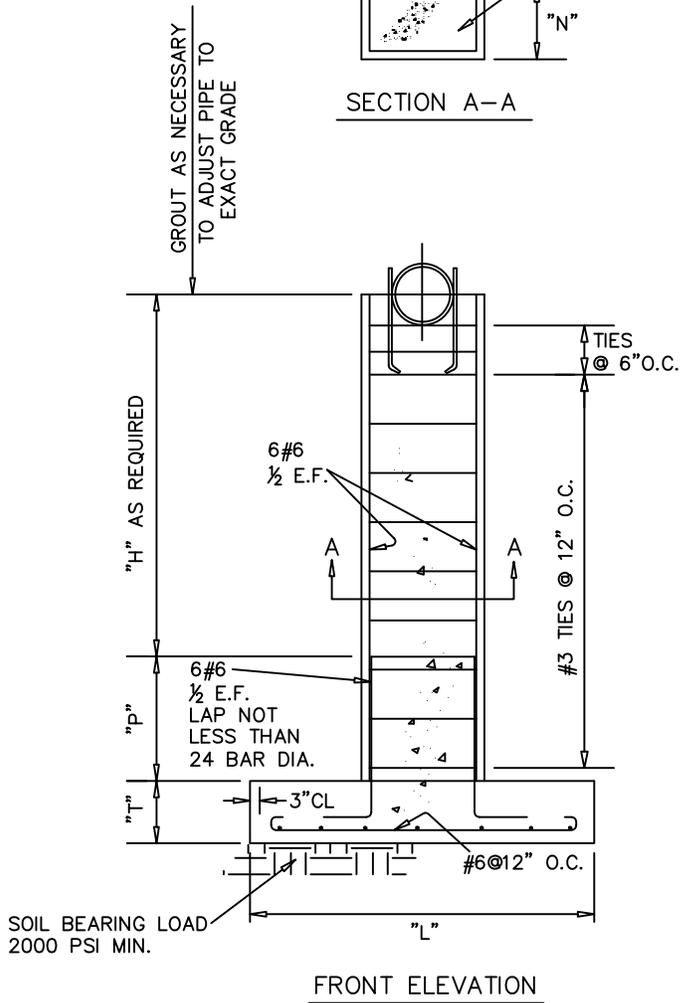
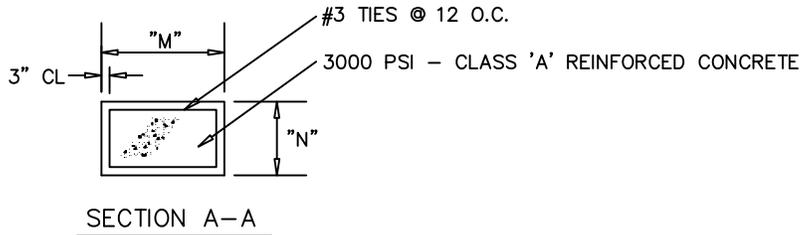
**AERIAL STEEL OR
D.I.P. PIPE CROSSING**

DRAWING NO.

S18

REVISION: DATE: BY: REVISION: DATE: BY: REVISION: DATE: BY: REVISION: DATE: BY: ORIGINAL ISSUE: 4-05-16

"H" =	0-5	5-10	10-15	15-20
"W" =	3	4	5	6
"L" =	4	5	7	10
"T" =	1	1	1.5	2
"N" =	1	1	1.5	1.5
"M" =	2	3	4	5
"P" =	2	3	4	5



NOTES:

1. ABOVE DETAIL IS THE MINIMUM ACCEPTABLE. SITE CONDITIONS MAY DICTATE MORE STRINGENT REQUIREMENTS.
2. ALTERNATE DESIGNS MAY BE SUBMITTED.

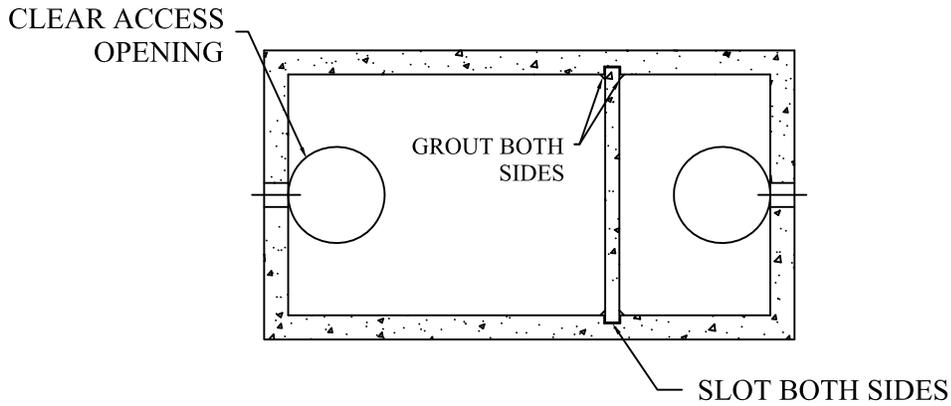
GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: GCDWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

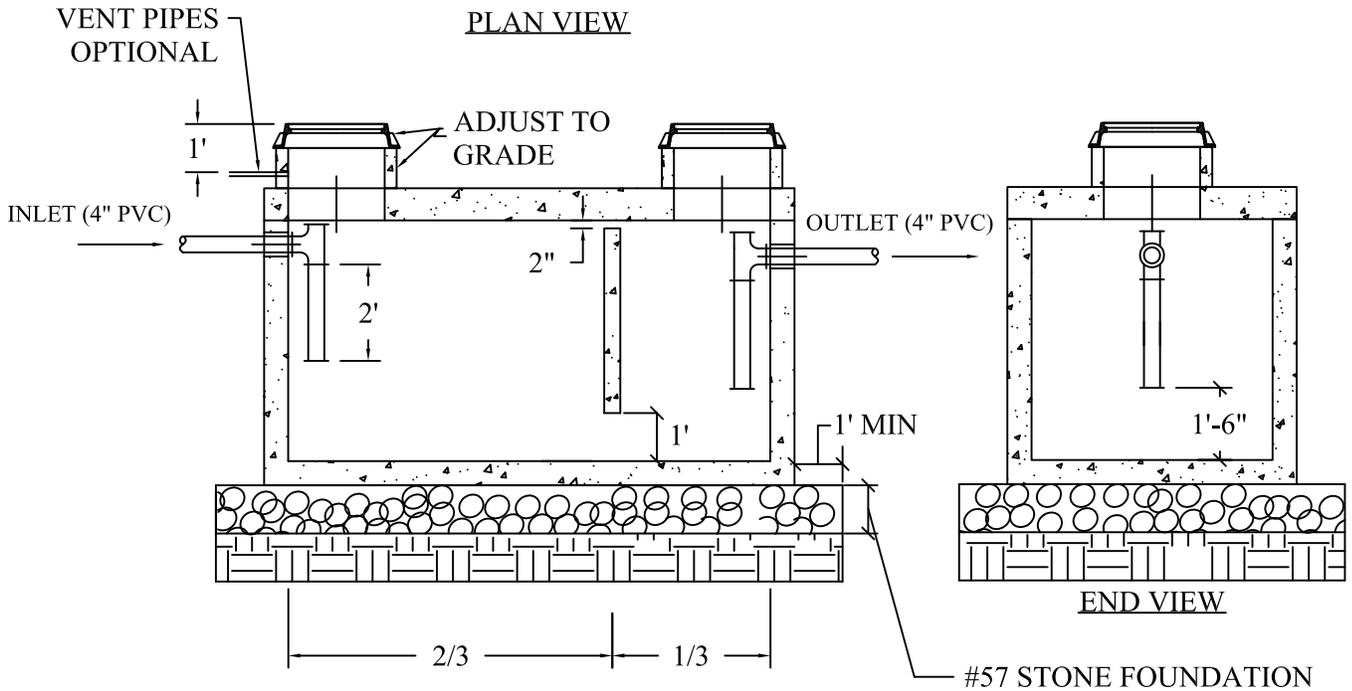
**CONCRETE PIER
 AND FOOTING**

DRAWING NO.
S19

DATE: _____ BY: _____
 DATE: _____ BY: _____
 REVISION: _____ REVISION: _____
 DATE: _____ DATE: _____
 BY: _____ BY: _____
 REVISION: _____ ORIGINAL ISSUE: 4-05-16



PLAN VIEW



ELEVATION

NOTES:

1. MUST MEET ASTM C 1613 STANDARD SPECIFICATIONS FOR PRECAST CONCRETE GREASE INTERCEPTOR TANKS.
2. TANK LENGTH TO BE GREATER THAN WIDTH. MINIMUM LIQUID DEPTH OF 30" AND MAXIMUM OF 72".
3. MINIMUM GREASE INTERCEPTOR CAPACITY - 1500 GALLONS.
4. WHEN A LARGER CAPACITY GREASE INTERCEPTOR IS REQUIRED, SHOW 1500 GALLON CAPACITY GREASE INTERCEPTORS IN A SERIES.
5. GRADE ADJUSTMENTS GREATER THAN ONE FOOT REQUIRE FOUR FOOT DIAMETER MANHOLE RISERS.
6. GRADE RISERS SHALL BE STACKABLE AND WATERTIGHT.
7. EJ 1357 OR APPROVED EQUAL TRAFFIC MANHOLE FRAME AND COVER.
8. BEDDING SHALL BE A MINIMUM OF 12" THICK #57 STONE.

GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

DESIGN BY: STD. COMMITTEE
 DRAWN BY: GCDWR
 CHECKED BY: PSB
 APPROVED BY: ARS
 SCALE: NONE

DRAWING NO.

GREASE TRAP

S20