GWINNETT COUNTY DEPARTMENT OF PUBLIC UTILITIES

SPECIFICATIONS FOR THE CONSTRUCTION OF NON-POTABLE REUSE LINE

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NON-POTABLE REUSE LINE DESIGN & CONSTRUCTION STANDARDS

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DESIGN/INSTALLATION DETAIL DRAWINGS

ARTICLE 1

GENERAL DESIGN PROCEDURES

1.1 SYSTEM EXPANSION AND REPLACEMENT/IMPROVEMENT PROJECTS

This section outlines procedures for designs performed by an Engineer under a direct contract with GCDPU.

1.1.1 Attend a "pre-design" meeting with DPU Project Manager to discuss project scope and parameters.

1.1.2 All designs shall be produced in a digital format meeting the Department's requirements (see Article 3).

1.1.3 DPU will provide a blueprint of the ortho-photo for use in digitizing the project. If the Engineer's CAD system has raster capabilities, a .COT or .TIFF file can be provided on Exabyte 8mm tape cartridge. At a resolution of 200 dots per inch, an ortho-photo of an area 2,500' X 2,500' occupies 25 Megabytes, making the use of floppy diskettes undesirable.

1.1.4 Conduct a field review of both sides of the road(s) for which the proposed water main is to be installed to develop plans of project area showing road centerline and edge of pavement, all side streets, creek crossings, large rock outcroppings, existing sanitary sewer manholes, existing water lines, existing storm drains and headwall structures, exceptional trees (12" or greater in diameter, ornamental or obviously cared for as ornamental by property owner), densely wooded areas or areas which would require substantial clearing, linear footage of sodded lawns, existing driveways and types, existing water meters, existing fences within and adjacent to the rights-of-way, power poles within the rights-of-way, existing fire hydrants and valves, and any other structures located within or adjacent to the rights-of-way which may impact the proposed construction.

1.1.5 Contact all utility companies, including but not limited to, gas or petroleum pipelines, natural gas, buried electric lines, buried phone cables, etc. to obtain locations of those utilities within the project limits of both sides of the rights-of-way, including side streets. (NOTE: Although the "One-Call" Utility Protection Center provides notification service to subscribing utilities for "design" locates, individual notification is also required by this Department to insure all available information concerning other utilities's facilities are included on the project design.)

1.1.6 Place property lines and street numbers, land lot and district lines on the plan. If design contract includes right-of-way research, place all existing rights-of-way and prescriptive easements on the plan.

1.1.7 All projects must be submitted on 24" X 36" paper. Plans shall be stamped by a Professional Engineer registered in the State of Georgia.

1.1.8 Submit a hardcopy of the preliminary plan to DPU. Plan will be checked by DPU to show existing water and sanitary sewer mains. If the design contract does not include right-of-way research, DPU will mark up all existing rights-of-way and prescriptive easements. Any required future stubs, size and side of road will be indicated. DPU will also at this time include a floppy diskette with all existing water meter account information, in ASCII format, to be imported into the drawing file. This information includes meter addresses, account names and numbers, meters sizes and meter number. The imported information is to be "cut & pasted" near each water meter symbol (also see Article 3)

1.1.9 Meet with DPU Project Manager to review plan and determine side of road on which the main is to be installed. DPU's normal location is the north side of ease-west streets, and the west side of north-

south streets, however, field conditions and obstacles identified on the field review may dictate a deviation from this standard. **NOTE: The NPRL location must maintain 3-feet horizontal separation from existing parallel water mains, and 18-inch vertical separation from any existing perpendicular crossing of sanitary sewer mains.**

1.1.10 Design the proposed water line to include horizontal alignment, all creek and bridge crossings, all tie-ins, future stubs, fire hydrants and valves, and abandonments of existing water lines, if any.

1.1.11 Digital plans created from a county-furnished ortho-photo generally do not require any field surveying work. Any required field surveying not in the design contract must be authorized in writing by the DPU Project Manager. All approved surveying work must include at least one GPS coordinate, tying in with the County's coordinate system.

1.1.12 Prepare any required easement plats (see page I-11).

1.1.13 Submit a "check print" of the final design to DPU for review.

1.1.14 Upon return of the "check print", make any changes noted and submit two (2) additional copies to DPU for approval.

1.1.15 Prepare submittal package, including any required drawings, plans, or details, for application of Ga. D.O.T., or railroad permits, or any other necessary permit applications and submit to DPU for processing (see Appendix II).

1.1.16 Provide the following to DPU for bidding purposes:

1. 3 set of reproducibles of the final approved design and a digital copy of the design file on a 3½" HD floppy diskette, or other approved media.
2. Materials list and labor items list using cost data furnished by DPU.
3. A project cost estimate in Lotus 1-2-3 for Windows, or version 3.1 for DOS, if approved, on a 3½" HD floppy diskette.
4. A bid summary in Lotus 1-2-3 for Windows, or version 3.1 for DOS, if approved, on a 3½" HD floppy diskette.

1.1.17 If included in the design contract, perform the following:

1. Attend bid opening and prepare bid tabulation in the format to be provided by DPU and submit to the DPU Project Manager.
2. Act as advisor and answer any questions regarding design during the construction phase.
3. Prepare and submit to DPU as-built drawings in both digital and hardcopy format.

1.2 PRIVATE DEVELOPMENT/SUBDIVISION PROJECTS

This section outlines procedures for designs performed by an Owner/Developer's Engineer for private developments/subdivisions.

1.2.1 Plans will generally be submitted through the plan review process (Gwinnett County Department of Planning & Development) to be routed to the Gwinnett County Department of Public Utilities (DPU). All projects not submitted through the County's plan review process must submit a complete set of plans to DPU for approval (allow one (1) week for review and comments). Designs should only be submitted during the preliminary stage of development. No designs will be approved submitted as "concept" plans.

1.2.2 Design the proposed NPRL to 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. DPU'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. **NOTE:The NPRL location must maintain 3-feet horizontal separation from parallel water mains, and 18-inch vertical separation from any perpendicular crossing of sanitary sewer mains**

1.2.3 If no NPRL sufficient to serve the proposed development exists at the project entrance, the engineer shall design a NPRL of DPU approved size, from a source specified by DPU, in accordance with DPU design criteria.

1.2.4 All projects must be submitted on 24" X 36" paper. Plans shall be stamped by a Professional Engineer or Professional Land Surveyor registered in the State of Georgia.

1.2.5 Plans will be reviewed and written comments will be provided indicated required corrections and/or changes. A sample "checklist" of specific plan requirements is available from DPU Plan Review Section. If a betterment, or up-sizing of the pipe, is necessary, DPU will so indicate and the engineer will be responsible for designing it in accordance with DPU design criteria. Plans submitted for preliminary review will not be returned to the engineer.

1.2.6 Prepare submittal package, including any required drawings, plans, or details, for application of Ga. D.O.T. or railroad permits, or any other necessary permit applications and submit to DPU for processing (see Appendix II).

1.2.7 Five (5) or more copies shall then be submitted to DPU for final approval and if the plans are acceptable, they will be stamped by DPU and the "Development Permit" can be signed off. DPU will retain two (3) copies of the stamped plans, the others will be returned to the engineer. If the project was designed on a CAD system, a 3½" HD floppy diskette shall also be submitted at this time (see Article 3 for compatible file format).

1.2.8 A plan bearing the original signed approved DPU stamp must be presented by the approved NPRL contractor in order to obtain a NPRL construction permit.

1.2.9 Any subdivision which is submitted and approved as one project must either be constructed as one project, or if subsequently phased out to be constructed in multiple phases or units, be resubmitted and receive approval for each phase or unit individually prior to any further construction by DPU. In the instance of multiple phases or units, separate construction permits must be obtained for each phase or unit.

1.2.10 Record drawings (as-builts) must be submitted and approved before a project can receive final

acceptance, and/or Certificates of Occupancy.

1.2.11 As-built record drawings must be sharp, clear, clean, legible, and suitable for micro-filming and filing.

1.2.12 As-built record drawings shall include a site plan and any supplemental or shop drawings as may be required by DPU.

1.2.13 Four (4) sets of as-built record drawings must be submitted by the Engineer/Developer for approval.

1.2.14 Record Drawings must be stamped by a Professional Engineer or Registered Land Surveyor registered in the State of Georgia.

ARTICLE 2

DESIGN CRITERIA

2.1 PROPOSED NON-POTABLE REUSE LINE

2.1.1 DPU's standard location for NPRL is on the same side of the street as the potable water main, between the potable water main and the right of way.

2.1.2 For subdivisions, the proposed water line shall be located on the north side of east-west streets, and on the west side of north-south streets.

2.1.3 For existing county roads, the proposed water line will generally be located 5' inside the right-of-way. For existing Ga. D.O.T. 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.

2.1.4 For private developments/subdivisions the NPRL shall be located 9' from the back of the curb (see detail on page A-1)

2.1.5 For non-subdivision streets, the side of the road the proposed NPRL will be located on may be primarily determined by the location of any existing lines to be tied into at the beginning and/or end of the project.

2.1.6 For non-subdivision streets, the location may also be determined by existing rights-of-way, or lack thereof. NPRL must be installed within deeded rights-of-way. Installations within "prescriptive" easements will not be permited.

2.1.7 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 NPRL **must** be designed on the opposite side of the road, and may require additional protective measures as specified by DPU.

2.1.8 For non-subdivision streets, if none of the above apply, then design the NPRL 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: NPRL location must maintain 3-feet horizontal separation from existing parallel water mains, and 18-inch vertical separation from any existing perpendicular crossing of water mains.**

2.1.9 The proposed NPRL shall be shown on the plans as solid lines (see page I-1)

2.1.10 The existing NPRL/water lines shall be shown a dashed lines (see page I-1)

2.1.11 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 Ga. D.O.T. roads will be bored with steel casing (see detail pages A-5 & A-34)

2.1.12 All NPRL's shall be ductile iron pipe, and shall be either "thickness class" CL50, or "pressure class" 350 D.I.P.

2.1.13 A minimum pipe size of 8" will be installed in all developments/subdivisions, including connection to existing mains. If adequate volumes for flow requirements, and pressures are not available at the point of connection, a larger main and/or additional improvements may be required. Determination of volume or pressure inadequacy will be hydraulically modeled and calculated by your Mechanical Engineer.

2.1.14 Standard depth of cover is two (2) feet below the elevation of the potable water main and not exceed six (6) feet in depth unless authorized be DPU. In the event the shoulder of the roadway is below the elevation of the edge of pavement, then a minimum of six (6) feet of earth cover is to be maintained at all times.

2.2 VALVES

2.2.1 Valves shall be depicted on the plan as in the example on page I-1.

2.2.2 In-line valves are to be generally located every 1,000 feet, 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.

2.2.4 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 A-10).

2.2.6 All proposed valves 12 inch and larger shall be butterfly valves (except tapping valves), or resilient seated gate valves for 12 inch only.

2.2.6 All valves must be marked with a White Drivable marker #CIB-380 (78") inchest long (manufactured by Carsonite International) to extend to the valve. The markers are not to protrude the finished surface grade more then (3') feet and no less then (18") inches above the finished grade. There must be a label on both sides of the marker, that will be provided by your DPU inspector or project manager. (See artical 4.6.8)

2.2.7 All NPRL valves will have square valve boxes with the words **"RECLAIMED WATER"** cast in the lid. All boxes must be painted on the inside and lid with (Pantone 522 or 512 or other shade of purple accepted by DPU). (see detail A-41)

2.3 TIE-INS TO EXISTING NPRL

2.3.1 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 in a 90-degree bend into the existing main, thus leaving a future stub on the proposed main.

5. Proposed main is laid parallel to the existing main and is tied in using a tap on the proposed main and cutting in a 90-degree bend into the existing main, thus leaving a future stub.

2.4 EASEMENTS

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

2.5 STATE HIGHWAY D.O.T PERMITS

2.5.1 If any portion of a proposed project enters a State of Georgia controlled right-of-way, then a Ga D.O.T. permit application is required. This is to be submitted to DPU for processing by the Ga. D.O.T. Pages must be 8½' X 11", but drawings need not be to scale. All measurements indicated on the permit application must be submitted in metric. Generally, portions of the project design can be reduced in size and matchlined, if necessary, as long as the text is still legible. Compaction notes (see example in Appendix "II", page II-4) must be included on every page of the application drawings (see "Georgia D.O.T. Utility Accommodation Policy and Standards"). Application must include four each of the following: plan, profile, traffic control plan, and section from D.O.T. county map. See Appendix "II" for Ga. D.O.T Permit Application Checklist, required forms, and examples.

2.6 TEXT

2.6.1 All proposed NPRL's shall be labeled for size and material.

2.6.2 All existing NPRL's shall be labeled for size, material, and DPU project reference number(s) under which they were installed. This information can be obtained through DPU Records Management Section.

2.6.3 For all side streets and intersections, indicate whether existing NPRL's are one-way fed or, if not, the location of the next in-line valve. This information can be obtained through DPU Records Management Section.

2.6.4 Any existing NPRL's to be abandoned as part of the proposed project shall be so noted and reflect the required symbology shown on page I-1.

2.6.5 All valves shall reflect the required symbology shown on page I-1, labeled as to size and whether gate valve or butterfly valve (GV or BFV), and stationed to the nearest 5-feet. Manufacturer's name shall be provided on the "asbuilt" drawing.

2.6.6 Water meter information on existing potable water lines will be provided by DPU in an ASCII format, and shall be imported into the drawing file and placed above the respective water meter symbol for account identification.

2.6.7 .1" fonts or larger shall be used for most text. .2" fonts or larger shall be used for road names and rights-of-way.

2.7 LINE WEIGHTS

2.7.1 Proposed water main and right-of-way should be equivalent to a #3 pen

2.7.2 Existing utilities should be equivalent to a #2 pen.

2.7.3 Edge of pavement, driveways, property lines, fences, etc. should be equivalent to a #1 pen.

2.8 RECORD DRAWINGS (ASBUILTS)

2.8.1 Record drawings (asbuilts) must be submitted to DPU before a project can receive final approval, and/or Certificates of Occupancy. (NOTE: In order to avoid delays in the "approval process" of developments/subdivisions, asbuilt drawings should be submitted as soon as the NPRL installation is complete to allow sufficient time for review).

2.8.2 Record drawings must be sharp, clear, clean, legible, and suitable for microfilming and scanning.

2.8.3 Record drawings shall include a site plan and any supplemental or shop drawings as may be required by DPU.

2.8.4 Four (4) complete sets of record drawings must be submitted by the Engineer/Developer to DPU for review and approval

2.8.5 Record drawings must be stamped and signed by a Professional Engineer or Registered Land Surveyor registered in the State of Georgia.

ARTICLE 3

DIGITAL FILE FORMAT

NOTE: The following section is mandatory for engineering firms designing system expansion and replacement/improvement projects under a direct contract with the County. The submittal of digital data from a private developer's engineer is presently not a requirement, however, if available, DPU prefers a digital copy of any development/subdivision record drawings for incorporation into the County G.I.S. mapping system, along with the required hard-copy documents.

The following are standards for the formating of digital data. DPU is willing to give DXF files to engineering firms to encourage digitall formatted projects (Concepts, Prelimary and, As-Built reviews). If at any time a firm receives files from DPU for personal gain and not for the intrest of DPU, we reserve the right to back charge for those files received or eliminate that firm from receiving DXF files from DPU at no charge.

FORMAT:

Projects are to be submitted as an AutoCAD DWG file release 11, 12, or 13 or Microstation 4 5 or 5 5 DGN file format No solid fill is to be used in DXF file, as this attribute is lost during the transition Instead, hatching or patterning may be used. "Compatibility with Public Utilities CAD/CAE systems" in Appendix "I" Page I-1

COORDINATE SYSTEM:

In accordance with the Gwinnett County, Georgia Standards for Digital Mapping Geographic Information Systems "GIS" the coordinate system used for mapping the County land features and the Water and Sewer System's facilities will be the Georgia State Plane Coordinate System, Western Zone, 1983 North America Datum and in feet units. Any files submitted to Public Utilities for base map, water or sewer updates will use this coordinate system.

GENERAL:

All map files contained in the Automated Mapping System are stored in ArcInfo coverages format. Automated mapping files will be supplied in AutoCAD format upon special request Base maps are sectioned into 2500 & 5000 square foot tiles These tiles contain topographical and hydrological features Water and Sewer maps are each sectioned into two (2) separate base files, one for each layer.

DESIGN DRAWINGS: **Product Requirements**

1. All files provided to consultants shall be returned to Gwinnett County Public Utilities in the same format, style and coordinate system as the original files provided to the consultant The consultant shall, as the Contract Documents specify, provide the final Water and Sewer system asbuilt drawings in digital format Projects should be submitted on double sided high density 3 5" floppy disk, or 100 meg ZIP disk, unless an alternative magnetic media storage device is agreed upon by both parties.

2. All sewer facilities and annotations will be stored in a separate file than the water or base map features Similarly, all water facilities and annotations will be stored in a separate file than the sewer or base map features. Water and sewer asbuilt drawings must contain only a single view of the project area, a "top" or "aerial" view. Any other

views, such as map inserts, plan and profiles, location maps, etc , must be placed in separate drawings than the asbuilts. When provided for in contract documents, these separate drawings shall be delivered to Public Utilities, alonge with the asbuilt drawing

3 All water and sewer features must be placed on the levels/layers specified and must use the specific cells or blocks as provided No other features should exist on the levels except those specified

4 All water and sewer features must be "snapped" together, such that there are no undershoots or overshoots between pipes, manholes, valves, etc Line features (i e pipes) shall not be broken so that text can be placed along the pipe

For sewer facilities, lines representing sewer mains should run continuously from one manhole to the next. However, lines should not run continuously between several manholes (i e , a line should not be digitized that runs the entire length of a street if there are more than two manholes along that street) There should be one- and only one - graphic line per any two manholes

5 For water facilities, all lines representing water mains must start and end at nodes Nodes are located at points in the water system where the water pressure may change (i e change in pipe diameter or material), or where there is a change in direction (i.e tees, bends crosses, etc) There should be one (and only one) graphic line per two nodes

6 Text must be placed beside each facility on the map (i e water and sewer), indicating the following information:

Water Main Appurtenances	Item Description (i e valves, Fire Hydrants, Etc) Station #
Water Mains:	Diameter Material Depth
Non-Potable Reuse Line Appurtenances	Item Description (i e valve, stubs, Etc) Station #
Non-Potable Reuse Lines	Diameter Material Depth
Sewer Manholes:	Invert Elevation(s) In Invert Elevation(s) Out Top Elevation (rim)
Sewer Mains:	Diameter Material Lengths and Slopes Existing and Proposed Ground Elevation

All texture information must be placed on the levels designated as "Label" for each of the facilities (i e Manhole Labels are Placed on level two of the sewer maps)

7 No grid shall be present on the map

8 The coordinate system of the final map must be identical to the coordinate system of the map provided by Public Utilities to the consultant at the onset of the project

9 Plans shall be delivered to Public Utilities in 2D (zero Z level) format only.

10 Any user defined layers (i e other than 1-63) must be removed from the drawing prior to submission to Gwinnett County Public Utilities

11 AutoCAD "shapes" will not be used in the drawing (In Appendix "I" Page I-1)

Any drawings not conforming to the above requirements, or their supplemental addenda, shall be rejected by Gwinnett County Public Utilities and returned to the consultant with comments for correction

ARTICLE 4

CONSTRUCTION INSTALLATION

4.1 PRIOR TO CONSTRUCTION

4.1.1 At no time will any Non-Potable Reuse Line construction commence prior to approval of all plans, receipt of any required agreement documents, and issuance of a "NO-POTABLE REUSE LINE CONSTRUCTION PERMIT".

4.1.2 Only DPU approved contractors may install Non-Potable Reuse Lines.

4.1.3 All NPRL, valves, blow offs, and other appurtenances to be dedicated to or owned by Gwinnett County DPU shall be installed according to the "approved" design. **All** field changes **must be pre-approved** by DPU. Contractor must have a set of the "approved" design containing an original DPU stamp, and a copy of the Non-Potable Reues Line Design & Construction Standards on site at all times.

4.1.4 Contractor 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.

4.1.5 Throughout the construction, the Contractor shall fully comply with the applicable requirements of local, State, and Federal agencies in the control and containment of soil erosion, including post-construction maintenance of erosion control devices.

4.2 EARTH EXCAVATION

4.2.1 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, make 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.

4.2.2 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 ordered and backfilled as directed.

4.2.3 Clearing and Care of Surface Materials

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 or disposed of in a satisfactory manner. On all lawns and other improved grass areas, the sod shall be carefully removed, kept alive, 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, in first class condition.

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.

The removal of existing pavement shall be done in accordance with the requirements of the authority within whose jurisdiction such pavement is located.

Whenever the removal of pavements (other than gravel types) is required, the Contractor shall outline the area to be removed by making 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 will be required to make a new saw cut beyond the furthest point of breakage.

4.2.4 Protection of Trees and Shrubbery

The Contractor shall be responsible for the protection of tops, trunks, and roots of existing tree 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 boxing 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 and all cuts or scars shall be covered with tree paints.

No tree shall be removed unless absolutely necessary for the construction, as directed by DPU. 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 DPU. Copies of such written authorization are to be provided to DPU prior to any removal.

4.2.5 Excavation Methods

All excavation shall be in open cut unless otherwise indicated on the "approved" design or directed by DPU. 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 given by DPU. 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.

All slopes shall be carefully cut or graded by hand to grades required by DPU 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 done just before concrete is placed.

In open or improved lawn areas, excavation should be done, if possible, utilizing a tractor-mounted backhoe and extreme care should be taken to avoid damage to adjoining lawn areas. In areas not readily accessible by machinery and where excavation is required near existing trees and shrubberies which may be damaged by excavation equipment, the trench shall be excavated using hand tools.

4.2.6 Removal of Water

The Contractor shall pump out, or otherwise remove and properly dispose of any water (including storm water), which may be found or may accumulate, as fast as it may collect in the excavation. This removal is required regardless of the source.

All necessary precautions shall be taken to prevent disturbance at, and to properly drain any areas upon which concrete is to be poured, or upon which pipe is to be laid.

There shall be located at the work site at all times during construction, proper and approved equipment with sufficient capacity for the removal of any water from the work, and in such a manner as not to withdraw sand or cement from any concrete. Contractor is also to insure that removal of any liquids will not interfere with the proper laying of masonry, pipe, or prosecution of any of the required work for the complete construction of the project.

The flow in sewers, drains, gutters, or water courses encountered during the construction shall be adequately provided for by the Contractor to insure these flows do not interfere with the prosecution of the Work, and are maintained in such a manner as to insure continuity of flow at all times.

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 done before pipe laying or concrete work is started and shall be so maintained until concrete and joint materials have attained initial set.

Should sewage or any other odorous liquids be encountered during the work in the excavation, DPU shall be immediately notified. DPU 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, DPU 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 DPU. Any other liquids will be properly disposed of as directed by DPU and/or any regulatory agencies having jurisdiction.

4.2.7 Sheeting and Shoring

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. If the sheeting, braces, shores, stringers, wailing timbers, or other supports are not properly placed, or are insufficient, the Contractor shall provide additional or stronger supports as may be required, or as directed. The requirement of sheeting or shoring, or of the addition of supports, shall not relieve the Contractor of his responsibility of their sufficiency.

Trench sheeting shall be left in place until the backfilling has been completed to an elevation not less than twelve (12) inches above the top of the pipe. Unless otherwise ordered by DPU, sheeting shall be cut off at the top of the lowest set of bracing and the upper section shall be removed.

Where in the opinion of DPU the removal of sheeting may endanger the work, such sheeting will be ordered to be left in place and the tops cut off as directed or as specified in Section 4.14.3. In removing the sheeting the work shall be done in such a manner as to prevent injurious caving of the sides. All voids left by the sheeting along trenches shall be carefully filled and rammed with suitable tools.

In quicksand or soft ground, sheeting shall be driven to such depth below the bottom of the trench as directed.

4.2.8 Trench Excavation

The maximum width of trench from an elevation of twelve (12) inches above the top of the pipe to the bottom of the trench shall be as indicated on Detail A-5.

Excavation of pipe trenches with sides sloping to the trench bottom will not be permitted. Should trenches be excavated with more than the specified maximum widths, DPU may

require the Contractor to furnish concrete cradles or concrete encasement for the pipe.

4.2.9 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 DPU 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 OPENED MORE THAN 150 FEET AHEAD OF PIPE LAYING AND BACKFILLING.

4.2.10 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 DPU. The Contractor 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 DPU, it is necessary to remove this excavated material from streets, or lots, the Contractor will be required to do so.

4.3 ROCK EXCAVATION

4.3.1 Work Included

The Contractor shall make the lines and grades as shown on the drawings or as directed, including excavation and removal of all rock and masonry as required, and shall dispose of all excavated materials as specified under Section 4.2, or as directed by DPU.

4.3.2 Removing Rock

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.

Unless otherwise directed by DPU, rock shall be fully taken out at least twenty-five (25)

feet in advance of pipe laying, and at least 6" below the invert of the pipe, and to a width not to exceed the maximum tre

use or storage of explosives, and assumes all responsibility/liability associated with blasting activities. Blasting shall be conducted so as not to endanger persons or property, and whenever required, or as ordered by DPU, the blast shall be covered with mats or otherwise satisfactorily confined. ONLY **LICENSED** EMPLOYEES OR SUBCONTRACTORS WILL BE ALLOWED TO CONDUCT BLASTING ACTIVITIES - PROOF OF SUCH LICENSING MUST BE PROVIDED DPU PRIOR TO ENGAGING IN ANY BLASTING ACTIVITIES

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.

4.4 FOUNDATION CUSHION

4.4.1 Work Included

The Contractor shall furnish all the materials for, and shall properly place at locations where deemed necessary by DPU, a cushion or foundation of well compacted crushed stone in order to obtain a firm base on which to build the structures and pipes.

4.4.2 Materials

Embedment materials shall be angular graded crushed stone, ¼ inch to ¾ inch in size with no more than 5% passing a No. 8 standard sieve, in accordance with Class I materials as defined in ASTM D2321-72 Section 5.1.1.

4.4.3 Placement

The bedding material shall be placed in the bottom of the trench after it has been excavated to an elevation sufficient to permit the placing of not less than six (6) inches, or as directed. The surface of the bedding material shall be screeded to form a uniform support for the pipe and appurtenances. After installing each section of the pipe, additional bedding material shall be placed on either side of the pipe to an elevation consistent with the Class Bedding indicated on the plans or specifications, or as directed by DPU. This material is to be well tamped and compacted into place so as to secure a firm, even bearing.

Foundation material shall be placed for the full width of the trench bottom.

4.5 DUCTILE IRON PIPE AND FITTINGS / STEEL PIPE-CARRIER AND FITTINGS

4.5.1 Work Included

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 NPRL's 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 directed.

No work may be started or continue 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 site for reference.

Whenever the work disturbs existing conditions or work already completed, the same shall be restored in as good or better than the original condition in every detail. All such replacement and repair shall meet with the approval of DPU.

It is the intent and requirement of these "Specifications" to insure an installation which is complete in every detail, whether or not indicated on the drawings, or specified herein. Consequently, the Contractor shall be responsible for all details, devices, accessories, and special construction which may be necessary to properly furnish, install, adjust, test and place in continuous and satisfactory operation, a complete installation.

Attention is also called to the construction procedure required. The proposed NPRL shall be constructed in complete sections; each section terminating at a valve. As each section is installed, it shall be tested, and upon receipt of a "passed" Inspection Report from the project Inspector, the Contractor shall place the section in service immediately. Water

shall be "carried forward" with the construction.

All ductile iron pipe and fittings shall be bituminous coated at the point of manufacture in accordance with AWWA Standard Specifications. Ductile iron pipe and fittings used in the construction of NPRL's shall be lined with Portland Cement Mortar in accordance with "Cement Mortar Lining for Ductile Iron Pipe and Fittings" (AWWA C102/A21.40). The thickness of linings for pipe and fittings shall not be less than 1/16th inch for 3-inch through 12-inch diameter pipe, and 3/32nd inch for 14-inch through 24-inch diameter pipe.

Steel pipe and fittings shall be bituminous coated at the point of manufacture in accordance with AWWA C203, and cement mortar lined in accordance with AWWA C205.

All ductile iron pipe shall be marked in accordance with AWWA C151 and ductile iron fittings shall be marked in accordance with AWWA C110. All steel pipe shall be marked in accordance with AWWA C200.

4.5.2 Push-On Pipe and Fittings

All push-on ductile iron pipe shall be manufactured in accordance with and meeting the latest requirements of AWWA C151/A21.51. Pipe shall generally be designed for Type 1 laying conditions and 6-feet of cover, however, exceptional conditions may be indicated on the approved plans and specifications, and these shall take precedence.

Wall thickness of pipe shall be as specified under Section 4.5.5

All push-on ductile iron fittings shall be manufactured having a body thickness and radii of curvature conforming to and in accordance with the latest AWWA C110 or AWWA C153/A21.53. Design of standard fittings, whether long or short pattern, shall be as directed, indicated, or noted on the approved drawings. Design of special push-on fittings shall conform to dimensions and details as directed, indicated, or noted on the approved drawings.

4.5.3 Flanged Ductile Iron Pipe and Fittings

All flanged ductile iron pipe shall be manufactured in accordance with and meeting the latest requirements of AWWA C151/A21.51.

Wall thickness of pipe shall be as specified under Section 4.5.5

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.

4.5.4 Mechanical Joint Ductile Iron Pipe and Fittings

All mechanical joint ductile iron pipe shall be manufactured in accordance with and meeting the latest requirements of AWWA C151/A21.51.

Wall thickness of pipe shall be as specified under Section 4.5.5

The mechanical joint herein specified for mechanical joint ductile iron pipe and fittings shall meet the requirements of AWWA C111/A21.11 except as modified under Section 15D.10.

4.5.5 Pipe Wall Thickness

Ductile iron pipe with push-on or mechanical joints shall have the following minimum wall thickness:

PIPE DIAMETER (IN.)	PIPE CLASS	MINIMUM WALL THICKNESS (IN.)
8	50	0.27
12	50	0.29
16	50	0.34
24	50	0.38

(NOTE: Where proposed pipe to be provided is "Pressure Class" rather than "Thickness Class", 350 PSI Class may be substituted for Class 50 ductile iron pipe through pipe diameter 12-inch, unless otherwise specified in the project design. "Pressure Class" pipe diameters greater than 12-inch shall be provided with a wall thickness greater than or equal to the standard specified minimum wall thickness of Class 50 ductile iron pipe unless otherwise specified in the project design.)

All ductile iron pipe with flanged joints shall be a minimum Class 53.

4.5.6 Steel Pipe-Carrier

Steel Pipe-Carrier shall be plain end for use with mechanical couplings. Steel Pipe-Carrier shall only be designed for use in special highway crossings, bridge/culvert crossings, or other special applications as determined by DPU, and only where specified on the approved drawings. The pipe shall be designed as to length, thickness, and size according to the intended application. Pipe shall comply with AWWA C200 and shall be lined and coated in accordance with AWWA C203, subject to the approval of DPU. Mechanical

couplings shall be Dresser Style No. 38, or approved equal. Coupling adapters shall be provided between steel pipe and pipe of other materials, and shall be Dresser sleeve type, or approved equal, as recommended by the adaptor manufacturer for the specific application. Harnessed joints shall be provided where indicated on the approved drawings and at all bends, and shall be carried for a sufficient number of pipe lengths to resist displacement of the pipe, and as approved by DPU. Additional anti-corrosion measures, as recommended or specified by the manufacturer, shall be provided at connectors, couplings, rollers, restraints, etc., as directed by DPU, or as indicated on the approved plans.

4.5.7 Flanges

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.

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.

Flanged bolt holes on each end of flanged ductile iron pipe and fittings shall accurately straddle the same horizontal and vertical center lines.

4.5.8 Push-On Joints

Push-on 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.

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 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**

4.5.9 Flanged Joints

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.

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.

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 A153-61
Studs and nuts to be utilized underground or in contact with liquids - alloy steel, Grade B8	ASTM A193-64

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.

After each joint has been properly made, give steel bolts and nuts a phosphate type chemical wash and then paint with one coat of primer especially prepared for galvanized surfaces. After this pre-treatment has been completed, coat bolts and nuts as follows:

Give bolts and nuts that will be exposed or submerged in liquids two coats of primer as specified by the manufacturer.

Paint all bolts and nuts that will be underground with two heavy coats of Koppers Bitumastic No. 50, or approved equal, coal tar pitch and paint.

4.5.10 Mechanical Joints

All mechanical joints on ductile pipe and fittings shall conform to the latest requirements of AWWA C111/A21.11 in all respects, except as otherwise specified or noted herein. Gaskets shall be of a rubber quality which is unaffected by liquids or gasses with which they will come in contact. Gland bolts shall be ductile iron.

All joints of mechanical joint ductile iron pipe and fittings shall be installed in accordance with the requirements of AWWA C600, Section 3.4, and also in accordance with the "Notes on Installation of Mechanical Joints", AWWA C111/A21.11, Appendix A. All bolts shall be tightened in alternating sequence to the recommended torque.

4.5.11 Protective Coating

After installation, the Contractor must paint all steel sleeves, tapping sleeves, threaded rods, straps, nuts, bolts, washers, couplings, or other connecting/restraining apparatus with either Roster Laboratories, Inc., "Roskote Mastic No. A-939", Koppers Company, Inc., "Bitumastic Superservice Black", or approved equivalent protective coating.

4.5.12 Painting of Pipe

Each section of pipe on the NPRL is to be painted in four (4) quadrants in a minimum Of two (2") inches width (Pantone 522C or 512C or other shade of Purple accepted by DPU.)

4.5.13 Polyethylene Tube Wrap

The NPRL must be wrapped in a Pantone 522C polyethylene wrap.
(ANSI/AWWA C105/A21.5) NOTE: POLYETHYLENE TUBE WRAP ONLY.
SEE Apendix A-13

4.5.14 Storing of Materials

All tools, materials, machinery, and equipment required for the Work may be stored in a neatly, compactly stock-piled manner adjacent to the work site, in a location approved by the DPU Project Manager, and in such a manner as to cause the least inconvenience to the affected property owners, insure 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 also be left uncovered by such storing of materials.

4.5.15 Cutting of Pipe

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

4.5.16 Drilling and Tapping of Pipe

Where indicated on the approved design, or as required by DPU, the Contractor shall drill and tap the ductile iron pipe or fittings to receive a threaded pipe connection. Holes shall be drilled accurately, with respect to the size and location of the pipe to be received, and at right angles to the axis of the pipe or fittings. Tapping shall be carefully and neatly done by skilled workers using the appropriate tools.

4.5.17 Connections to Existing Lines

Connections to existing NPRL's 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 DPU. 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.**

The closing of any existing mainline valves to isolate a particular pipe for a "wet cut-in" will be accomplished by the Contractor under the specific direction and presence of the DPU Project Inspector, and at such time as may be directed by DPU. All such shut downs must be approved in advance by DPU. 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. DPU 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.

THE CONTRACTOR WILL BE RESPONSIBLE FOR NOTIFYING ALL CUSTOMERS WHO WILL BE AFFECTED BY THE INTERRUPTION OF REUSE WATER SERVICE. SUCH NOTIFICATION MUST BE MADE AT LEAST 24 HOURS IN ADVANCE OF THE PLANNED SHUT-DOWN. NO SERVICE MAY BE INTERRUPTED WITHOUT DPU INSPECTOR'S PRIOR APPROVAL.

4.5.18 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.

4.5.19 Anchorage and Reaction Blocking

Where indicated on the approved drawings, specified, or as directed, plugs, caps, tees, tapping sleeves, offsets and bends deflecting 11¼-degrees or more, or other fittings or combination of fittings, shall be provided with concrete reaction blocking, metal thrust-restraint systems, or other methods of anchoring the fittings to provide the required pressure-system integrity. Such anchoring systems must be "individually" inspected by DPU to ascertain their conformity and compliance with the specific type system required for each kind of installation which requires anchoring; size and shape as identified in Details A-18 through A-30. Concrete for reaction blocking shall be Class B as specified under Section 4.13.

4.5.20 Marking

All ductile iron pipe shall be marked in accordance with the requirements of Section 51-10, "Marking Pipe", of AWWA C151/A21.51. All ductile iron fittings shall be marked in accordance with the requirements of Section 10-9, " Marking of Fittings", of AWWA C110/A21.10.

When requested, the Contractor shall furnish DPU 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.

4.5.20.1 Direct Burial Tape

During the installation of the NPRL a three (3") wide tape to say **"REUSE WATER"** (purple with white or black lettering) is to be installed two (2") above the line during installation.

4.5.21 Material Inspection

When requested, the Contractor shall furnish DPU with three (3) copies of the manufacturer's sworn affidavit of inspection and testing of all ductile iron pipe and fittings provided for the intended work. All ductile iron pipe and fittings will be subject to the inspection and approval by DPU 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.

Such inspection by DPU does not relieve the Contractor of full responsibility for the materials installed. FAILURE BY DPU TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS.

4.5.22 Unloading and Laying

Unload ductile iron pipe, fittings, and accessories from cars or trucks 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 accidently dropped, it shall be immediately set aside, and thoroughly inspected by DPU before any decision is made regarding its acceptability. If damage occurs to the lining, make repairs or replacement as directed by DPU. If there is any question regarding acceptability of said suspect materials by DPU, the contractor shall either remove and replace the questionable materials, or obtain a sworn statement from the manufacturer certifying the materials as "undamaged".

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.

Pipe may not be "strung" along the project within existing highway rights-of-way, unless specifically directed to do so by DPU, and only then after receiving permission from the road authority which has jurisdiction.

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 DPU.

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 DPU, before new or further pipe installation may commence.

4.5.23 Clean-Up

A thorough clean-up of the entire project shall be made before final acceptance is given by DPU. All excess rock, clearing debris, stumps and roots, pipe, fittings, and materials shall be removed from the site. All public rights-of-way and private property shall be restored in as good or better than original condition, to the satisfaction of DPU. In private developments, final plat approval or Certificates of Occupancy may be withheld until all clean-up is complete.

4.5.24 Guarantee of Work Completed

The Contractor (and Developer in private developments) shall guarantee for a period of twelve (12) months from the date of final acceptance (from date of final plat approval or Certificate of Occupancy in private developments), all water mains, 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.

The Contractor shall be responsible for repairs to any leaking pipe, fittings, 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 leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement.

The determination of the requirement for the Contractor to perform work under this guarantee shall be at the sole discretion of DPU.

4.6 VALVES & WET CUT-INS

4.6.1 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.

4.6.2 Wet Cut-ins

The contractor shall provide all labor and equipment necessary to make a cut-in to an existing NPRL's for the purpose of making a connection, installing a valve, 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.

4.6.3 Gate Valves

Gate valves shall conform to AWWA C500-86 for double-disc gate valves, or AWWA C509-87 for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, Mueller, or approved equal.

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.

All gate valves shall open by turning the operating nut to the left (counter clockwise).

Gate valves shall only be used in sizes 2" through 10", (12" permitted if using resilient seated gate valves).

4.6.4 Butterfly Valves

Butterfly valves shall conform to the requirements of AWWA C504-87, and shall be as manufactured by American Flow Control, Henry Pratt, Allis-Chalmers, or approved equal.

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.

All butterfly valves shall open by turning the operating nut to the left (counter clockwise).

Butterfly valves shall only be used in sizes 12" and larger.

4.6.5 Resilient Seated Gate Valves

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

4.6.6 Tapping Sleeves and Valves

The Contractor shall furnish and install tapping sleeves and valves suitable for connection to the existing NPRL's 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, and O.D. and class of the existing pipe before ordering the tapping sleeve and valve.

Prior to making the tap, the Contractor, in the presence of the Project Inspector, shall hydrostatically pressure test the complete tapping sleeve and valve installation at a test pressure of 150 PSI, or 50 PSI over the existing system static pressure, whichever is greater, **(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.

Tapping sleeves shall be cast iron or ductile iron with mechanical joint ends as manufactured by American Flow Control, Mueller, or approved equal. Fabricated split

steel tapping sleeves of the full-circle variety, as manufactured by Rockwell, JCM, or equal, may be used with the approval of DPU. 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 tapping sleeve. **THE USE OF STRAP-TYPE TAPPING SADDLES FOR TAPS LARGER THAN 2" IS NOT PERMITTED.**

Tapping valves shall conform to the requirements for gate valves hereinbefore stipulated, except for any modifications necessary to permit the use of full size shell cutters. If of the double-disc variety, tapping valves 16" and larger shall be installed in a horizontal configuration, and shall be supplied with a by-pass. Resilient seated tapping valves 16" and larger may be supplied without the by-pass. 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.

4.6.6.1 Backtaps

BACKTAPS SHALL NOT BE PERMITTED UNLESS SPECIFICALLY AUTHORIZED BY DPU. 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, AND SHALL BE WELDED FOR A MINIMUM OF 8-INCHES ON EACH ROD ALONGSIDE THE CASING. **WELDING OF I-BOLTS DIRECTLY TO THE CASING FOR THE PURPOSE OF INSTALLING THREADED ROD IS NOT PERMITTED.**

4.6.7 Accessory Equipment

All valves which are to 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 DPU prior to fabrication and placement.

4.6.8 Valve Markers

Valve markers shall be furnished and installed with each valve on the proposed project. The markers shall be white drivable markers #CIB-380 (78") long (manufactured by Carsonite International) and extend to the valve. The markers shall be installed as close to the valve as possible, facing the street. The marker is not to protrude the finished surface grade more than (3') feet and no less then (18") inches above the finished grade. Each marker must be labeled on both sides (the labels will be provided by the DPU Inspector or Project Manager. (See also Article 2.2)

4.6.8.1 **END OF LINE / STUB OUTS**

At the end of all lines there must be a two (2") inch blow off. The blow off will consist of (2") inch copper (type "k") with a two (2") inch female by pack joint curb stop lockable (Ford BRW41-777W) or equivalent. Locks will be provided by DPU. The curb stop will tagged and installed in a Carson-Brooks Plastics meter box 1325 with a bolt down cover 1324, both must be violet in color.

4.6.8.2 Future Stubs

All stubs for future use must be marked with a White Drivable Marker #SNFB096-01 eight (8') feet long (manufactured by Carsonite International) and extend to the pipe. The markers shall be installed facing the street. The marker is not to protrude the finished grade less then two (2') feet and not to exceed three (3') feet. Each marker must be labeled on both sides (the labels will be provided by the DPU Inspector or Project Manager.

4.6.9 Installation and Placement

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 hereinbefore specified for ductile iron water mains.

Tapping sleeves and valves and insert valves shall be installed in accordance with the manufacturer's recommendation.

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 concrete collar shall be placed around the collar of the valve box as indicated in Detail A-8.

Valve boxes shall be Russco C2503 6.5" square.
Valve box lids are to have "RECLAIMED WATER" cast in the lid. See Detail A-41
NOTE: STANDARD ROUND VALVE BOXES ARE PROHIBITED IN THE NON-POTABLE REUSE SESTEM

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.

4.6.10 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 DPU.

4.6.11 Shop Drawings

If directed, the Contractor shall provide the Project Manager copies of all shop drawings or "cut sheets" for the proposed valves, prior to their installation.

4.6.12 Painting 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.

4.7 RELOCATION AND RE-CONNECTION OF EXISTING, VALVES, AND LARGE METERS

4.7.1 Work Included

The Contractor shall, where required, disconnect, relocate and reconnect existing, valves, and large meters. The work shall be done in accordance with the following items:

Salvaging valves shall include transporting and delivering such valves for salvage to locations designated by DPU.

Relocating existing 3" and larger NPRL water meters shall include removal of the existing metering 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 a wet cut-in is required for the relocation, the Contractor shall request the DPU 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 and coordinated by DPU.**

4.7.2 Existing Materials and Appurtenances

Existing valves which, in the opinion of DPU, 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.

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 re-connection shall be replaced or repaired by the Contractor at his own expense and to the satisfaction of DPU.

4.8 RECLAIMED WATER SERVICE CONNECTIONS

4.8.1 Work Included

The Contractor shall furnish all materials, labor, tools, and equipment for the proper installation, relocation or replacement of all NPRL service connections, service lines, NPRL water meters and meter boxes which are indicated to be so addressed on the approved design, or as directed by DPU. If in the process of conducting the work, the Contractor determines that additional NPRL services or connections will be affected by the proposed design, or discovers NPRL services which were hereto previously unknown, the Contractor shall immediately notify the DPU Project Manager for direction concerning the services. New service connections to NPRL's shall be made in accordance with the approved design, or if, in the opinion of DPU, such are necessary for establishing proper service to the customer.

The Contractor shall make all relocations of existing NPRL services from existing mains to NPRL mains constructed as part of the approved project, as indicated on the approved design, or as directed by DPU, 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.

The Contractor shall make all pavement and sidewalk cuts, excavation, sheeting, shoring, boring, backfilling, sidewalk and pavement repairs, and landscaping and re-grassing/reseeding required for the installation of NPRL service connections. This includes any disturbed areas associated with long-side services on both sides of roadways. Said work is to be accomplished as specified elsewhere in these Standards.

4.8.2 Special Attention

All temporary relocations or replacements of reclaimed service connections necessary to prosecute 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.

NOTE: RECLAIMED SERVICE CONNECTIONS SHALL NOT BE CONNECTED TO NEW MAINS UNTIL SUCH HAS BEEN ACCEPTED BE DPU.

4.8.3 Specific Replacement Conditions

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

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

If existing service line is 1½" or 2" and is either galvanized pipe which is greater than 10 years old or which shows evidence of significant corrosion internally or externally, or is PVC or polyethylene pipe, the entire service line from the main to the meter shall be replaced with galvanized pipe as specified below.

4.8.4 New Service Installations/Meters and Meter Boxes

Reclaimed meters must be a Badger meter for Reclaimed water. To ensure Identifation of reclaimed water meters, the international color of Pantone 522 is located on the lid of register; the register face, lid, shroud and meter bottom and the word **"RECLAIMED WATER"** is marked on the brass housing.

All reclaimed meters will be installed in a Carson-Brooks Plastics box violet in color 1419, 1220 or, 1324. Meter box lids will be violet in color and labeled "RECLAIMED WATER" OR "REUSE WATER".

All reclaimed meter installations must maintain a minimum of three (3') from the potable water meter.

4.8.4.1 Double Check Valve-Backflow Preventer (DCV-BFP)

Every NPRL meter is required to have a DCV-BFP installed. The Customer/Owner shall provide a Double Check Valve-Backflow Preventer (DCV-BFP) in a size to match that of the required service meter. The DCV-BFP assembly shall be installed in a Utility Box adjacent to or as close as practical to, the outlet side of the meter installation. For suggested devices see the Gwinnett County Public Utilities "Backflow-prevention and Cross-Connection Control" Information Handbook current edition.

4.8.5 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 shall be standard weight galvanized steel with screw joints conforming to ASTM Designation A-120. Fittings shall be galvanized, except that nipples and couplings shall be of the same material as the pipe.

Appurtenances such as corporation stops, curb stops, adapters for copper and galvanized steel service lines shall meet the requirements of ASTM Designation B-62 for bronze construction, and AWWA C-800 for threads. Adapters shall be furnished as required for connecting copper and galvanized steel pipe. Corporation stops shall be Ford FBRW1100-4, curb stops shall be Ford B41-444W. All fittings must be labeled **"RECLAIMED WATER"** or any other products approved by DPU. 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. (See Detail A-14)

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

4.9 JACKED CASING

4.9.1 Work Included

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 DPU, including, but not limited to bore pit excavation, sheeting, shoring, plating, and safety barriers for the protection of workers, traffic, and 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.

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 DPU 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 DPU of the pavement failure.

All jacking/auguring operations must be performed in compliance with the rules and regulations of the Gwinnett County Department of Transportation, State of Georgia Department of Transportation, or other authorities having jurisdiction.

Any sheeting placed for the jacking/auguring operation must be completely removed by the Contractor prior to backfill.

4.9.2 Maintaining Traffic and Public Safety

All working operations of the Contractor, his subcontractors, and/or their agents or employees must be subordinated to the free and unobstructed use of the highways, and structures encountered in the prosecution of jacking and boring operations.

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 DPU, shall suspend all operations relating to jacking and boring until necessary safety precautions have been met.

The Contractor shall submit for approval, when requested by DPU and/or highway Departments, all working drawings and schedules of procedure proposed to be followed in the prosecution of jacking and boring operations.

Working drawings shall show in detail the size and location of bore pits, together with all sheeting and shoring to be used in supporting embankments and trench walls, and all other structural details together with large scale plan and profile of the proposed jack and bore installation. Drawings shall also indicate the location and proximity of any adjacent structures or underground utilities which could be affected by the operation.

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

The Contractor shall not proceed with any portion of the jack and boring operation until he has received approval of the Drawings and Schedule by DPU and/or highway Departments.

4.9.4 Jacked Casing

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 pipe shall be a minimum .375 (_) 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.

Each joint of the casing pipe shall be fully welded around its entire circumference to the adjacent joint prior to being jacked.

Following completion of the jacking operations, the NPRL pipe shall be inserted within the casing and its invert supported by wood skids as indicated in Detail A-34. Pre-fabricated casing spacers are acceptable in lieu of wooden skids, pending pre-installation approval by DPU. The ends of the casing shall be sealed with brick bulkheads using brick and mortar.

4.9.5 Free-Bore

Where permitted or directed by DPU, 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.

At no time will free-bores in excess of forty (40) feet be permitted.

4.9.6 Steel Casing (Open-Cut Installation)

Where permitted or directed by DPU, 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 Section 4.12.4 relating to steel casing specification shall apply. Ditch preparation, backfill, and compaction shall be as required for direct-bury ductile iron pipe.

4.10 CONCRETE

4.10.1 Work Included

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.

There shall be two classes of concrete; Class A for foundation, cast-in-place manhole and vault sections, brace and thrust blocking, concrete pipe cradles, footings, and steel reinforcement structures; and Class B for concrete encasement and concrete fill. The Contractor shall provide concrete which on tests in standard cylinders shall have a compressive strength of not less than three thousand (3,000) pounds per square inch in twenty-eight days for Class A; and not less than two thousand (2,000) pounds per square inch in twenty eight days for Class B concrete.

Slump shall range from three to five inches for Class A concrete, and four to six inches for Class B concrete; except that where vibration equipment is used slump shall not exceed three inches.

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.

No admixtures will be permitted unless specifically approved by the DPU Project Manager prior to placement.

4.10.2 Placement

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.

4.10.3 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.

4.10.4 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.

4.11 LUMBER LEFT IN PLACE

4.11.1 Work Included

When in the opinion of DPU proper protection and support of the pipe or structures may be adversely affected by the continuation of the work, the Contractor may be ordered to leave in place such sheeting, sheetpiling, bracing, and shoring as may be considered necessary to provide the proper protection.

Where sheeting and bracing is left in place in accordance with the orders of DPU, all projecting planks shall be cut off two feet below the surface of the ground. If so ordered, the upper portion of the lower set of sheeting shall be cut off so as to permit the complete filling in of the space below the timbers of the upper set of sheeting.

4.12 BACKFILLING

4.12.1 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 twelve 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.

4.12.2 Trenches

Backfill in trenches where pipe has been laid shall be placed continuously by hand in layers not exceeding six inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve inches above the top of the pipe. This backfilling and compacting must be done promptly and before any backfill material is deposited directly from a machine bucket, loaders, trucks, or other mechanical equipment. Once 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.

Except as otherwise ordered by DPU, all forms, bracing, and lumber shall be removed

from the trench before backfilling.

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 done 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 backfill within two feet 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.

Where foundation conditions are such that proper bedding cannot be provided, such as in quicksand, the Contractor may be directed by DPU to provide foundation cushion, concrete cradles, or other special provisions as may be required for the proper support of the pipe.

Only after the backfill has been placed and hand-compacted to at least twelve 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. In streets, other surfaced areas, or where directed, the backfill shall be placed and compacted in lifts not to exceed twelve inches in thickness. 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. The number of men tamping shall at no time be less than the number of men backfilling, and if necessary, additional men shall be kept in the trench to spread the material.

Material shall be compacted to a density of not less than 95% as determined by a modified proctor ASTM Des. D1557-70. When directed, the Contractor shall arrange to have such compaction tests conducted by an independent testing firm; the number and locations to be determined by DPU.

Materials used for backfilling shall be free from all perishable organics or other objectionable materials, and shall contain no stones larger than twelve inches in its longest dimension.

No clay backfill shall be used in pipe trenches under roadways or other paved areas. In such paved areas where clay is encountered, trenches shall be backfilled with run-of-the-bank gravel.

If, in the opinion of DPU, the original excavated material is unsuitable for use as backfill, such as perishable matter, refuse, building materials, wire, brush, stumps, ashes, large stones, muck, 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.

Backfilling shall not be done in freezing weather, except by permission of DPU, and shall not be done using frozen materials or upon frozen materials.

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, not withstanding applicable warranty periods. Where directed by DPU, the Contractor shall mound the backfill slightly above the adjacent ground to allow for settlement.

4.12.3 Embankment Over Pipes

Where indicated on the approved design, or where authorized by DPU, 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 by 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 1½ horizontal to 1 vertical extending to the surface of the undisturbed ground. Provisions shall be made to allow for surface drainage.

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 as defined in Section 4.15.2. 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 DPU. The embankments shall not 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 done evenly on all sides to avoid unbalanced loading or overturning action.

4.12.3.1 Concrete Protection Cap

Where indicated on the approved design, or where authorized by DPU, 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 B 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 as required under Section 4.15.3.

4.12.4 Erosion Control

The Contractor shall fully comply with the applicable requirements of local, State, and Federal agencies in the control and containment of soil erosion. The Contractor shall

install/construct all necessary measures or devices in accordance with Best Management Practices, as may be indicated on the approved design, as may be directed by DPU, or as directed by other agencies having jurisdiction, to control and contain all soil erosion within the construction limits, with no exception. Necessary measures and devices may include, but not limited to, reinforced silt fencing, hay bales, and/or rock check dams. Such measures shall be maintained by the Contractor until such time as a satisfactory vegetative cover is established, and final acceptance of the work is obtained from DPU, notwithstanding any required warranty period. The Contractor shall be held fully responsible and liable for any damages and/or penalties arising out of his failure to install or maintain an adequate soil erosion control program at all times during the project.

4.12.5 Disposal of Material

The Contractor will 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 done immediately after the backfill is completed to the satisfaction of DPU. All material removed shall become the property of the Contractor, and he shall make his own arrangements for its disposition, subject to DPU's approval. All surplus material, shot rock, organics, clearing debris, stumps, and other such material as DPU may deem unfit for use as backfill, shall be disposed of by the Contractor, and shall be done in such manner so as to give a minimum of inconvenience to the public.

Any material which may spill or drip from the vehicles while being transported on public streets, drives, or other paved surfaces, shall be immediately removed by the Contractor and those surfaces cleaned to the satisfaction of DPU.

4.12.6 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 from locations approved by DPU. Locating such acceptable "borrow" sites shall be the sole responsibility of the Contractor.

All materials to be used as borrow shall be approved by DPU. Borrow material for backfilling trenches under roadways or other paved areas shall be run-of-the-bank gravel reasonably free from loam or other foreign material.

4.13 TESTING

4.13.1 Testing

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 DPU, 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 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. If elevation differentials, within a test section, vary by more than 45 feet, then the section shall be broken into shorter lengths by the insertion of additional valves.

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.

All testing of NPRL mains, fittings, and appurtenances shall be conducted in the presence of the DPU project Inspector, and under his direction. To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring the 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 DPU project Inspector to verify that all 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 a 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. The County shall furnish all water necessary for flushing and testing of the main. The Contractor shall provide whatever means necessary to transport or convey the water from a designated source to the main.

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 ¾" service taps at the highest elevations, including any intermediate points, of the section of the pipe to be tested, or at locations directed by DPU. Any such taps installed, must be removed by the Contractor prior to final acceptance of the main.

The test pressure shall be maintained for a minimum of two hours to allow for thorough examination for leakage, and permit the DPU project Inspector to confirm that all air has been removed, and that all valves within the test section of pipe are fully open.

4.14 RESTORING PAVEMENTS, SIDEWALKS, AND CURBS

4.14.1 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 DPU. 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.

4.14.2 Materials and Workmanship

Materials to be used in the repair and restoration of pavements, drives, sidewalks, and curbs, shall be first quality. All materials removed while accomplishing the work shall be disposed by the Contractor on sites approved by DPU. No existing material may be reused in the Work unless pre-approved by DPU. All workmanship shall be first class.

4.14.3 Restoring Pavements

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 DPU.

For backfilling roadway cuts, only crusher-run gravel, run-of-the-bank gravel, or properly rammed sand shall be used. Backfill material shall be placed and compacted to a density of not less than 95% as determined by a modified proctor ASTM Des. D1557-70. DPU may require that tests, conducted by an independent laboratory, be made at various locations to confirm the density of the compacted material. The location and number of tests shall be designated by DPU as the work progresses. All costs associated with such testing shall be borne by the Contractor.

All roadway restoration shall be done 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 highway authorities to insure proper restoration of paved areas.

Whenever the removal of pavements is required (other than gravel types), the Contractor shall outline the area to be removed by making 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.

The Contractor shall be responsible for maintaining all pavement cuts prior to project acceptance, and during the one-year maintenance period. Should any failures be noted associated with any portion of the work, the Contractor shall remove all such damaged surfaces and make full repairs, including adding and re-compacting approved backfill

materials, placing and maintaining bituminous concrete pavement or stone road surfaces. All required pavement repairs necessitated due to pavement failure, either prior to final project acceptance or during the one-year maintenance period, shall be effected by the Contractor within five (5) working days of notification by DPU.
Bituminous concrete pavements or stone road surfaces, which the Contractor is required to replace, shall be in at least as good condition at the end of the one-year maintenance period as it was before construction.

4.14.4 Roadway Permits

The Contractor is responsible for obtaining all road opening permits from the Gwinnett County Department of Transportation, including providing any required restoration bonds.

DPU shall obtain all road opening permits required by the Ga. Department of Transportation. The Contractor is not permitted to make any type cuts on roadways requiring a permit from the Ga. D.O.T. until such time as the permit is provided and prominently displayed on-site.

4.14.5 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 drawing A-44 in the Appendix, 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, or where directed, concrete slab removal shall be made in entire pavement sections to the nearest existing expansion-joint.

4.14.6 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 that adjoining. In restoring curbs, the subsoil and foundation material shall be well compacted so as to prevent any future settlement of the concrete curbing.

All concrete shall conform to the specifications for Class A Concrete, sec. 4.13.1

4.14.7 Restoring Sidewalks

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.

Where necessary to cut a walk, entire sections shall be removed and replaced unless otherwise directed by DPU.

The sub-base shall be thoroughly rolled or tamped and shall be wetted just before the concrete is placed, but shall show no pools of water.

4.14.8 Contractor's Warranty of Restored Paved Surfaces

The Contractor shall make every provision to insure compaction by properly tamping any backfill under areas to be paved. Any settlement which may occur during the one-year warranty period shall be corrected by the Contractor 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.

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.

4.15 SEEDING / SOD REPLACEMENT

4.15.1 Work Included

The Contractor shall furnish all materials for, and properly restore to the satisfaction of DPU, all ground surfaces irrespective of type, which may be disturbed in the progress of the work.

This shall include in general but without limitation, the spreading of topsoil, seeding, sod replacement, fertilizing, and mulching required to restore disturbed areas as may be necessary, directed, or specified herein. On all "sod" type lawns and other improved, well established grass areas, the sod/grass shall be carefully removed, kept alive, and replaced after the backfilling and grading is finished. The Contractor shall also remove all spoil from such areas as quickly as possible after the excavation is backfilled, and he shall leave the premises in as good condition as before undertaking the work. It is the intent of these Specifications to restore all disturbed areas, to place seed and mulch in areas not specifically identified as improved lawns, to place topsoil and seed where improved lawns

existed prior to construction, and to provide for "sod" removal and replacement in areas identified as such prior to construction.

4.15.2 Standard Specification for Seeding / Sod Replacement

The requirements of the Department of Transportation of the State of Georgia "Standard Specifications - Construction of Roads and Bridges, " 1983 Edition, and as revised to date, shall apply insofar as they are applicable for all seeding/sod replacement. If requirements set forth in these Specifications differ from those of the Ga. D.O.T., then these requirements shall take precedence.

\

4.15.3 Topsoil

Where directed by DPU, area to be seeded shall be covered with a layer of topsoil. The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of four (4) inches will be available. The Contractor shall furnish natural topsoil of a good condition and tillable structure. Obtain topsoil as borrow from an outside source of uniform texture, drainage, and other characteristics so as to constitute a homogeneous soil meeting the requirements of the Ga. D.O.T., and as approved by DPU. The Contractor shall furnish topsoil that is free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated rock, large roots, or other materials that are not integrally a natural component of good agricultural soils, and which are harmful or not beneficial for successful plant growth. Do not use topsoil containing frost or in a muddling condition. If utilizing existing material obtained from the initial excavation of the work site for re-use as topsoil, the Contractor must first obtain approval from DPU as to suitability of its content, including approval of location and method of storage of topsoil for re-use.

4.15.4 Seeding

Seeding shall be accomplished by the Contractor using a properly proportioned mixture of inoculated seed approved for use in "Zone One" as detailed in the Ga. D.O.T.'s Standard Specifications. Seeding shall only be permitted in the specified planting season for "Zone One" for the specified mixture. All seeded areas shall be uniformly mulched immediately after seeding.

The Contractor shall maintain all seeded areas to include mowing, watering, and re-seeding any bare areas until a satisfactory stand of grass has been obtained and final acceptance of the work has been received from DPU. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and re-seeded as required.

In general, the Contractor shall replace existing maintained lawn areas with the same type of grass as was established prior to construction. Any deviations or alternatives proposed

due to unavailability of seasonal grasses, or inappropriateness of seeding due to time of year must be presented to DPU Inspector in writing with **signed** authorization of homeowner.

4.15.5 Preparation of Seeded/Sod Areas

The subgrade for any areas to be seeded shall be brought to a uniform grade by the Contractor, and shall be free of stones larger than 1", roots, gravel, or other debris. Where topsoil is required by DPU, the topsoil shall uniformly graded, trimmed, and raked free of unsuitable materials, ridges, bumps, or depressions. Over this area, the Contractor shall spread agricultural lime at the rate of 40 pounds per 1,000 square feet, and shall spread a general fertilizer uniformly on the surface of the ground at a rate of 1,500 pounds per acre. The lime and fertilizer shall be mixed uniformly into the top four (4) inches of the soil using suitable harrows, tillers, or other mechanical equipment.

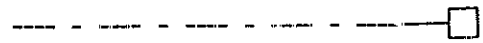
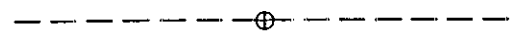
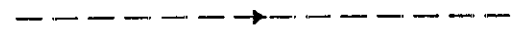
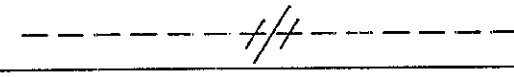
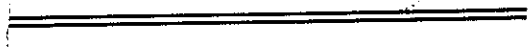
4.15.6 Sod Removal/Replacement

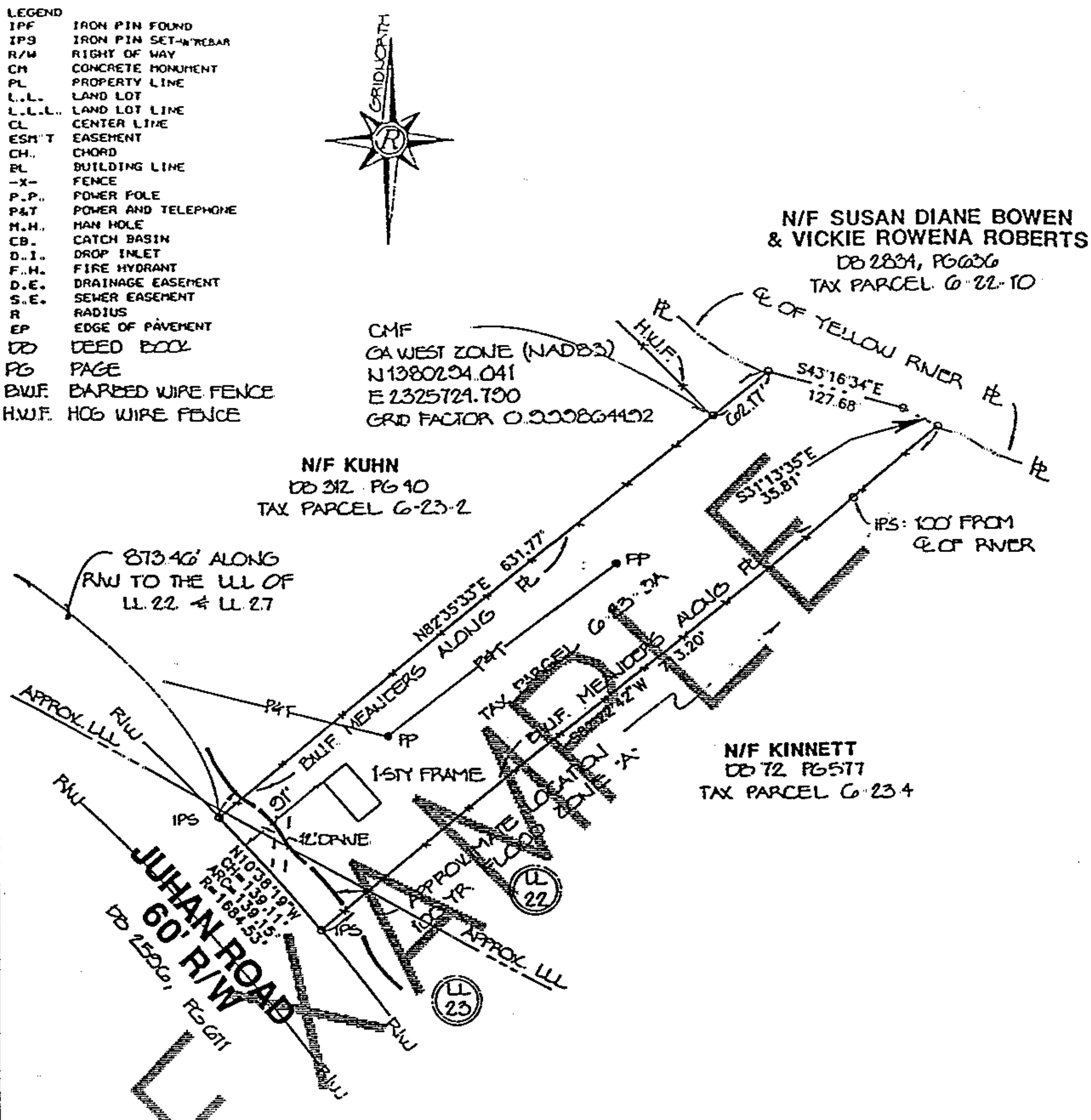
On all well established and "sod" type lawns, the Contractor may at his discretion, utilizing suitable sod cutting equipment, cut the sod into rolls, carefully remove and store the sod , and water and maintain in a viable condition for replacement after backfill. Any such sod removed and replaced in this manner must be demonstrated to be living to DPU Inspector prior to final acceptance of project.

If sod is to be replaced with "new" sod, the Contractor shall only replace using sod of the same type as that removed. Any deviations or alternatives proposed due to unavailability of seasonal grasses must be presented to DPU Inspector in writing with **signed** authorization of homeowner.

APPENDIX "I"

DESIGN DETAILS

ITEM	SYMBOLOGY
EXISTING FIRE HYDRANT	
END OF LINE TERMINATION	
VALVE	
TAPPING VALVE AND SLEEVE	
REDUCER	
PLUG OR STUB	
SERVICE METER	
EXISTING LINE TO BE ABANDONED	
POWER POLE	
SEWER MANHOLE	
PROPOSED N P R L.	
PROPOSED WATER MAIN	
EXISTING WATER MAIN	



2.133 ACRES

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE PRECISION OF ONE FOOT IN 13180 FEET AND AN ANGULAR ERROR OF 02" SECONDS PER ANGLE AND WAS ADJUSTED USING THE COMPASS RULE.
THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND IS FOUND TO BE ACCURATE WITHIN ONE FOOT IN 106,183 FEET.
TOPCON GTS-2 USED FOR ANGULAR AND LINEAR MEASUREMENTS.

NOTE: THIS PROPERTY IS LOCATED IN A FLOOD HAZARD AREA AS PER F.E.M.A. FLOOD INSURANCE RATE MAP FOR THE
CITY OF N/A
COUNTY OF GWINNETT
STATE OF GEORGIA
COMMUNITY PANEL NO. 130322 0290B
EFFECTIVE DATE: JUNE 15, 1981
REVISION DATE: N/A
ZONE "A"

GEORGIA REGISTERED No. PROFESSIONAL LAND SURVEYOR

In my opinion this plat is a correct representation of the land platted and has been prepared in conformity with the minimum standards and requirements of the law.

GRAPHIC SCALE
100 50 0' 100

JOB # 92205 - 1700

SHEET 1 OF 1
DATE 10-12-92
SCALE 1"=100'
DISK NO. C1&11
FILE NO. 92205

SURVEY FOR
GWINNETT COUNTY
DEPARTMENT OF PUBLIC UTILITIES
BEING
VICTOR PONDER TRACT
LOCATED IN
LAND LOTS 22 & 23 6th DISTRICT
GWINNETT COUNTY, GEORGIA

I - 2

APPENDIX "II"

Ga. D.O.T. PERMIT APPLICATION

ATTACHED IS A CHECKLIST WITH THE REQUIREMENTS FOR "MINIMUM INFORMATION FOR A UTILITY PERMIT APPLICATION" AS REQUESTED BY THE GA. D.O.T.

****

SECTION I. APPLICATION FORM
Completed by the Gwinnett County Department of Public Utilities.

SECTION II. SUPPORTING DRAWINGS (ALL UTILITIES)
Completed by the Project's Engineering Firm.
ALL Drawings must be submitted on 8 1/2" x 11"
ALL Drawings, text and measurements must be legible.
ALL Drawings must have four (4) copies of each subsection.
ALL Subsections (A, B and C) must be completed.

SECTION III. SPECIAL ASSURANCES FORM
Completed by Approved Contractor at the time the Construction Permit is issued - Minimum 72 hours notice required prior to construction.

SECTION IV. COMPUTER SHEET
Completed by the Gwinnett County Department of Public Utilities.

****

Submit all drawings to the Gwinnett County Department of Public Utilities. Allow four (4) weeks processing. Following the Ga. DOT permit approval, this Department will obtain the Approved Permit and the County's Inspector will bring the permit to the project site. The Approved Permit must remain on site at all times.

****

Please direct questions to :

Gwinnett County Department of Public Utilities
Pipeline Construction Engineering Division
410 Hurricane Shoals Road
Lawrenceville, Georgia 30245

Contact:
Tommy Hunter
D.O.T. Coordinator
(770) 822-5031

(1990)

MINIMUM INFORMATION FOR A UTILITY PERMIT APPLICATION

I. APPLICATION FORM - COMPLETED BY GWINNETT CO. DEPT. OF PUBLIC UTILITIES

____1. Name and address of applicant
____2. State Highway or County Road Number
____3. County
____4. Description of proposed utility (including size, type, & length)
____5. Location
____6. Date
____7. Signature of authorized representative and witness in ink in assembled order (yellow, white, blue, green)

II. SUPPORTING DRAWINGS (ALL UTILITIES) - COMPLETED BY ENGINEERING FIRM

A. Construction Prints (four copies) (8½"X11")

General Information

____1. Dimensions of the roadway
____ a. Right of Way Width
____ b. Pavement (indicate centerline)
____ c. Distance to curb and/or ditch
____ d. Grass plot and sidewalk, if applicable
____2. North Arrow
____3. Location of proposed installation using distances to nearest roads, mileposts, etc.
____4. Length, size and type of utility
____5. Note whether own forces or contractor will be used

Additional Underground Information

____1. Distance of facility from edge of pavement or curb and right of way
____2. Depth of cover of facility on backslope & under ditches, shoulders and pavement
____3. Details, if attached to bridges or over drainage structures
____4. Boring or tunnel (drawing of a detailed cross section)
 a. Length, size and type of casing
 b. Location from edge of pavement and size of bore pit
____5. Size and method of repair for pavement cuts
____6. Method of installation
____7. Detailed reasons for any variation of installing other than in the back of the right of way
____8. Detailed distance for offset portions of installation
____9. Location of fire hydrant, manholes and other appurtenances (this also includes distance from pavement and right of way)

Additional Aerial Information

____1. Distance from edge of pavement/curb and right of way for proposed poles and anchors
____2. Overhead clearance for crossings at maximum sag
____3. Location of temporary poles
____4. Distance from edge of pavement/curb and right of way for existing poles when new conductors or cable are replaced or added
____5. Indicate poles to be changed out or eliminated if applicable
____6. Show cross section of each pole less than 30' from edge of pavement

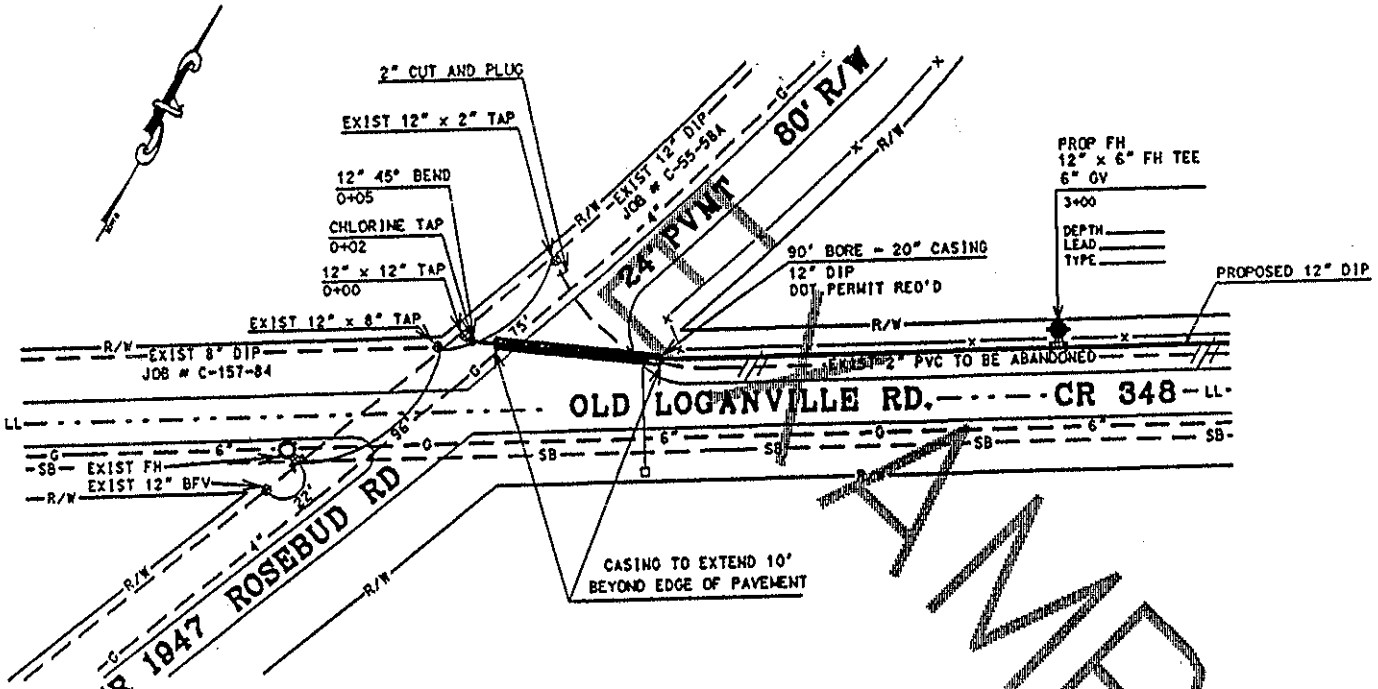
B. Marked Section from D.O.T. issued county map (four copies) (8½"X11")

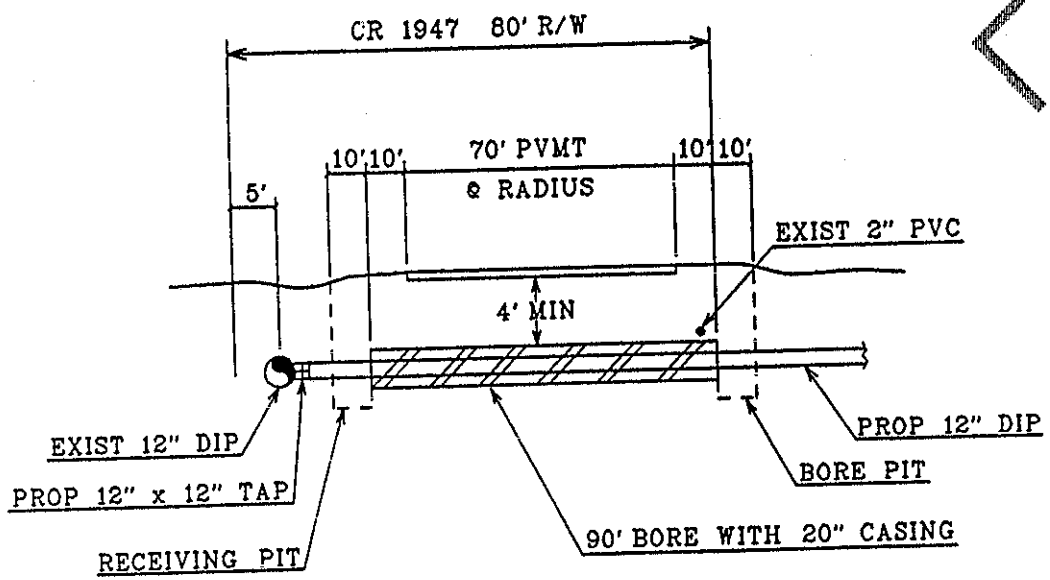
C. Traffic Control Plan is required (four copies) (8½"X11")

III. Special Assurances Form for Utility Contract Work (four copies as original)
- SIGNED BY APPROVED CONTRACTOR AT TIME OF PERMIT APPROVAL

IV. Computer Sheet (one copy)
- COMPLETED BY GWINNETT CO. DEPT. OF PUBLIC UTILITIES

Strickland Cem
Trinity Ch.
Rockwell International
Lebanon Church
G.M.D. 404
Meadow Ch.
Gwinnett Schiffli Embroideries, Inc.
Faith Ch.
Fairview Ch.
Christ the Lord Church
Hughes Lake
Mt Vernon Church
New Hope Church
G.M.D. 544
LAWRENCEVILLE
Sweetwater Church
Johnson Lake
Bethesda School
Oak Hill
Bethesda
Inset No. 1
Rocky Branch Church
Browns Lake
CAPE KENERLY AIRPORT (PRIVATE)
Gloster
Lake Mathews
Spencers Lake
Five Forks
G.M.D. 408
SNELLVILLE





COMPACTION NOTES

A. COMPACTION SHALL BE REQUIRED TO 100% OF THEORETICAL MAXIMUM DENSITY FOR THE FULL DEPTH OF THE TRENCH. SPECIAL BACKFILL MATERIALS MAY BE REQUIRED TO ACHEIVE 100% COMPACTION

B. COMPACTION SHALL BE ACHEIVED TO THE SANE DENSITY AS THE SURROUNDING SOIL.

NO EXCAVATION FOR A TAP ON AN EXISTING MAIN WILL BE PERMITTED BETWEEN THE EDGE OF PAVEMENT AND THE MAIN WHEN IT VIOLATES THE ONE (1) TO ONE (1) POLICY.

GWINNETT COUNTY
DEPARTMENT OF PUBLIC UTILITIES
ENGINEERING DIVISION

OLD LOGANVILLE RD.
PROPOSED 12" DIP

LOCATION:	INTER. OF CR 348 AND CR 1947		
JOB #:	C-67-91	DATE:	8-12-91
L.L.:	65, 66	DRAWN BY:	AVM
DISTRICT:	5	APPROVED BY:	
G.C. PERMIT #:	0903	NOT TO SCALE	

COMPACTION NOTES

A. COMPACTION SHALL BE REQUIRED TO 100% OF THEORETICAL MAXIMUM DENSITY FOR THE FULL DEPTH OF THE TRENCH. SPECIAL BACKFILL MATERIALS MAY BE REQUIRED TO ACHEIVE 100% COMPACTION

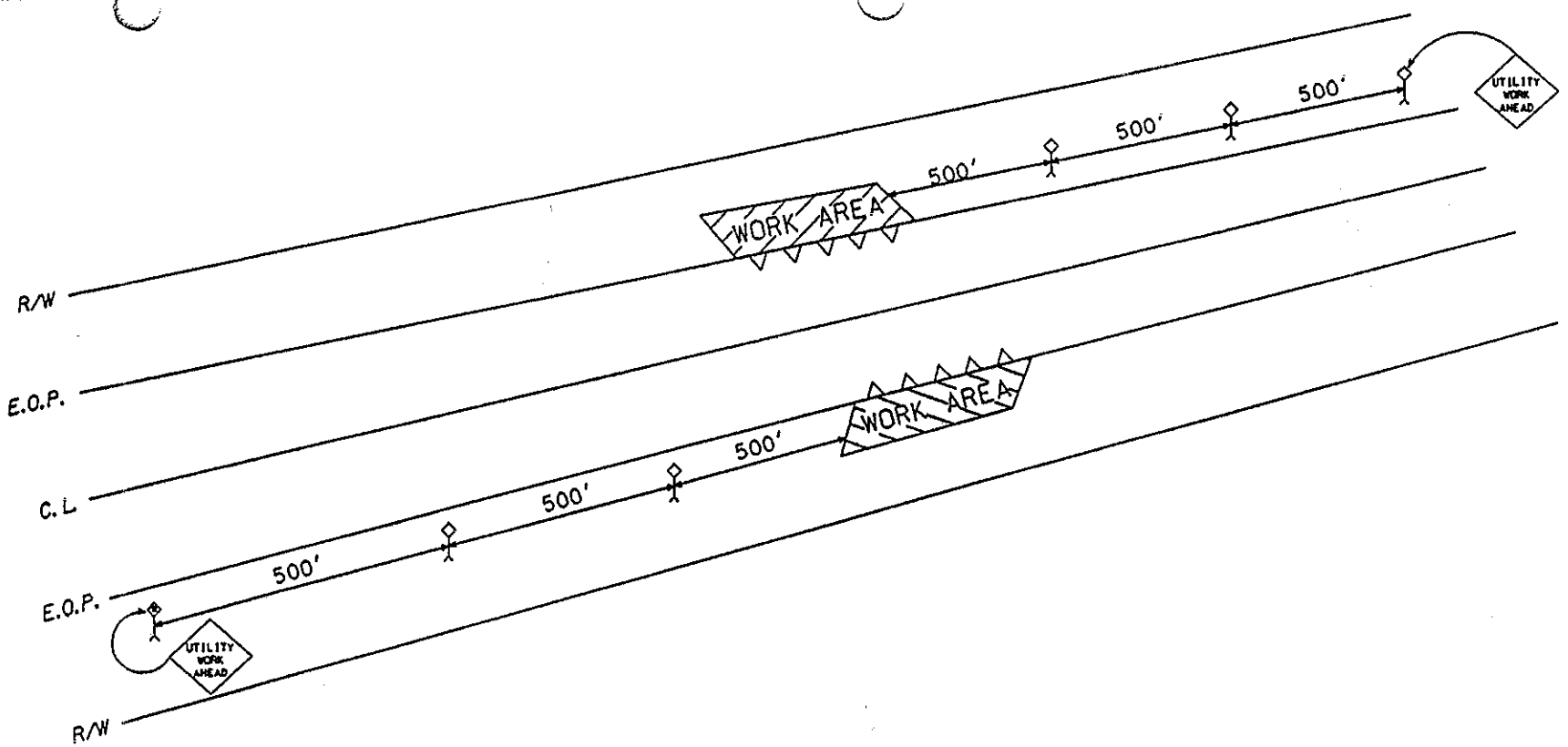
B. COMPACTION SHALL BE ACHEIVED TO THE SAME DENSITY AS THE SURROUNDING SOIL.

NO EXCAVATION FOR A TAP ON AN EXISTING MAIN WILL BE PERMITTED BETWEEN THE EDGE OF PAVEMENT AND THE MAIN WHEN IT VIOLATES THE ONE (1) TO ONE (1) POLICY.

GWINNETT COUNTY
DEPARTMENT OF PUBLIC UTILITIES
ENGINEERING DIVISION

PROPOSED *DIP*

LOCATION:	
JOB #:	DATE:
L.L.:	DRAWN BY:
DISTRICT:	APPROVED BY:
G.C. PERMIT #:	NOT TO SCALE



TRAFFIC CONTROL PROCEDURES ARE HERETO APPROVED IN GENERAL AND ARE SUBJECT TO CHANGES BY THE DEPARTMENT AS FIELD CONDITIONS WARRANT.

△ TRAFFIC CONES

WHERE OPEN HIGHWAY CONDITIONS PREVAIL ON THE APPROACH TO THE WORK SITE, ADVANCE WARNING SIGNS SHOULD BE PLACED APPROXIMATELY 1,500 FEET IN ADVANCE OF THE CONDITION TO WHICH THEY ARE CALLING ATTENTION. WHERE A SERIES OF ADVANCE WARNING SIGNS ARE USED, THE WARNING SIGN NEAREST THE WORK SITE SHOULD BE PLACED APPROXIMATELY 500 FEET FROM THE POINT OF RESTRICTION WITH THE ADDITIONAL SIGNS AT 500-1000 FOOT INTERVALS. ON EXPRESSWAY AND LIMITED ACCESS FACILITIES, THE ADVANCE WARNING DISTANCE SHOULD BE INCREASED TO ONE-HALF MILE OR MORE. ON CITY STREETS, WHERE MORE RESTRICTIVE CONDITIONS GENERALLY PREVAIL ON THE APPROACH TO THE WORK AREA, SIGNS IN THE IMMEDIATE VICINITY OF THE WORK MAY BE PLACED AT CLOSER SPACING. TYPICAL SEQUENCES AND SPACING OF ADVANCE WARNING SIGNS ARE SHOWN IN FIGURES 6-2 TO 6-10 IN THE MUTCD.

GWINNETT COUNTY
DEPARTMENT OF PUBLIC UTILITIES
ENGINEERING DIVISION

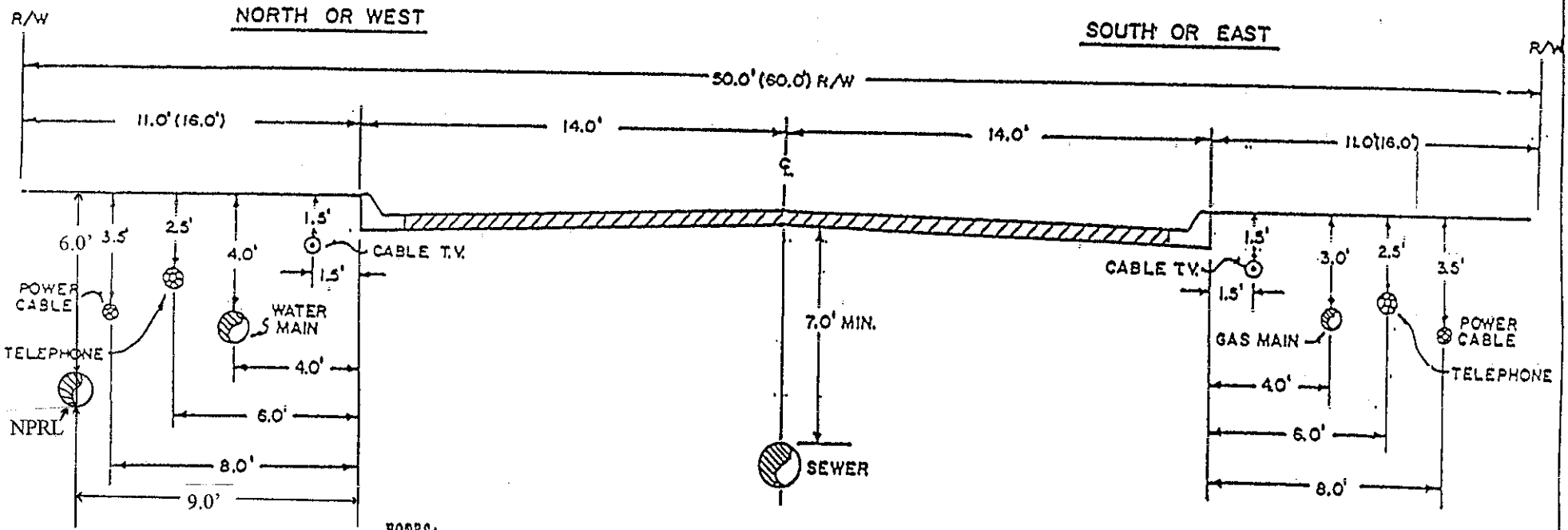
PROPOSED DIP

LOCATION:	
JOB # :	DATE:
L.L.:	DRAWN BY:
DISTRICT:	APPROVED BY:
G.C. PERMIT # :	NOT TO SCALE

APPENDIX "A"

DESIGN/INSTALLATION DETAIL DRAWINGS

A-1 thru A-50



NOTES:

1. STANDARD UTILITY DETAIL FOR UTILITY LOCATION WITHIN RIGHT OF WAY OF SUBDIVISIONS ONLY.

2. IN GENERAL, THE DEEPEST UTILITIES SHOULD BE INSTALLED FIRST TO MINIMIZE ANY POSSIBLE INTERFERENCE WITH LATERALS OR SERVICE LINES.

3. IN CUL-DE-SAC STREETS, THE DIMENSIONS FROM THE CURB SHALL VARY. HOWEVER, THE STANDARD STREET SPACING SHALL BE MAINTAINED.

4. ANYONE DIGGING IN THE RIGHT OF WAY SHALL CALL THE UTILITIES PROTECTION CENTER, INC., AT 1-800-282-7411 BEFORE YOU DIG, AS REQUIRED BY LAW.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

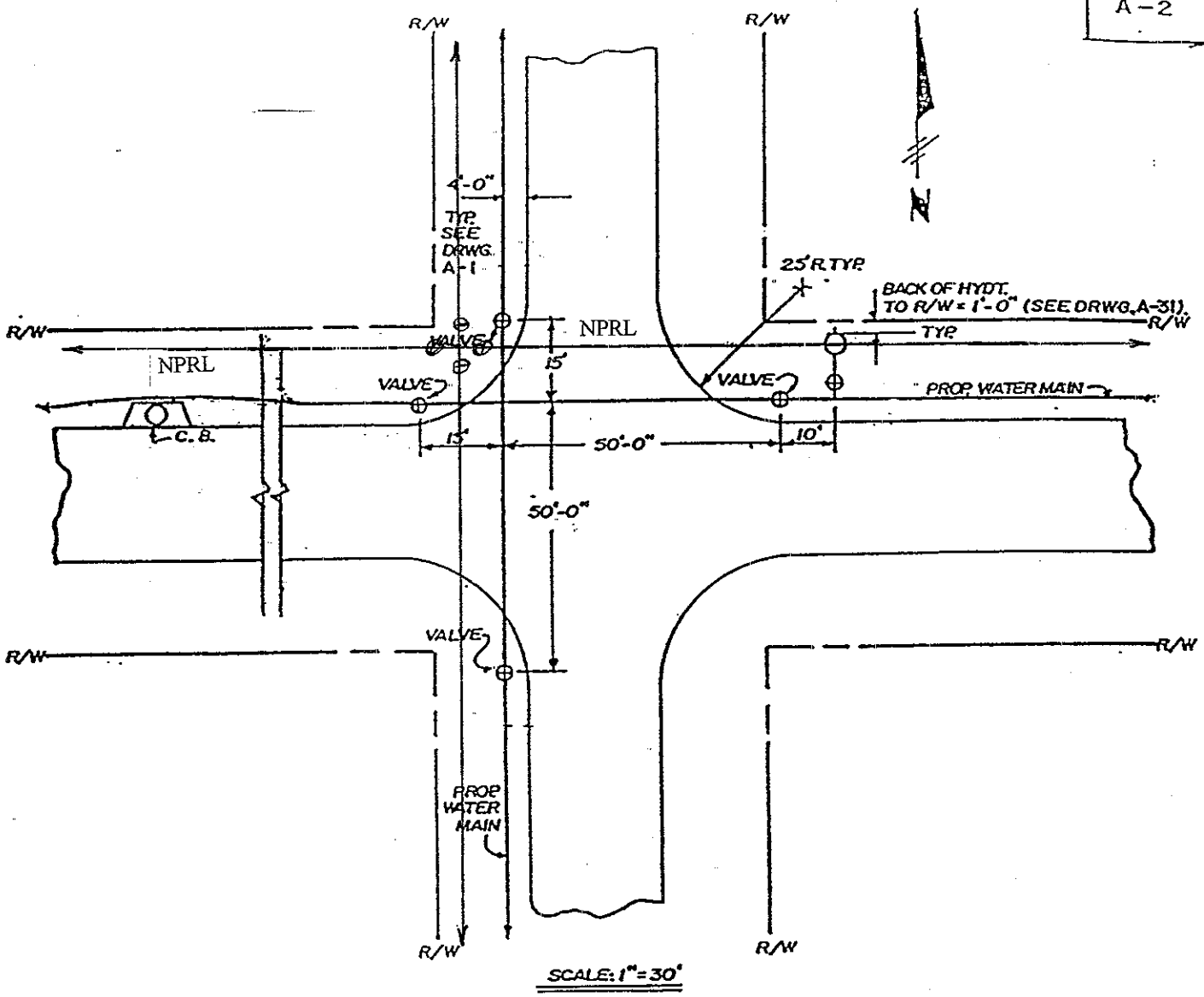
UTILITY LOCATION WITHIN RIGHT OF WAY - SUBDIVISIONS -

DRN. BY: RAB

REV. 10/98

A-1

A-2



SCALE: 1" = 30'

NOTES

1. DEPTH OF COVER OVER WATER MAINS SHALL BE 6'0" AS MEASURED FROM TOP OF CURB.
2. MIN. 6" COMPACTED SOIL BETWEEN BOTTOM OF PIPE AND ROCK. MIN. 9" COMPACTED SOIL BETWEEN SIDES OF PIPE AND ROCK.
3. NO ROCK IN BACKFILL FOR FIRST 2'-0" ABOVE TOP OF PIPE.
4. BACK OF CURB WIDTHS:
   50' R/W = 28'
   60' R/W = 28'
   80' R/W = 52'
   100' R/W = 64'
5. IF RADIUS IS NOT 25', ADJUST PIPE LENGTHS SO THAT VALVES ARE NOT IN STREET.
6. VALVES TO BE A MIN. OF 2' FROM BACK OF CURB. TOP SECTION OF BOX TO HAVE 2'-0" CONCRETE COLLAR. SEE DRWG. A-8.

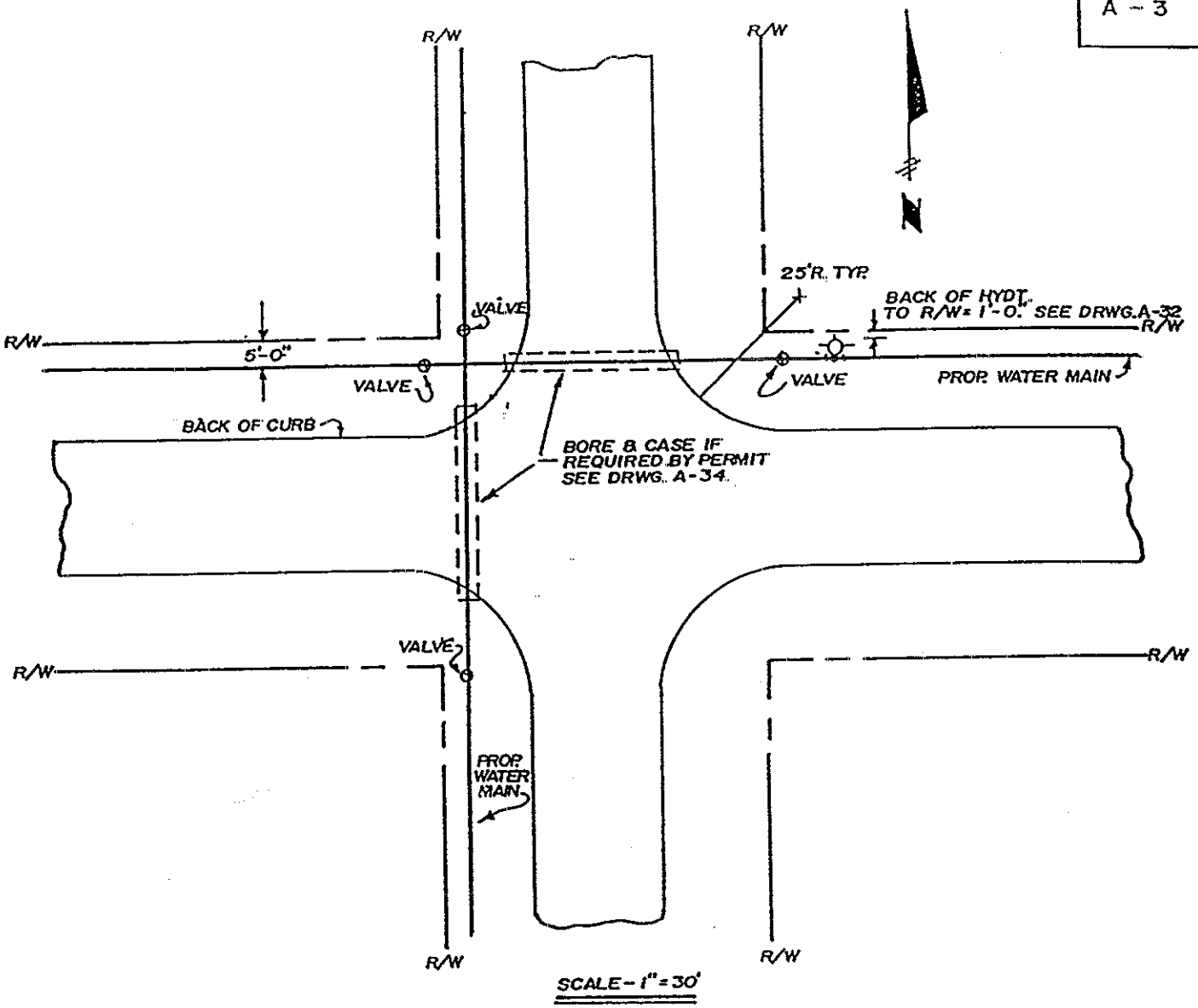
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

INTERSECTION DETAILS

NPRL

DRN. BY: RAB | REV: 10/98

A - 3



SCALE - 1" = 30'

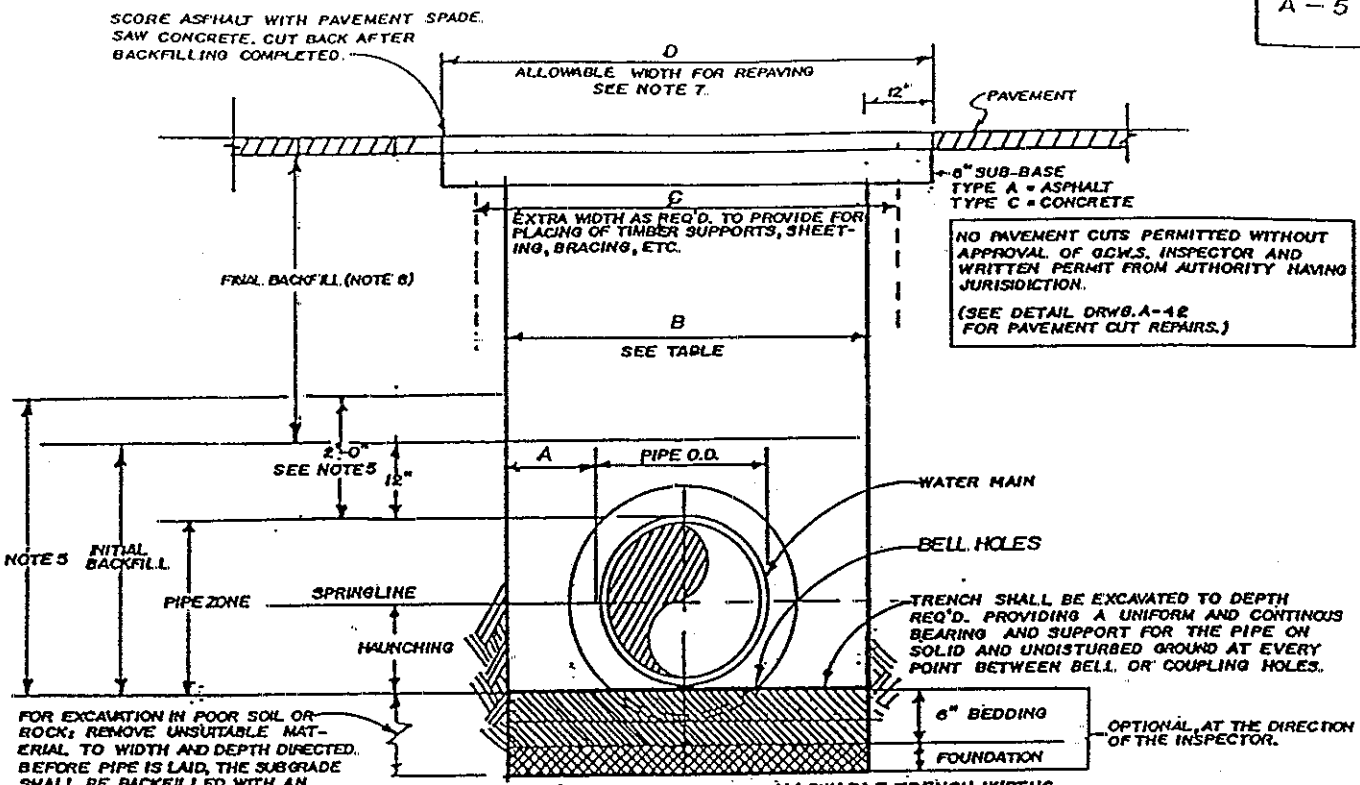
NOTES

1. DEPTH OF COVER OVER WATER MAINS SHALL BE 4'-0" AS MEASURED FROM TOP OF CURB.
2. MIN. 6" COMPACTED SOIL BETWEEN BOTTOM OF PIPE AND ROCK. MIN. 9" COMPACTED SOIL BETWEEN SIDES OF PIPE AND ROCK.
3. NO ROCK IN BACKFILL FOR FIRST 2'-0" ABOVE TOP OF PIPE.
4. BORE OR BORE AND CASING MAY BE REQ'D. PERMITTING AGENCY.
5. ALL PIPE TO BE DUCTILE OR STEEL AS REQ'D.
6. IF RADIUS IS NOT 25', ADJUST PIPE LENGTHS SO THAT VALVES ARE NOT IN STREET.
7. VALVES TO BE 6'-0" MIN. FROM BACK OF CURB OR EDGE OF PAVEMENT. BOX WILL HAVE CONC. COLLAR, DRWG. A-8.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

INTERSECTION DETAILS
WATER MAINS, VALVES
FIRE HYDT.
(GA. D.O.T. & COUNTY ROADS)

DRN. BY: KLB | REV: 2/98



ALLOWABLE TRENCH WIDTHS

PIPE SIZE (NOM)	A SIDE CLEARANCE–INCH		B DITCH WIDTH – INCH.				C SHORING WIDTH (ADDITIONAL – INCH.)	D CUT REPAIR WIDTH – FEET			
			SOIL		ROCK			SOIL		ROCK	
	SOIL	ROCK	MJ	SJ	MJ	SJ		MJ	SJ	MJ	SJ
3/4"-2"	2	6	NA	8	NA	14	AS APPROVED	NA	3.00	NA	3.17
4"	9	12	25	23	27	25	"	4.08	3.92	4.25	4.08
6"	9	12	28	28	30	30	"	4.33	4.33	4.50	4.50
8"	9	12	32	30	34	32	"	4.67	4.50	4.83	4.67
10"	9	12	34	32	36	34	"	4.83	4.67	5.00	4.83
12"	9	12	36	34	38	36	"	5.00	4.83	5.17	5.00
14"	9	14	39	36	41	38	"	5.25	5.00	5.42	5.17
16"	9	14	42	38	44	40	"	5.50	5.17	5.67	5.33
20"	9	14	45	44	47	46	"	5.75	5.67	5.92	5.83
24"	9	14	50	48	52	50	"	6.17	6.00	6.33	6.17
30"	9	18	58	54	60	66	"	6.83	6.50	7.00	6.67
36"	9	18	64	61	66	63	"	7.33	7.08	7.50	7.25
42"	9	18	72	64	74	66	"	8.00	7.33	8.17	7.50
48"	9	18	78	73	80	76	"	8.50	8.08	9.34	8.25

NOTES:

1. COMPACTION: BACKFILLS SHALL BE BUILT UP IN LAYERS AND EACH LAYER SHALL BE THOROUGHLY COMPACTED BEFORE BEGINNING ANOTHER LAYER. LAYERS SHALL BE NO MORE THAN 6" IN DEPTH. PUDDLING WILL NOT BE PERMITTED, NOR WILL FROZEN OR WET MATERIAL BE PLACED IN TRENCHES.
2. COMPACTION STANDARDS: ALL BACKFILL MATERIALS USED SHALL CONTAIN A SUFFICENT AMOUNT OF MOISTURE FOR PROPER COMPACTION AND THESE MATERIALS SHALL BE COMPACTED AT NOT LESS THAN 95% OF THEIR OPTIMUM COMPACTION FOR ANY SPECIFIC SOIL CLASSIFICATION AS DETERMINED BY THE MODIFIED PROCTOR TEST ASTM. D698
3. COMPACTION TESTS: COMPACTION TESTS MAY BE REQUIRED IN EXISTING OR PROPOSED STREETS, SIDEWALKS, DRIVES AND OTHER EXISTING OR PROPOSED PAVED AREAS AT VARYING DEPTHS AND AT INTERVALS AS DETERMINED BY THE ENGINEER WITH A MINIMUM OF ONE TEST ON EACH JOB, AND A MAXIMUM OF ONE REQUIRED TEST FOR EACH 400' OR LESS OF WATER MAIN CONSTRUCTION, UNLESS SOIL CONDITIONS OR CONSTRUCTION PRACTICES, IN THE OPINION OF THE ENGINEER, WARRANT THE NEED FOR ADDITIONAL TESTS.
4. NO BOULDERS OR LOOSE ROCKS PERMITTED IN THE BACKFILL FROM BOTTOM OF PIPE TRENCH TO 2'-0" ABOVE PIPE.
5. ALL DESIGNS – BASED ON FULLY COMPACTED BACKFILL AND UNIFORMLY SUPPORTED PIPE.
7. FOR SERVICE LINE PAVEMENT CUT REPAIRS SEE DRWG. A-43 FOR WATER MAIN PAVEMENT CUT REPAIRS SEE DRWG. A-42.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

ALLOWABLE TRENCH WIDTHS 3/4"–2" SERVICE LINES & 2" AND LARGER WATER MAINS

DRN. BY: KLB | REV: 2/98

MAXIMUM
PERMISSIBLE DEFLECTIONS

SIZE (NOM)	PUSH-ON JOINT (18 FT. JOINTS)		MECHANICAL JOINT (18 FT. JOINTS)	
	DEGREE	MAX. OFFSET	DEGREE	MAX. OFFSET
3"	4.0	15"	4.5	17"
4"	4.0	15"	4.5	17"
6"	4.0	15"	4.5	17"
8"	4.0	15"	4.5	17"
10"	4.0	15"	4.5	17"
12"	4.0	15"	4.5	17"
14"	2.5	9.4"	3.0	11"
16"	2.0	7.5"	3.0	11"
20"	2.0	7.5"	2.0	7.5"
24"	2.0	7.5"	2.0	7.5"
30"	1.5	5.5"	2.0	7.5"
36"	1.5	5.5"	2.0	7.5"
42"	1.5	5.5"	1.5	5.5"
48"	1.5	5.5"	1.5	5.5"

NOTES

1. WHEN A PIPE IS DEFLECTED, THE PIPE SHALL FIRST BE ASSEMBLED IN A STRAIGHT LINE, BOTH HORIZONTALLY AND VERTICALLY BEFORE THE DEFLECTION IS MADE.
2. FOR MECHANICAL JOINT PIPE, THE BOLTS SHALL BE PARTIALLY TIGHTENED BEFORE THE LENGTH OF PIPE IS DEFLECTED. ANY SUPPORTED PIPE, SHALL BE SO SUPPORTED THAT THERE IS ZERO DEFLECTION EXCEPT WHERE EITHER A HORIZONTAL OR VERTICAL CURVE ON A BRIDGE OR OTHER STRUCTURE IS INVOLVED.
3. THRUST RESTRAINTS MAY BE REQUIRED ON THE DEFLECTED JOINTS.

GWINNETT CO. DEPARTMENT
OF PUBLIC UTILITIES

MAXIMUM PERMISSIBLE
JOINT DEFLECTIONS

DRN BY: KLB

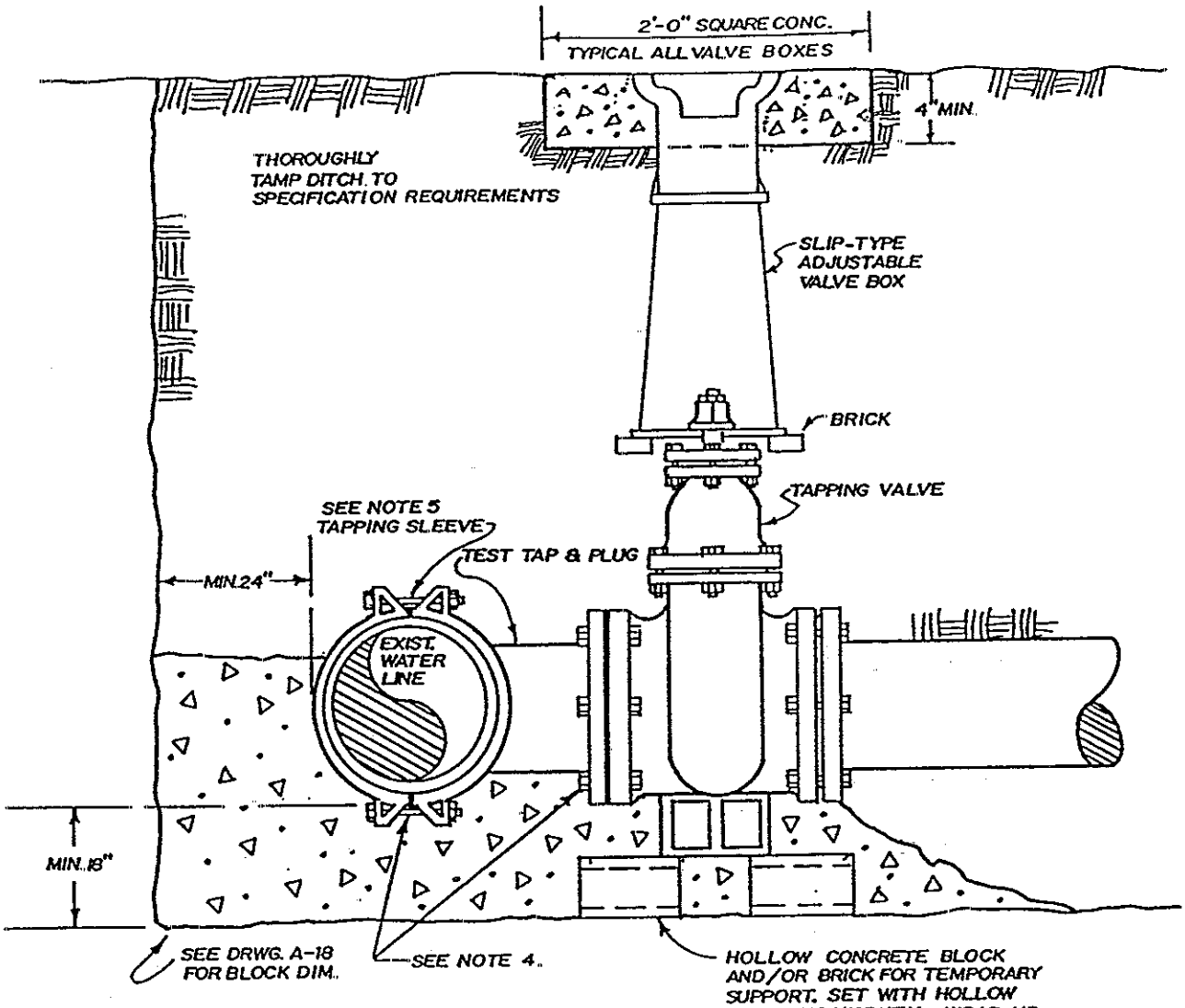
NOM. PIPE DIA.	BELL DEPTH	BOLTS				JOINT ACCESSORY WEIGHT-lbs.
		DIAMETER	LENGTH	NUMBER PER JOINT	REC. TORQUE Ft. - Lbs.	
4	2 1/2"	3/4"	3 1/2"	4	75-90	10
6	2 1/2"	3/4"	3 1/2"	6	75-90	16
8	2 1/2"	3/4"	4"	6	75-90	25
10	2 1/2"	3/4"	4"	8	75-90	30
12	2 1/2"	3/4"	4"	8	75-90	40
14	3 1/2"	3/4"	4 1/2"	10	75-90	45
16	3 1/2"	3/4"	4 1/2"	12	75-90	55
18	3 1/2"	3/4"	4 1/2"	12	75-90	65
20	3 1/2"	3/4"	4 1/2"	14	75-90	85
24	3 1/2"	3/4"	5"	16	75-90	105
30	4"	1"	6"	20	100-120	220
36	4"	1"	6"	24	100-120	285
42	4"	1 1/4"	6"	28	120-150	400
48	4"	1 1/4"	6"	32	120-150	475

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

MECHANICAL JOINT BOLT USAGE CHART

DRN BY: KLB | REV. 2/98

A-8



NOTES

1. TEMPORARILY SUPPORT TAPPING SADDLE AND VALVE AND APPLY STANDARD HYDROSTATIC TEST.
2. IF NO LEAKS, POUR INDICATED PERMANENT CONCRETE BLOCK AND SUPPORT PAD.
3. MAKE TAP, LINE EXTENSION AND BACKFILL.
4. COVER GLANDS AND BOLTS WITH HEAVY POLYETHELENE SHEETING TO KEEP CONCRETE FROM BONDING. TYPICAL WHENEVER BOLTS OR GLANDS MAY BE "WRAPPED-UP" IN CONCRETE.
5. COAT TAPPING SLEEVE AND BOLTS WITH AN APPROVED BITUMASTIC COATING BEFORE POURING CONCRETE. TYPICAL FOR ALL STEEL INCLUDING RODS, COUPLINGS, STRAPS AND OTHER BURIED STEEL. SEE NOTE 5, DRWG A-30 FOR COATING.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

TAPPING SLEEVE AND VALVE INSTALLATION DETAILS

DRN BY: KLB | REV: 2/98

MINIMUM TAPPING SLEEVE LENGTH

MAIN & TAP (IN. NOMINAL)	LENGTH (ALONG RUN)
6 x 6, 6 x 3, 6 x 4, 6 x 2	18"
8 x 2, 8 x 3, 8 x 4, 8 x 6	19"
8 x 8	21"
10 x 2, 10 x 3, 10 x 4, 10 x 6	19"
10 x 8, 10 x 10	23"
12 x 2, 12 x 3, 12 x 5, 12 x 6	19"
12 x 8	21"
12 x 10, 12 x 12	25"

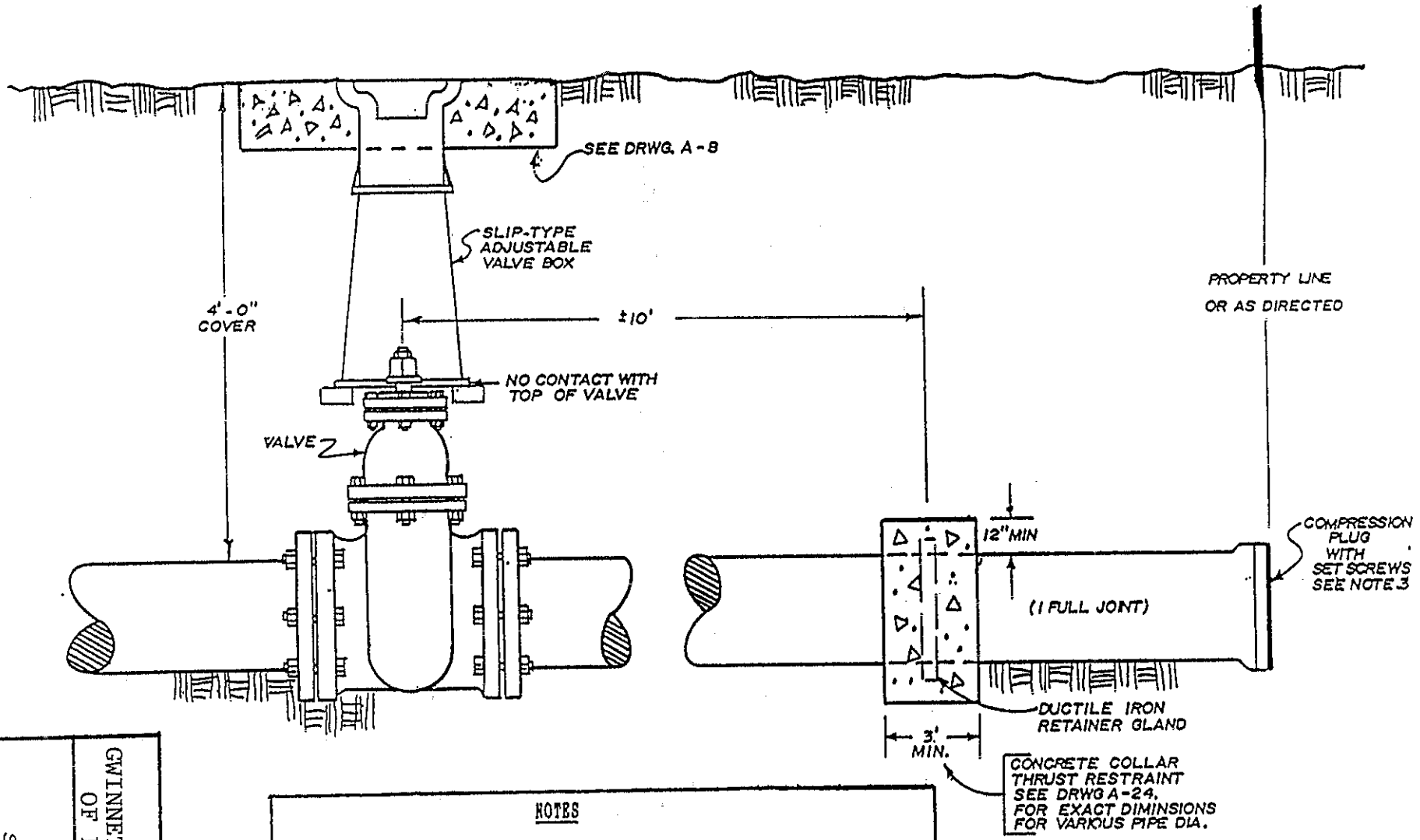
NOTES

1. ALL TAPPING SLEEVES AND VALVES SHALL BE HYDRO-STATICALLY TESTED BEFORE TAP IS MADE. SEE DRWG. A-8 FOR TYPICAL INSTALLATION AND NOTES.
2. WORKMEN INSTALLING TAPPING SLEEVE AND VALVE SHALL FOLLOW MANUFACTURER'S INSTALLATION PROCEDURES AND THE REQUIREMENTS OF THE G.C.W.S.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

TAPPING SLEEVE LENGTH

DRN. BY: KLB | REV. 2/98



NOTES

STUB OUT MUST BE HYDROSTATICALLY TESTED WITH REST OF WATER MAIN.

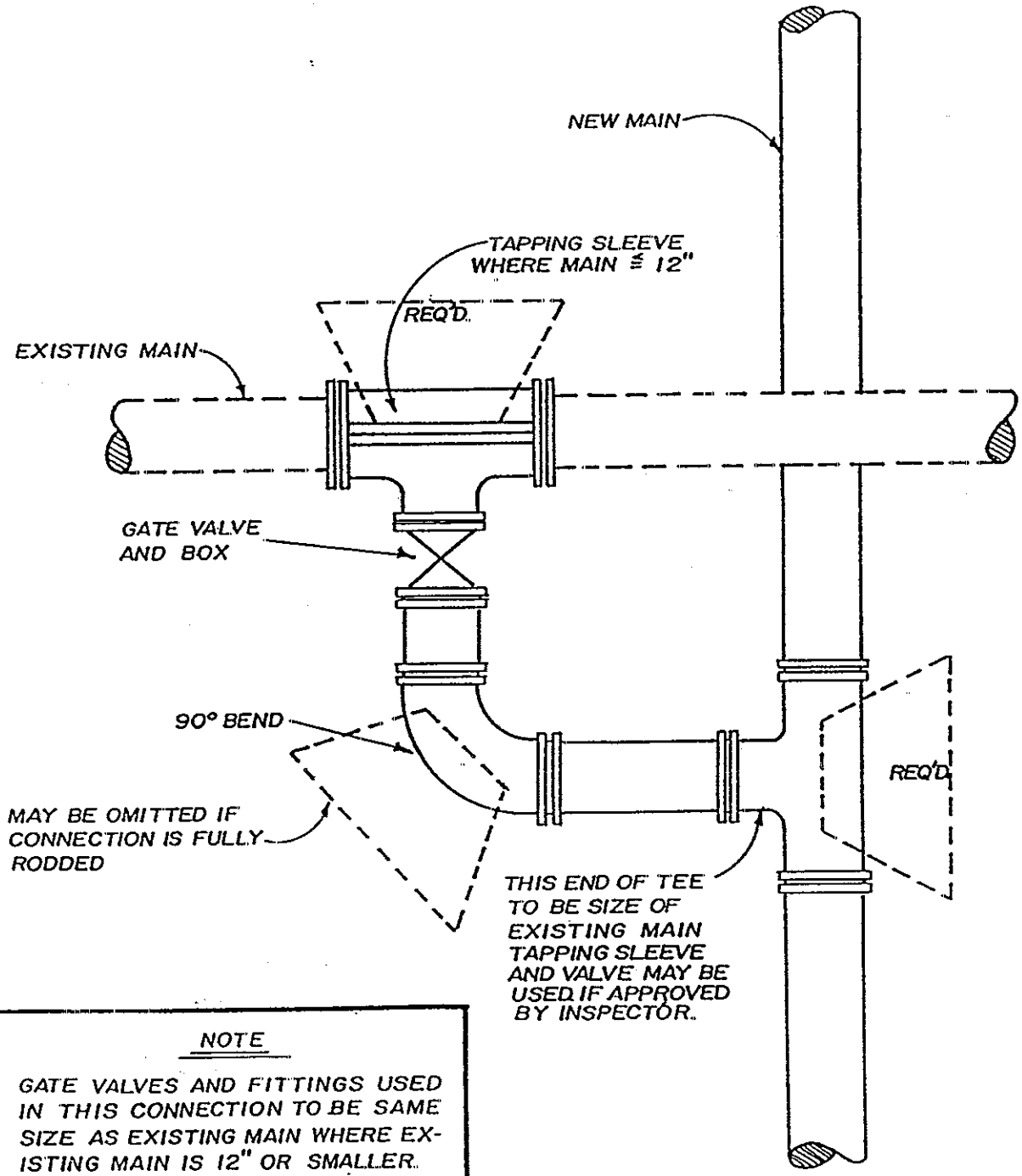
IN LIEU OF SLIP-JOINT AND COMPRESSION PLUG, AN M.J. JOINT MAY BE USED WITH AN M.J. PLUG.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

STUB OUT DETAIL

DRN BY: KLB | REV: 2/98

A - 11



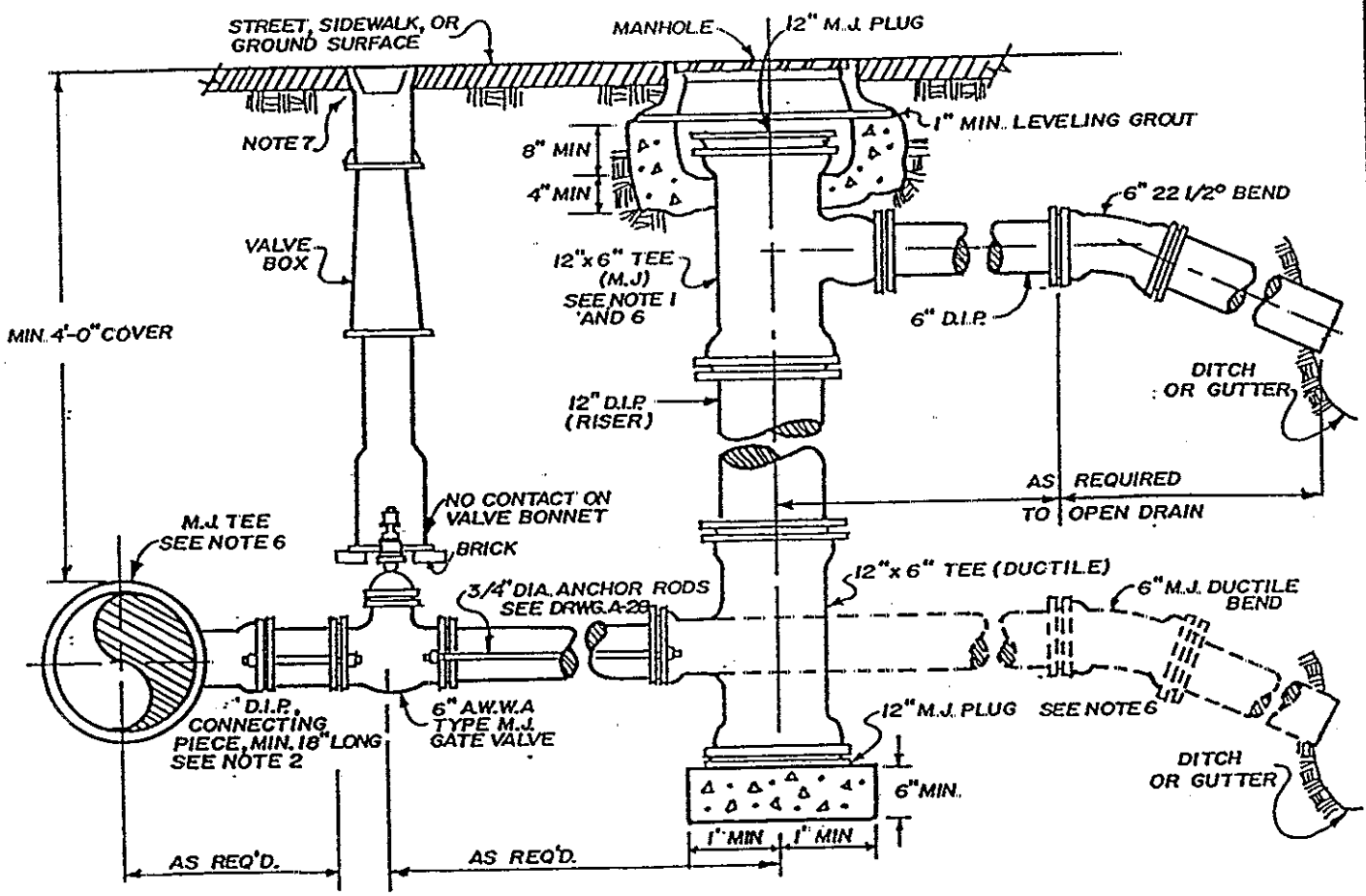
NOTE

GATE VALVES AND FITTINGS USED IN THIS CONNECTION TO BE SAME SIZE AS EXISTING MAIN WHERE EXISTING MAIN IS 12" OR SMALLER.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

ROUND CONNECTION DETAIL

DRN BY: KLB | REV. 2/98



NOTES

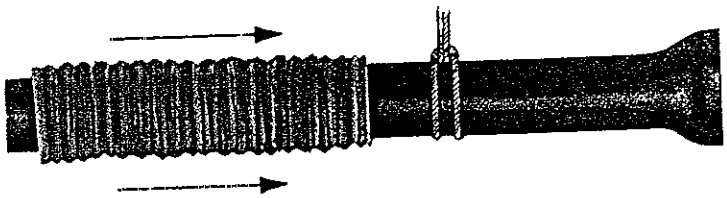
1. IF 6" DRAIN CANNOT BE PROVIDED, A MIN. OF 10-1" DIA. HOLES ARE TO BE DRILLED IN THE M.J. PLUG AT THE TOP OF RISER. (TOP TEE DELETED AND RISER PIPE EXTENDED AS REQ'D., TERMINATING WITH BELL END)
2. FOR MAIN SIZE 6"—16" Ø, USE 6" BLOW-OFF PIPING & VALVE. FOR MAIN SIZE 20"-48" Ø, USE 8" BLOW-OFF PIPING & VALVE.
3. ALL CAST IRON FITTINGS, EXCLUSIVE OF VALVES AND VALVE BOXES, SHALL BE D.I.P.
4. RODS TO BE HIGH TENSILE, HOT ROLLED STEEL WITH TENSILE STRENGTH OF 150,000 P.S.I. AND MIN. YIELD STRENGTH OF 130,000 P.S.I.
5. BLOW-OFF OUTLETS MAY NOT BE SUBMERGED IN ANY STREAM OR GUTTER, NOR DISCHARGE DIRECTLY INTO ANY SEWER.
6. RUN DIA. AS REQ'D. FOR 8"—36" DIA. D.I.P. MAIN WITH 6" BELL BRANCH. FOR 48" MAIN, USE 48" x 6" M.J. TEE DUCTILE IRON.
7. IF NO PAVEMENT OR SIDEWALK, POUR 2'-0" CONCRETE COLLAR AROUND TOP OF VALVE BOX. SEE DRWG. A-8.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

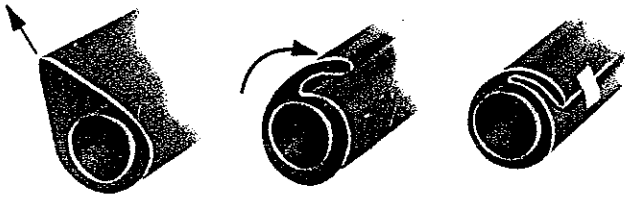
BLOW-OFF DETAIL
6" AND LARGER

DRN. BY: KLB

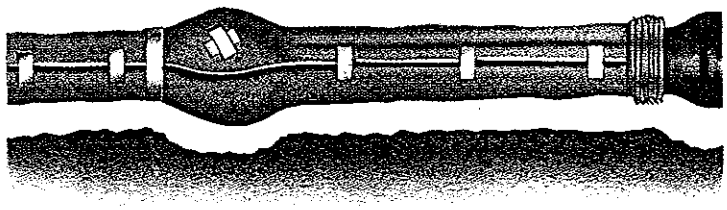
REV: 2/98



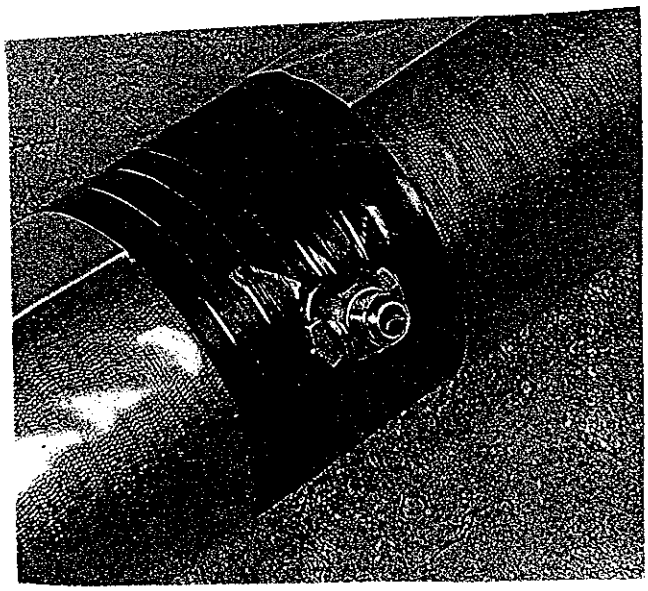
Cut a section of polyethylene tube approximately 2 feet longer than the pipe section. Slip the tube around the pipe, starting at the spigot end. Bunch the tube accordian-fashion on the end of the pipe.



Take up the slack in the tube along the barrel of the pipe to make a snug, but tight, fit. Fold excess polyethylene back over the top of the pipe.



Secure the fold at several locations along the pipe barrel (approximately every 3 feet).

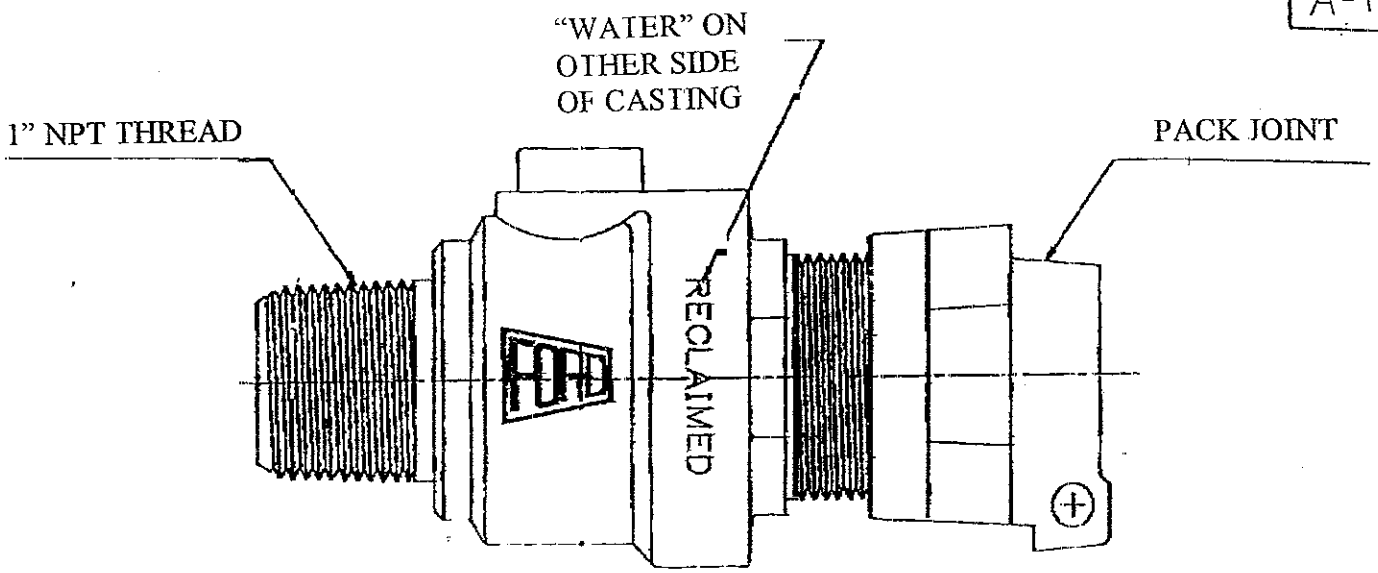


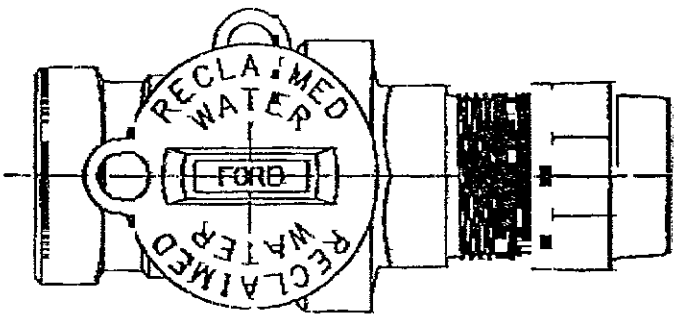
All fittings and taps are to be wraped and taped in a matter to protect and alert any one exposing the pipe/fitting.

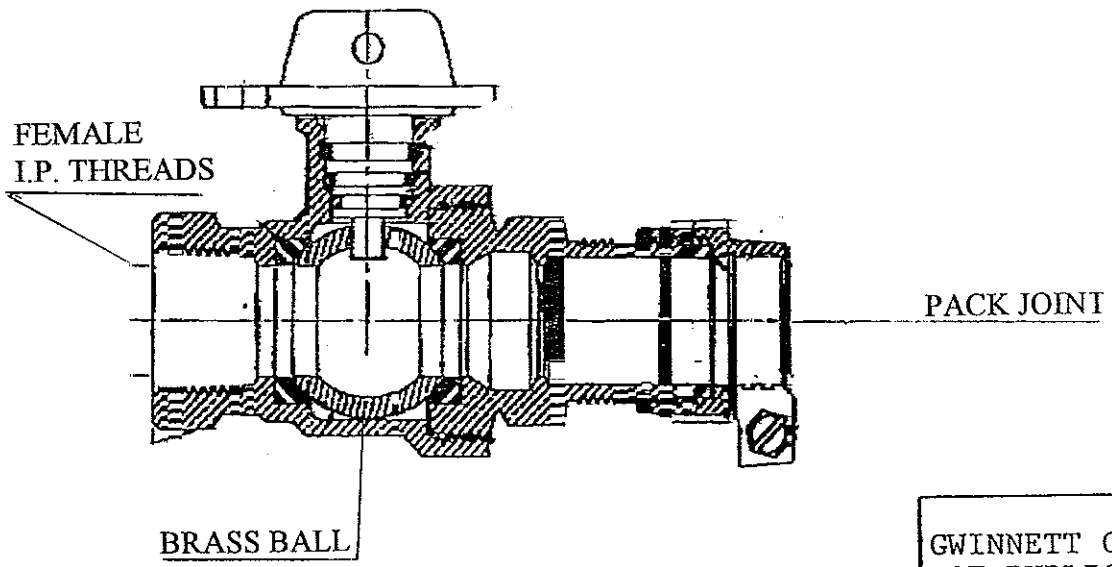
ANSI/AWWA C105/A21.5 Polyethylene Encasement for Ductile Iron Pipe Systems

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES	
POLYETHYLENE WRAP FOR FOR NON POTABLE REUSE LINE	
DRN. BY: RAB	REV: 10/98

A-14





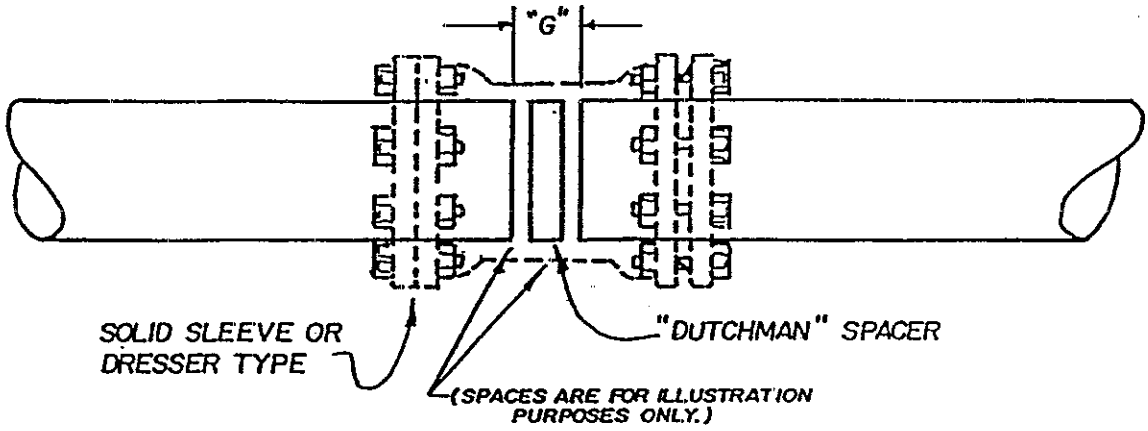


ALL BRASS
AWWA C800
ASTM B62

GWINNETT CO. DEPARTMENT
OF PUBLIC UTILITIES

BRASS FITTINGS FOR METER
INSTALLATION ON NPRL

DRN. BY: RAB | REV: 10/98



NOTES

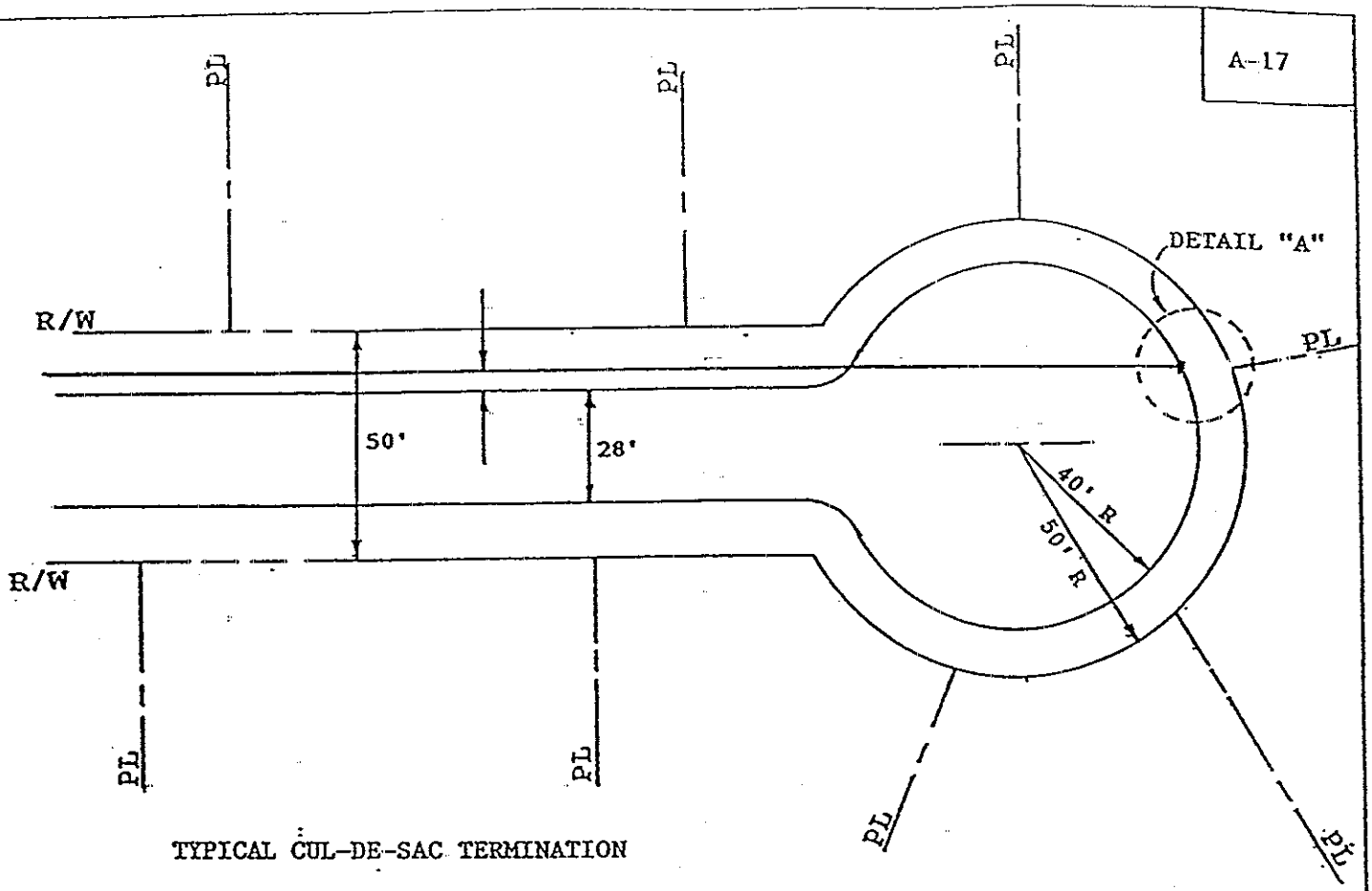
1. IF "G" IS GREATER THAN 1/2", AT ITS NARROWEST POINT, THEN A FULL-CIRCLE SPACER OR "DUTCHMAN" MUST BE CUT AND PLACED IN THE GAP BEFORE THE SLEEVE IS USED TO CLOSE THE JOINT.
2. THE "DUTCHMAN" SPACER SHALL BE CUT TO A WIDTH NO LESS THAN 1/4" LESS THAN THE NARROWEST WIDTH OF "G".
3. EACH PIPE SPIGOT SHALL BE MARKED TO INDICATE THE POINT WHERE THE SLEEVE WILL BE PROPERLY CENTERED OVER THE POINT.
4. "FULL-CIRCLE" REPAIR CLAMPS ARE NOT APPROVED FOR JOINING PIPE. SUCH CLAMPS ARE SPECIFICALLY DESIGNED FOR REPAIRS ONLY.
5. IF "STEEL" SLEEVE IS USED, PROPERLY COAT BEFORE BACKFILLING. SEE NOTE 5, DRWG. A-30 FOR COATING.

GWINNETT CO. DEPARTMENT
OF PUBLIC UTILITIES

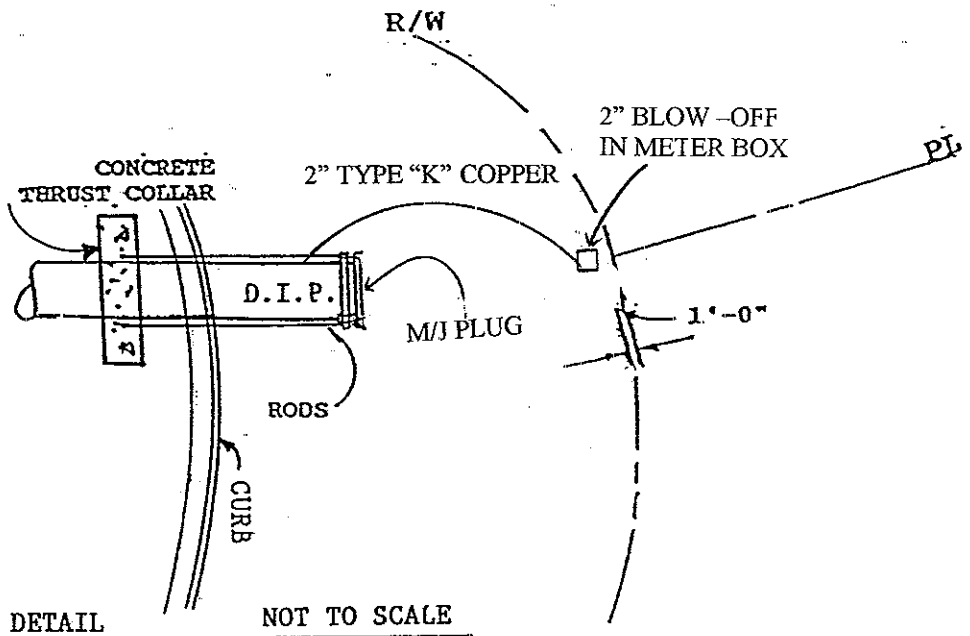
PIPE JOINING: USE
OF SOLID SLEEVE

DRN. BY: KLB | REV: 2/98

A-17



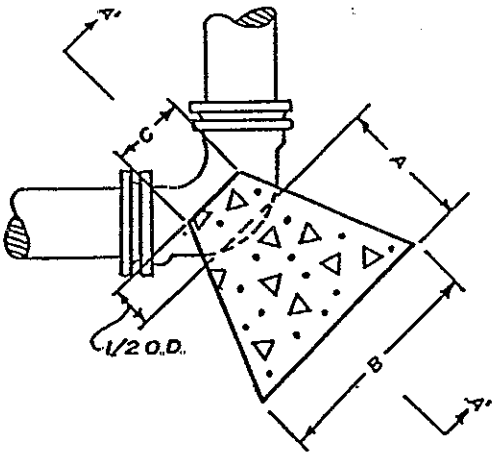
TYPICAL CUL-DE-SAC TERMINATION

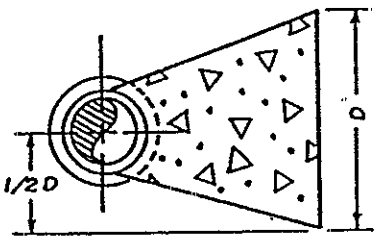


DETAIL "A"

NOT TO SCALE

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES	
END-OF-LINE TERMINATION IN CUL-DE-SAC	
DRN. BY: RAB	REV: 10/98





SECTION A'

MINIMUM DIMENSIONS IN FEET FOR CONCRETE BLOCKING

BEND	SIZE	A (FT.)	B (FT.)	C (IN.)	D (FT.)	VOLUME (CU. YDS) APPROX.	THRUST LBS.
11 1/4°	6"	1.0	2.0	6	1.0	0.04	1,385
	8"	1.0	2.0	7	1.0	0.05	2,465
	10"	1.0	2.0	9	1.0	0.07	3,850
	12"	1.0	2.5	11	1.5	0.12	5,550
	14"	2.0	2.5	11	2.0	0.24	7,550
	16"	2.0	2.5	12	2.0	0.26	9,860
	20"	2.0	3.5	15	2.5	0.48	15,405
	24"	2.0	4.0	18	3.0	0.70	22,185
22 1/2°	6"	1.0	2.0	6	1.0	0.04	2,760
	8"	1.0	2.0	7	1.5	0.06	4,905
	10"	1.0	2.0	9	2.0	0.10	7,665
	12"	1.0	3.0	11	2.0	0.16	11,040
	14"	2.0	3.5	11	2.5	0.37	15,025
	16"	2.0	3.5	12	3.0	0.45	19,625
	20"	2.0	4.0	15	4.0	0.74	30,665
	24"	3.0	5.0	18	4.5	1.47	44,160
45°	6"	1.0	2.0	6	1.5	0.06	5,415
	8"	1.0	2.5	7	2.0	0.10	9,625
	10"	2.0	3.5	9	2.5	0.31	15,040
	12"	2.0	3.5	11	3.0	0.41	21,655
	14"	2.0	4.0	11	3.75	0.56	29,475
	16"	3.0	5.0	12	4.0	1.45	38,495
	20"	4.0	6.0	15	5.0	2.06	60,145
	24"	4.0	7.5	18	6.5	3.35	91,610
90°	6"	1.0	2.5	12	2.0	0.13	10,005
	8"	2.0	3.0	14	3.0	0.38	17,785
	10"	2.5	4.5	18	3.0	0.74	27,785
	12"	3.0	5.0	20	4.0	1.24	40,010
	14"	3.0	5.5	24	5.0	1.77	54,460
	16"	4.0	6.5	26	5.5	2.91	71,125
	20"	4.0	8.0	32	7.0	4.68	111,135
	24"	5.0	10.0	40	8.0	8.50	160,035
TEES AND PLUGS	6"	1.0	2.5	12	1.5	0.10	7,070
	8"	1.7	3.25	14	2.0	0.27	12,565
	1.0"	2.0	4.0	18	2.5	0.50	19,635
	12"	2.5	4.5	20	3.25	0.91	28,275
	14"	3.0	5.0	24	4.0	1.41	38,485
	16"	3.0	5.0	26	5.0	1.77	50,265
	20"	4.0	7.0	32	5.75	3.69	78,540
	24"	6.0	9.0	40	6.5	7.94	113,100

NOTES

1. SOIL CONDITIONS SHALL BE VERIFIED BY THE ENGINEER BEFORE THRUST BLOCK DESIGN IS IMPLEMENTED.

DESIGN DATA

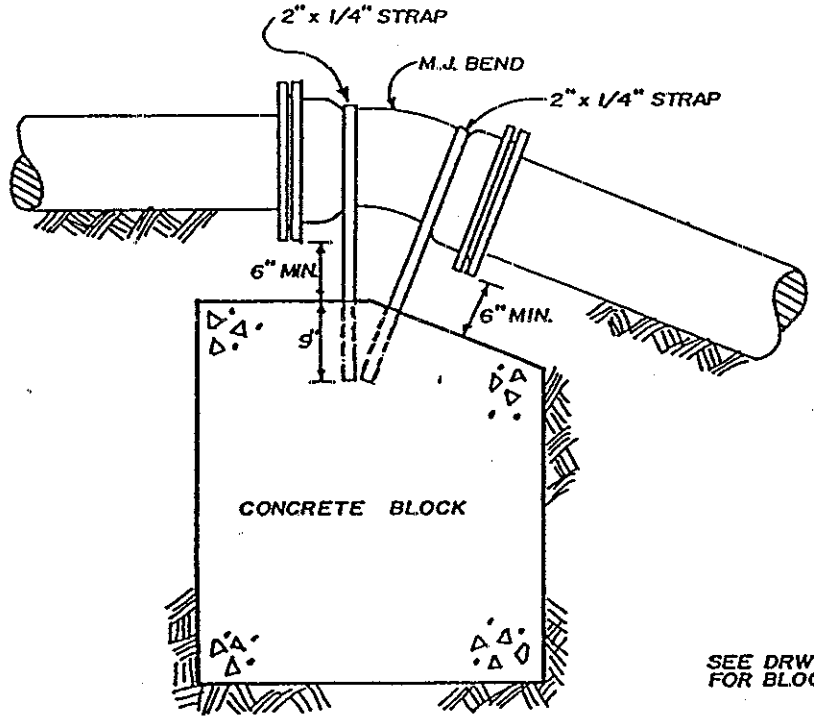
1. DIMENSION OF THRUST BLOCK IN FEET BASED ON 2000 POUNDS PER SQUARE FOOT SOIL BEARING PRESSURE. ACTUAL INSIDE DIA. OF D.I.P., CLASS 51, 250 P.S.I. TEST PRESSURE.
2. CONCRETE SHALL BE CLASS A, 3000 P.S.I.
3. UNDER ADVERSE CONSTRUCTION CONDITIONS, CONCRETE SHALL BE "HIGH EARLY" TYPE.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

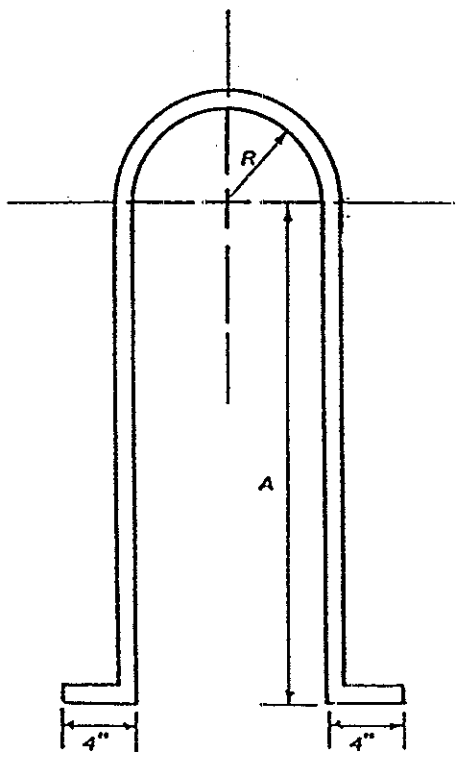
THRUST RESTRAINT HORIZONTAL BLOCK

DRN. BY: KLB

REV. 2/98



SEE DRWG.A-21.
FOR BLOCK DIMINSIONS.



2"x 1/4" STEEL STRAP

SIZE	A	R	LENGTH OF STRAP
6"	1'-11 1/2"	3 1/2"	5'-4 1/2"
8"	1'-11 7/8"	4 21/32"	5'-10 1/4"
10"	2'-1"	5 45/64"	6'-4"
12"	2'-2"	6 3/4"	6'-9 3/4"
14"	2'-3 3/8"	7 21/16"	7'-3"
16"	2'-4 3/4"	8 3/4"	7'-8 1/2"
20"	2'-6"	10 3/4"	8'-8"
24"	2'-9 1/2"	12 7/8	9'-7 1/2"

GWINNETT CO. DEPARTMENT
OF PUBLIC UTILITIES

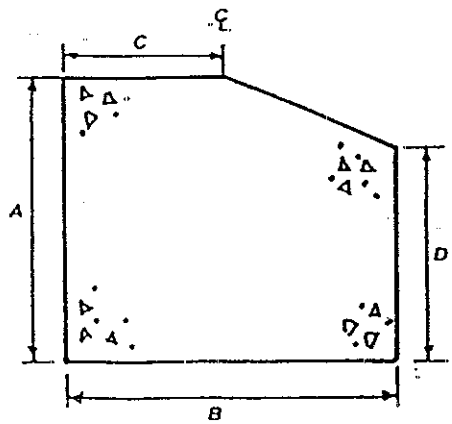
THRUST RESTRAINT

UPWARD THRUST

DRN. BY: KLB

REV: 2/98

BEND	SIZE	A	B	C	D	WIDTH	CU. YDS.
11 1/4°	6"	2'-0"	2'-0"	1'-0"	1'-10"	2'-0"	0.29
	8"	2'-4"	3'-0"	1'-6"	2'-1"	2'-0"	0.51
	10"	2'-9"	2'-9"	1'-4.5"	2'-6"	2'-9"	0.78
	12"	3'-0"	3'-4"	1'-6"	2'-8"	3'-0"	1.11
	14"	3'-0"	4'-0"	1'-8"	2'-8"	3'-4"	1.48
	16"	4'-0"	4'-0"	1'-8"	3'-8"	3'-4"	2.22
	20"	4'-1"	5'-0"	2'-0"	3'-9"	4'-2"	3.69
	24"	5'-1"	5'-0"	2'-4"	4'-8"	4'-9"	4.22
	30"	5'-3"	6'-0"	3'-0"	4'-8"	6'-0"	7.0
	36"	6'-1"	7'-0"	3'-2"	5'-6"	6'-4"	10.3
22 1/2°	6"	2'-10"	2'-6"	1'-3"	2'-4"	2'-6"	0.56
	8"	3'-4"	3'-0"	1'-6"	2'-9"	3'-0"	1.01
	10"	3'-11"	4'-0"	2'-0"	3'-1"	3'-0"	1.54
	12"	4'-2"	4'-0"	2'-0"	3'-5"	4'-0"	2.19
	14"	4'-4"	5'-0"	2'-6"	3'-4"	4'-0"	2.98
	16"	4'-6"	5'-0"	2'-6"	3'-6"	5'-0"	3.88
	20"	5'-4"	5'-6"	2'-9"	4'-2"	6'-0"	6.07
	24"	6'-4"	6'-7"	3'-4"	5'-1"	6'-0"	8.75
	30"	7'-4"	7'-6"	3'-9"	5'-10"	7'-0"	13.64
	36"	8'-4"	8'-5"	4'-2"	6'-8"	8'-0"	19.87
45°	6"	3'-6"	3'-0"	1'-6"	1'-9"	3'-3"	1.08
	8"	3'-9"	4'-0"	2'-0"	1'-10"	4'-0"	1.19
	10"	4'-6"	4'-0"	2'-0"	2'-3"	5'-0"	2.92
	12"	4'-6"	4'-2"	2'-1"	2'-3"	5'-0"	3.06
	14"	5'-6"	5'-3"	2'-7"	2'-9"	6'-0"	5.83
	16"	6'-1"	6'-0"	3'-0"	3'-0"	6'-0"	7.41
	20"	7'-1"	7'-0"	3'-6"	3'-6"	7'-0"	11.88
	24"	7'-9"	8'-0"	4'-0"	3'-10"	8'-0"	17.29
	30"	9'-6"	9'-0"	4'-5"	4'-9"	9'-0"	26.7
	36"	10'-5"	10'-5"	5'-2"	5'-3"	10'-0"	38.48



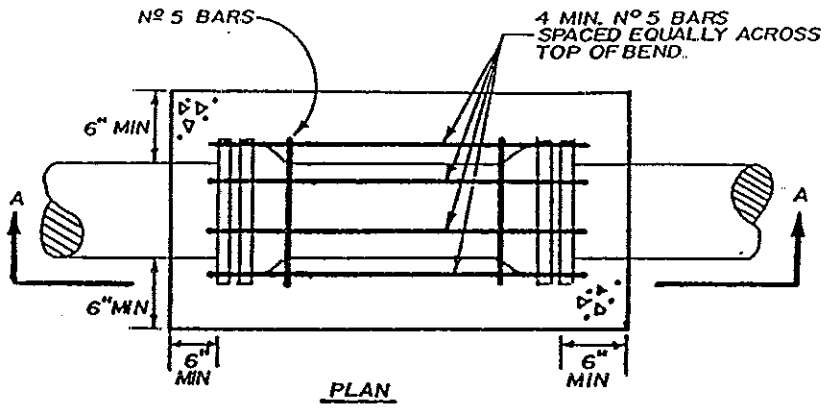
SEE DRWG. A-20
FOR DETAILS OF STRAPS
USED WITH THIS BLOCK.

GWINNETT CO. DEPARTMENT
OF PUBLIC UTILITIES

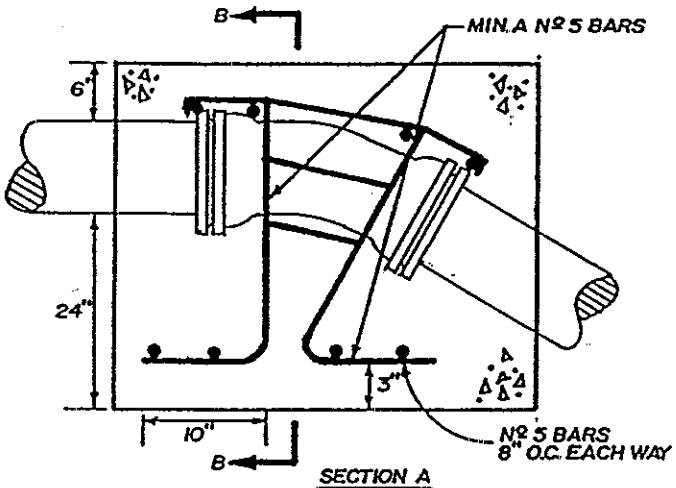
THRUST RESTRAINT:
UPWARD THRUST

DRN. BY. KLB

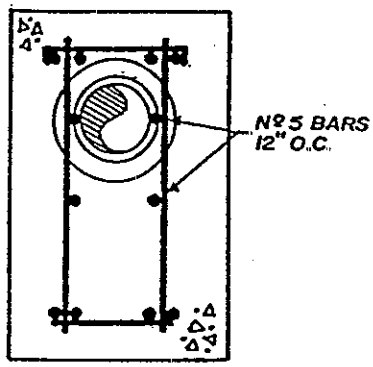
REV: 2/98



PLAN



SECTION A



SECTION B

CONCRETE REQ'D. TO RESIST UPWARD THRUST

BEND	SIZE	VOLUME CU.YDS	A VERT.BARS	BEND	SIZE	VOLUME CU. YDS.	A VERT.BARS
11 1/4°	6"	0.3	2	45°	6"	1.1	2
	8"	0.5	2		8"	1.9	2
	10"	0.8	2		10"	3.0	2
	12"	1.1	2		12"	4.3	2
	14"	1.5	4		14"	5.8	4
	16"	1.9	4		16"	7.6	4
	20"	3.0	4		20"	11.9	4
	24"	4.4	4		24"	17.1	4
22 1/2°	6"	0.5	2	90°	6"	2.0	2
	8"	1.0	2		8"	3.5	2
	10"	1.5	2		10"	5.5	2
	12"	2.2	2		12"	7.9	4
	14"	3.0	4		14"	10.8	4
	16"	3.9	4		16"	14.0	4
	20"	6.1	4		20"	21.9	4
	24"	8.7	4		24"	31.6	4

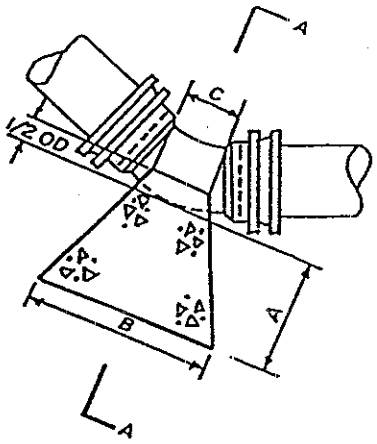
DESIGN DATA

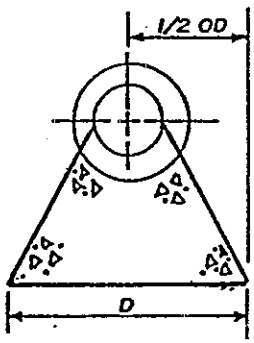
1. DESIGN OF THRUST BLOCK IN FEET BASED ON 2000 POUNDS PER SQUARE FOOT SOIL BEARING PRESSURE AND 290 P.S.I. TEST PRESSURE. ACTUAL INSIDE DIA. OF D.I.P., CLASS 51 AS STD.
2. CONCRETE SHALL BE CLASS A, 3000 P.S.I., UNDER ADVERSE CONS'T CONDITIONS, CONCRETE SHALL BE HIGH EARLY.
3. ENGINEER SHALL VERIFY SOIL CONDITIONS BEFORE THRUST BLOCK DESIGN IS IMPLEMENTED.
4. USE OF THIS TYPE OF BLOCKING REQUIRES SPECIFIC APPROVAL OF THE INSPECTOR.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT: UPWARD THRUST (ENCASED)

DRN. BY: KLB | REV: 2/98





NOTE

ENGINEER SHALL VERIFY SOIL CONDITIONS BEFORE THRUST BLOCK DESIGN IS IMPLEMENTED.

MINIMUM DIMINSIONS FOR CONCRETE BLOCKING

BEND	SIZE	A (FT)	B (FT)	C (IN)	D (FT)	VOLUME (CU. YDS)
11 1/4°	6"	1.0	2.0	6	1.0	.05
	8"	1.0	2.0	7	1.0	.05
	10"	1.0	2.0	9	1.0	.05
	12"	1.0	2.0	11	1.0	.05
	14"	2.0	2.0	11	1.5	.16
	16"	2.0	2.0	12	2.0	.22
	20"	2.0	3.0	15	2.0	.32
	24"	2.0	3.0	18	3.0	.50
22 1/2°	6"	1.0	2.0	6	1.0	.05
	8"	1.0	2.0	6	1.0	.05
	10"	1.0	2.0	9	1.6	.08
	12"	1.0	2.0	11	2.0	.11
	14"	2.0	3.0	11	2.0	.29
	16"	2.0	4.0	12	2.0	.37
	20"	2.0	4.0	15	3.0	.58
	24"	3.0	4.5	18	4.0	1.33
45°	6"	1.0	2.0	6	1.0	.05
	8"	1.0	2.0	6	1.0	.05
	10"	2.0	3.0	9	2.0	.28
	12"	2.0	3.0	11	3.0	.44
	14"	2.0	4.0	11	3.0	.55
	16"	3.0	5.0	12	3.0	1.00
	20"	4.0	6.0	15	4.0	2.15
	24"	4.0	7.0	18	5.0	3.15
90°	6"	1.0	2.0	12	2.0	.11
	8"	2.0	3.0	13	2.4	.37
	10"	2.6	3.7	18	3.0	.72
	12"	2.0	4.0	20	4.0	.84
	14"	3.0	5.0	24	4.4	1.71
	16"	4.0	6.0	26	4.7	2.84
	20"	4.0	7.0	32	6.8	4.51
	24"	5.0	8.0	40	8.0	5.40
TEES AND PLUGS	6"	1.0	2.0	12	1.5	.08
	8"	1.7	2.5	14	2.0	.23
	10"	2.0	4.0	18	2.0	.23
	12"	2.5	3.7	20	3.0	.75
	14"	3.0	5.0	24	3.0	1.17
	16"	3.0	5.0	26	4.0	1.59
	20"	4.0	6.0	32	5.0	3.21
	24"	6.0	9.0	40	5.0	6.85

DESIGN DATA

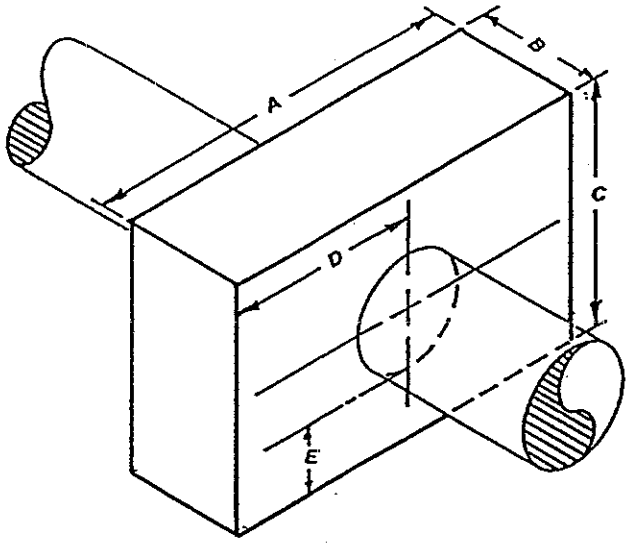
1. DIMINSION OF THRUST BLOCK IN FEET BASED ON 2000 POUNDS PER SQUARE FOOT SOIL BEARING PRESSURE AND 200 P.S.I. TEST PRESSURE. ACTUAL INSIDE DIA. OF D.I.P., CLASS 51 USED AS STANDARD.
2. CONCRETE SHALL BE CLASS A, 3000 P.S.I.. UNDER ADVERSE CONSTRUCTION CONDITIONS, CONCRETE SHALL BE HIGH EARLY.

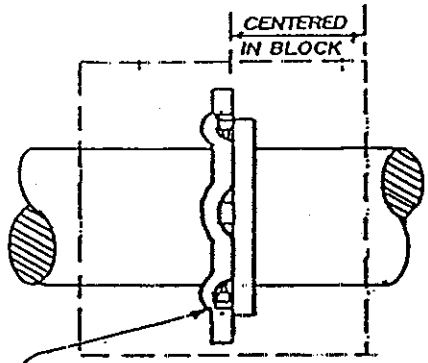
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT: DOWNWARD THRUST

DRN. BY: KLB | REV: 2/98

A-24





TORQUE SET SCREWS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. INSPECTOR MUST WITNESS INSTALLATION.

MINIMUM DIMENSIONS IN FEET FOR CONCRETE COLLAR

ON DUCTILE IRON PIPE TO BE USED WITH EMBEDED DUCTILE IRON RETAINER GLAND

PIPE SIZE	A	B	C	D	E	VOLUME CU. YDS.	CONC. WT.	THRUST
4"	3'-6"	3'-0"	1'-5"	1'-6"	1'-0"	0.55	2230	3150
6"	4'-0"	3'-0"	2'-7"	2'-0"	1'-0"	1.15	4650	7070
8"	4'-6"	3'-0"	3'-0"	2'-3"	1'-3"	1.50	6075	12,570
10"	5'-2"	3'-0"	3'-2"	2'-7"	1'-3"	1.81	7330	19,635
12"	5'-9"	3'-0"	3'-8"	2'-10½"	1'-8"	2.34	9475	28,775
14"	6'-6"	3'-0"	4'-0"	3'-3"	1'-9"	2.89	11,700	38,490
16"	6'-9"	3'-0"	4'-9"	3'-3"	2'-3"	3.56	14,410	50,270

NOTES:

1. ALL WATER MAINS GREATER THAN 13" I.D. SHALL BE INDIVIDUALLY CALCULATED BY G.C.W.S. ENGINEERING DEPARTMENT.
2. SOIL CONDITIONS SHALL BE VERIFIED BY THE ENGINEER BEFORE THRUST RESTRAINT DESIGN IS IMPLEMENTED.
3. PIPE MUST BE DUCTILE IRON.

DESIGN DATA:

1. DIMENSION OF THRUST RESTRAINT IN FEET BASED ON 2000 POUNDS PER SQUARE FOOT SOIL BEARING PRESSURE AND 250 PER SQUARE INCH TEST PRESSURE. ACTUAL INSIDE DIAMETER OF DUCTILE IRON PIPE, CLASS 51, USED AS STANDARD.
2. CONCRETE SHALL BE CLASS A, 3000 P.S.I.
3. UNDER ADVERSE CONSTRUCTION CONDITIONS, CONCRETE SHALL BE "HIGH EARLY" TYPE.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT CONCRETE COLLAR

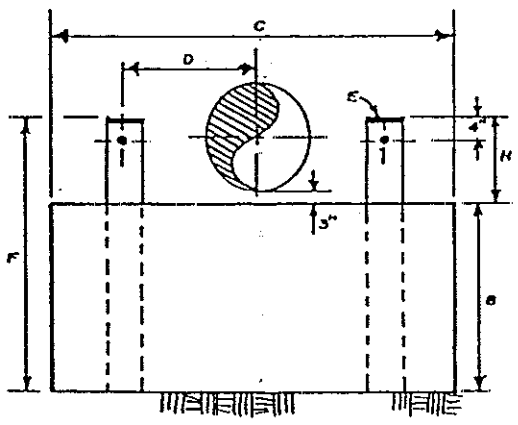
DRN BY: KLB

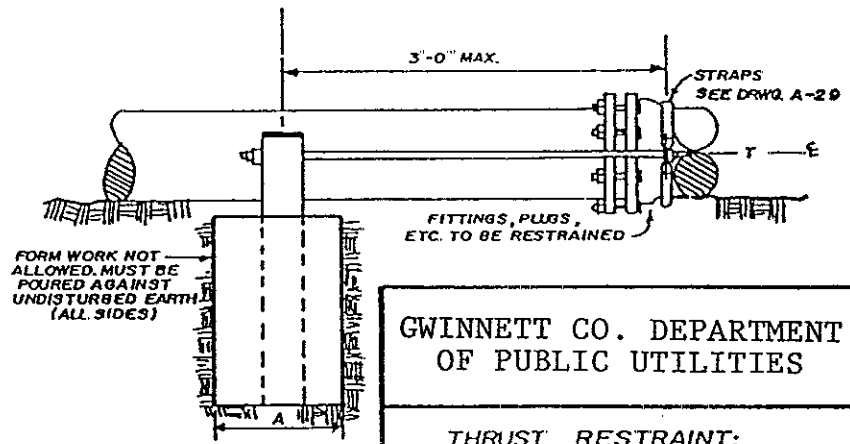
REV. 2/98

BEND	SIZE	A	B	C	D	VOL. YDS³	H	T	ROD DIA.	E (IN)	F
TEES, PLUGS AND VALVES	6"	2'-0"	3'-0"	3'-0"	1'-0"	0.67	0'-10"	5700	3/4"	6x6x3/8	3'-10"
	8"	3'-0"	3'-0"	5'-0"	1'-1"	1.67	0'-11"	10,000	3/4"	6x6x3/8	3'-11"
	10"	4'-0"	3'-0"	6'-0"	1'-2"	2.67	1'-0"	16,000	3/4"	6x6x3/8	4'-0"
	12"	3'-0"	4'-0"	6'-0"	1'-3"	4.44	1'-1"	22,650	3/4"	10x10x1/2	3'-1"
	14"	6'-0"	4'-0"	7'-0"	1'-6"	6.22	1'-2"	31,000	3/4"	10x10x1/2	3'-2"
	16"	7'-0"	4'-0"	8'-0"	1'-8"	8.50	1'-3"	40,250	3/4"	10x10x1/2	3'-3"
	20"	9'-0"	4'-8"	9'-0"	1'-11"	13.5	1'-3"	62,850	3/4"	W12x190	3'-11"
	24"	11'-0"	4'-8"	10'-0"	2'-2"	18.33	1'-7"	90,300	3/4"	W14x136	6'-1"
	30"	14'-6"	5'-6"	10'-0"	2'-6"	26.85	1'-10"	141,375		W14x398	6'-10"
	36"	18'-0"	5'-6"	10'-0"	2'-9"	36.67	2'-1"	203,375		W14x665	7'-7"
11 1/4°	6"	2'-0"	3'-0"	3'-0"	1'-0"	0.67	0'-10"	1110	3/4"	6x6x3/8	3'-10"
	8"	2'-0"	3'-0"	5'-0"	1'-1"	0.67	0'-11"	2000	3/4"	6x6x3/8	3'-11"
	10"	2'-0"	3'-0"	3'-0"	1'-2"	0.67	1'-0"	3100	3/4"	6x6x3/8	4'-0"
	12"	2'-0"	3'-0"	3'-6"	1'-3"	0.78	1'-1"	4450	3/4"	10x10x1/2	4'-1"
	14"	2'-0"	3'-0"	3'-6"	1'-6"	0.78	1'-2"	6050	3/4"	10x10x1/2	4'-2"
	16"	3'-6	3'-0"	4'-0"	1'-8"	1.56	1'-3"	7900	3/4"	10x10x1/2	4'-3"
	20"	4'-0"	3'-0"	5'-6"	1'-11"	2.44	1'-5"	12,350	3/4"	W12x190	4'-5"
	24"	5'-0"	3'-6"	6'-0"	2'-2"	3.89	1'-7"	17,750	3/4"	W14x136	5'-1"
	30"	6'-0"	4'-0"	8'-0"	2'-6"	7.11	1'-10"	27,750	1"	W14x398	5'-10"
	36"	7'-6"	4'-0"	9'-0"	2'-9"	10.0	2'-1"	40,000	1"	W14x665	6'-1"
22 1/2°	6"	2'-0"	3'-0"	3'-0"	1'-0"	0.67	0'-10	2250	3/4"	6x6x3/8	3'-10
	8"	2'-0"	3'-0"	3'-0"	1'-1"	0.67	0'-11"	4000	3/4"	6x6x3/8	3'-11"
	10"	2'-0"	3'-0"	3'-6"	1'-2"	0.78	1'-0"	6150	3/4"	6x6x3/8	4'-0"
	12"	3'-6"	3'-0"	4'-0"	1'-3"	1.56	1'-1"	8850	3/4"	10x10x1/2	4'-1"
	14"	4'-0"	3'-0"	5'-0"	1'-6"	2.22	1'-2"	12,050	3/4"	10x10x1/2	4'-2"
	16"	4'-0"	3'-6"	6'-0"	1'-8"	3.11	1'-3"	15,700	3/4"	10x10x1/2	4'-9"
	20"	5'-0"	4'-0"	7'-0"	1'-11"	5.19	1'-5"	24,350	3/4"	W12x190	5'-3"
	24"	6'-6"	4'-0"	8'-6"	2'-2"	8.19	1'-7"	35,400	3/4"	W14x136	5'-7"
	30"	9'-0"	4'-0"	9'-0"	2'-6"	12.00	1'-10"	55,200	1"	W14x398	5'-10"
	36"	11'-0"	4'-0"	10'-0"	2'-9"	16.30	2'-1"	80,000	1"	W14x665	6'-1"
45°	6"	2'-0"	3'-0"	3'-0"	1'-0"	0.67	0'-10"	4350	3/4"	6x6x3/8	3'-10"
	8"	2'-0"	3'-0"	4'-0"	1'-1"	0.89	0'-11"	7700	3/4"	6x6x3/8	3'-11"
	10"	4'-0"	3'-0"	5'-0"	1'-2"	2.22	1'-0"	12,050	3/4"	6x6x3/8	4'-0"
	12"	4'-0"	4'-0"	5'-6"	1'-5"	3.26	1'-1"	17,350	3/4"	10x10x1/2	5'-1"
	14"	5'-6"	4'-0"	6'-0"	1'-6"	4.89	1'-2"	23,600	3/4"	10x10x1/2	5'-2"
	16"	6'-0"	4'-0"	7'-6"	1'-8"	6.67	1'-3"	30,000	3/4"	10x10x1/2	5'-3"
	20"	7'-0"	4'-6"	9'-0"	1'-11"	10.50	1'-5"	48,100	3/4"	W12x190	5'-11"
	24"	9'-6"	4'-6"	9'-6"	2'-2"	16.04	1'-7"	70,000	3/4"	W14x136	6'-1"
	30"	12'-6"	4'-6"	10'-0"	2'-6"	20.83	1'-10"	108,250	1"	W14x398	6'-4"
	36"	15'-6"	5'-0"	10'-0"	2'-9"	28.70	2'-1"	155,850		W14x665	7'-1"
90°	6"	2'-6"	3'-0"	4'-0"	1'-0"	1.11	0'-10"	8000	3/4"	6x6x3/8	3'-10"
	8"	4'-0"	3'-0"	5'-6"	1'-1"	2.44	0'-11"	14,250	3/4"	6x6x3/8	3'-11"
	10"	5'-0"	3'-0"	7'-6"	1'-2"	4.17	1'-0"	22,250	3/4"	6x6x3/8	4'-0"
	12"	6'-0"	3'-0"	8'-0"	1'-3"	5.33	1'-1"	32,000	3/4"	10x10x1/2	4'-1"
	14"	7'-6"	3'-0"	9'-0"	1'-6"	7.50	1'-2"	43,650	3/4"	10x10x1/2	4'-2"
	16"	9'-0"	3'-6"	9'-0"	1'-8"	10.50	1'-3"	56,900	3/4"	10x10x1/2	4'-9"
	20"	12'-0"	3'-6"	9'-0"	1'-11"	14.00	1'-5"	88,900	3/4"	W12x190	4'-11"
	24"	14'-0"	4'-0"	10'-0"	2'-2"	20.74	1'-7"	128,000		W14x136	5'-7"
	30"	18'-0"	4'-6"	10'-0"	2'-6"	30.00	1'-10"	200,000		W14x398	6'-4"
	36"	22'-0"	5'-0"	10'-0"	2'-9"	40.74	2'-1"	287,900		W14x665	7'-1"

NOTES

1. BASED ON ROD AND NUT HAVING YIELD STRENGTH OF 96,000 P.S.I.
2. SOIL BEARING CAPACITY OF 2000 P.S.I.
3. RODS TO HAVE 6" OF THREAD ON ENDS.
4. ALL METAL TO BE CLEANED AND COATED WITH APPROVED PROTECTIVE COATING FOLLOWING INSTALLATION AND PRIOR TO BACKFILLING.





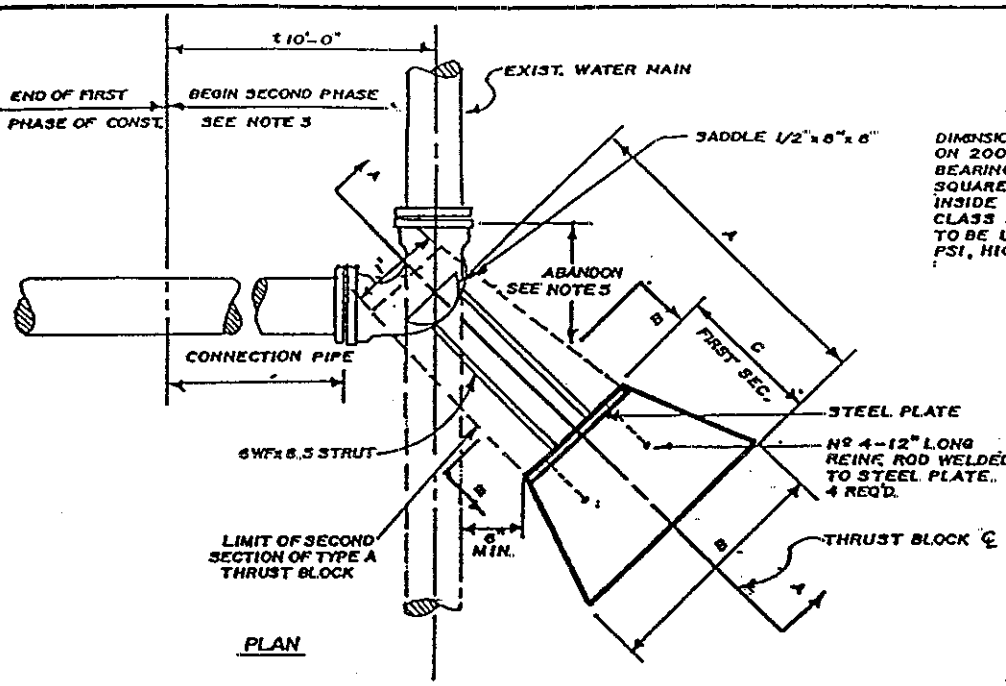
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT: "DEAD MAN" CONCRETE TYPE

DRN. BY: KLB

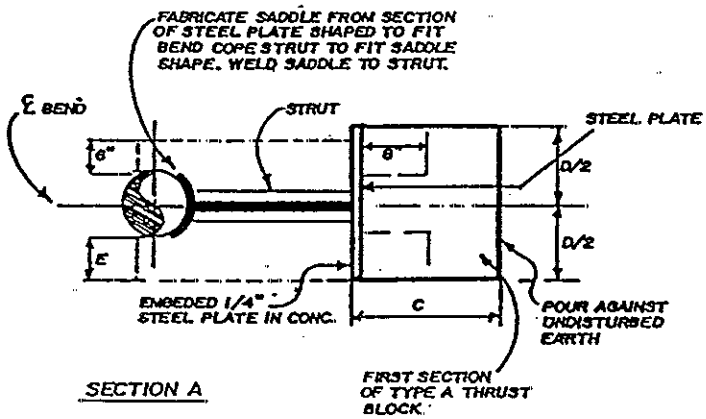
REV: 2/98

A-26

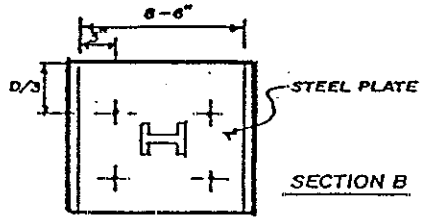


DESIGN DATA

DIMENSION OF THRUST BLOCK IN FEET BASED ON 2000 POUNDS PER SQUARE FOOT SOIL BEARING PRESSURE AND 250 POUNDS PER SQUARE INCH TEST PRESSURE. ACTUAL INSIDE DIAMETER OF DUCTILE IRON PIPE, CLASS 51 USED AS STANDARD. ALL CONC. TO BE USED SHALL BE CLASS A, 3000 PSI, HIGH EARLY.



SECTION A



SECTION B

NOTES

1. TYPE A THRUST BLOCK SHALL ONLY BE USED IN SITUATIONS WHERE NEW WATER MAIN CONSTRUCTION IS TO BE CONNECTED TO AN EXISTING WATER MAIN AND SHUT DOWN TIME ALLOWED WILL NOT PERMIT CONCRETE TO PROPERLY CURE FOR STANDARD THRUST BLOCK CONSTRUCTION.
2. CONTRACTOR WILL INSTALL NEW WATER MAIN TO A POINT APPROXIMATELY 10' FROM THE POINT OF CONNECTION TO THE EXISTING WATER MAIN AND INSTALL THE FIRST SECTION OF THRUST BLOCK. AFTER THE NEW WATER MAIN HAS BEEN SATISFACTORILY TESTED FOR HYDROSTATIC PRESSURE, BACTERIOLOGICALLY CHECKED AND ALL TEMPORARY THRUST BLOCKING HAS BEEN REMOVED, THE CONNECTION WILL BE COMPLETED.
3. (OMITTED)
4. INSTALLATION OF NEW BEND AND WIDE FLANGE STRUT SHALL BE PERFORMED AFTER THE FIRST SECTION OF THRUST BLOCK IS PROPERLY CURED.
5. CUT AND REMOVE PORTION OF EXISTING WATER MAIN AS REQ'D. TO ALLOW INSTALLATION OF STEEL STRUTS AND SECOND SECTION OF TYPE A THRUST BLOCK. REMAINING UNUSED SECTION OF EXISTING WATER MAIN TO BE ABANDONED.
6. WATER MAY BE TURNED ON AFTER WIDE FLANGE STRUTS HAVE BEEN SECURELY WELDED TO THE BEARING PLATE EMBEDDED IN THE FIRST SECTION OF THRUST BLOCK AND TO THE BEND SADDLE.
7. SECOND SECTION POUR OF CONCRETE TO PROTECT STEEL STRUTS TO BE COMPLETED BEFORE BACKFILL.
8. PIPE SADDLES AND STRUTS MAY BE FIELD FABRICATED.
9. SOIL CONDITIONS SHALL BE VERIFIED BY THE ENGINEER BEFORE THRUST BLOCK DESIGN IS IMPLEMENTED.
10. THE ENGINEERING DEPT. WILL FURNISH DIMENSIONS FOR BENDS LESS THAN 45°

DIMENSIONS IN FEET FOR CONCRETE BLOCKING – HORIZONTAL THRUST

BEND	SIZE	A	B	C	D	E
45°	6"	3'-6"	2'-0"	1'-6"	1'-6"	0'-6"
	8"	4'-0"	2'-6"	2'-0"	2'-0"	0'-8"
	10"	4'-6"	3'-0"	2'-0"	2'-0"	0'-7"
	12"	5'-0"	4'-0"	2'-6"	3'-0"	1'-0"
	14"	5'-6"	4'-0"	2'-6"	3'-0"	0'-10"
90°	6"	3'-6"	2'-6"	1'-6"	2'-0"	0'-9"
	8"	4'-0"	3'-6"	2'-0"	2'-6"	0'-11"
	10"	4'-6"	4'-0"	2'-6"	3'-0"	1'-0"
	12"	5'-0"	5'-0"	2'-6"	4'-0"	1'-6"
	14"	5'-6"	5'-6"	3'-0"	4'-0"	1'-4"

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT – HORIZONTAL
6", 8", 10", 12", AND 14" MAINS
(TYPE A)

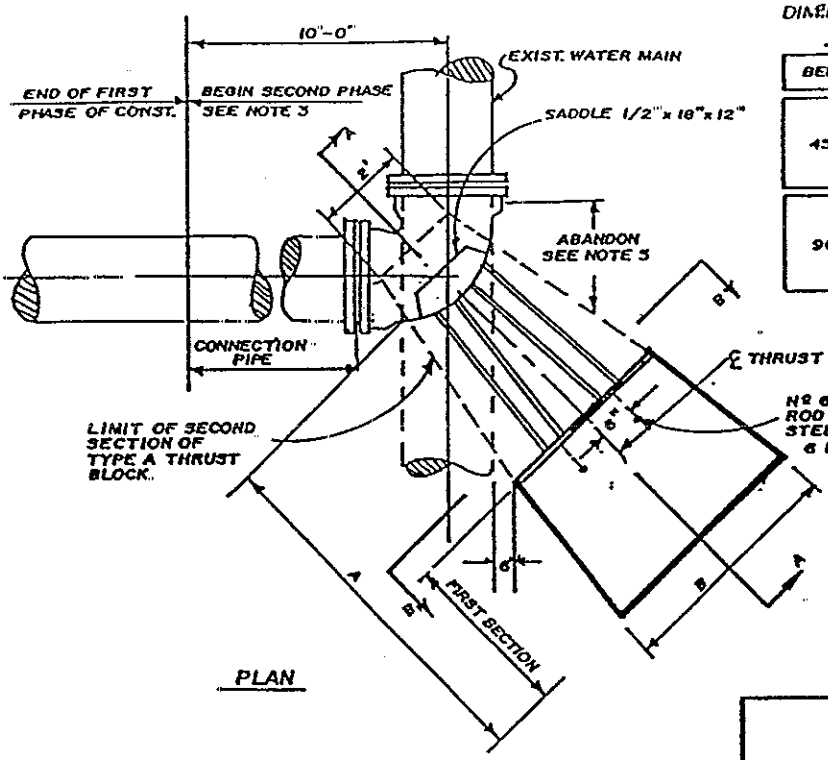
DRN. BY: K.L.B

REV: 2/98

A-27

DIMENSIONS FOR CONCRETE BLOCKING — HORIZONTAL THRUST

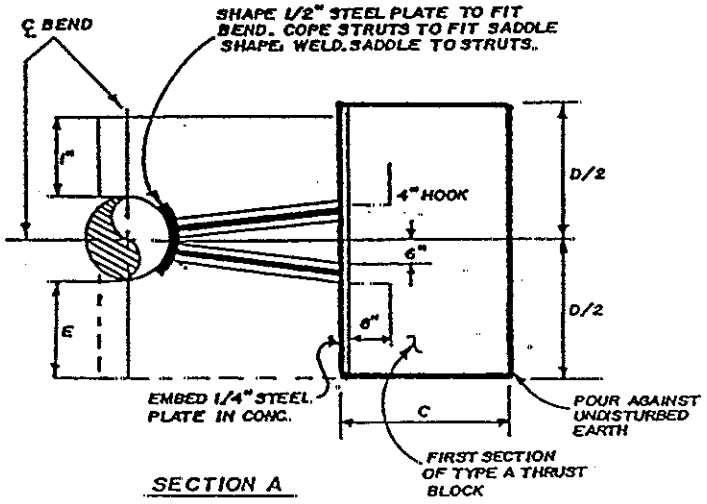
BEND	SIZE	A	B	C	D	E
45°	16"	7'-0"	5'-0"	5'-0"	4'-0"	1'-3"
	20"	7'-6"	6'-0"	5'-6"	5'-0"	1'-7"
	24"	9'-0"	6'-0"	4'-6"	3'-6"	1'-9"
90°	16"	7'-0"	6'-6"	5'-0"	5'-6"	2'-0"
	20"	7'-0"	6'-0"	5'-6"	7'-0"	2'-9"
	24"	9'-0"	9'-0"	4'-9"	9'-0"	3'-5"



PLAN

DESIGN DATA

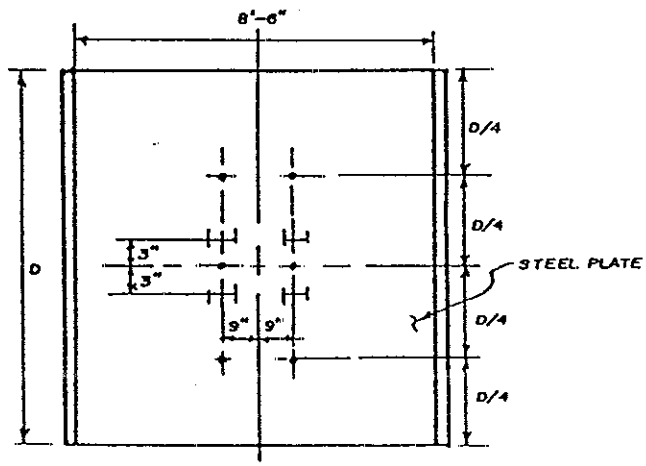
DIMENSION OF THRUST BLOCK IN FEET BASED ON 2000 POUNDS PER SQUARE FOOT SOIL BEARING PRESSURE AND 250 POUNDS PER SQUARE INCH TEST PRESSURE ACTUAL INSIDE DIAMETER OF D.I.P., CLASS 51 USED AS STANDARD. ALL CONC. USED SHALL BE CLASS A, 3000 PSI, HIGH EARLY.



SECTION A

NOTES

1. TYPE A THRUST BLOCK SHALL ONLY BE USED IN SITUATIONS WHERE NEW WATER MAIN CONSTRUCTION IS TO BE CONNECTED TO AN EXISTING WATER MAIN AND SHUT DOWN TIME ALLOWED WILL NOT PERMIT CONCRETE TO PROPERLY CURE FOR STANDARD THRUST BLOCK CONSTRUCTION.
2. CONTRACTOR WILL INSTALL NEW WATER MAIN TO A POINT APPROXIMATELY 10' FROM THE POINT OF CONNECTION TO THE EXISTING WATER MAIN AND INSTALL THE FIRST SECTION OF THRUST BLOCK. AFTER THE NEW WATER MAIN HAS BEEN SATISFACTORILY TESTED FOR HYDROSTATIC PRESSURE, BACTERIOLOGICALLY CHECKED AND ALL TEMPORARY THRUST BLOCKING HAS BEEN REMOVED, THE CONNECTION WILL BE COMPLETED.
3. (OMITTED)
4. INSTALLATION OF NEW BEND AND WIDE FLANGE STRUTS SHALL BE PERFORMED AFTER THE FIRST SECTION OF THRUST BLOCK IS PROPERLY CURED.
5. CUT AND REMOVE PORTION OF EXISTING WATER MAIN AS REQ'D. TO ALLOW INSTALLATION OF STEEL STRUTS AND SECOND SECTION OF TYPE A THRUST BLOCK. REMAINING UNUSED SECTION OF EXISTING WATER MAIN TO BE ABANDONED.
6. WATER MAY BE TURNED ON AFTER WIDE FLANGE STRUTS HAVE BEEN SECURLY WELDED TO THE BEARING PLATE EMBEDDED IN THE FIRST SECTION OF THRUST BLOCK AND TO THE BEND SADDLE.
7. SECOND SECTION POUR OF CONCRETE TO PROTECT STEEL STRUTS TO BE COMPLETED BEFORE BACKFILL.
8. PIPE SADDLES AND STRUTS MAY BE FIELD FABRICATED.
9. SOIL CONDITIONS SHALL BE VERIFIED BY THE ENGINEER BEFORE THRUST BLOCK DESIGN IS IMPLEMENTED.
10. THE ENGINEERING DEPT. WILL FURNISH DIMENSIONS FOR BENDS LESS THAN 45°.



SECTION B

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT: HORIZONTAL

16", 20", AND 24" MAINS

(TYPE A)

DRN BY: KLB | REV: 2/98

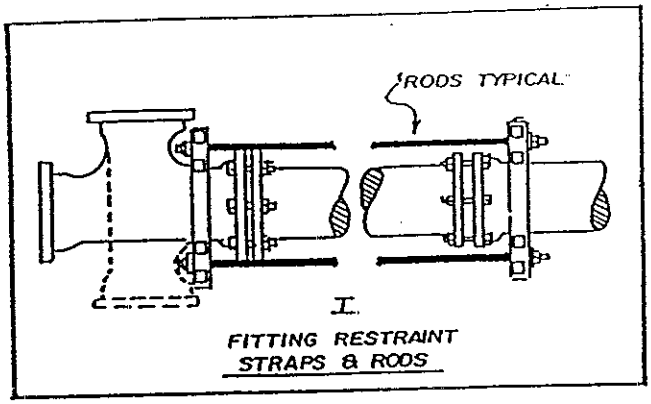
	PIPE SIZE	ROD DIA.	Nº RODS	TOTAL THRUST (lbs)
TEES, PLUGS & VALVES	6"	3/4"	2/3	5635
	8"	3/4"	2/3	10,055
	10"	3/4"	3	15,710
	12"	3/4"	4	22,620
	14"	3/4"	6	30,800
	16"	3/4"	4	40,215
	20"	3/4"	6	62,835
	24"	3/4"	8	90,480
	30"	1"	6	141,375
	36"	1"	6	203,595
11 1/4° B	6"	3/4"	2	1,110
	8"	3/4"	2	1,970
	10"	3/4"	2	3,080
	12"	3/4"	2	4,435
	14"	3/4"	2	6,035
	16"	3/4"	2	7,885
	20"	3/4"	2	12,320
	24"	3/4"	2	17,740
	30"	1"	2	27,720
	36"	1"	2	39,910
22 1/2° B	6"	3/4"	2	2,210
	8"	3/4"	2	3,925
	10"	3/4"	2	6,130
	12"	3/4"	2	8,825
	14"	3/4"	2	12,015
	16"	3/4"	2	15,690
	20"	3/4"	2	24,515
	24"	3/4"	2	35,305
	30"	1"	2	55,160
	36"	1"	2	79,435
45° B	6"	3/4"	2/3	4,430
	8"	3/4"	2/3	7,700
	10"	3/4"	2	12,025
	12"	3/4"	4	17,312
	14"	3/4"	4	23,565
	16"	3/4"	4	30,780
	20"	3/4"	4	48,090
	24"	3/4"	6	69,250
	30"	1"	4	108,205
	36"	1"	6	155,810
90° B	6"	3/4"	2/3	8,000
	8"	3/4"	3	14,220
	10"	3/4"	4	22,214
	12"	3/4"	6	32,000
	14"	3/4"	6	43,540
	16"	3/4"	4	56,870
	20"	3/4"	6	88,860
	24"	3/4"	8	127,960
	30"	1"	6	199,930
	36"	1"	6	287,900

1. ON PIPE SIZES 6"- 14" ROD AND NUT WILL HAVE MIN. YIELD STRENGTH OF 50,000 PSI. ON PIPE SIZES 16" - 24" ROD AND NUT WILL HAVE MIN. YIELD STRENGTH OF 100,000 PSI.
2. RODS HAVE 6" OF THREAD ON EACH END.
3. ALL METAL TO BE CLEANED AND COATED WITH AN APPROVED PROTECTIVE COATING FOLLOWING INSTALLATION AND PRIOR TO BACKFILLING. SEE NOTE 5, DRWG. A-30.

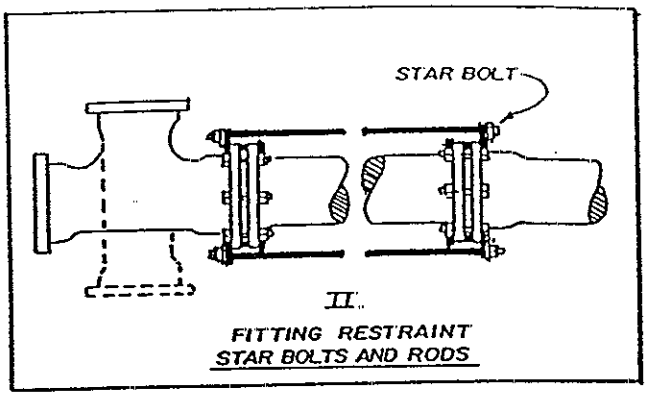
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINTS:
TIE ROD CHART

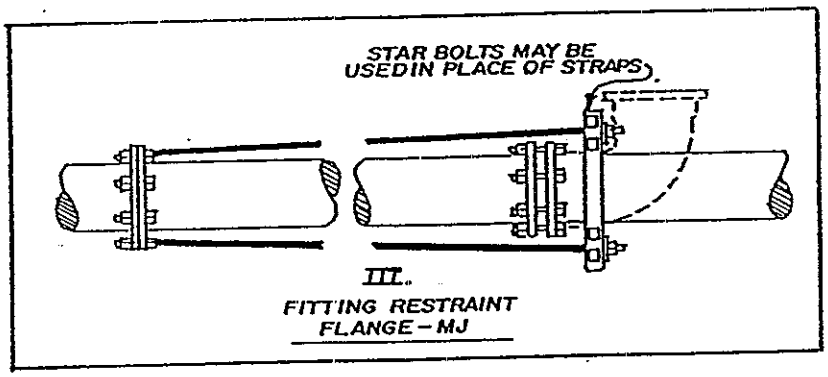
DRN BY: KLB | REV: 2/98



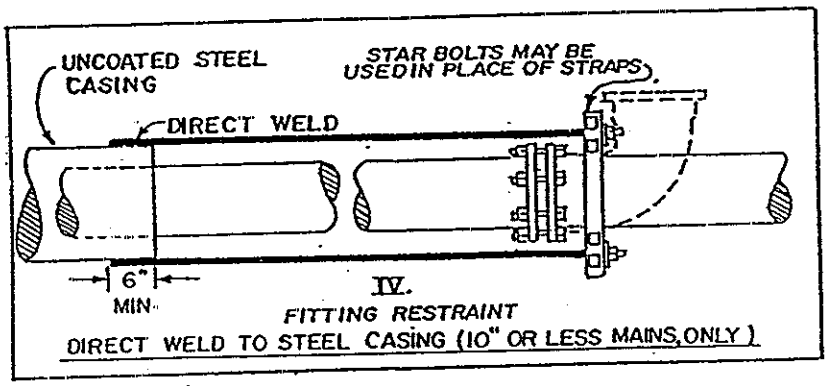
I.
FITTING RESTRAINT
STRAPS & RODS



II.
FITTING RESTRAINT
STAR BOLTS AND RODS



III.
FITTING RESTRAINT
FLANGE - MJ



IV.
FITTING RESTRAINT
DIRECT WELD TO STEEL CASING (10" OR LESS MAINS ONLY)

NOTES

1. SEE DRWG. A-28 FOR NUMBER AND DIAMETER OF RODS REQUIRED.

2. NO FLANGED JOINTS ARE TO BE BURIED.

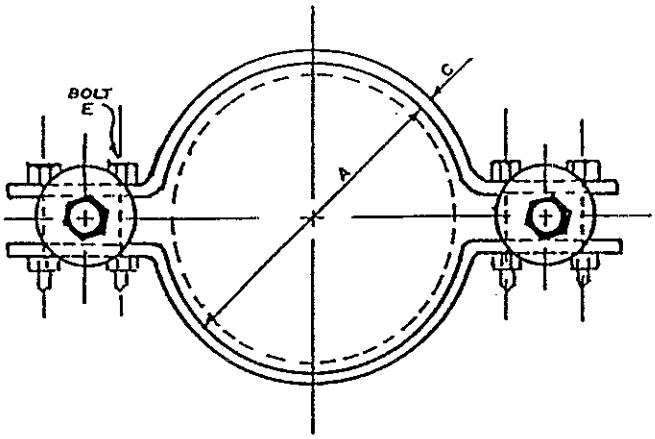
3. AFTER INSTALLATION, TIE-RODS AND CLAMP ASSEMBLIES SHALL BE CLEANED AND THOROUGHLY COATED WITH ROYSTON LABORATORIES, INC. ROSKOTE PLASTIC NO. A 939 OR KOPPERS CO., INC. BITUMASTIC SUPERSERVICE BLACK OR APPROVED EQUIVALENT.

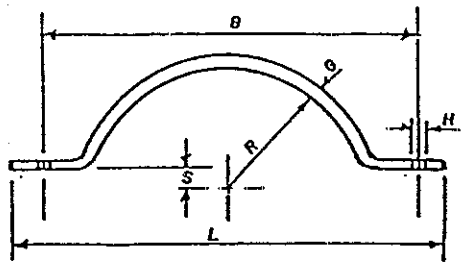
4. WHEN RESTRAINING FITTINGS TO STEEL CASING PIPE, THE TIE-RODS MUST BE DIRECT WELDED TO THE CASING - USE OF STAR BOLTS PROHIBITED. CASING MUST BE FULLY WELDED THROUGHOUT ITS LENGTH AND BE A MINIMUM OF 30' IN LENGTH. AREA TO BE WELDED MUST BE COMPLETELY BARE AND FREE OF ANY COATING MATERIAL.

GWINNETT CO. DEPARTMENT
OF PUBLIC UTILITIES

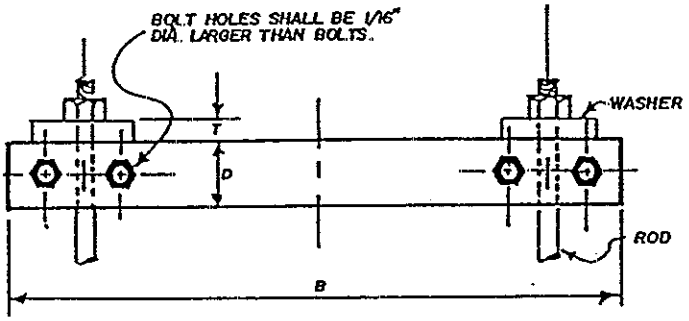
THRUST RESTRAINT:
TIE-ROD INSTALLATION

DRN BY: KLB | REV: 2/98

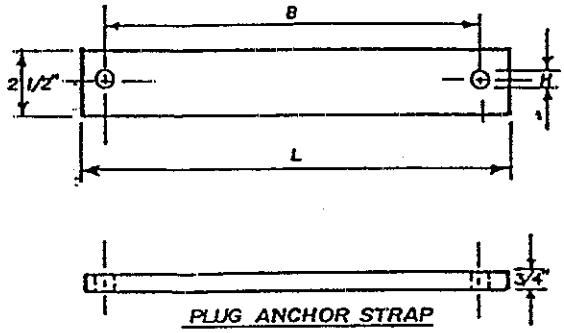




TEE ANCHOR STRAP AT PLUG



TYPICAL JOINT STRAP & ROD ARRANGEMENT



PLUG ANCHOR STRAP

STEEL SOCKET CLAMP DIMINSIONS (INCHES)

SIZE	A	B	C	D	E	T	ROD & C WASH SIZE
4	3	14 5/8	1/2	2	5/8 x 3 1/2	5/8	3/4
6	7 1/8	18 7/8	1/2	2	5/8 x 3 1/2	5/8	3/4
8	9 5/16	19 1/8	5/8	2 1/2	5/8 x 3 3/4	5/8	3/4
10	11 1/2	21 3/8	5/8	2 1/2	3/4 x 3 3/4	5/8	3/4
12	13 1/2	25 1/8	5/8	3	7/8 x 4 1/2	5/8	3/4
14	13 3/4	26 1/4	3/4	3	7/8 x 4 1/2	7/8	3/4
16	17 7/8	31 5/8	3/4	4	1 x 4 1/2	7/8	3/4
20	22 1/8	37 3/4	3/4	4 1/2	1 1/4 x 5	1 1/8	3/4
24	26 3/8	44 1/4	3/4	5	1 1/2 x 5 1/2	1 1/4	3/4

ABOVE ANCHOR STRAP DIMINSIONS (INCHES)

SIZE	B	G	H	L	R	S
4	10 1/8	5/8 x 2 1/2	13/16	12 1/2	2 1/2	3/4
6	12 1/8	5/8 x 2 1/2	13/16	14 1/2	3 9/16	3/4
8	14 3/8	5/8 x 2 1/2	13/16	16 3/4	4 21/32	3/4
10	16 11/16	5/8 x 2 1/2	1 1/16	19 1/16	5 3/4	3/4
12	19 3/16	5/8 x 3	1 1/16	22 5/16	6 3/4	7/8

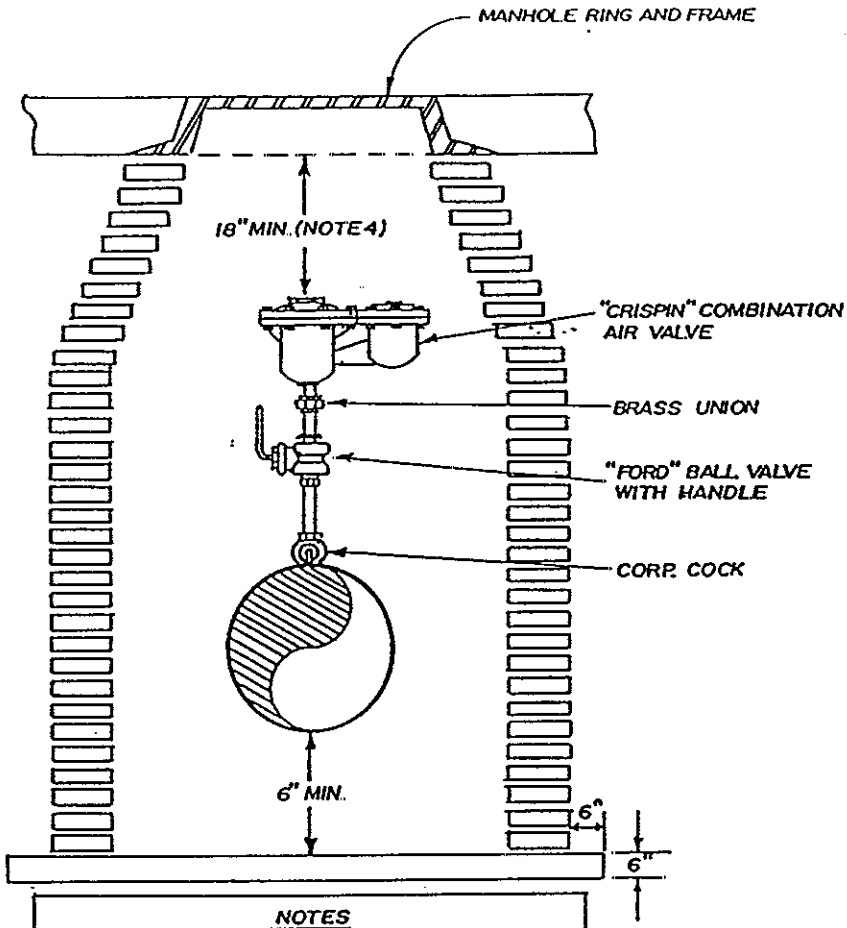
NOTES

1. INSTALLATION OF, AND MATERIALS FOR RODS, CLAMPS, STRAPS, BOLTS AND WASHERS SHALL CONFORM TO THE NATIONAL FIRE CODES - NFFA NO. 24 LATEST REVISION.
2. YOKES AND ANCHOR STRAPS FOR FITTINGS LARGER THAN 12" SHALL BE DESIGNED AND APPROVED FOR SPECIFIC INSTALLATION.
3. RODS TO BE HIGH TENSILE, HOT ROLLED STEEL WITH TENSILE STRENGTH OF 110,000 P.S.I. AND A MIN. OF 95,000 YIELD STRENGTH.
4. NUTS TO HAVE HEAVY DUTY SEMI-FINISH WITH NATIONAL COURSE THREADS.
5. AFTER INSTALLATION TIE RODS AND CLAMP ASSEMBLY SHALL BE THOROUGHLY COVERED WITH ROYSTON LABORATORIES, INC. ROSKOTE MASTIC ND A939, OR KOPPERS CO., INC. BITUMASTIC SUPERSERVICE BLACK OR APPROVED EQUIVALENT.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

THRUST RESTRAINT
STRAP AND ROD DETAILS

DRN BY: KLB | REV: 2/98



NOTES

1. ALL NIPPLES TO BE "ALL THREADED" MINIMUM LENGTH.
2. ALL PIPE TO BE RED BRASS.
3. ALL FITTINGS TO BE BRASS.
4. WHERE DIMINSIONS WILL BE LESS THAN 18," CONTACT G.C.W.S. ENGINEERING DEPT. FOR SPECIAL DESIGN.

AIR VALVE SIZING	
MAIN SIZE	AIR VALVE SIZE
6"–12"	1"
14"–16"	1 1/2"
20"–30"	2"
36"–42"	2"

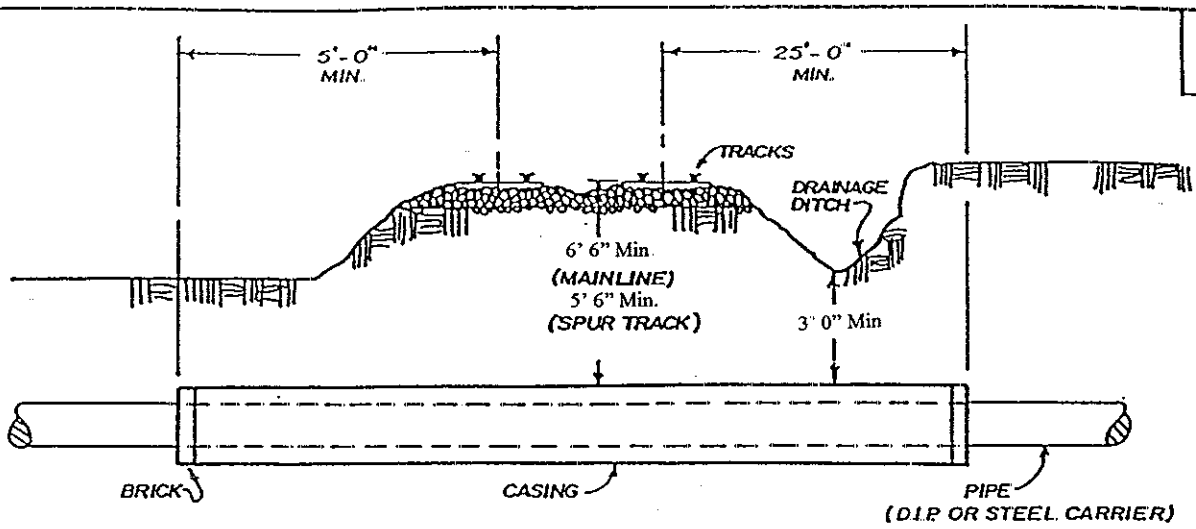
NOTE: AIR VALVES SHALL BE "CRISPIN" COMBINATION AIR VALVES WITH SCREWED CONNECTIONS.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

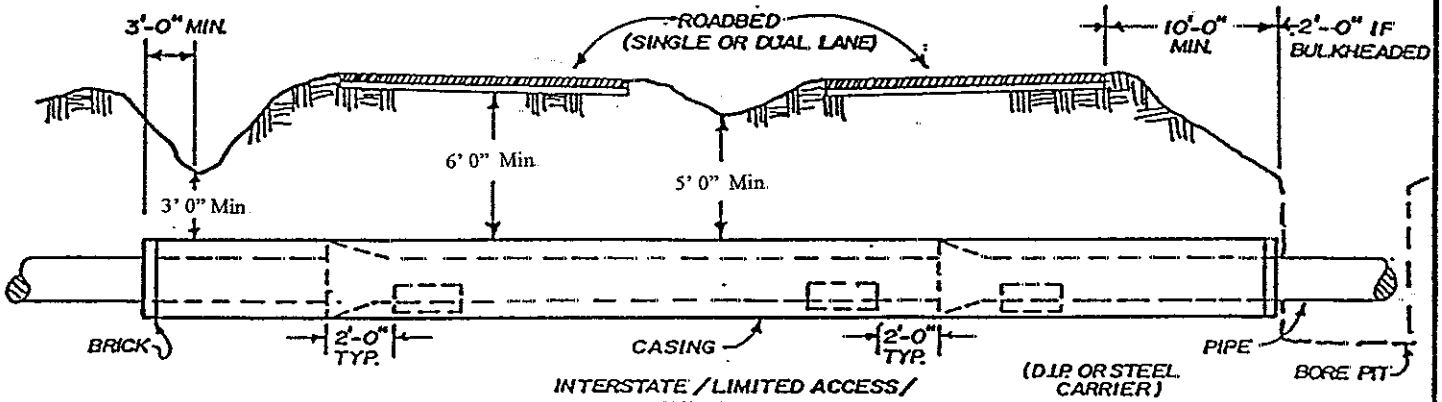
AIR VALVE INSTALLATION

DRN. BY: KLB | REV. 2/98

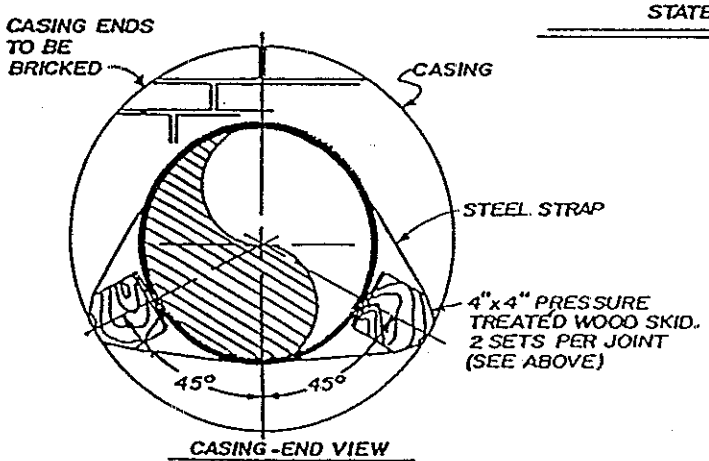
A-34



RAIL ROADS



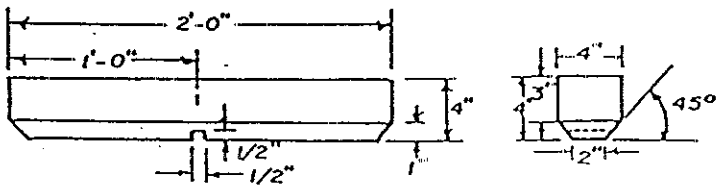
INTERSTATE / LIMITED ACCESS / STATE ROADS



CASING-END VIEW
PIPE ACCESSIBLE

BORED CASINGS			
PIPE SIZE	PIPE O.D.	CASING SIZE	CASING I.D.
6"	6.90"	12"	11.376"
8"	9.05"	16"	14.314"
12"	13.20"	20"	17.938"
16"	17.40"	24"	21.564"
20"	21.60"	28"	27.0
24"	25.80"	36"	35.0

NOTE: IF CASING UNDER RAILROAD IS NOT COATED OR CATHODICALLY PROTECTED, INCREASE THICKNESS .062"

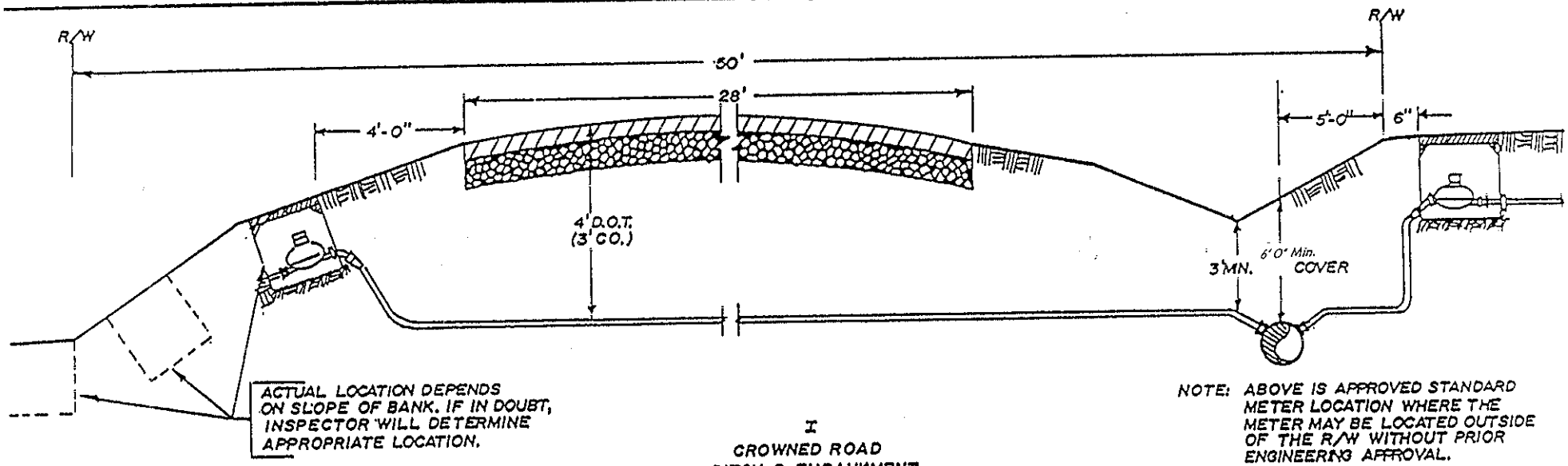


WOOD SKID DETAIL

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

CASING / PIPE
SUPPORT INSTALLATION

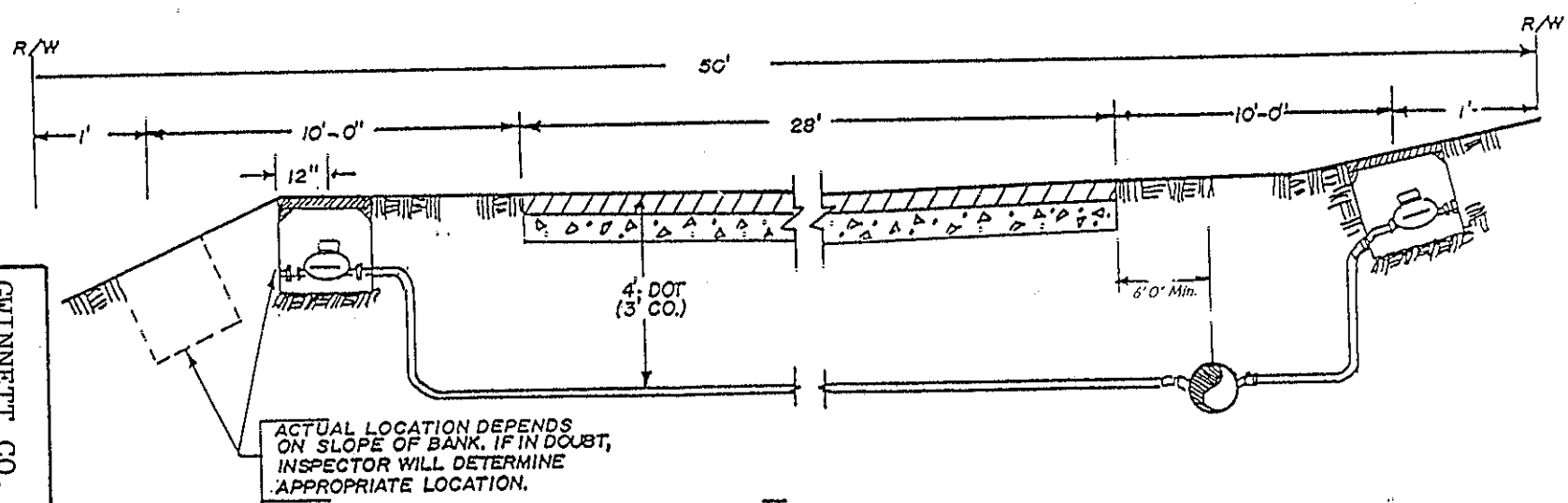
DRN BY: KLB | REV: 1/99



I

CROWNED ROAD
DITCH & EMBANKMENT

SEE DRWG. A-39 FOR INSTALLATION REQUIREMENTS



II

FLAT OR CONCRETE ROAD
SLIGHT DITCH & EMBANKMENT

SEE DRWG. A-39 FOR INSTALLATION REQUIREMENTS

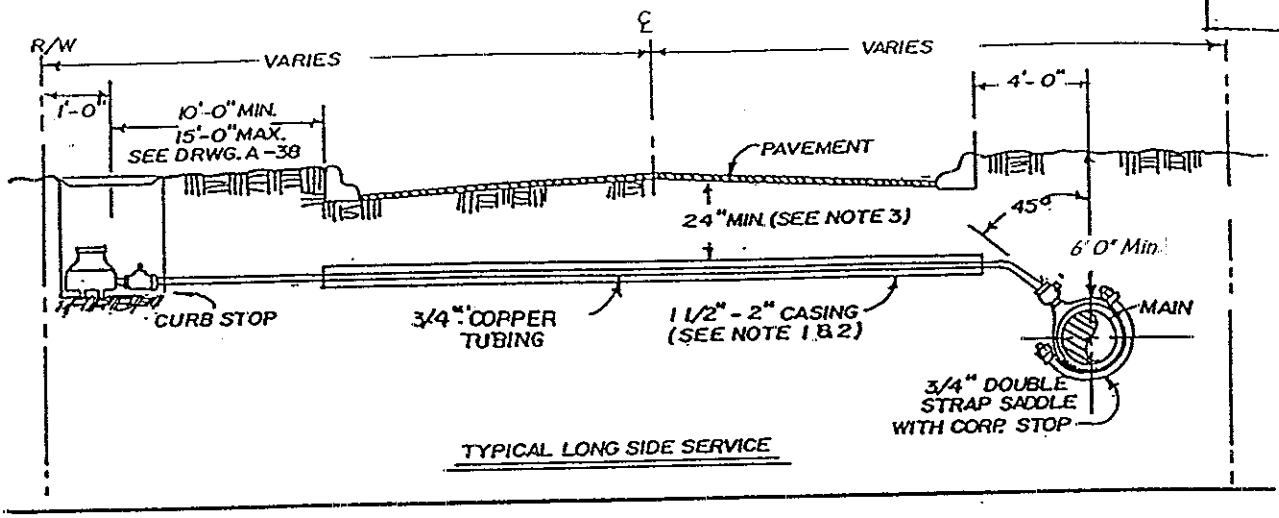
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

METER LOCATIONS:
3/4"-2"

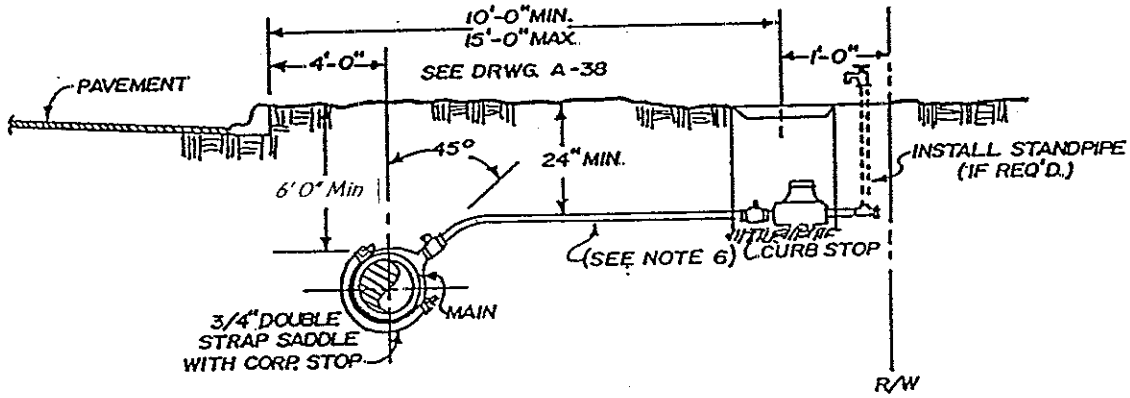
DRN BY: KLB

REV: 1/99

A-38



TYPICAL LONG SIDE SERVICE



TYPICAL SHORT SIDE SERVICE

1. IN THE EVENT CASING IS NOT PRESENT ON LONG SIDE LOT, BORING SHALL BE PERMITTED, WHEN CASING DOES EXIST – 1' OR ¾' PIPE SHALL BE INSERTED THROUGH CASING TO COMPLETE THE INSTALLATION FROM THE MAIN TO THE METER.

2. APPROVAL MUST BE OBTAINED BY GWINNETT COUNTY DOT PRIOR TO ROAD CUT, DPU DOES NOT HAVE THE AUTHORITY TO APPROVE ROAD CUTS. NO ROAD CUT WILL BE PERMITTED UNTIL 3 ATTEMPTS HAVE BEEN MADE AT BORING OR LOCATING CASING.

3. 24"COVER (MIN.) FROM SURFACE TO TOP OF SERVICE PIPE APPLIES TO COUNTY MAINTAINED ROADS FOR STATE ROADS SAID MINIMUM CLEARANCE SHALL BE 48"

4. ALL CUTS IN PAVEMENT SHALL BE REPAIRED IN ACCORDANCE WITH EITHER GA. D.O.T. OR GWINNETT CO. STANDARDS. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER DITCH COMPACTION CUT BACK OF DITCH SIDES AND PAVING OF THE REQUIRED CONCRETE SUB-BASE AND PLATTING THE DITCH TO ALLOW TRAFFIC FLOW WHILE CONCRETE IS SETTING UP. STEEL TRAFFIC PLATES WILL COVER POURED CONCRETE FOR A MINIMUM OF 24 HOURS.

5. METERS ARE TO BE SET DIRECTLY OPPOSITE TAP ON MAIN THE METER SHALL NOT BE OFFSET LATERALLY FROM TAP ON WATER MAIN.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

3/4"–1" METER SETTINGS
SHORT AND LONG SIDES

DRN. BY: KLB | REV: 1/99

A - 40

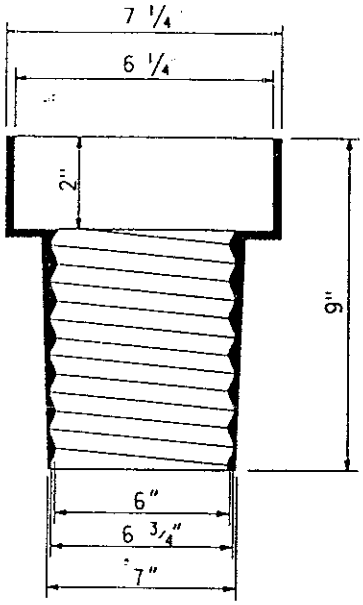
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

2" METER SETTINGS

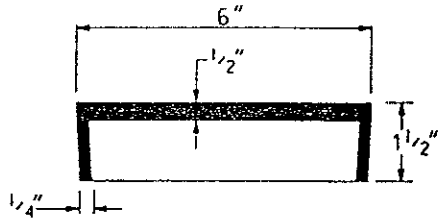
DRN. BY: KLB

REV: 1/99

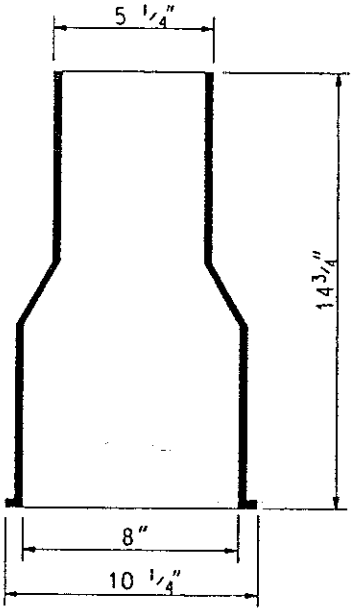
A-41



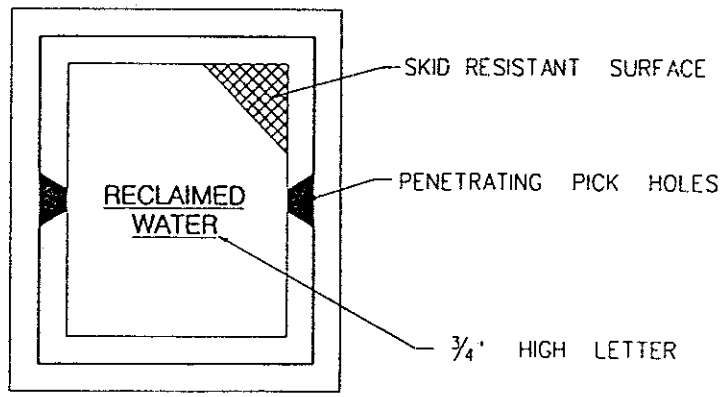
TOP SECTION



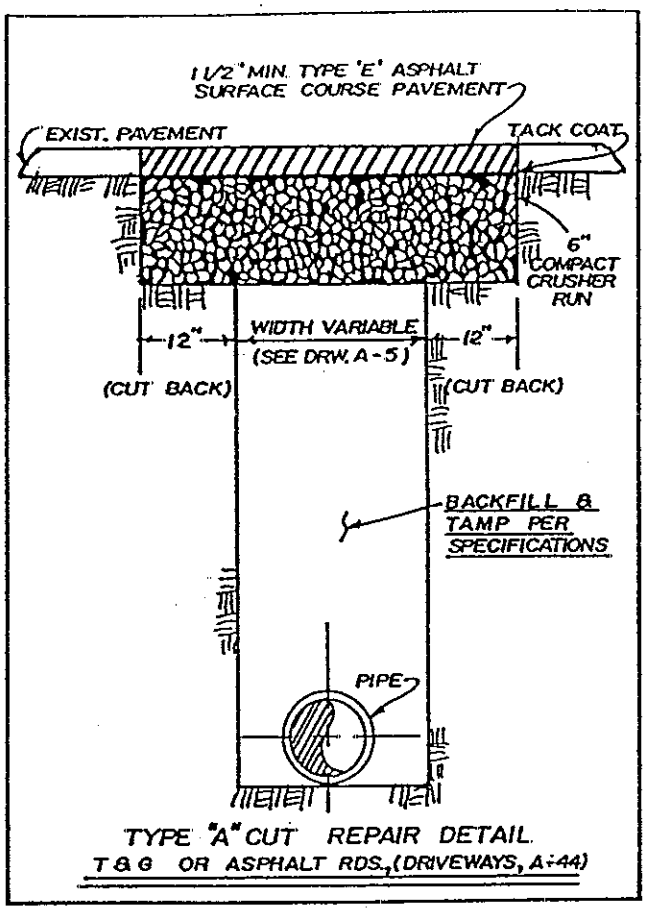
COVER



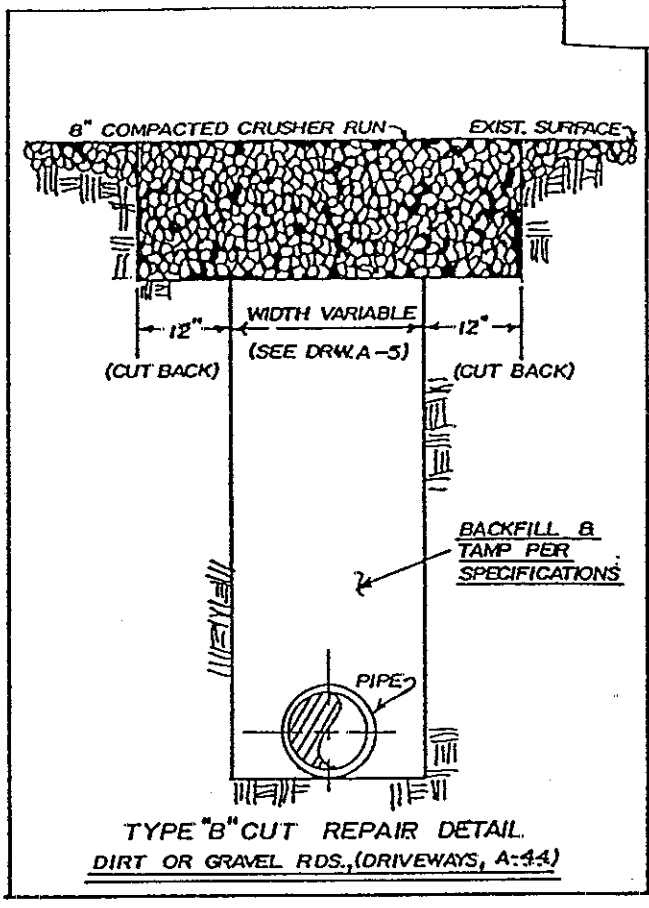
BOTTOM SECTION



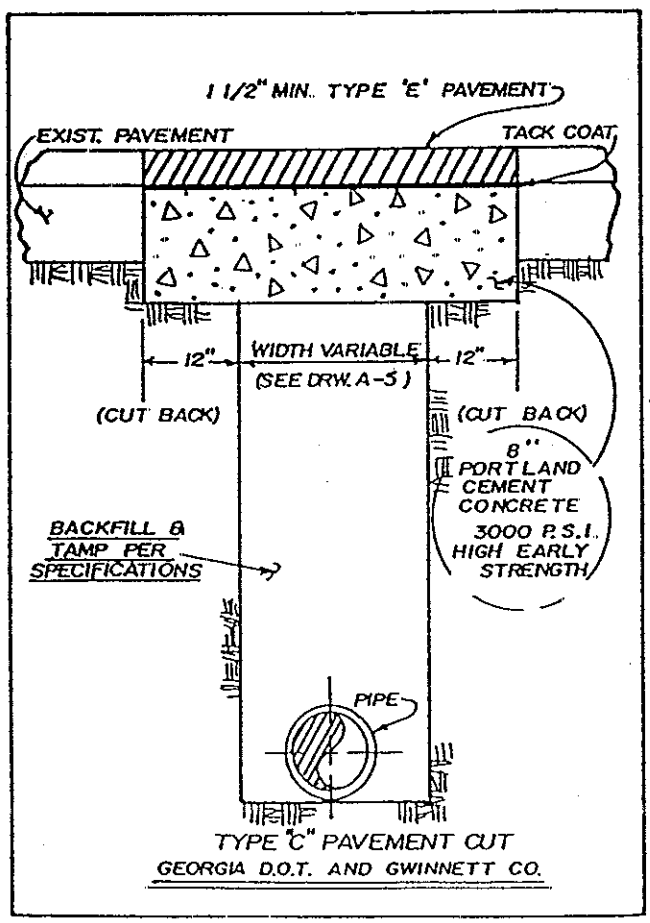
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES	
VALVE COVER MARKINGS	
NON POTABLE REUSE LINE	
DRN. BY: RAB	REV: 10/98



TYPE "A" CUT REPAIR DETAIL.
T & G OR ASPHALT RDS., (DRIVEWAYS, A-44)



TYPE "B" CUT REPAIR DETAIL.
DIRT OR GRAVEL RDS., (DRIVEWAYS, A-44)



TYPE "C" PAVEMENT CUT
GEORGIA D.O.T. AND GWINNETT CO.

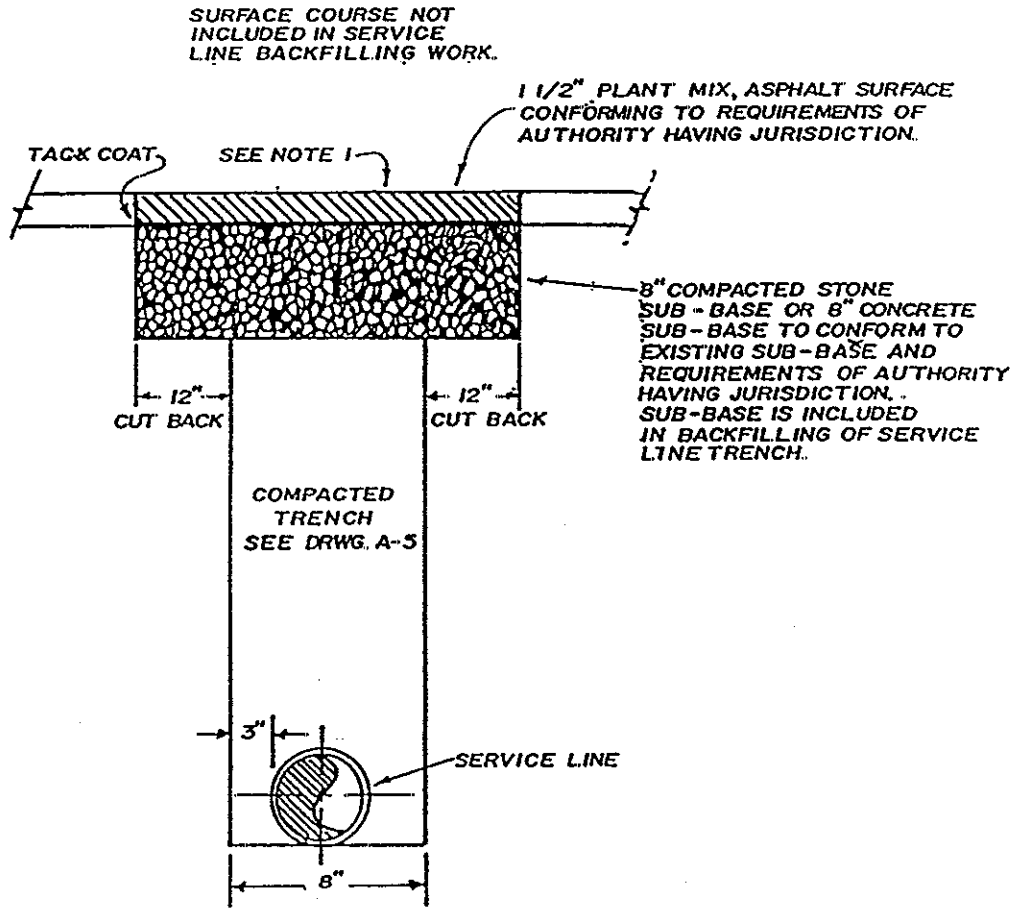
NOTES

1. ALL MATERIALS AND METHODS OF INSTALLATION SHALL COMPLY WITH THE GA. D.O.T.'s "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTITUTION," 1983 EDITION OR LATEST REVISION THERE TO.
2. FOR TYPE "C," THE CONTRACTOR SHALL COVER THE POURED CONCRETE WITH STEEL PLATES A MINIMUM OF 24 HOURS TO ALLOW ADEQUATE SET-UP.
3. CONTRACTOR'S TRAFFIC CONTROL PLAN MUST BE APPROVED BY THE AUTHORITY HAVING JURISDICTION BEFORE WORK BEGINS.
4. FINAL APPROVAL OF CONTRACTOR'S PAVEMENT CUT REPAIRS RESIDES WITH THE AUTHORITY HAVING JURISDICTION. CONTRACTOR SHALL MEET ALL REQUIREMENTS OF SAID AUTHORITY.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

PAVEMENT CUT REPAIRS
TYPE A, B, & C

DRN BY: KLB | REV: 2/98



NOTE:

1. WHERE ROADWAY IS CONCRETE, NO ASPHALT SURFACE IS REQUIRED. CONCRETE SUB-BASE SHALL BE POURED LEVEL WITH EXISTING ROAD SURFACE WHILE MAINTAINING 8" THICKNESS.

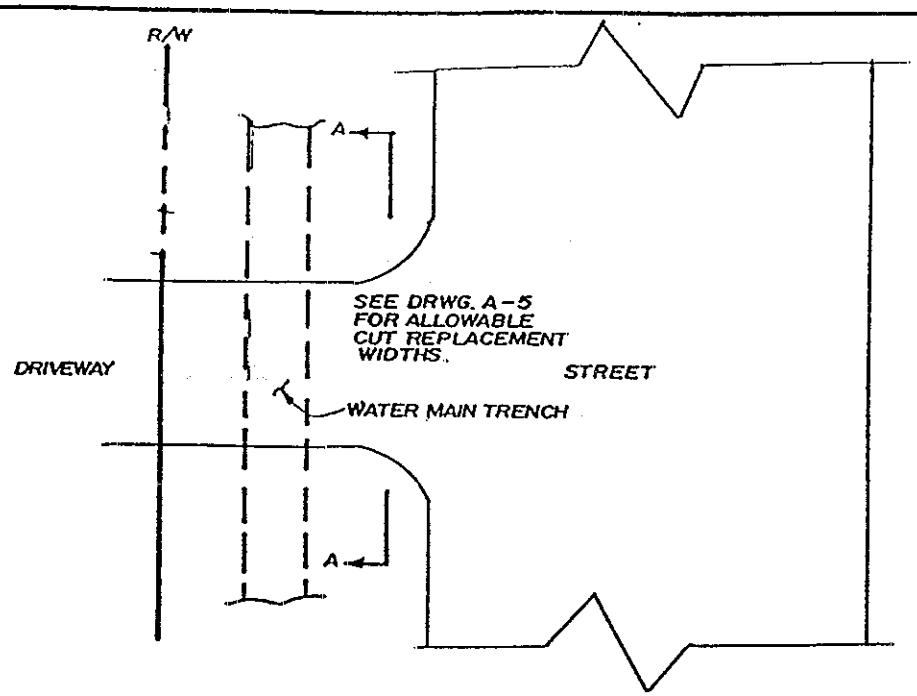
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

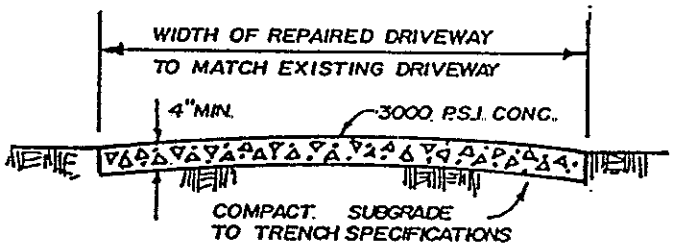
PAVEMENT CUT REPAIRS

3/4" - 2" SERVICE LINES

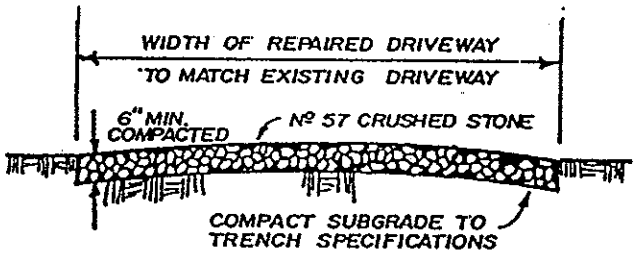
DRN. BY: K.L.B | REV: 2/98

A-44



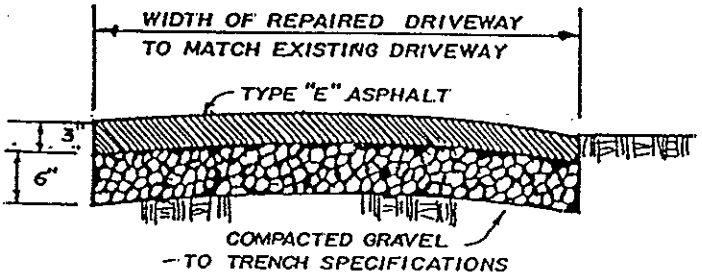


CONCRETE
"A - A"



GRAVEL
"A - A"

—FINISH SURFACE OF REPAIRED AREA TO MATCH EXISTING SURFACE. EDGES OF CUT TO BE SAWN VERTICAL. EXPANSION MATERIAL TO BE USED AS DIRECTED.



ASPHALT
"A - A"

NOTE: 1. FINISHED GRADE TO BE FLUSH WITH EDGE OF DRIVE — TYPICAL ALL DRIVES.

(SEE DRWG. A-42 FOR STREET CUT REPAIRS)

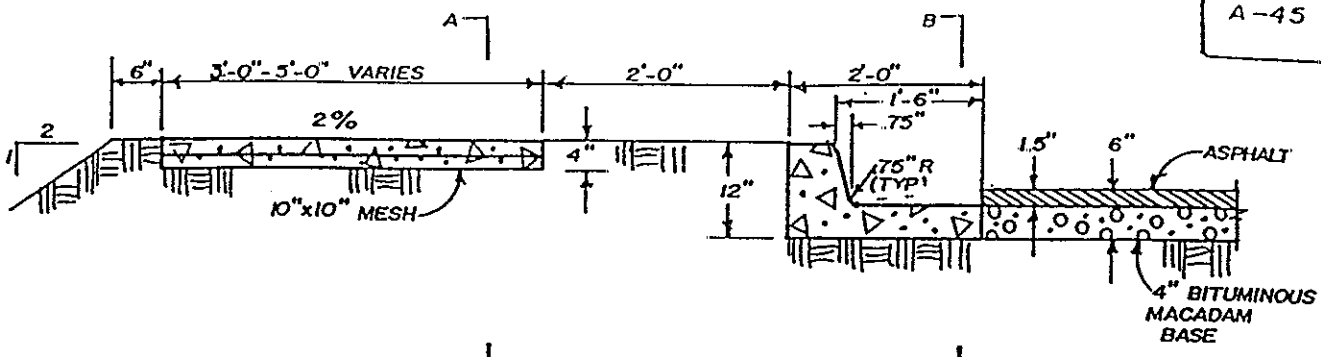
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

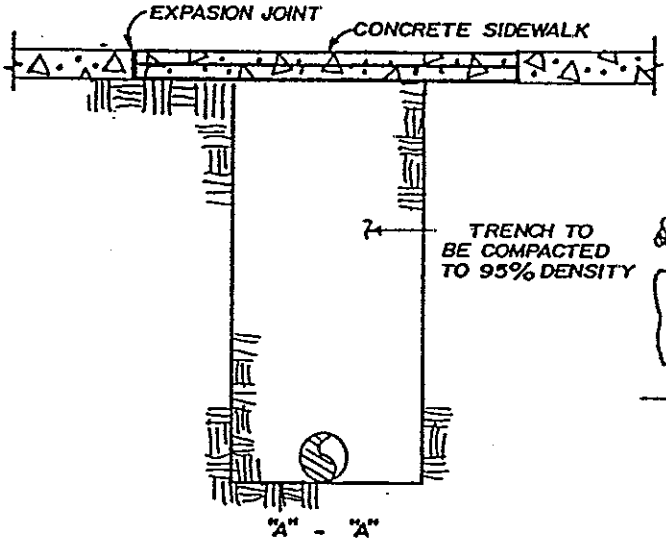
DRIVEWAY CUT REPAIRS
CONCRETE, GRAVEL & ASPHALT

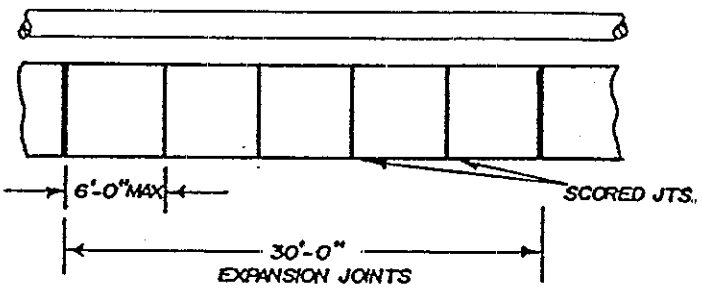
DRN. BY: KLB

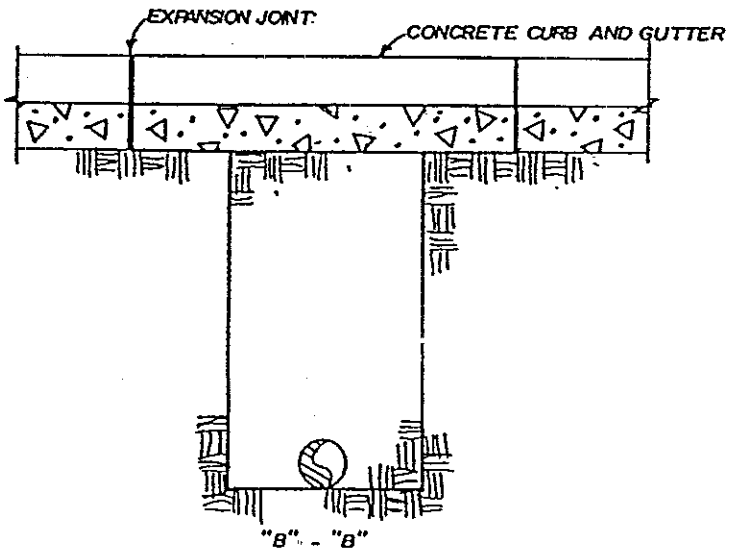
REV: 2/98

A-45



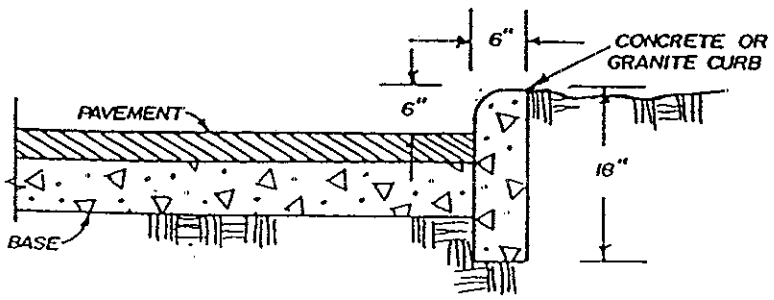






NOTES

1. DETAILS ARE TYPICAL.
2. REPLACE SIDEWALKS, CURB AND GUTTER AND CURBING TO MATCH EXISTING MATERIALS OR AS DIRECTED.

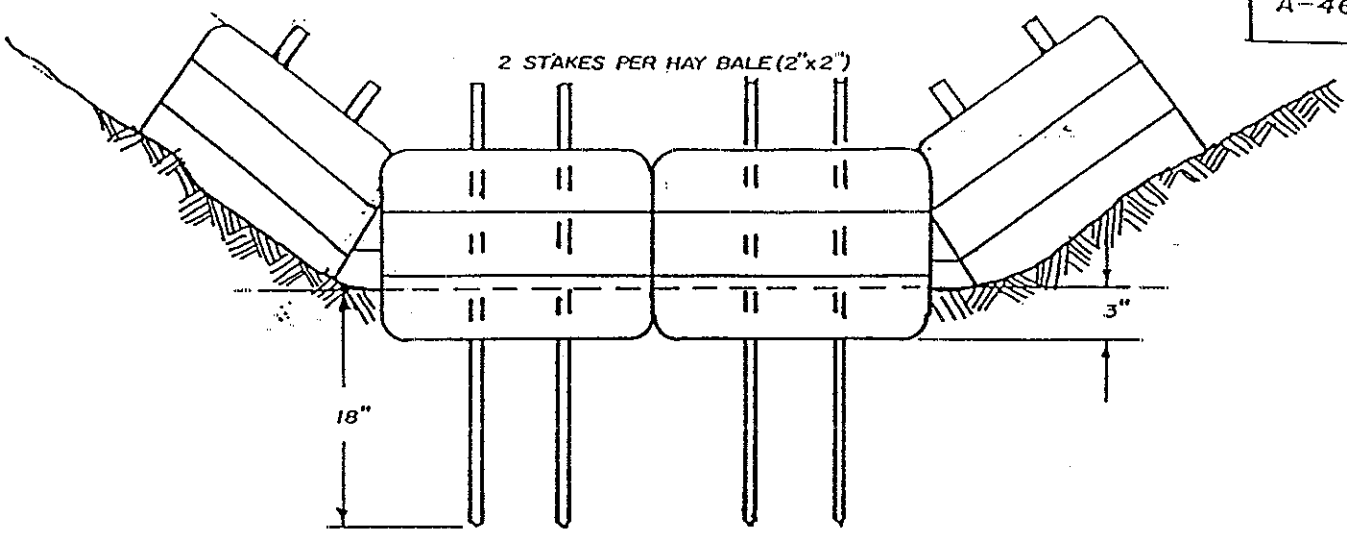


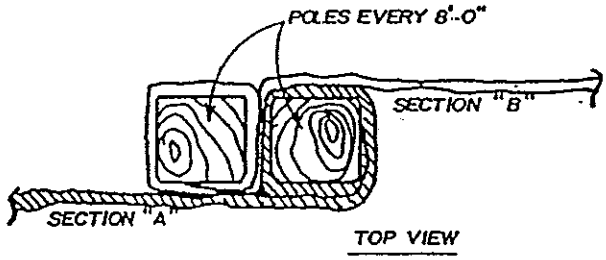
GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

SIDEWALK
CURB AND GUTTER REPAIRS

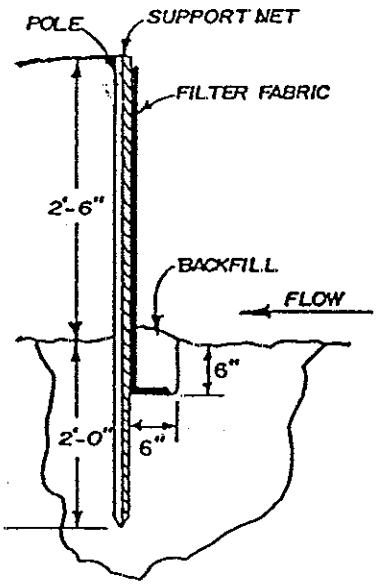
DRN. BY: KLB | REV: 2/98

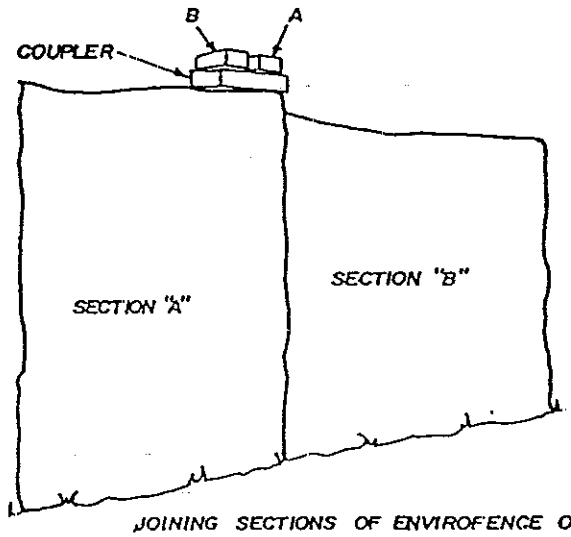
A-46





TOP VIEW





JOINING SECTIONS OF ENVIROFENCE OR EQUAL.

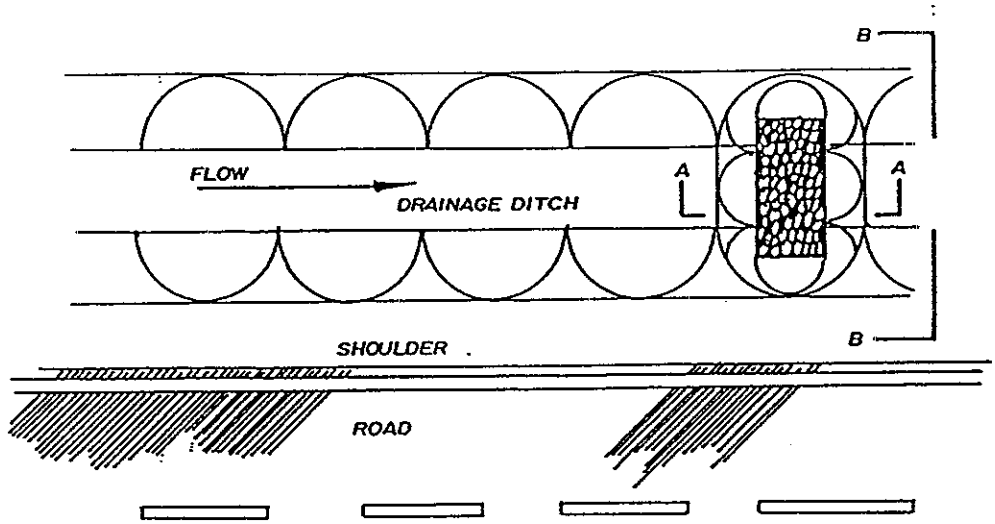
NOTES

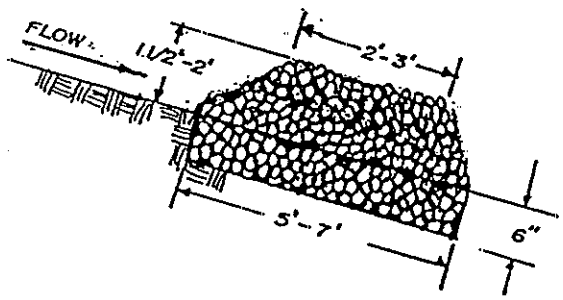
1. ALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL COMPLY WITH THE G.C.W.S AND ENGINEERING DEPTS. "MANUAL OF STANDARDS AND SPECIFICATIONS FOR CONTROL OF SOIL EROSION AND SEDIMENT IN AREAS UNDERGOING URBAN DEVELOPMENT IN GWINNETT COUNTY" OR THE REQUIREMENTS OF THE GEORGIA D.O.T. WHERE APPLICABLE.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

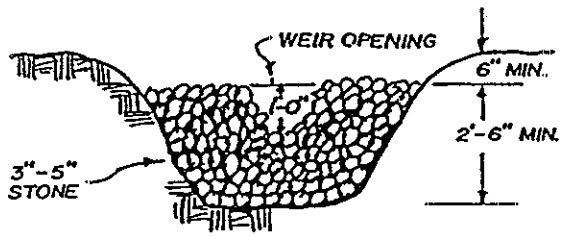
EROSION CONTROL / SILT FENCING HAY BALES

DRN BY: KLB | REV: 2/98





SECTION A-A



SECTION B-B

NOTES

1. USE AND LOCATION OF CHECK DAMS SHALL BE AS DIRECTED BY INSPECTOR.
2. SEE NOTE 1, DRWG. A-46.

GWINNETT CO. DEPARTMENT OF PUBLIC UTILITIES

EROSION CONTROL:

CHECK DAMS

DRN. BY: KLB

REV: 2/98