

Jefferson County, Alabama Environmental Services Department

Standards for Construction of Commercial and Residential Sanitary Sewer Systems

Adopted November 10, 1999



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Section 1.00

Policies and Procedures

1.0100 Purpose

1.0101 The purpose of this document is to assemble in one volume the Policies, Procedures, Design Criteria, Standard Specifications, and Standard Drawings for Commercial and Residential Construction of Sanitary Sewer Systems developed by the Jefferson County Environmental Services Department. These Standards have been developed to protect the public health, safety, and welfare, and to promote uniformity in the development of the sanitary sewer system. The Standards are for projects proposed to be constructed by others, to be dedicated to the County sewer system; and are not to be confused with the Jefferson County Standard Contract Construction Sanitary Sewer Specifications that are used for County construction projects.

1.0102 Minimizing the quantities of infiltration and inflow (I/I) that may enter the sewer system and minimizing the possibility of sanitary sewer overflows is essential to the long term goals of the Environmental Services Department. Federal and State regulations require that all water entering the system must receive treatment in accordance with State permits before being discharged into streams and tributaries. Jefferson County has been obligated to spend a considerable amount of funds to try to remove infiltration and inflow from the existing system. A major objective of these Standards is to minimize new sources of infiltration and inflow (I/I) in future projects.

1.0200 Applicability or Jurisdiction

1.0201 All sanitary sewer facilities that connect to the County Sanitary Sewer System shall be designed in accordance with all criteria established herein. All materials, construction, and testing of such facilities shall be according to all Sections of this document, regardless of whether such facilities will be dedicated to the County, and shall be subject to inspection by the County as deemed necessary to insure compliance with the requirements contained herein.

1.0300 Contractor Prequalification

1.0301 All sanitary sewer facilities that connect to the Jefferson County Sanitary Sewer System shall be constructed by an Environmental Services Department prequalified contractor. Prequalification forms and information are available at the Environmental Services Department.

1.0400 Proposed Pumping Station

1.0401 Commercial and residential property Owners may propose to construct a pumping station and force main sewer to transport the wastewater from residential or commercial developments in Jefferson County to the Jefferson County Sanitary Sewer System. Because of the continuous costs of maintenance, operation, and utilities, installation of a pump station will be considered as a last alternative to provide sewer service only after all options for gravity sewers have been investigated. Pumping stations that connect to the County sewer system shall be designed and constructed according to the Jefferson County Environmental Services Department Standard Guidelines for Design and Construction of Commercial and Residential Sanitary Sewer Pumping Stations, a copy of which is available at the Environmental Services Department.

1.0500 Amendments

1.0501 These Standards are subject to change, and interested parties are advised to verify with the Jefferson County Environmental Services Department that they are using the latest version of the published document. Updates to these Standards are available at the Jefferson County Courthouse, Environmental Services Department.

1.0600 Alternate Construction Methods

1.0601 These standards represent the approved construction practices and procedures for construction of sanitary sewers. Any special designs not covered by this document must be submitted to and approved by the Jefferson County Environmental Services Department before construction is allowed.

1.0602 The provisions of these Standards are not intended to prevent the use of any method of construction not specifically prescribed by the Standard, provided any such alternative has been approved and its use authorized by the Director. The Director shall approve any such alternate, provided he finds that the alternate for the purpose intended is at least the equivalent of that prescribed in this Standard in quality, strength, effectiveness, durability, and safety and satisfies the objective set out in paragraph 1.0102. The Director shall require that sufficient evidence or proof be submitted to substantiate any claim that may be made regarding the alternate.

1.0700 Definitions

1.0701 Wherever the words, forms, or phrases defined or pronouns used in their place occur in this Standard, or any document or instrument herein contemplated or to which these

Standards apply, the intent and meaning shall be construed and interpreted as follows. Words not defined below shall have the meaning in Webster's Ninth Collegiate Dictionary, as revised.

1.0702 ABBREVIATIONS: The following organizations are referred to in these Standards by abbreviations of their titles:

- A. AASHTO American Association of State Highway and Transportation Officials
- B. ANSI American National Standards Institute
- C. ASA American Standards Association
- D. ALDOT State of Alabama Department of Transportation
- E. ASTM American Society for Testing and Materials
- F. ADEM Alabama Department of Environmental Management
- G. AWWA American Water Works Association
- H. EPA U.S. Environmental Protection Agency
- I. NEMA National Electrical Manufacturer's Association
- J. OSHA Occupational Safety and Health Administration
- K. USGS United States Geologic Survey

1.0703 AS-CONSTRUCTED DRAWINGS: Construction Drawings that have been revised, based on field surveys of the constructed sewers and other data, to show significant changes made during construction and to indicate the constructed location of each service connection.

1.0704 BACKFILL: Soil, rock or other material used to replace, or the act of replacing, soil or rock material removed during excavation and construction.

1.0705 CONTRACTOR: The person, firm or corporation with whom the Owner has entered into a written agreement, with attached approved project documents, covering the work to be performed.

1.0706 COUNTY: Environmental Services Department of Jefferson County, Alabama

- 1.0707** COUNTY SEWER CONSTRUCTION INSPECTOR: An authorized representative of the Sewer Construction Office of the Environmental Services Department of Jefferson County, Alabama assigned to observe the construction of main sewers, and in some cases the service line from the main sewer to the property line, and advise the Director of the conformance with these Standard Specifications.
- 1.0708** COUNTY SEWER SERVICE INSPECTOR: An authorized representative of the Sewer Permitting and Inspecting Office of the Environmental Services Department of Jefferson County, Alabama assigned to observe the construction of all new service lines, repairs to existing service lines, connections, and disconnections, and advise the Environmental Services Director of the conformance with these Standard Specifications.
- 1.0709** COUNTY REPRESENTATIVE: An authorized representative of the Environmental Services Department of Jefferson County, Alabama assigned to review proposed sewer system Drawings, coordinate required procedures for approval, and advise the Director of the conformance with these Standard Specifications.
- 1.0710** DESIGN ENGINEER: The engineer of record who performs detail design of the sanitary sewer facility and prepares Construction Drawings and Specifications to be submitted to the County for approval.
- 1.0711** DIRECTOR: Director of the Environmental Services Department of Jefferson County, Alabama or his authorized agent.
- 1.0712** DRAWINGS: The official construction drawings or exact reproduction thereof which show and describe the work to be done.
- 1.0713** EQUIPMENT: All machinery, together with the necessary supplies for upkeep and maintenance. Also all tools and apparatus necessary for the proper construction and acceptable completion of the work.
- 1.0714** FILL: A soil or broken rock material or embankment used to provide the bulk required to raise the elevation of an area.
- 1.0715** FORCE MAIN: A pressurized sewer line intended to carry wastewater from a sewer pumping facility to the point where it can flow by gravity.
- 1.0716** INFILTRATION/ INFLOW (I/I): Infiltration shall mean the water entering a sewer system and service connections from the ground, through such means as, but not limited to broken or cracked pipe, defective pipe joints, improper connections, manhole walls etc. Inflow shall mean the water discharged into a sewer system including service connections, from such sources as, but not limited to: roof leaders, cellars, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy

areas, cross connections from storm sewers, surface runoff, etc. The term Infiltration/ Inflow (I/I) shall mean the total quantity of water from both infiltration and inflow without distinguishing the source.

- 1.0717** LABORATORY: The official testing laboratories of the County or such other laboratories as may be designated by the County.
- 1.0718** MAIN SEWER: A pipe or conduit eight (8) inches or larger intended to carry wastewater. The pipe is located in a public easement or right-of way. In other documents and publications the smaller (8 or 10 inch) main sewers may be referred to as “lateral” sewers, “collector” sewers, and “public” sewers. However the basic criteria is the same; any sewer that is 8" in diameter or larger is a main sewer.
- 1.0719** MANHOLE: A junction structure from the surface of the ground to the sewer, which allows for changes in direction or grade and which is large enough to enable access for inspection and maintenance.
- 1.0720** MATERIALS: Any substance specified for use in the work and its appurtenances.
- 1.0721** OR EQUAL: Wherever a particular process, material, device, detail, or part is specified herein, followed by these words or by similar or equivalent expressions, such words or expressions shall be understood to mean and permit the use of another process, material, device, detail, or part that the Director shall determine is fully equal in suitability, quality, durability, performance, and in all other respects, to the process, material, device, detail, or part herein specified for such use, and is approved for such use in the work. The decision of whether a particular process, material, device, detail or part is considered equal or not is the sole discretion of the Director.
- 1.0722** OWNER: The term “Owner” shall mean the company, organization, developer, or municipality who intends to design and construct the proposed sanitary sewer facilities or improvements. The terms “Developer, Owner/Developer” equal “Owner” and shall be used interchangeably.
- 1.0723** PLANS: The DRAWINGS.
- 1.0724** PLUMBING INSPECTOR: An authorized representative of the Inspection Services Department of Jefferson County, Alabama assigned to observe the installation of the internal plumbing of a building.
- 1.0725** PREQUALIFICATION: All work to be dedicated to the Jefferson County Sanitary Sewer System shall be constructed by pre-qualified Contractors that have received pre-qualification approval from Jefferson County Environmental Services Department for the various classifications of projects.
- 1.0726** SANITARY SEWER: A sewer intended to carry wastewater.

- 1.0727** SANITARY SEWER SYSTEM: All gravity sewer lines, manholes, force mains, pump stations, and appurtenances that convey wastewater to the County's wastewater treatment plants.
- 1.0728** SERVICE LINE: Any sanitary sewer line or conduit located outside the building structure that connects the building's plumbing to the main sewer. The service line is usually 4 inches and sometimes 6 inches in diameter, but no larger.
- 1.0729** SHALL: "Shall" is mandatory; "may" is permissive
- 1.0730** SPECIFICATIONS: A part of the documents containing the written directions, provisions, and requirements for completing the work. Standards for specifying materials or testing which are cited in this document by reference shall have the same force and effect as if set out in full in these standards.
- 1.0731** STATE: The State of Alabama.
- 1.0732** STATION: A specific point on the centerline of a sewer main or on the survey baseline designating some specific distance from the point of origin. Stations are numbered in terms of one hundred linear feet measured horizontally.
- 1.0733** STORM SEWER: A pipeline intended to carry rainfall surface runoff and/or subsurface waters. There is a distinct difference between storm sewers and sanitary sewers. Storm sewers exclude flow from domestic wastewater and industrial waste.
- 1.0734** STORM WATER: Rain water or any sort of runoff that does not come from sanitary sewers.
- 1.0735** STUB OUT: A portion of the service line extended from the main sewer and then capped or dedicated for later use.
- 1.0736** STRUCTURES: Facilities such as bridges, culverts, catch basins, inlets, retaining walls, cribbing, water lines, underdrains, electrical ducts, manholes, lighting fixtures and poles, transformers, flexible and rigid pavements, buildings, vaults, and other manmade features that may be encountered in the work and not otherwise classified herein.
- 1.0737** TAP: The actual connection or opening in the main sewer to allow the wastewater from the service line to enter the main sewer.
- 1.0738** WASTEWATER: Any liquids containing waste matter, originating from residences, commercial buildings, institutions, and industrial establishments together with any extraneous water that may be present, whether treated or untreated, which is discharged into or permitted to enter the County maintained infrastructures.

1.0800 Standard Reference Specifications

1.0801 All standard Specifications referenced throughout these Specifications are to be taken as the latest revision available.

1.0802 The following is a nonexclusive list of national standard Specifications referenced in these Specifications:

ANSI/AWWA

C104/A21.4 Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water.

C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3-inch Through 48-inch for Water and Other Liquids.

C111/A21.11 Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

C150/A21.50 Thickness Design of Ductile-Iron Pipe.

C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

C153/A21.53 Ductile-Iron Compact Fittings, 3-inch Through 12-inch for Water and Other Liquids.

C600 Installation of Ductile Iron Water Mains and their Appurtenances.

C900 Polyvinyl Chloride (PVC) Pressure Pipe 4 inch through 12 inch with Addendum C900-92.

C907 Polyvinyl Chloride (PVC) pressure fittings 4 inch through 8 inch.

ASTM

A48 Specification for Gray Iron Castings.

A53 Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.

A82	Cold-Drawn Steel Wire for Concrete Reinforcement.
A185	Welded Steel Wire for Concrete Reinforcement.
A615	Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
C31	Making and Curing Concrete Test Specimens in the Field.
C32	Sewer and Manhole Brick (Made From Clay or Shale).
C33	Concrete Aggregates.
C39	Comprehensive Strength of Cylindrical Concrete Specimens.
C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
C76	Reinforced Concrete, Culvert, Storm Drain and Sewer Pipe.
C90	Hollow Load-Bearing Concrete Masonry Units.
C94	Ready Mix Concrete.
C150	Portland Cement.
C172	Sampling Free Concrete.
C216	Facing Brick.
C443	Joints for Circular Concrete Sewer and Culvert Pipe.
C478	Precast Reinforced Concrete Manhole Sections.
C923	Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
D448	Standard Sizes of Coarse Aggregate for Highway Construction.
D1557	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. Rammer and 18in. Drop.
D1599	Test Method for Short Term Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings.

D1784	Specification for Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC Compounds.
D2412	Test Method for External Loading Properties of Plastic Pipe by Parallel Plate Loading.
D2434	Test method for Permeability of Granular Soils.
D2487	Classification of Soils for Engineering Purposes.
D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
F477	Specifications for Flexible Elastomeric Seals for Joining Plastic Pipe.
F610	Practice for Estimating the Quality of Molded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings by the Heat Reversion Process.
F1336	Poly(vinyl chloride) (PVC) Gasketed Sewer Fittings.

1.0803 The following is a list of other publications referenced in these Specifications:

- A. Jefferson County Publications
 - 1. Jefferson County Standard Contract Construction Sanitary Sewer Specifications.
 - 2. Jefferson County Standards for Construction of Sanitary Sewer Service Lines and Connections
 - 3. Jefferson County Sewer Use Ordinance
 - 4. Jefferson County Guidelines for Design and Construction of Commercial and Residential Sanitary Sewer Pumping Stations.

- B. State of Alabama Department of Transportation Publications
 - 1. Alabama Manual on Uniform Traffic Control Devices for Streets, and Highways
 - 2. Standard Specifications for Highway Construction
 - 3. Utility Manual

- C. Occupational Safety and Health Administration Publications
 - 1. Safety

D. American Railway Engineering Assoc.

1. Part 5 Specifications for Pipeline

1.0804 Any reference in the ANSI/AWWA or ASTM standards or specifications to “Owner” or “purchaser” is to be interpreted as “The County.”

1.0900 Construction Drawings Review and Approval Process

1.0901 The Environmental Services Department, as a department of Jefferson County, AL operates and maintains the County Sanitary Sewer System and must regulate any proposed additions or changes to the system in order to carry out and accomplish the purpose defined in Section 1.0100. Prior approval of any projects affecting the sewer system is required. Construction Drawings are required to be prepared for all new sewers to be built in Jefferson County and connected to the County Sanitary Sewer System. In the event a project is to be built that crosses existing sewers or encroaches in County easements, drawings must be submitted to the County for approval.

1.0902 The Construction Drawings of all sanitary sewer facilities that will connect to the County Sanitary Sewer System or wastewater treatment plants shall be prepared and submitted to the Environmental Services Department for approval in accordance with requirements of Section 2.0300.

1.0903 The Owner or the Owner’s Design Engineer shall submit two (2) sets of Sewer Construction Drawings, and one copy of the complete development (subdivision apartment complex, office complex, etc.) drawings, to the Jefferson County Environmental Services Department at the Sewer Plans Review Office in Room 634, 2121 8th Avenue North. If the Drawings are to be sent by mail, the proper mailing address can be obtained from that office. [Current Telephone No. 521-7515.]

1.0904 The County Representative will review the Drawings submitted and if necessary, the County will return one (1) set of markup drawings to the Design Engineer for revision and resubmittal.

1.0905 The Design Engineer will provide the corrected set of original drawings to the County Representative.

1.0906 All main sewers 8” and larger must be located in sanitary sewer easements dedicated to the County in accordance with Section 2.0400. Easement deeds will be required for all easements in commercial developments and residential developments that are not dedicated by Record Maps. Easements transferred by Record Map shall be dedicated Sanitary Sewer Easements. Minimum easement width is twenty (20) feet, ten (10) feet each side of the sewer centerline. The Owner’s Design Engineer will submit one (1) copy of all required deeds for review prior to execution.

1.0907 A deposit amount to guarantee submittal of “As-Constructed Drawings,” shall be required before Sewer Construction Drawings are approved. See Section 1.1001.

1.0908 The Owner or Design Engineer will submit the original executed deeds and right of way accommodation permits to the Jefferson County Environmental Services Department at the Sewer Plans Review Office in Room 634, 2121 8th Avenue North. If the Deed/permits are to be sent by mail, the proper mailing address can be obtained from that office. [Current Telephone No. 521-7515.] Deeds will be reviewed by the County Representative and if acceptable, recorded in Probate Court. The County will not accept deeds recorded by others.

1.0909 Upon approval of the Sewer Construction Drawings, the Director will sign all sheets and return them to the Design Engineer. The signature of the Director of Environmental Services indicates the following:

“Director of Environmental Services”: Indicates review of Construction Drawings for conformance with the “Standards for Construction of Commercial and Residential Sanitary Sewers.”

1.0910 The approval of Sewer Construction Drawings is valid for a period of 180 calendar days. If construction has not begun at the end of 180 calendar days the Drawings must be resubmitted for approval prior to starting construction. Drawings over 180 days representing projects for which construction has not yet begun are void unless indicated by an updated stamp of approval.

1.1000 Final Project Acceptance

1.1001 The Environmental Services Department will make inspections on the proposed projects while they are under construction. The County will not issue a letter of acceptance for the project until a successful field final inspection, including required testing, has been performed. All work shall be complete and in accordance with these Specifications. All easements must be deeded correctly and a final set of “As Constructed Drawings” submitted.

1.1100 As-Constructed Drawings

1.1101 Prior to approval of Construction Drawings, a refundable deposit is required to guarantee submittal of the As-Constructed Drawing(s). Deposits must be a banking institution cashiers check (referred to by some banking institutions as Official Check). No personal or company checks will be accepted. The parties on the check must be reflected as follows: “Jefferson County Treasurer or (relative party)” (both parties to be separated

strictly/only by the word or). Should there be any questions as to the reflection of all parties on the check, consult with the Environmental Services Department, Sewer Plans Review Office in Room 634, 2121 8th Avenue, North. If check is to be sent by mail, the proper mailing address can be obtained from that office, [Current Telephone No. 521-7515]. The amount of deposit shall be \$1,000.00 minimum or \$2.00 per linear foot of main sewer, as measured station to station (center of manhole to center of manhole), whichever is greater. The total amount of deposit should be verified in advance with the aforementioned office. Any other inquiries should be directed to that office. In the event the owner/developer does not submit the As-Constructed Drawings, clear written notification of failure to submit will be given, after which the County reserves the right to use the deposit to perform the survey and prepare As-Constructed Drawings.

1.1102 Upon completion of construction, the Design Engineer shall have the project surveyed by an Alabama Licensed Surveyor to locate the constructed facilities on the As- Constructed Drawing(s). With information from the survey and from construction records, the Design Engineer or Surveyor will make revisions to the approved Construction Drawings, in accordance with Section 2.0500, to accurately show the actual facilities that were installed.

1.1103 Final As-Constructed Drawings shall be submitted for acceptance at the Environmental Services Department, Sewer Plans Review Office in Room 634, 2121 8th Avenue North.

1.1200 Inspection Policy

1.1201 The intent and desire of the County is that all sanitary sewer facilities be constructed in such a manner and under such supervision and inspection that the County may be assured that acceptable materials are used and that appropriate construction standards are observed, resulting in the installation of a sewer that minimizes the amount of infiltration and inflow in accordance with Section 1.0100.

1.1202 The Contractor shall be responsible for contacting the Sewer Engineering Construction Office prior to beginning work [Current Telephone No. 325-5127].

1.1203 The County Sewer Construction Inspector may inspect for the following:

- A. Inspection may be made of the excavated trench before placement of any material, pipe, etc. into the trench, and the trench shall be in compliance with these Specifications. The inspector may ascertain the condition of the trench bottom, and approve the suitability of the trench bottom before placement of material, pipe, etc.
- B. The purpose of the inspection is to confirm that all work is in accordance with Section 3.00 and 4.00 of the Construction Specifications.

- C. Inspection may be made of the pipe bedding before installation of pipe.
- D. Inspection may be made of the complete pipe backfill until one (1) foot of backfill material is placed over pipe.
- E. Any testing required in Section 5.00 of the Standard Specifications shall be witnessed by the County Sewer Construction Inspector as required.

1.1300 Enforcement Policy

- 1.1301** When an inspection report indicates the work does not meet requirements of these standards, the County will advise the Owner/Developer that the work is being completed at risk of not being accepted.
- 1.1302** The County reserves the right to withhold future permits if the work is not brought up to standards.

1.1400 Miscellaneous

- 1.1401** Any proposed sanitary sewer facilities not specifically covered herein shall be submitted to the County for its approval. Before commencing with the preparation of construction drawings, the County Environmental Services Director should be consulted, regarding specific design requirements for any non-routine sewer facilities including all pump stations, any manholes deeper than twenty feet, all tunnels, all bores, creek crossings, all siphons, and any other unique sanitary sewer facility.

1.1500 Permits

1.1501 ALDOT

For any sanitary sewer facilities proposed to be installed within State highway right of way, the Alabama Department of Transportation (ALDOT) requires a Right of Way Accommodation Permit. The Design Engineer or Owner/Developer shall prepare, for the County to execute, all required Right of Way Accommodation Permits. Currently the State requires the County rather than any private party or Owner/Developer to submit the application for permit agreements. Accordingly, the project Owner/Developer must enter into an agreement with the County accepting responsibilities imposed by the State. (This requires County Commission Action.) The Owner/Developer is responsible for performing all duties imposed on the County by the State. The County's involvement in

the process is strictly limited to the submittal of the application. The Design Engineer and/or Owner/Developer is responsible for accuracy of all information conveyed on the permit application. Further, the County is not responsible for the State revoking an Accommodation Agreement after it has been issued. Any inquiries concerning this matter should be directed to the Environmental Services Department, Sewer Plans Review Office, [current Telephone Number 521-7515].

1.1502 Railroads

In the event a proposed sanitary sewer facility is to be located within or crossing an existing railroad right-of-way, the Design Engineer or Owner/Developer must contact said railroad. The Owner/Developer may be required to file for a permit as well as entering into an agreement with the railroad that details all duties that are imposed on the Owner/Developer by said railroad. All documents between Owner/Developer and railroad are to be included with the sewer construction drawings at the time they are submitted for County review and approval. An Owner/Developer should be advised that approval of sewer construction drawings can be upheld and/or denied if any language in the documents between the Owner/Developer and the railroad is found to restrict the County's ability to properly maintain and operate said proposed sanitary sewer facilities, or if the language contains any indemnification or hold harmless clauses the County will be prohibited from entering into. Any costs such as crossing fees imposed by the railroads are to be paid by the Owner/Developer.

1.1503 Utilities

In the event a proposed sanitary sewer facility is to be located within or crossing existing utility right-of-way, the Design Engineer or Owner/Developer must contact said utility. The Owner/Developer may be required to file for a permit as well as entering into an agreement with the utility that details all duties that may be imposed on the Owner/Developer by said utility. All documents between Owner/Developer and utility are to be included with the sewer construction drawings at the time they are submitted for County review and approval. The Owner/Developer should be advised that approval of sewer construction drawings can be upheld and/or denied if any language in the documents between the Owner/Developer and the utility is found to restrict the County's ability to properly maintain and operate said proposed sanitary sewer facilities, or if the language contains any indemnification or hold harmless clauses the County will be prohibited from entering into. Any costs imposed by the utility are to be paid by the Owner/Developer.

Section 2.00

Design Guidelines for Sanitary Sewers

2.0100 General

- 2.0101** The Owner shall obtain the services of a Professional Engineer, registered in the State of Alabama, to provide engineering design services. Services shall include both surveying by a Professional Land Surveyor and engineering design by a Professional Engineer.
- 2.0102** The Design Engineer must be knowledgeable of the minimum design standards, laws and regulations relating to the project. The Design Engineer will prepare project Drawings and Specifications for approval by the County.
- 2.0103** The Owner will select and contract with a Jefferson County Environmental Services Department pre-qualified general contractor licensed in the State of Alabama to be responsible for constructing the project according to the Drawings and Specifications. The Contractor or Design Engineer will be responsible for coordinating inspections of the work as required by the County for final acceptance.
- 2.0104** Minimizing the quantities of infiltration and inflow (I/I) that enter the sewer system and minimizing the possibility of sanitary sewer overflows is essential to the long term goals of the Environmental Services Department. Federal and State regulations require that all water entering the system must receive treatment in accordance with State permits before being discharged into streams and tributaries. Jefferson County has been obligated to spend a considerable amount of funds to try to remove infiltration and inflow from the existing system. A major objective of these Standards is to minimize new sources of infiltration and inflow (I/I) in future projects.

2.0200 Surveys and Investigations

- 2.0201** An actual ground centerline survey of the route of the proposed sewer must be performed by the Owner. The Survey must obtain information on existing topography and underground utilities to be shown on the Drawings. Base lines or reference marks must be established in the field. Ground profile data must be field surveyed along the actual alignment. Topography may be obtained from either aerial surveys, field measurements, or both methods.

2.0300 Contents of Construction Drawings

2.0301 Sewer Construction Drawings must be prepared, under the direct supervision of an Alabama Registered Professional Engineer and stamped, sealed, and dated by said registered engineer. Construction Drawings submitted for approval shall contain the following items.

- A. A Land Tie stamped, sealed and dated by an Alabama Registered Land Surveyor, shall show the location of the center line or manhole of sanitary sewer in relation to section line, quarter section line, or quarter-quarter section line using two verified monuments and labeled as applicable. Ties made within platted subdivisions may be made to lot lines when the Land Surveyor deems that this is the best and most reproducible tie that can be made. Properties that rely on meets and bounds descriptions should be tied in a manner similar to their deed calls. Direct ties should be made whenever possible. The Land Tie shown on Standard Drawing SD1 shall be used as an example (See Appendix). Alignment and property surveys required for right of way acquisitions shall meet the requirements of Rules 1.03-1.06 of the Minimum Technical Standards for Land Surveying in the State of Alabama. Closure data for both Horizontal and Vertical Control shall be submitted to the Sewer Plans Review office for review and verification.
- B. Each drawing sheet shall contain the name of the project, and the name(s), address, and telephone numbers of the Owner/ Developer(s), the Design Engineer, and the Land Surveyor.
- C. Drawings shall be prepared using standard drafting practice on 24"x 36" sheets. Sewer drawings shall be on 24"x 36" half plan/profile sheets. The profile grid shall have 50' (H) and 1' (V) lines.
- D. Drafting media for submittal of drawings shall be 4 mil polyester drafting film, premium bond paper or tracing paper of reproducible quality.
- E. Preliminary Drawings shall be in reproducible black, blue-black ink, or pencil. Final Drawings for approval shall be submitted in permanent ink only.
- F. The minimum text height shall be 0.1 inch and shall be legible.
- G. Plan and profile of proposed sewer lines shall be on the same sheet, drawn at 1"=50' horizontal and 1"=10' vertical scales. Grades shall be shown in percent (%) and indicated between each manhole. Both invert and existing profile elevations are to be indicated at every 50 ft. station. The flowline elevation of each line entering and exiting a manhole shall also be shown.
- H. Sheets shall be properly numbered, indicating "Sheet _____ of _____."

- I. All symbols shall conform to the standard symbols indicated on Standard Drawings No. SD3, SD4 and SD5, (See Appendix).
- J. Standard Detail sheet(s) shall be included in the project drawings and shall be in accordance with the Standard Drawings attached in the Appendix herein.
- K. Stationing shall commence at the left of the sheet and at the lowest point of the sewer and continue upstream to the right across the sheet. A maximum of 1,200 feet of sewer may be on each sheet.
- L. Standard Notes (as shown on Standard Drawings SD2 in Appendix) shall be shown on at least one of the Plan/Profile Drawings.
- M. Pipe material shall be shown between each manhole and where a pipe material change occurs. Concrete collars, if required, shall be shown on the Drawings.
- N. County reference number, station location, size, direction of flow, and type material of all existing sewers shall be indicated on the Drawings.
- O. Direction of flow for each proposed sewer line shall be shown.
- P. Horizontal station location of all manholes, deflection angles at manholes, distance between manholes, angles to existing sewers and other system features shall also be shown.
- Q. North arrows shall be indicated on each sheet.
- R. An Alabama registered Professional Engineer's seal, signature, and date shall be included on each sheet. An Alabama Registered Land Surveyor's seal, signature, and date shall be affixed to each sheet that indicates right-of-way or property boundaries.
- S. Temporary Bench Mark elevations shall be based on U.S.G.S. Datum and properly identified on the appropriate sheets.
- T. All topographic features, both existing and proposed, shall be shown. Examples include but are not limited to storm sewers, drainage ditches, creeks, utilities, etc. In profile the existing ground shall be shown as a dashed line, and the proposed ground shall be shown as a solid line.
- U. All property lines, subdivision block and lot numbers, rights-of-way, and required or utilized easements shall be shown. All sanitary sewer easements, both those to be dedicated by record map and those to be dedicated by recorded deed shall be shown. Easements dedicated by plat shall contain the

following statement on the plat: "Easements for sanitary sewer lines, if not previously dedicated to Jefferson County, AL. are for construction and access in the installation and maintenance of sanitary sewers and their appurtenances only."

- V. Section information (quarter section, township, and range) shall be shown on each sheet near the title block.
- W. Capped sewer plans must include a four (4) inch drain out of the top of the lowest manhole and into the nearest storm sewer or drainage ditch.
- X. Streets shall be shown and named or numbered.
- Y. Service lines and connections shall be shown and stationed. Drawings shall require the Contractor to furnish the Engineer with a video tape survey of the constructed sewer. See Paragraph 2.0502.B.

2.0400 Easements, Right of Way and Property Deed Descriptions

- 2.0401** All Easements and/or property required for gravity sewers, force mains, and pumping stations which will not be transferred to the County by record map must be described and deeded to the County. Easements for residential construction can be transferred by Record Map. Easements not within the boundaries of said record map shall be transferred by deed to the County. Commercial and apartment property must have deeded easements and cannot be transferred by Record Map. The minimum easement width is twenty (20) feet, ten (10) feet each side of the sewer centerline. Property descriptions shall be prepared utilizing field surveys (completed by a registered Professional Land Surveyor) of the land tie, properties being transferred, and the project sewer alignment.
- 2.0402** Deeds shall be prepared on Jefferson County standard deed forms, copies of which may be obtained from the Sewer Plans Review Office in 634, 2121 8th Avenue North. [Current Telephone No. 521-7515]. The project name shall be indicated on the front top left of deed and the preparer's name and address shall be indicated on the front top right of the deed.
- 2.0403** Property descriptions shall locate the property by commencing with a monumented land tie as required in paragraph 2.0301 A. It shall then traverse from the land tie to the centerline of the project sewer alignment, then along the centerline sewer alignment to the point of beginning of the property being described, then along the centerline sewer alignment to the point ending the property being described. Strip deeds for right of way and easements shall indicate the property being described relative to the centerline alignment by indicating the right of way width and offset from the centerline. Property parcels for facility sites shall continue with the above sewer alignment and then with a

closed traverse around the boundary of the parcel. Where lines are curved, the significant elements of the curve shall be described.

2.0404 Dimensions for descriptions shall be formatted as follows:

- A. Distances shall be horizontal, indicated in feet to two decimal places.
- B. Angles shall be in degrees, minutes, and seconds to the nearest second. Angles shall be indicated as deflecting to the left or right (i.e., deflection angle, delta angle, exterior angle) from the direction of the previous course. Azimuths and bearings will not be accepted as angular measurements.
- C. Area shall be shown in acres to two decimal places.

2.0500 As-Constructed Drawings

2.0501 Upon completion of construction, an actual ground survey shall be performed to locate the constructed facilities.

2.0502 Sanitary Sewer As-Constructed Drawings shall contain the following information:

- A. As-Constructed Drawings shall reflect all changes made to the approved Construction Drawings and should accurately show the actual sewer facilities that were installed.
- B. As-Constructed Drawings shall show the constructed location of all service lines in every sewer reach as measured and recorded from the constructed location of the first manhole immediately downstream. The Contractor shall furnish the Engineer a video tape survey of the constructed sewer. The Engineer shall utilize the tape and measured lengths from the Contractor's log to indicate the as-constructed location of all service lines. The tape and log shall be transferred to the County when the drawings are submitted.
- C. In general the As-Constructed Drawings shall have the same format and information, excluding notes, etc., required on the Construction Drawings in Section 2.0300.
- D. As-Constructed Drawings shall be submitted on 4 mil polyester 24" x 36" plan/profile drafting film with matte finish on both sides. The profile grid shall be 50' (H) lines and 1' (V) lines. Drawings shall be done with permanent black ink.
- E. Plan and profile of constructed sewer system shall be on the same sheet, drawn at 1"=50' horizontal and 1"=10' vertical scales, with grades in percent (%)

indicated between each manhole and invert elevations shown at 50-foot stations and at every manhole.

- F. Pipe material type shall be indicated between the manholes and at locations where pipe material changes.
- G. The following note shall be attached to the drawings:

I (printed name) certify that this is a true and accurate sewer plan and profile map as field surveyed after construction.

Signature

Alabama Licensed Engineer

Registration Number

2.0600 General Design Criteria

- 2.0601** All Residential and Commercial sanitary sewer facilities shall be designed in accordance with these standards.
- 2.0602** Design flow shall be based on the guidelines of paragraph 2.0900.

2.0700 Manholes

- 2.0701** All manholes shall be designed in accordance with the following guidelines:
 - A. Minimum inside diameter of manholes shall be 48 inches.
 - B. Manholes shall be installed at the end of each line, at all changes in grade, pipe size, alignment, and at all intersections of main sewers.
 - C. The maximum distance between manholes shall be 400 ft.
 - D. The maximum deflection angle of sewer alignment at manholes shall be 90 degrees.
 - E. For differences of in/out invert elevations greater than 2.0 ft., a Memphis Tee drop manhole (see Standard Drawing SD1560 in Appendix) shall be used. Drop manholes shall be avoided where practical.
 - F. Bolt down frames and covers shall be required where the proposed manholes are subject to being flooded. See Standard Drawing SD1575.

- G. Manhole Boots are required for all penetrations of pipe up to 18 inches nominal diameter.
- H. The minimum depth of all manholes shall be 55 inches.
- I. Cones shall be the concentric type. Flat slab and eccentric conical sections are prohibited.
- J. Frame and covers shall be in accordance with Section 4.0820 and Standard Drawings SD1570 and SD1575.
- K. Manholes deeper than twenty (20) feet require a special design be submitted to the County for approval. Likely, a minimum diameter greater than 48 inches will be required.

2.0800 Pipe Material

2.0801 All sanitary sewers shall be constructed of the following types of pipe:

- A. Gravity sanitary sewers 8 inches to 12 inches in diameter shall be constructed of Class 52 Ductile Iron Pipe or AWWA C-900 PVC pipe except as specified below. AWWA C-900 PVC pipe shall be allowed where the slope is less than or equal to 14.00% and the cut is less than or equal to 14 ft. Where the slope is greater than 14.00% or the cut is greater than 14 ft., ductile iron sewer pipe shall be used. "Cut" is defined as the vertical distance from the finished ground, or surface, to the invert of the pipe.
- B. Gravity sanitary sewers from 16 inches to 20 inches in diameter shall be constructed of ductile iron sewer pipe only. If a 24 inch diameter pipe or larger is needed, the sewer will be approved on a case by case basis.
- C. Sanitary sewers crossing storm drains, creeks, or ditches shall be ductile iron pipe. If a sanitary sewer line is running parallel with a storm drain, ductile iron shall also be used.
- D. Sanitary sewers that are to be constructed with less than 4 ft. of cover shall be submitted to the County for approval on a case by case basis and shall be ductile iron pipe.
- E. In areas that have been filled and the proposed sewer will be within the fill, ductile iron pipe with restrained joints shall be used. (See paragraph 4.0204.)
- F. The first upstream joint out of a manhole shall be ductile iron if the invert of the pipe is greater than 6 inches above the invert of the manhole.

- G. Sewers requiring concrete bedding or encasement shall be ductile iron.
- H. All carrier pipes installed in a bore or tunnel shall be ductile iron.
- I. All Sanitary sewers located in mobile home parks shall be ductile iron pipe.

2.0900 Quantity of Sanitary Sewage

- 2.0901** The County provides sewer service access to carry wastewater to a treatment facility for treatment. In the interest of keeping this volume to a minimum, all waters not requiring treatment at a publicly owned treatment works (POTW) must be excluded from the sewer system as far as practical. Therefore, connections of roof, yard, and foundation drains to the sanitary sewer system are strictly prohibited.
- 2.0902** The sewer capacity to be provided for must be determined from careful analysis of the present and probable future quantities of domestic, commercial, and industrial wastewater.
- 2.0903** Developments having sewer systems and anticipating future growth in upper reaches of the sewer drain area must develop a long range plan for the installation of sewer facilities. The plan must consider the entire drainage area beyond the limits of the subdivision.
- 2.0904** Sanitary sewers shall be designed to carry the flow from the estimated ultimate tributary population.
- 2.0905** Estimated design flows shall be determined and submitted to the Environmental Services Department for approval as follows:
 - A. Average Daily Flows shall be calculated using the following criteria:
 - 1. Not less than 100 gallons per person per day calculated for single family residential areas at 7 persons per acre and in apartment complexes at 17 units per acre, 3.5 persons per unit.
 - 2. Average sewer flow from institutional and industrial establishments shall be determined from a study of similar establishments and submitted to the County for review and subsequent approval. Commercial volume of flow shall be computed on the basis of 20 people per acre and 50 gallons per person over a 16-hour period.
 - 3. Allowance shall be made for vacant lots and property in consideration of existing development patterns, trends, and engineering judgement.

- B. Gravity sewers shall be designed using Manning's approximation of Kutter's formula, to flow ½ full at peak flow. The peak flow shall be calculated by applying a peaking factor of 3 to the Average Daily Flows.

2.1000 System Layout

- 2.1001** The system layout begins by selecting an outlet, determining the sewer drainage boundary, locating the trunk and main sewers, and determining the need for and location of pumping stations.
- 2.1002** Develop preliminary layouts on site topographic maps generally to slope in the same direction as streets and the ground surface. Sewers shall be located to serve all parcels of property.
- 2.1003** Sewers located along back property lines without alleys must provide right-of-way access for construction, inspection, maintenance and repair.
- 2.1004** Commercial and Residential sewer easements must extend to the upper limits of the drainage basin of a particular property.
- 2.1005** Sanitary sewers to be dedicated to the County shall be constructed within the center of the dedicated right-of-way. Permanent easements for sanitary sewers shall be a minimum width of 20 feet. When the easement is running parallel with a road right-of-way or property line, the easement shall extend to the right-of-way or property line.
- 2.1006** Separation between sanitary sewers and water mains shall be a minimum of 10 feet horizontally. When crossing a water main, the top of the sanitary sewer shall be a minimum of 24 inches below the bottom of the water main. If running parallel with a water line the sewer line shall be ductile iron. If circumstance requires the sanitary sewer to be closer than 10 feet horizontally the sewer must be a minimum of 24 inches below the waterline. The sanitary sewer cannot be installed in the same excavated ditch with a water main.
- 2.1007** Sewers shall not run parallel under concrete curbs or gutters. To allow for maintenance, the minimum distance between the edge of the curb and center line of a parallel sanitary sewer shall be 4 feet.
- 2.1010** Depth of Sewers - To the extent possible, sewers should be at such depth that they can receive the contributed flows by gravity. Deep basements and buildings on land substantially below street level may require individual pumping stations. If installed, these pumping stations shall be owned and maintained by the individual property owner. Depth of sewers along property should provide minimum slope of 1% for building service lines to be installed according to the County's Standards for Construction of Sanitary Sewer Service Lines and Connections. All sanitary sewers shall have a minimum of 30 inches of

cover in non-traffic areas and 36 inches in paved areas subject to vehicular traffic. Proposed sewers with less than 4 feet of cover shall be submitted for approval to be considered on a case by case basis.

2.1011 Sewers constructed in fill areas: All areas to receive fill shall be filled and compacted prior to the installation of any sewer lines or any structure. See paragraph 2.0800E for pipe material for pipe material requirement. The following note shall be indicated on each tangent of the sewer profile in areas of fill:

Note: All areas to receive fill shall be filled and compacted per the sanitary sewer design drawings prior to the installation of the sanitary sewer lines or any structures.

2.1020 Minimum Velocities and Maximum Slopes - Gravity sewers shall be designed for a minimum velocity of 2.0 ft./second (f.p.s.) at peak flow. Where required, gravity sewers on slopes greater than 15% shall be restrained to prevent separation of pipe joints. When using standard manholes, the maximum grade allowed is 15%. Any slope in excess of 15% requires special pipe restraints and special manholes which must be designed and submitted for approval. The Design Engineer shall make every effort to not exceed the 15% grade.

2.1021 Scouring Velocities.

- A. At peak flow, the minimum velocity in the sewer shall be 2 fps.
- B. The minimum grade for collector and lateral sewers shall be as follows:

Nominal Pipe Diameter –Inches	Minimum Grade – ft./ft.	Percent Grade
8	.0040	.40
10	.0028	.28
12	.0022	.22
16	.0015	.15
18	.0012	.12

2.1100 Design for Various Conditions

2.1110 Open Cuts – Inasmuch as the load imposed on a sewer built in open cut is a function of the bedding, trench width, backfill material and superimposed load on the ground surface, consideration must be given to all of these elements.

2.1120 Tunnel and Cased Bores - Where sewers cross roads, railroads, highways or require trenchless installation under the ground surface, tunnels or cased bores may be required. Permitting requirements of the Alabama Department of Transportation, Utility Manual, or the American Railway Engineering Assoc. shall be included. If a tunnel is approved, it must be installed in accordance with the Jefferson County Standard Contract Construction Sanitary Sewer Specifications.

2.1200 Service Lines (4 and 6 Inch Lines)

2.1201 Sewers will be designed, where possible, to serve every lot or parcel adjacent to the sewer. A manufactured 90-degree "Tee" fitting shall be installed at every lot or parcel for connecting service lines to the main sewer.

2.1202 Where service lines are allowed to enter manholes, flexible manhole boots are required as specified in paragraphs 3.1202 and 3.1203.

2.1203 The installation, permitting and inspection of service lines (building laterals) are covered by the Jefferson County Standards for Sanitary Sewer Service Lines and Connections, a copy of which is available from the Environmental Services Department Permitting and Inspection Office.

Section 3.00

Construction Specifications for Sanitary Sewers

3.0100 Site Preparation

3.0101 Before starting construction operations, the Contractor shall remove all vegetable growth, debris and other objectionable matter standing or lying on the surface within the limits of the areas to be excavated or filled; and shall demolish and remove from it such buildings and other structures as are specifically designated on the Drawings for removal.

3.0102 The Contractor shall comply with all local, County and State regulations regarding site preparation, pollution, burning permit, erosion control and stormwater runoff.

3.0200 Excavation

3.0201 Trench excavation or excavation for pipe lines shall consist of the excavation necessary for construction of the sanitary sewer system and all appurtenant facilities thereof, including manholes, pipe bedding, and pipe protection as called for on the Drawings. It shall include clearing and grubbing, where necessary, backfilling and tamping of pipe trenches and around structures, and the disposal of waste materials. The Contractor must comply with all federal, state, and local safety rules and regulations, including those of OSHA. The County will not inspect for compliance with safety regulations, and disclaims any responsibility to ensure the safety of workers.

3.0202 The bottom of the trench shall be level in cross section and shall be cut to the depth necessary to place the bedding and install the pipe to design grade.

3.0203 Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest its entire length upon the bedding material. Bell holes shall be large enough to permit proper installation of joints in the pipe. Bell holes shall not be excavated more than five joints ahead of pipe installation.

3.0204 The bottom of the excavation for manholes and other structures shall be true to the required shape and elevations shown on the Drawings. Should the Contractor excavate below the elevations shown or specified, he shall fill the void thus made with Pipe Bedding material. No earth backfilling will be permitted under pipe or structures, unless specifically shown on the Drawings.

- 3.0205** When muck, quicksand, soft clay, swampy, or other materials unsuitable for foundations or subgrade are encountered which extend below the limits of the excavation, such material shall be removed and replaced with foundation backfill material [see paragraph 4.0540] thoroughly compacted and inspected by the County Sewer Construction Inspector. The County Sewer Construction Inspector shall have the final decision on whether material is unsuitable for subgrade and shall determine the gradation of the foundation backfill on a case by case basis.
- 3.0206** The Contractor is required to install and maintain any and all required silt fences.
- 3.0207** Where excavations are made adjacent to existing buildings or other structures or in paved streets or alleys, the Contractor shall take particular care, subject to OSHA regulations, to sheet, shore and brace the sides of the excavation adequately so as to prevent any undermining of or settlement beneath such structures or pavement.
- 3.0208** Sheeting, shoring, or bracing materials shall be removed before backfilling unless otherwise directed by the Design Engineer or County Sewer Construction Inspector. Such materials shall be removed in a way that will not endanger or damage the new structure or any existing structures or property in the vicinity, either public or private, and so as to avoid cave-ins or slides. Trench sheeting and bracing shall not be removed until the trench has been backfilled one (1) foot above the top of the pipe.
- 3.0209** Where the excavation area shown on the Drawings falls under the water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the excavation work and for the protection of the work thereafter; provided the method and equipment to be used have received prior approval of the County. In such cases, the excavation area shall be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed to the satisfaction of the County.
- 3.0210** Rock encountered in trench excavation for sewers shall be removed for the overall width of the trench and to a depth below the bottom of the barrel of the pipe as shown on the Standard Drawings in the Appendix. The space excavated below the barrel and bell of the pipe shall be backfilled with pipe bedding, as specified in Section 4.0510. All over-shot rock must be removed by the Contractor before placing the bedding. If the Contractor excavates below the required trench bottom, the excess space must be filled with ASTM D-448 No. 57 crushed stone.

3.300 Pipe Bedding

- 3.0301** A cushion of stone aggregate shall be provided under all sanitary sewers unless other types of construction are shown on the Drawings or directed by the County. Pipe bedding material shall meet the requirements of Section 4.0510 of these Specifications.
- 3.0302** Pipe bedding shall be placed below the barrel of the pipe, across the full width of the trench, and shall consist of a 4 inch layer of ASTM D-448 No. 57 crushed stone. Bedding shall be compacted to the exact grade for the full length of the pipe barrel and for the full width of the trench before each pipe is installed. Bedding material shall be thoroughly compacted.

3.0400 Pipe Installation

- 3.0401** The Contractor is responsible for accurately placing pipe to the exact line and grade shown on the Drawings. The control of vertical and horizontal alignments shall be accomplished by using a laser beam instrument. When a laser is used, the elevation and alignment of the pipe shall be checked by transit and level rod at the first joint out of the manhole, and then every 50 feet. Other approved methods of controlling vertical and horizontal alignments may be used if specifically authorized by the County Sewer Construction Inspector. All pipe shall be installed in accordance with these specifications and the recommendations of the manufacturer. The practice of bumping or snatching (with backhoe or crane, etc.) to adjust the pipe after placement in the trench will not be permitted.
- 3.0402** Each piece of pipe and special fitting shall be carefully inspected before it is backfilled. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells up the hill. Trench bottoms found unsuitable for foundations shall be undercut and brought to exact line and grade with pipe bedding, concrete cradles, foundation backfill, or as directed by the County Sewer Construction Inspector.
- 3.0403** For bell and spigot pipe, bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. Bell holes shall be cut not more than five (5) joints ahead of pipe laying. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and to avoid sudden offsets or inequalities in the flow line.
- 3.0404** Water in the trench shall not be above the pipe bedding while pipe installation is in progress or before the trench has been backfilled. The Contractor shall not open at any time more trench than his available pumping facilities can dewater. Movement of water that would tend to erode or affect the trench walls will not be allowed. Under no circumstances shall trench water be allowed to drain into an existing sewer.

3.0405 As the work progresses, the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been installed, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.

3.0406 Backfilling of trenches shall start immediately after the pipe is in place and the pipe and joints have been inspected and approved by the County Sewer Construction Inspector.

3.0407 On all force main sanitary sewers and C-900 piping, the Contractor shall install tracing tape suitable for visual identification approximately twelve inches (12") below proposed finished grade. The tape shall be on 3" x 1000' rolls, shall be labeled "sanitary sewer" and shall have an aluminum backing for detection with a metal detector. Tape shall be Lineguard Maintenance Systems, or approved equal.

3.0500 Joint Construction

3.0501 For bell and spigot pipe, the inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.

3.0502 Joints on ductile iron and C-900 PVC sewers shall be compression joints, and shall be installed according to the pipe manufacturer's specifications and recommendations.

3.0503 Any leaks or defects discovered anytime after completion of work shall be repaired immediately by removing that section and reinstalling. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe that has been disturbed after jointing shall be taken up, the joint cleaned and remade and the pipe reinstalled and inspected.

3.0504 Contractors are referred to Section 4.00 "Material Specifications for Sanitary Sewers" for additional specifications regarding joints for specific types of pipe.

3.0600 Backfilling Trenches

3.0601 No backfilling of sewer line trenches shall be started until the work has been inspected and approved by the County Sewer Construction Inspector. Upon said approval, the sewer line trench shall be immediately backfilled. Backfill material as specified in Section 4.0530 and in the Standard Drawings SD2020 and SD2030, (in Appendix) shall be carefully deposited. Care shall be take to insure that material under haunches of pipe is consistently placed.

- 3.0602** Where pipe trenches extend along or across paved streets, roadways, alleys or sidewalks, the Contractor shall obtain approval and conform with the requirements of the local government having jurisdiction over the paved surface.
- 3.0603** For trenches that do not extend along or across paved streets, roadways, alleys or sidewalks, backfill material from a height of one (1) foot above the top of the pipe upward will not require tamping unless otherwise specified. See paragraph 3.0605.
- 3.0604** Where excavation has been within the limits of easements across private property, the trench surface backfill material shall consist of fine, loose earth free from large clods, vegetable matter, debris, stones, and/or other objectionable materials, unless rip rap is required for erosion control.
- 3.0605** Where tamping is not required for the full depth, the backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation. Any deficiency in the quantity of materials for backfilling the trenches, or for filling depressions caused by settlement shall be supplied by the Contractor.
- 3.0606** Backfilling around structures located in paved streets shall be done utilizing ASTM D-448 No. 57 stone.
- 3.0607** All backfilling shall be done in such a manner as will not disturb or injure the pipe. Any pipe injured, damaged, or moved from its proper line or grade during backfilling operations shall be replaced or repaired, inspected and then rebackfilled as herein specified.
- 3.0608** The Contractor shall replace all surface material and shall restore paving, curbing, sidewalks, gutters, and other surfaces disturbed, to a condition equal to that before the work began, and in accordance with the local government having jurisdiction.
- 3.0609** Backfill materials shall meet the requirements of Section 4.0530 and shall be of the type indicated on the Standard Drawings in the Appendix of these Specifications. All pipe should have a minimum of one (1) foot stone backfill above the top of the pipe.

3.0700 Disposal of Materials

- 3.0701** All materials removed by excavation that are suitable for the purpose shall be used whenever practicable for backfilling and for such other purposes as may be shown on the Drawings or directed by the County Sewer Construction Inspector. All materials not used for such purposes shall be considered as waste materials and disposed of by the Contractor in an approved manner.

3.0702 Upon completion of any part of the work, proper disposal shall be made of all surplus or unused materials left within the construction limits of such work and the surface of the work left in a neat and workmanlike condition.

3.0800 Construction Sequence Constraints

3.0801 Sections of sewer under construction upstream of an existing or recently accepted sewer shall be kept isolated, by means of a plug or semi-permanent bulkhead, until the section under construction has been fully tested and accepted by the County Sewer Construction Inspector. The plug or bulkhead may be removed only with the permission of the County Sewer Construction Inspector.

3.0802 New sections of sewer shall be constructed, when feasible, from the lower end to the higher end so that testing and acceptance can go in a logical sequence and new sections placed into service.

3.0803 Sanitary sewage shall not be discharged into any section of sewer upstream of uncompleted or unaccepted sections, unless special arrangements have been made to divert the flow into the County sewer system. Such special arrangements must be approved by the Director before implementation.

3.0900 Connections and Stubouts for Service Lines

3.0901 Sanitary sewer service lines and connections shall be installed, tested, and inspected in accordance with the Jefferson County Standards for Construction of Sanitary Sewer Service Lines and Connections. The Contractor shall be responsible for contacting the County for inspection of the service line.

3.0902 Service Connections - Standard manufactured tees shall be installed in sanitary sewer lines at all points shown on the approved Drawings. If such tees are not to be used immediately, they shall be closed with approved stoppers and shall be physically restrained. Service connection points on new sewer lines shall be constructed with standard manufactured tees.

3.0903 If the work consists of the construction of a sewer that is to replace an existing sewer, all existing service lines shall be connected to the new sewer by installation of standard manufactured tees.

3.0904 Tees shall be installed in sanitary sewers so as to properly serve each existing house and each vacant lot facing or abutting the street, alley or easement in which the sewer is being installed and at such other locations as may be designated by the County. The exact location of each connection shall be recorded by the Contractor before backfilling

and said locations recorded on an "As-Constructed" drawing and delivered to the office of the Director.

3.0905 Building Stubouts - All service lines shall consist of four inch (4") or six (6") nominal diameter pipe, but no larger sizes. Service line stubouts shall be installed from the tee in the sewer to a point just beyond the right-of-way line. The open end of such stubouts shall be closed with approved stoppers and properly restrained. It shall be the responsibility of the Contractor to install and mark the location of all stubouts. All eight inch diameter lines will be considered main lines dedicated to and maintained by the County.

3.0906 The Contractor must determine the constructed location of all service lines in each sewer by measuring from the first manhole immediately downstream. The information shall be recorded on the As-Constructed Drawings and delivered to the County.

3.1000 Connecting New Sewer Mains to Existing Sewers

3.1001 Connections shall be made to all existing sewer lines in the vicinity of the work, as shown on the Drawings or as directed by the County Sewer Construction Inspector, and with the written approval of the Director. Connections shall be made by the construction of a manhole or the use of an existing manhole.

3.1002 Connection of lateral collector sewers to large diameter County trunk sewers shall be made at existing manholes. Should no manhole be available, a direct tap into the barrel of the trunk may be approved by the County on a case by case basis. Specific approval must be obtained in each instance from the County. Such connections shall be made under County supervision and in accordance with Standard Drawing No. SD 2045 (see Appendix).

3.1003 Connections to existing manholes shall be made by coring a hole in the wall of the existing structure and inserting a flexible manhole sleeve ("Boot") into the opening. The flexible manhole sleeve shall be Kor-N-Seal or equal. A minimum length of eighteen (18) feet of ductile iron sewer pipe shall be inserted into the boot, filling around same with non-shrinking grout and troweling the inside and outside surfaces of the joint to a neat finish.

3.1004 Connections of new sewers to existing sewers shall be plugged, and shall remain plugged until final acceptance by the County.

3.1100 Clay Ditch Check

3.1101 An impervious clay ditch check shall be required on the downstream side of all stream crossings. This ditch check shall be constructed for a length of fifteen (15) feet as measured along the centerline of the pipe and for the full width and depth of the trench excavation. See Standard Drawing SD 2090 (see Appendix).

3.1200 Manholes

3.1201 Manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Appendix, Standard Drawings, and at the locations shown on the Drawings. They shall be constructed of precast concrete sections conforming to the requirements of Section 4.0700 of these Specifications. The depth of the manhole will vary with the location but in all cases it shall be such as will place the cover (or lid) at the finished grade of the pavement or ground surface or as otherwise indicated on the Drawings. In undeveloped or rural areas, manholes shall be finished to a height of two (2) feet above ground. The invert shall be placed at the elevation shown on the Drawings. Eccentric cone sections will not be allowed. Only concentric cones will be used as detailed in Standard Drawing SD 1500.

3.1202 The manholes shall be assembled with the fewest number of sections to makeup required height, thereby reducing the number of joints. The use of more than one 16" riser section per manhole is prohibited. The composition of each manhole must be submitted to the Design Engineer for approval. Copies of the submittal must be at the job site. The County Representative may require any manhole that is not composed of the minimum number of sections to be replaced.

3.1203 The design of manhole base sections shall be submitted to and approved by the Design Engineer before manufacture. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored at the manufacturing facility. Bases shall be set on a foundation of ASTM D-448 No. 57 compacted stone aggregate, 12-inch minimum thickness, covering the entire bottom of the excavation, as shown on Standard Drawing SD 1500.

3.1204 Flexible manhole sleeves ("Boots") are required on all pipe 18" and smaller. The flexible sleeve shall be manufactured by Kor-N-Seal and conform to ASTM C 923 and shall be made from ethylene propylene rubber (EPDM). Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to ASTM C 923. The space between the pipe and manhole opening shall be filled with non-shrinking grout material [see paragraph 4.0651] inside and out of Boot.

3.1205 All joints for precast manhole stacks shall be made as shown on Standard Drawing SD 1515, offset tongue and groove type with Tylox Super Seal pre-lubricated gaskets

manufactured by Hamilton-Kent. Gaskets shall meet the requirements of ASTM C443, latest revision. Each joint shall also be sealed with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants. The width and installation of the joint sealant shall be in accordance with the manufacturer's recommendations. When shown on drawings, manhole joints shall be supplied with 3" x 16" x 1/2" bitumastic coated steel strap anchors and bolts. Three (3) strap anchors, 120° apart circumferentially shall be required per joint.

- 3.1206** Where the difference in invert elevation of two sewers is greater than six (6) inches, a standard length of Ductile Iron Pipe shall be installed in the upstream reach to bridge the fill area between the manhole and the undisturbed pipe trench. Where the difference in the invert elevation of two or more sewers, 18 inches in diameter or smaller, intersecting in one (1) manhole is 2 feet or more, a Memphis Tee Manhole (drop manhole) shall also be constructed in the manner shown in Standard Drawing SD1560. Memphis Tee Manholes shall be similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by Class A concrete. The manhole and the drop connection shall be placed on a 12 inch reinforced concrete foundation base as shown in the Standard Drawings. The drop connection piping assembly shall be bolted to the barrel of the manhole riser using four 5/8 inch diameter stainless steel (316) bolts with suitable washers to prevent failure caused by pulling the bolt head through the manhole wall.
- 3.1207** Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as called for on the Drawings, and as shown in the Standard Drawings. Manhole inverts shall be constructed of cement mortar and brick and shall have the same cross-section as the invert of the sewers that they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- 3.1208** Shallow manholes shall be constructed to the minimum sizes, shapes and dimensions as shown in the Standard Drawings SD 1511, SD1530 and at the locations shown on the Drawings. They shall be constructed of precast concrete sections as shown on the Drawings.
- 3.1209** All water standing in the trench shall be removed before placement of manhole foundation base concrete is started. The foundation shall be maintained in as dry a condition as possible.
- 3.1210** Manhole frames and covers shall be provided and installed at each sanitary sewer manhole, and in all other locations shown in the Drawings or specified.

- 3.1211 Manhole covers and frames shall conform to these specifications, SD1570, SD1575, all referenced standards, the requirements of the manhole manufacturer, and appropriate industry standards.
- 3.1212 Manholes covers shall be of either Standard Type (non-bolted) or Bolt-Down Type, as indicated on the Drawings or as otherwise specified. If not otherwise indicated, manhole covers shall be Standard Type.
- 3.1213 The top elevation of manhole frames must be adjusted to grade in areas such as streets, alleys, and parking lots or where shown on the Drawings. A maximum adjustment of 16 inches will be allowed using brick and mortar. Adjustments greater than 16 inches must be made by changing precast concrete riser sections. Brick used will be in accordance with Section 4.0850.
- 3.1214 Prepare manhole top cone for frame installation per manhole and manhole cover manufacturer's recommendations.
- 3.1215 Prepare and install manhole frame and cover per manufacturer's recommendations.
- 3.1216 Check installation of all gaskets. Replace all missing gaskets.
- 3.1217 Check manhole cover for fit in frame. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or otherwise moves in its frame, the frame and cover shall be removed and replaced by the Contractor.
- 3.1218 Following a final inspection of the pipe and manhole, install and tighten stainless steel bolts on all Bolt-Down Type covers.
- 3.1219 Manhole base and riser sections shall be supplied with a manhole lift system in accordance with Section 4.0700. All personnel handling manhole sections shall follow the manufacturer's recommendations requiring the use of spreader bars to lift and set the components.
- 3.1220 All manholes shall be tested in accordance with requirements of Section 5.0140.

- 3.1300 **Concrete Work**
- 3.1301 Ready Mix concrete shall be either Class A or Class B in accordance with ASTM C93. Usually, Class A concrete shall be reinforced concrete, cast-in-place in forms for foundations, pipe collars, footings, piers, head walls, manholes, and similar structures; Class B concrete shall be unformed, unreinforced plain concrete and shall be used for trench bottom stabilization, pipe protection, anchors, massive sections and similar work.
- 3.1302 Materials used in the concrete shall conform to Section 4.0600 of these Specifications.

3.1303 Concrete ingredients shall be selected, proportioned, and mixed to produce a workable, homogeneous concrete. The slump, at the point of delivery, shall be a minimum of 1.5 inches and a maximum of 4 inches for Classes A and B unless specifically approved by the Director. See Section 4.0600.

3.1304 Forms shall be constructed of steel or finished lumber true to line and grade, mortar tight, free from irregularities and holes. They shall be of sufficient strength to avoid displacement and held together with approved form clamps. Forms shall be coated with a non-staining mineral oil or other approved release agent. Forms shall be removed within 24 to 72 hours after placing concrete, but shall not be removed until inspected and approved by the County Sewer Construction Inspector.

3.1305 The concrete shall be placed in such manners as to produce solid concrete free of honeycomb and sand streaks. Concrete shall not be allowed to drop freely a distance greater than 5 feet. Concrete shall be consolidated with mechanical vibrating equipment. It shall be placed upon clean, damp surfaces, free from water. Concrete that has contained its water content for more than 45 minutes shall not be placed unless a variance is approved by the County. Freshly placed concrete shall be protected from rain, flowing water or other damaging conditions, and shall not be allowed to become dry from the time it is placed until the expiration of the seven (7) day curing period. Concrete shall be placed only when the temperature is at 40 degrees Fahrenheit or above, and rising, unless specifically authorized by the Director.

3.1306 After concrete has been placed, it shall be protected against the loss of moisture and from damage from other adjacent construction operations. The concrete shall be kept wet until forms have been removed. After forms have been removed, the concrete shall be finished as specified, and then wetted and tightly covered with polyethylene film or other approved curing material for a period of twenty-one (21) days in accordance with ASTM C309 for curing concrete. It shall be the responsibility of the Contractor to maintain moisture in the concrete during the specified curing period.

3.1400 Improved Surface Installation and/or Replacement

3.1401 In replacing or installing pavements and unpaved surfaces, the materials used and the construction methods shall comply with the applicable requirements of the standard specifications of the government having jurisdiction over the street or road.

3.1600 Existing Utilities

3.1601 Gas pipe lines shall not pass through manholes or other sewer structures. When sanitary sewer lines cross over gas lines, the minimum cover and encasement shall be as specified

by the owner of the gas line. (Cover is the vertical distance between the outside top and outside bottom of the two pipe lines.) This cover space shall be carefully backfilled with thoroughly compacted with crushed stone.

3.1700 Work Within the Rights-of-Way of Highways, Railways, or Streets

3.1701 In the event the sewer crosses, runs parallel to or alongside any highway, county road, city street, or railroad right-of-way, the Contractor shall obtain a utility permit from the governing body having jurisdiction. A copy of said permit or agreement shall be submitted to the County before commencement of construction.

3.1800 Special Construction

3.1801 Where the work requires special stream or railroad crossings or any other extraordinary conditions, or where alternate types of construction are used that are not covered by these Specifications, the materials and construction methods shall be as shown on the Drawings and specified by the Design Engineer and approved by the County.

3.1900 Right-of-Way Clean Up and Grassing

3.1901 After the sewer is installed and backfilled and a sufficient amount of time has elapsed for backfill to settle, the disturbed area shall be machined to a smooth surface matching the adjacent or adjoining ground surfaces and the ground profile on the Drawings. A vegetative cover will be established for erosion control.

3.2000 Special Slope Protection

3.2001 Areas to receive rip rap, or special slope protection materials, shall be graded to the lines and slopes shown on the Drawings, or as directed by the County Sewer Construction Inspector. Any loose material shall be compacted. No rip rap shall be placed on a slope greater than 1:1.

3.2002 Stone for rip rap shall be of the size and weight designated on the Standard Drawing SD2500 (in the Appendix of these specifications). In addition, the stones shall be durable and of a suitable quality to insure permanence in the structure and in the climate in which it is to be used. It shall be free of cracks, seams, and other defects that would unduly increase its deterioration from natural causes. Not more than 3 percent of the stones shall have shale seams, which would separate when exposed to weathering. The inclusion of objectionable quantities of dirt, sand, clay or rock fines will not be permitted.

3.2003 Precast concrete grids "Monoslabs" or approved equals, may be used in lieu of rip rap stone for slope protection. Other slope protection measures must receive prior approval from the Director before use.

3.2100 Cased Bores

3.2101 Installation of Casing pipe shall be by the Jack and Bore Method. Boring operations shall begin at the low end of the sewer line and go up grade, care being exercised to install the casing pipe to the proper line and grade as shown on the Drawings. Care shall be taken to avoid loss of ground outside the casing and to insure bearing against the ground all around the casing. Bulkheads shall be built at each end after completion of the casing pipe and insertion of the carrier pipe. The carrier pipe shall be bedded and restrained within the casing pipe in accordance with the Drawings.

3.2102 Construction operations must not interfere with highway or railway traffic.

3.2103 The Contractor shall use casing pipe as specified in Section 4.0410. The casing pipe and carrier pipe shall be installed in accordance with the Drawings.

3.2104 Cased Bores under railroads may involve special insurance requirements by the railroad company. The Contractor's attention is directed to any agreements between the Owner/Developer and the railroad company.

3.2105 The Contractor shall notify the railroad company, highway department, or other utility affected before beginning any work so that said utility may have a representative present if desired.

Section 4.00

Material Specifications for Sanitary Sewers

4.0100 Materials

- 4.0101** All material used in the construction of sewers shall be new and unused manufactured in the United States.
- 4.0102** All sanitary sewers shall be constructed of the types of pipe as specified in Section 2.0800.
- 4.0103** At points on the sewer where a change in pipe material is shown on the Plans, the Contractor must make the transition at a pipe joint.

4.0200 Ductile Iron Pipe

- 4.0201** Ductile iron pipe shall be centrifugally cast and manufactured and tested in accordance with ANSI/AWWA C151/A21.51. Pipe class (wall thickness) will be as indicated on the Plans or as specified by the County Engineer. However, minimum thickness for pipe 6 inches or less will be Pressure Class 350 and for pipe 8 inches and larger will be Thickness Class 52. Each pipe shall be hydrostatically tested before shipment to a minimum pressure of 500 pounds per square inch (psi).

<i>Wall Thickness of Ductile-Iron Pipe Classes</i>							
Size In.	Outside Diameter-In.	Thickness Class					
		Pressure Class 350	52	53	54	55	56
Wall Thickness – in.							
4	4.80	0.25	0.29	0.32	0.35	0.38	0.41
6	6.90	0.25	0.31	0.34	0.37	0.40	0.43
8	9.05	--	0.33	0.36	0.39	0.42	0.45
10	11.10	--	0.35	0.38	0.41	0.44	0.47
12	13.20	--	0.37	0.40	0.43	0.46	0.49
14	15.30	--	0.39	0.42	0.45	0.48	0.51
16	17.40	--	0.40	0.43	0.46	0.49	0.52
18	19.50	--	0.41	0.44	0.47	0.50	0.53
20	21.60	--	0.42	0.45	0.48	0.51	0.54
24	25.80	--	0.44	0.47	0.50	0.53	0.56
30	32.00	--	0.47	0.51	0.55	0.59	0.63
36	38.30	--	0.53	0.58	0.63	0.68	0.73
42	44.50	--	0.59	0.65	0.71	0.77	0.83
48	50.80	--	0.65	0.72	0.79	0.86	0.93
54	57.10	--	0.73	0.81	0.89	0.97	1.05

- 4.0202** All ductile iron pipe and fittings shall have a cement-mortar lining of standard thickness conforming to the requirements of ANSI/AWWA C104/A21.4 and a standard bituminous outer coating unless otherwise required by the County.
- 4.0203** Joints for ductile iron pipe shall be push-on type such as Fastite, Tyton, or Super Bell-Tite or approved equal. Joints shall be manufactured in accordance with ANSI/AWWA C111/ A 21.11.
- 4.0204** Restrained joints for ductile iron pipe shall be the push on type such as American, “Fast-Grip” or U.S. Pipe, “Field Lock Joint” restraint systems. Gaskets shall be rated for 250 psi based on performance requirements of ANSI/AWWA, C111/A21.11.
- 4.0205** Fittings for ductile iron pipe shall be ductile iron to conform to ANSI A 21.10/AWWA, C-110.
- 4.0206** Unless otherwise specified, mechanical joint fittings shall be used for all pipe types. Ductile iron fittings for mechanical joint pipe shall be designed for the same working pressure, laying conditions and cover as the pipe used. Joints shall be standard mechanical joints.
- 4.0207** The joining of push-on joint ductile iron pipe shall be performed in accordance with the AWWA C600 Standard for Installation of Cast Iron Water Mains, Section 9c. Instructions for assembly of push-on joints may vary according to the particular manufacturer. The procedure for joining pipe equipped with push-on joints must therefore be in accordance with instructions of the manufacturer of the particular joint furnished.
- 4.0208** For push-on ductile iron pipe, the inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the socket. A thin coating of gasket lubricant shall be applied to either the inside surface of the gasket or outside surface of the spigot, or both. Gasket lubricant shall be as supplied by the particular manufacturer and approved by the County Sewer Construction Inspector.
- 4.0209** For ball and socket joints. The bell, ball and retainer shall be ductile iron, Grade 70-50-05, conforming to the requirements of ANSI A21.11.
- 4.0210** A list of approved manufacturers of Ductile Iron Pipe may be obtained from the Environmental Services Department, Sewer Plans Review Office in Room 634, 2121 8th Avenue, North, (current telephone no. 521-7515).

4.0300 C-900 PVC Pipe

- 4.0301** PVC pipe, for gravity and pressure sewers, 12 inches or less, shall be manufactured and tested in accordance with AWWA C-900 latest edition. Pipe dimensions for each nominal size shall be with Cast Iron (CI) equivalent outside dimension. Pipe class (wall thickness) will be identified on the Drawings or as specified by the Design Engineer. However, the minimum thickness will be Dimension Ratio (DR) – 18 and Pressure Class – 150 psi.
- 4.0302** All PVC pipe shall be solid wall with a minimum pipe stiffness of 264 psi when tested in accordance with ASTM D2412, Standard Test Method.
- 4.0303** All thermoplastic material shall be rigid poly vinyl chloride (PVC) plastic and shall meet or exceed the requirements of ASTM D1784, for a minimum cell classification of 12454-B.
- 4.0304** Each joint of pipe shall be marked on the barrel according to AWWA C-900 Marking Requirements.
- A. Nominal size and outside diameter dimension base (C.I.)
 - B. PVC
 - C. Dimension Ratio (18)
 - D. AWWA pressure class (PC 150)
 - E. AWWA (900) designation number
 - F. Manufacturer's name and production code indicating date of manufacturer and production shift time
- 4.0305** All PVC pipe shall be joined with integral bell push-on type gasketed joints. Each bell shall have an elastomeric gasket securely locked in place to prevent displacement during assembly. The gasket used shall be as recommended and furnished by the manufacturers.

4.0306 Fitting for use with PVC pipe, 12 inches or less, shall be one of the following types:

- A. Injection molded Class 150 PVC fittings, AWWA C-907, manufactured with gasketed joints and designed for use with pressure Class 150 AWWA C-900 pipes with cast iron outside diameter.
 - 1. Burst pressure test 755 psi minimum per ASTM D-1599.
 - 2. Dimensional – The minimum wall thickness of the molded fitting body must be at least 125 percent of the wall thickness of Pressure Class 150 C-900 pipe of the same size. The wall thickness at any point in the bell must be equivalent to the same thickness determined by Dimension Ratio 18.
 - 3. Fusion Test – Selected fittings must pass the acetone immersion test.
 - 4. Injection Molding Quality Test – Heat-reversion test, ASTM F610, is performed at intervals to insure the PVC compound has properly fused.
 - 5. Gasketed and injection molded PVC fittings shall be tested for stiffness, joint performance and dimensional accuracy.
 - 6. Test fittings for impact per ASTM F1336.
 - 7. Bells shall be gasketed joints per ASTM D3139.
 - 8. Gaskets shall conform to ASTM F477.
- B. Ductile iron fittings mechanical joint type, per AWWA C110, as manufactured by an approved ductile iron pipe manufacturer.
- C. Ductile iron compact fittings per AWWA C153, as manufactured by an approved ductile iron pipe manufacturer.

4.0307 A list of approved manufacturers of PVC pipe and fittings may be obtained from the Environmental Services Department, Sewer Plans Review Office in Room 634, 2121 8th Avenue, North (Current telephone no. 521-7515).

4.0400 Miscellaneous Pipe

4.0410 Casing Pipe

4.0411 Steel casing pipe shall be provided to enclose sewers where shown on the Drawings. Wall Thickness shall be as shown on the Drawings. The diameter of the casing pipe shall be not less than 4 inches greater than the largest outside diameter of the sewer, bell or joints. The casing pipe shall be steel pipe meeting the minimum requirements of ASTM A53 in Schedule 40 thicknesses or a minimum of .5 inch, whichever is greater and with ends beveled for welding.

4.0420 Carrier Pipe

4.0421 Carrier pipe for tunnels and bores will be ductile iron pipe, class 52 thickness or greater, in accordance with Section 4.0200. Carrier pipe will be push-on type joints.

4.0500 Pipe Bedding, Backfill and Foundation Backfill

4.0510 General

4.0511 Aggregates used for pipe bedding and Backfill shall be either crushed limestone or crushed dolomite. The use of slag will not be allowed.

4.0512 Where reference is made to ASTM D-448 No. 57 stone, No. 67 stone is acceptable and vice versa. No other screening size is acceptable. In no case is "crusher run", (unscreened gradations that include fine material), acceptable unless specifically called for.

4.0520 Pipe Bedding

4.0521 All sanitary sewer pipe shall be bedded on a minimum of 4 inches, (or 6 inches in a rock cut trench), crushed stone aggregate meeting the requirements of ASTM D-448 No. 57.

4.0522 Where concrete bedding is required on the Drawings or by the County Sewer Construction Inspector. The concrete shall be Class B conforming to the requirements of Section 4.0600.

4.0530 Backfill

4.0531 Backfilling of sanitary sewer pipe shall be accomplished using the specific backfill material specified in Section 3.0600 or in the Standard Drawings Details.

4.0532 Crushed stone backfill shall meet the requirements for gradation as set forth by the No. 57 Stone in accordance with ASTM D-448, 1-inch down to No. 4 sieve.

4.0533 Earth backfill shall consist of suitable native materials of low organic content. Stumps, roots, topsoil and other highly organic materials are not acceptable for use as backfill. Earth backfill shall not contain any rocks, stones or boulders which might be large enough to damage or endanger the sanitary sewer pipe. The decision regarding the suitability of a particular material for use as earth backfill will be at the sole discretion of the County Sewer Construction Inspector.

4.0540 Foundation Backfill

4.0541 Foundation backfill is a term used to describe a coarse stone aggregate which may be used at the direction of the County Sewer Construction Inspector to stabilize the bottom of the pipe trench prior to placement of pipe bedding material. Foundation backfill shall be a coarse gradation of either crushed limestone or crushed dolomite. The gradation of stone for foundation backfill shall be determined on a case by case basis.

4.0600 Cast-in-Place Concrete

4.0610 General

4.0611 In general Class A concrete shall be formed, reinforced concrete having a 28 day minimum compressive strength of 4,000 psi. In general, Class B concrete shall be non-formed, non-reinforced concrete having a 28 day minimum compressive strength of 3,000 psi. Class A concrete shall be cast-in-place in forms for foundations, pipe collars, footings, piers, headwalls, manholes, junction boxes and similar structures. Class B concrete shall be used for trench bottom stabilization, pipe protection, encasement, anchors, massive sections, and similar structures. Other classes, types or design for cast-in-place concrete may be approved by the County as circumstances require.

4.0620 Concrete Components

4.0621 Concrete components shall conform to the minimum requirements of this Section.

4.0622 Aggregates shall be crushed limestone conforming to the requirements of ASTM C 33, except as further specified herein. Crushed limestone for coarse aggregate shall consist of uncoated particles of sound, durable rock of uniform quality, without an excess of flat, elongated or laminated pieces. No surface, yellow or soft stone shall be permitted. The specific gravity of the stone shall be not less than 2.55.

4.0623 Water used in concrete shall be potable water.

4.0624 Sand used in concrete shall be natural sand consisting of clean, hard, durable, uncoated grains.

4.0625 Cement used in concrete shall be "Portland Cement" conforming to the requirements of ASTM C 150. Type II cement shall be used unless otherwise specified. When used for construction of sewage bearing structures, the Tri Calcium Aluminate content must be less than 5.5%.

4.0630 Reinforcing Material For Cast in Place Concrete

4.0631 Reinforcing bars shall conform to the requirements of ASTM A 614. Reinforcing bars shall be grade 60 deformed bars, or as specified on the Drawings.

4.0632 Welded wire fabric or cold-drawn wire for concrete reinforcement shall conform to the requirements of ASTM A 185 or ASTM A 82, respectively.

4.0640 Grout

4.0641 Grout shall consist of a mixture of water and cement or water and one part cement to two parts mortar sand, by volume. The water may be adjusted to produce a mixture suitable for job conditions.

4.0650 Non-Shrinking Grout

4.0651 Non-shrinking grout cement shall be Bonsal Instant Hydraulic Cement, or Thoro Waterplug. No other products will be allowed.

4.0660 Testing

4.0661 Testing of cast-in-place concrete shall be in accordance with Section 5.0150 "Field Testing Concrete".

4.0700 Precast Concrete Manholes

4.0701 Unless otherwise specifically approved by the Director, all manholes will be precast concrete manholes as specified herein.

4.0702 The precast reinforced concrete manholes shall be constructed in accordance with ASTM C-478. Reinforced concrete manholes shall consist of manhole base sections, riser sections, transition sections, and conical sections as described in this Section. The manhole components shall be configured to minimize the number of joints required per manhole.

4.0703 Portland cement concrete used in the precast reinforced concrete manholes shall have a minimum compressive strength of 4,000 psi at 28 days. The concrete shall contain type II Portland cement with a C3A content of 5.5% or less and meet the requirements of ASTM C-478. Limestone aggregate for concrete, except for maximum size and gradation, shall be as specified in applicable sections of these Specifications. Manholes shall be cured in accordance with the requirements of ASTM C-478 for a minimum of seven (7) days prior to shipment to the site.

- 4.0704** Reinforcing steel shall be bars of intermediate grade, open hearth, billet steel, conforming to ASTM A-615, or Cold-Drawn Steel Wire for Concrete Reinforcement, ASTM A-82; or of wire fabric conforming to ASTM A-185. The circumferential reinforcement in the riser and conical top sections shall have an area of not less than 0.12 square inches per linear foot.
- 4.0705** The interior and exterior surface of the manhole shall have smooth hard finish, and shall be free from cracks, chips and spalls.
- 4.0706** Manhole Base Sections shall be circular, wet cast, and may be supplied in 48", 60", 72", 84" or 96" diameters. Heights shall range from 24" to 96" depending on availability with diameter and as specified or approved by the Design Engineer. All base sections shall be supplied with Manhole Lift System inserts as manufactured by Press-Seal Gasket Corporation. Lifting eyebolts, also manufactured by Press-Seal Gasket Corporation, shall be supplied to the Contractor upon request. Manhole bases manufactured with pipe openings 18" or less shall be furnished with Kor-N-Seal flexible pipe-to-manhole connectors ("boots").
- 4.0707** Riser Sections shall be circular, and may be supplied in 48", 60", 72", 84" or 96" diameters. Heights shall range from 16" to 48", in 16" multiples, as specified or approved by the Design Engineer. The use of 16" risers shall be minimized and shall only be used to adjust to final grade. All riser sections shall be supplied with manhole Lift System inserts as manufactured by Press-Seal Gasket Corporation. Lifting eyebolts, also manufactured by Press-Seal Gasket Corporation, shall be supplied to the Contractor upon request.
- 4.0708** Transition Sections
- A. Conical transition sections shall be supplied for 60" to 48" diameter transitions. Conical transitions shall be 32" high. Shorter conical transitions may only be used when specifically approved by the County. All conical transition sections shall be supplied with a Manhole Lift System as manufactured by Press-Seal Gasket Corporation.
 - B. Flat slab transitions shall be supplied for base sections 72" to 96" in diameter. Flat slab transitions shall be manufactured structurally to meet individual project requirements. Clear access openings shall be provided to accommodate riser sections as specified in individual project plans and specifications or as detailed in the Standard Drawings.
- 4.0709** Conical Sections shall be wet cast, concentric only. Eccentric sections will not be allowed. Conical sections shall transition from 48" diameter to a 27" clear access opening and be either 24", 36", or 46" high. They shall be supplied with a Manhole Lift System as manufactured by Press-Seal Gasket Corporation. Where Bolt Down Manhole Frame and Covers are indicated on the Drawings, Conical Sections shall be supplied with

four (4) stainless steel Anchor Bolts. (See Standard Drawing SD1575 in the Appendix of these specifications).

- 4.0710** Precast manhole riser joints shall be offset tongue and groove “push on” type, supplied with Tylox Super Seal pre-lubricated gasket as manufactured by Hamilton Kent meeting the requirements of ASTM C443. Each joint shall also be supplied with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants, in widths as recommended by the manufacturer.
- 4.0711** Where required by the County and indicated on the Drawings, the contractor shall install manhole joint straps as shown in the detail on Standard Drawing SD 1515. Bolted together manhole joints shall be permanently strapped utilizing three (3) bitumastic coated steel strap anchors located 120° apart circumferentially.
- 4.0712** Standard manholes of precast concrete construction, and other manholes of precast concrete construction having entering sewers of 24" diameter or smaller shall have precast openings in the manhole walls for incoming or outgoing sewers as indicated on the Plans.
- 4.0713** All components of a manhole for a particular location shall be clearly marked in order that the manhole may be correctly assembled to suit construction conditions existing at that particular location.
- 4.0714** All precast concrete manhole base sections and drop manhole bases shall be set on a foundation of No. 57 compacted stone aggregate, 12 inch minimum thickness, and covering the entire bottom of the excavation for the manhole. Aggregate size may be adjusted by the County Sewer Construction Inspector based on field conditions.
- 4.0715** Steps, frames and covers shall conform to the requirements of Section 4.0820.
- 4.0716** Pipe Connections at Manholes
- A. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored.
 - B. Flexible manhole sleeves (boots) shall be required for all pipe 18” and smaller. The manhole connector shall be Kor-N-Seal or equal and conform to ASTM C-923 and shall be made from ethylene propylene rubber (EPDM) designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils, and petroleum products. Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to ASTM C-923 and ASTM A-167.
 - C. All stainless steel elements of the manhole connector shall be totally non-magnetic series 304 stainless steel, excluding the worm screw for tightening the steel band

around the pipe, which shall be series 305 stainless steel. The worm screw for tightening the steel band shall be torqued by a breakaway torque wrench available from the precast manhole supplier, and set for 60 –70 inch-lbs. The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer. The connector shall be of a size specifically designed for the pipe material and size being utilized on the project.

4.0717 A list of approved manufacturers of Precast Concrete Manholes may be obtained from the Environmental Services Department, Sewer Plans Review Office in room 634, 2121 8th Avenue North (Current Telephone No. 521-7515).

4.0800 Structural Materials and Castings

4.0810 Gray Iron Castings

4.0811 Gray iron castings shall conform to the requirements of ASTM A48. All castings shall be clean and free of scale, adhesions or inclusions. They shall be completely coated as required. Gray iron castings for manhole or inlet frames and covers or gratings shall be cast from Class 30B cast iron. Bearing surfaces between manhole or inlet frames and covers or gratings shall be such that the cover or grating shall seat in any position onto the frame without rocking. Bearing surfaces for standard manhole frames and covers shall be machined.

4.0820 Manhole Frame and Cover

4.0821 Manhole covers and frames shall be constructed of cast iron conforming to ASTM A48-83 Class 30, as a minimum. Tensile strength of the cast iron shall be a minimum of 30,000 psi. Covers and frames shall be made in the United States, and shall be made of materials from the United States.

4.0822 Covers and frames shall be “Heavy Duty” type, rated for a minimum of H-20 loading.

4.0823 All castings shall be sound, smooth and clean, and free of blisters, pits, cracks and other defects. Castings judged to be defective by the Owner or the Engineer will be rejected, and shall be replaced by the Contractor.

4.0824 Casting tolerances shall be +/-1/16”, with an additional 1/16” per foot of dimension.

- 4.0825** Manhole covers shall be cast with two (2) non-penetrating type pick-holes, located as indicated in the Standard Details. Pick-holes shall conform to the dimensions indicated in the Standard Details. Covers shall not have vent holes.
- 4.0826** Frames shall have integrally cast, full perimeter mud rings. Frames shall be cast with four (4) 1" diameter holes in the flange for anchor bolts. Anchor bolt holes shall be located as shown in the Standard Details.
- 4.0827** The seating surfaces of frames and covers shall be machined flat to ensure contact between the cover and frame along the full perimeter, in accordance with Federal Specification RR-F-621.
- 4.0828** Gaskets shall be provided for all and installed on all manhole frames. Gaskets shall be secured to the seating surface of the frame with a non-degrading glue by the manufacturer. Gaskets shall be flat, 1/8" thick, black neoprene with a minimum tensile strength of 2,000 psi.
- 4.0829** For manhole covers indicated as Bolt-Down Type, frames shall be cast and machined to accept four (4) cover bolts, on the pattern shown in the Standard Details. Covers shall be cast with four (4) holes, 3/4" diameter, for the bolts on the pattern shown in the Standard Details. Bolts shall be stainless steel, 5/8" – 11 x 2" hex-head cap screws, and shall be provided with all Bolt-Down Type covers. Bolts shall include stainless steel washers and rubber sealing gaskets.
- 4.0830** Covers and frames shall bear the emblem of Jefferson County as illustrated in the Standard Details. No substitute cover designs will be accepted.
- 4.0831** Covers shall be cast with four (4) stacking lugs, each 5/8" wide by 2" long, on the bottom of the lid.
- 4.0832** Covers and frames shall conform to the following critical dimensions:

	<u>Standard</u>	<u>Bolt Down</u>
Overall frame height	6¾ to 8"	6¾ to 8"
Cover diameter	23½"	23½"
Cover thickness, min.	1-3/8"	1-3/8"
Frame opening for cover	23-11/16"	23¾"
Frame opening for entry	22"	20-5/8"
Mud ring O.D.	25-7/8"	25¾"
Mud ring height, min.	¾"	1-5/8"

4.0833 The following company manufactures acceptable Frame and Cover models.

East Jordan Ironworks/Vulcan Foundry #V-2480 (Bolt-down cover)

East Jordan Ironworks/Vulcan Foundry #V-1480 (Standard cover)

A list of approved manufacturers of Manhole Frame and Covers may be obtained from the Environmental Services Department, Sewer Plans Review Office in Room 634, 2121 8th Avenue, North, (current telephone no. 521-7515).

4.0840 Manhole Steps - Manhole and inlet steps shall be made of steel reinforced copolymer polypropylene plastic, model PS1 PF, as manufactured by M.A. Industries, Inc. They shall be installed at maximum 16" intervals. Manhole steps shall conform to Standard Drawing No. SD1580 with rod and pull out ratings meeting OSHA standards.

4.0850 Brick

4.0851 Brick shall comply to the following requirements for which its use is intended. Bricks with holes through them will not be allowed in the work.

4.0852 Brick used to adjust manhole frame to grade shall conform to ASTM C 32 for grade SM. Bricks shall conform to the following dimensions, unless otherwise approved by the Design Engineer:

	<u>Depth (Inches)</u>	<u>Width (Inches)</u>	<u>Length (Inches)</u>
Standard Size	2-1/4	3-3/4	8
Allowable Variation	+1/4	+1/4	+1/2

All brick shall be new and whole, of uniform standard size and with substantially straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, tough and strong, free from injurious cracks and flaws and shall have a clear ring when struck together. No soft or salmon brick shall be used in any part of the work. Brick shall be culled after delivery, if required, and no culls shall be used except at such places, to such extent, and under such conditions as may be approved by the Design Engineer.

4.0860 Masonry Blocks

4.0861 Masonry blocks shall conform to the requirements of ASTM C 90, Grade N, Type I or II, for hollow load bearing blocks.

4.0870 Mortar

4.0871 Mortar shall be prepared only in the quantities needed for immediate use. Mortar which has been mixed for more than 30 minutes or which has set or has been retempered shall not be used in the work.

4.0900 Corrosion Protection

4.0910 Paint

4.0911 The paints and the paint products of "Sherwin-Williams Company" mentioned in the following specifications are set out for simplification of specific identity. Products comparable in quality and type to those specified, will be acceptable.

4.0912 All metal surfaces, specified to be shop painted, shall receive a one coat application of Sherwin-Williams Kromik Universal Metal Primer, applied at a rate to achieve approximately 3.0 dry mil thickness per coat.

4.0913 Where the shop prime coat has been damaged in transit or erection, or there is bare metal that must be field primed, the field prime coat shall be Sherwin-Williams Kromik Universal Metal Primer, applied at a rate to achieve approximately 3.0 dry mils.

4.0914 Any equipment or material which is delivered or stored on the job site and which shows evidence of rusting, shall be sand blasted to white metal and shall be prime coated immediately. Sand blasting one day and coating the next will not be allowed.

4.0915 Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, shall be allowed and all such thinning shall be done strictly in accordance with the manufacturer's instructions as well as with the full knowledge and approval of the Director.

4.0916 All materials shall be brought to the job site in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the County Inspector on the job.

4.0920 Epoxy

4.0921 All ferrous metal surfaces in contact with sewage or sludge or which are exposed to a corrosive sewage atmosphere shall receive a two coat application of Sherwin-Williams High Mil Sher-Tar Epoxy, applied at a rate to achieve approximately 8.0 dry mil thickness per coat (minimum total thickness equals 15.0 dry mil).

4.0940 Liners

4.0941 Cement liners shall conform to the minimum requirements of ANSI A21.4 or AWWA C 104.

4.1000 Improved Surface Installation Replacement

4.1010 When installing or replacing pavements and unpaved surfaces, the materials used and the construction methods shall comply with the applicable requirements of the standard specifications of the governing body concerned.

Section 5.00

Testing for Acceptance of Sanitary Sewer Lines

5.0100 Testing Methods and Specifications

5.0110 General

5.0111 Upon completion of all or part of a sanitary sewer line, the Contractor will be required to test said sewer for acceptability. The Contractor shall provide all necessary water, equipment, and instrumentation for water flushing before testing. Source and quality of water, test procedures, and method of disposal of water shall all be submitted to the County for review and approval. The method(s) of testing shall be as specified herein.

5.0112 All tests shall be conducted in the presence of the County Sewer Construction Inspector. Preliminary tests not observed by the County Sewer Construction Inspector will not be accepted. The County Sewer Construction Inspector shall be notified at least 24 hours before any work is to be inspected or tested. The County Sewer Construction Inspector may be scheduled to witness tests from 8:00 a.m. to 3:00 p.m., Monday through Friday [Current Telephone No. 325-5127].

5.0113 All defective sewer lines (those not passing the specified test) shall be repaired, or replaced, and retested until acceptable by the County. Repairs shall be made to the standard of quality specified for the entire system.

5.0114 Sections of the system may be tested separately. However, any defect which may develop in a section previously tested and accepted shall be promptly corrected and retested until acceptable to the County.

5.0115 All piping systems shall be tested in accordance with these test methods. Any other tests required by local plumbing codes or building authorities shall also be conducted independent of these tests.

5.0116 Testing of sewer lines shall include internal television inspection as called for in Section 5.0200.

5.0120 Gravity Sewer Testing

5.0121 Prior to any testing, all lines shall be cleaned of debris and flushed clean with water as necessary. Debris and flush water shall be caught at a lower manhole and removed from the line, and shall not be allowed into existing live sanitary sewers. Before sewers are placed into service, the County Sewer Construction Inspector

shall inspect the sewers for line and grade. All gravity sewer lines shall be air tested as follows:

- A. The sewer lines to be tested shall be tested between manholes. The line shall be sealed at each end. Service Lines shall be capped securely at the Tee connection or at the right-of-way line as applicable. The seal at one end shall have an orifice through which to pass air into the pipe. An air supply shall be connected to the orifice. The air supply line will contain an on/off valve and a pressure gauge with a range from 0 to 10 psi. The gauge shall have minimum divisions of 0.10 psi, and shall have an accuracy of +/- 0.04 psi.
- B. The pipeline being tested shall be pressurized to 4 psig. The line will be allowed to stabilize between 4 psig and 3.5 psig for a period of no less than 5 minutes. If necessary, air should be added to the line to maintain pressure above 3.5 psig. After the stabilization period, the valve shall be closed. When the line pressure drops to 3.5 psig, timing with a stop watch should begin. The stop watch shall run until the pressure drops to 2.5 psig. Then the stop watch shall be stopped and the time lapse compared with the allowable time lapse in the table below for the pipe size and leakage allowance specified by the County.
- C. If the time lapse is greater than that specified, the section being tested shall have passed, and the tests may be discontinued. If the time lapse is less than that specified, the line has not passed the test and the Contractor will be required to repair the line until it does pass the test.

D. Air Leakage Chart

<u>Size of Pipe (inches)</u>	<u>Minutes:Seconds per 100 ft.</u>
4	1:00
6	1:00
8	1:30
10	2:00
12	2:30
18	3:00
21	3:30
24	4:00
27	4:30
30	5:00
36	6:00

- E. If the pipeline to be tested is beneath the groundwater level, the test pressure shall be increased 0.433 psi for each foot the groundwater level is above the invert of the pipe.

- F. The Contractor will be required to test lines while construction is in progress and before the pipe laying is completed to ascertain compliance with Section 5.0120. Any visible or audible leaks in the sewer that can be located shall be repaired or corrected as directed by the County Sewer Construction Inspector, regardless of test results.

5.0130 Pressure Sewer (Force Main) Testing

- 5.0131** All piping shall be flushed with water to remove construction debris prior to testing.
- 5.0132** Before testing, at least 7 days shall elapse after the last concrete thrust or reaction backing has been cast.
- 5.0133** The section being tested will be sealed pressure tight at each end with restrained valves, plugs or caps.
- 5.0134** The pipe line shall be filled with water and all air removed either at air release valves or through taps into the pipe.
- 5.0135** Test pressure for all pipelines shall be 1.5 times the working pressure at the point of testing. The duration of testing shall be two (2) hours or as directed by the County Construction Inspector. The allowable leakage shall not be greater than the value calculated from the following formula:

$$L = (S \times D \times \sqrt{P}) \div 133,200$$

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

- 5.0136** Any visible or audible leaks in the sewer piping that can be located shall be repaired or corrected as directed by the County Sewer Construction Inspector, regardless of pressure test results.
- 5.0140 Manhole Testing**
- 5.0141** All manholes shall be tested by the Contractor using the vacuum test method, following the manufacturer's recommendations for proper and safe procedures. Any leakage in the manhole or structure, before, during, or after the test shall be repaired.

5.0142 All pipe openings shall be sealed by installing suitable plugs that completely isolate the manhole structure. Any other openings such as lifting holes shall be permanently sealed. A suitable vacuum pump shall be connected at the top access point of the manhole. A vacuum of 10 inches of mercury (Hg) (5.0 psi) shall be drawn on the manhole, and the time shall be measured for the vacuum to drop to 9 inches of mercury (Hg) (4.5 psi). Manholes will be considered to have failed the vacuum test if the time to drop 1 inch of mercury is less than what is shown in the following table.

Vacuum Test Timetable				
Depth – feet	Manhole Diameter – Inches			
	48 inches	60 inches	72 inches	96 inches
4	10 sec.	13 sec.	16 sec.	19 sec.
8	20 sec.	26 sec.	32 sec.	38 sec.
12	30 sec.	39 sec.	48 sec.	57 sec.
16	40 sec.	52 sec.	64 sec.	76 sec.
20	50 sec.	65 sec.	80 sec.	95 sec.
+ Each 2'	+ 5 sec.	+ 6.5 sec.	+ 8.0 sec.	+ 9.5 sec.

5.0143 Manhole depths shall be rounded to the nearest foot. Intermediate values shall be interpolated. For depths above 20 feet, add the values listed in the last line of the table for every 2 feet of additional depth.

5.0144 All manholes that fail the test or that have visible leaks, even if they pass the test, shall be repaired or replaced until the manholes pass the test, to the complete satisfaction of the County. Manholes that have any visible leaks will not be accepted.

5.0150 Field Testing Concrete

5.0151 Strength Tests During The Work: If concrete is being poured, the Contractor will make four concrete test cylinders for each 50 cubic yards poured or for each days pour, whichever amount of concrete is smaller. Cylinders will be made and tested in accordance with ASTM C31, ASTM C172 and ASTM C39. The standard age of the test shall be 28 days. The first cylinder will be broken at 7 days. If the 7 day break exceeds the specified strength, then no further tests will be made until the 28th day. If the 7 day break does not meet the specified strength, then the second cylinder will be tested at the 14th day. In either event, the remaining cylinder(s) will be tested at the 28th day. When the test cylinders fail to conform to the compressive strength requirements, the County shall have the right to order a change in the concrete mix for the remaining portions of the work. The Contractor may wish to make additional cylinders at his own expense as verification.

5.0152 Test of Hardened Concrete In, or Removed From the Structure: When the results of the strength tests of the control specimens indicate the concrete as placed does not meet specification requirements or where there is other evidence that the quality of the concrete is below specification requirements, core-boring tests shall be made in conformance with ASTM C42. Core specimens will be tested by a certified testing laboratory approved by the County. All deficiencies shall be corrected; or, if the Contractor elects, he may submit a proposal, for approval, that load tests be made. If the proposal is approved, the load test shall be made by the Contractor and the test results evaluated by the County. If any concrete shows evidence of failure during the load test, or fails the core test as evaluated, the deficiency shall be corrected. Any deficiency shall be corrected in a manner approved by the County and at no additional cost to the County.

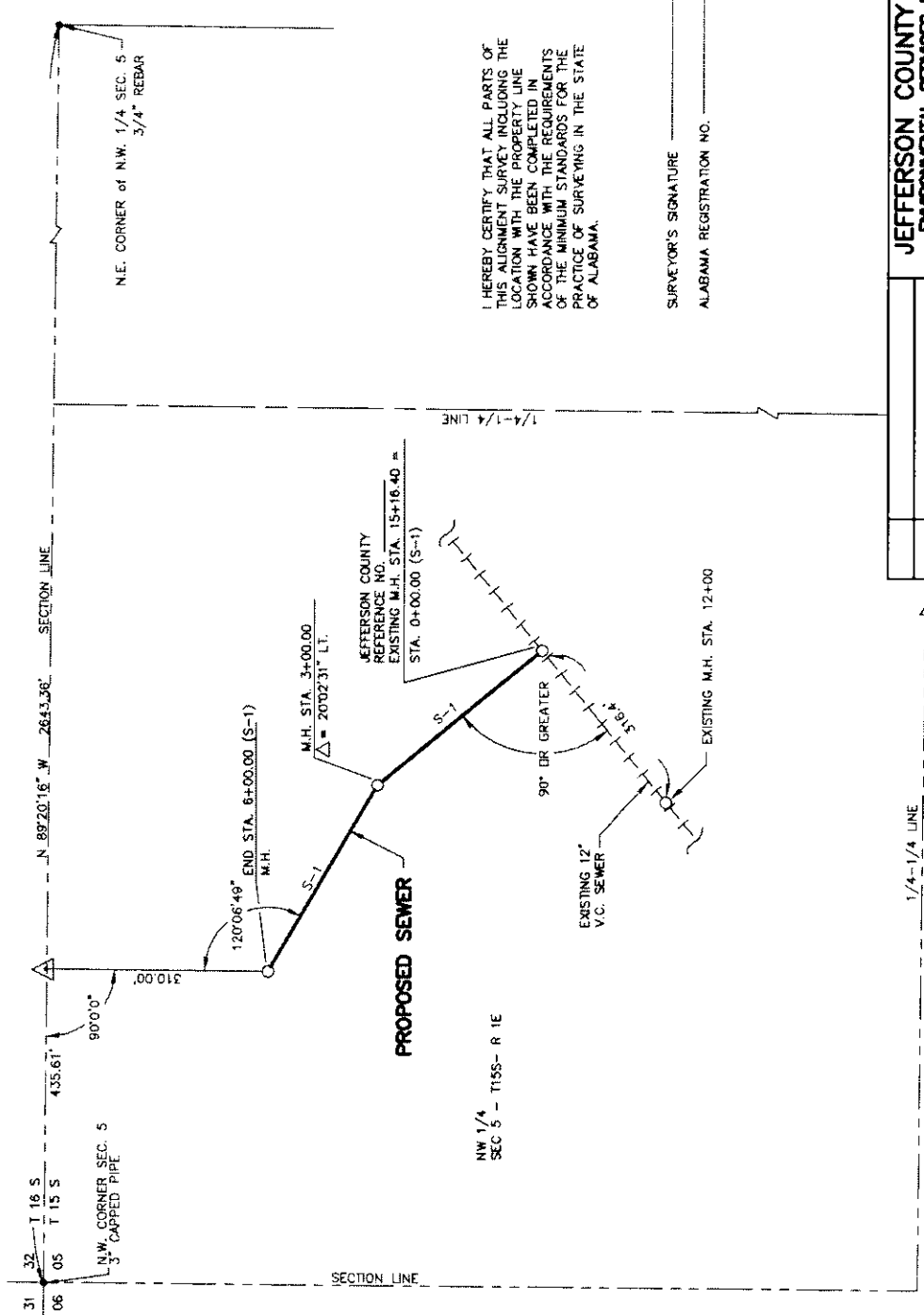
5.0200 Television Inspection of New Sewers

5.0210 General

5.0211 The Contractor shall have internal television inspection performed by a qualified subcontractor for all new sewers. The inspection shall be video taped and all features shall be measured and logged as the camera progresses through the pipe. TV inspection reports shall include pipe size, pipe material, location of changes in pipe material, service connection locations and location of defects.

5.0212 As part of the acceptance procedure, the Contractor shall review the tape and log with the County Sewer Construction Inspector. Any defects that are found must be repaired in a manner acceptable to the County. The final inspection tape and log shall be submitted to the County for permanent record.

APPENDIX
Standard Drawings



I HEREBY CERTIFY THAT ALL PARTS OF THIS ALIGNMENT SURVEY INCLUDING THE LOCATION WITH THE PROPERTY LINE SHOWN HAVE BEEN COMPLETED IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARDS FOR THE PRACTICE OF SURVEYING IN THE STATE OF ALABAMA.

SURVEYOR'S SIGNATURE _____
ALABAMA REGISTRATION NO. _____

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
STANDARD FORM AND CONTENT FOR LAND TIE	
NOV. 1999	APPROVED: _____
STANDARD DRAWING NO. SD1	

**JEFFERSON COUNTY STANDARD NOTES
FOR 8 INCH AND LARGER SANITARY SEWERS**

1. All construction shall be in accordance with the standards and specification of Jefferson County, the local municipality and/or the State Highway Department, and applicable O.S.H.A. regulations, as applicable.
2. The Contractor shall notify the Jefferson County Environmental Services Department 325-5127 at least 24 hours prior to beginning construction. There shall be no changes in Drawings without written approval by the Jefferson County Environmental Services Department.
3. Ductile iron pipe shall be Class 52 or better.
4. PVC pipe shall be AWWA C900, Cast Iron (C) standard dimensions. Dimension Ratio (DR) 18. Pressure Class (PC) 150 psi or better.
5. In earth trench, four inches of crushed stone shall be placed under sewer lines of 12 inches in diameter or smaller and six inches of crushed stone shall be placed under sewer lines larger than 12 inches in diameter. In rock trenches, six inches of crushed stone shall be placed under all sewers. The ditch shall be backfilled with crushed stone to a depth of 12 inches above the top of the pipe. When crossing existing roads and streets, the total backfill shall be crushed stone and properly choked.
6. At the direction of the ESD Inspector, a connection of Sanitary sewer pipes (8 inch through 16 inch) of dissimilar sizes or for repair of sanitary sewer pipes of similar materials may be made by means of an approved mechanical seal type adjustable coupling. Couplings with any required adapting bushings shall be manufactured of an approved preformed elastomeric material specifically for dimensions of the pipe materials to be connected. Couplings of the mechanical seal type shall have nut and bolt tightening clamps or devices made of 316 stainless steel, with an adjustable stainless steel shear ring, and stainless steel hardware. A concrete collar as shown on Appendix Standard Drawing SD2060 is required. The adjustable coupling shall be installed as recommended and specified by the manufacturer. Each coupling shall bear the manufacturer's name and required markings.
7. Manholes shall meet ASTM specification C-478. Joints between the manhole sections shall be offset tongue and groove "push on" type, supplied with Jylox Super Seal pre-lubricated gasket as manufactured by Hamilton Kent meeting the requirements of ASTM C443. Each joint shall also be supplied with Consol CS-231 waterstop sealant as manufactured by Concrete Sealants, in widths as recommended by the manufacturer. Manholes shall have a minimum diameter of 48 inches and a minimum thickness of 5 inches. All manhole cones shall be of the concentric type. Manholes may be finished to street grade with brick and mortar. This adjustment height shall not exceed 16 inches.
8. Stubouts for Sanitary sewer service lines shall end on or near the property line unless otherwise noted. On "downhill" side lots install laterals on a minimum 1% grade. On "uphill" side lots, install service lines to grade that will terminate a maximum depth of 10 feet. The first joint out of a manhole, for building or house service, shall be ductile iron pipe class 52 or better (minimum 8 feet). Any building service line set outside of easement or R.O.W. must be installed by a master plumber and have a sewer connection permit for each lot.

9. If the contractor is installing service lines at the same time as main line, the service line shall be installed in accordance with Jefferson County Standards for Construction of Service Lines and Connections, and inspected/tested by County Inspector before it is backfilled.
10. All service line stubouts installed in Road ROW or under asphalt shall be per Standard Specifications for Sanitary Sewer Service Lines and Connections Section 4.
11. Construction signs for work within and adjacent to public roads, highways, and alleys shall be in accordance with ALDOT Standards.
12. Contractor will be responsible for the continuous and proper operation of all existing utilities located on or adjacent to the project site and within the construction limits of this project.
13. All embankment fill areas shall be filled and compacted prior to excavation of sewer line trenches.
14. Contractor will be responsible for the construction and maintenance of erosion and sedimentation controls and for acquisition of all permits during construction to insure that damage does not occur to adjacent properties, public roads and/or ditches (creeks, streams).
15. Upon completion of all or any part of a sanitary sewer line, the Contractor will be required to test said sewer for acceptability. Gravity sewers will be pressure tested with air. Force main sewers will be pressure tested with water. Manholes will be vacuum tested. All tests will be conducted in the presence of the County Sewer Construction Inspector in accordance with section 5.00 Standards for Commercial and Residential Construction of Sanitary Sewer Systems. Gravity Sanitary Sewers will be television inspected following air testing with the final video tape and log furnished to the County for record information.

NOTE: These notes shall be placed on at least one sheet of the drawings.

	JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
STANDARD CONSTRUCTION PLANS NOTES		
	NOV. 1999	
		APPROVED: _____
		STANDARD DRAWING NO. <u>SD2</u>

ABBREVIATIONS

Acquired	Acq'd	Horizontal	Horiz.
Acre	Ac.	Junction	Jct.
Alabama Department of Transportation	A.L.D.O.T.	Junction Box	Jct. Box
Bench Mark	B.M.	Linear Feet	L.F.
Bituminous Coated Corrugated Metal Pipe	B.C.C.M.P.	Mail Box	M.B.
Brick Residence	Br. Res.	Point of Curve	P.C.
Building	Bldg.	Point of Intersection	P.I.
Carrying Capacity	C.C.	Point of Tangent	P.T.
Cast Iron Pipe	C.I.P.	Pound	Lb.
Center Line	☉	Property Line	ℙ
Concrete	Conc.	Railroad	R.R.
Corner	Cor.	Range	R.
Cubic Yard	C.Y.	Right of Way	R.O.W.
Curb and Gutter	C & G	Required	Req'd.
Design Flow	D.F.	Rubble Masonry	R.M.
Distance	Dist.	Sanitary Sewer	San. Sew.
Double	Dbl.	Section	Sec.
Drainage Area	D.A.	Shoulder	Shldr.
Drop Inlet	D.I.	Side Drain	S.D.
Ductile Iron Pipe	D.I.P.	Square Yard	S.Y.
Easement	Esmt.	Station	Sta.
Elevation	El.		
Flow Line	F.L.		
Frame Residence	Fr. Res.		
Gallons Per Minute	G.P.M.		
Gas Meter	G.M.		
Gas Valve	G.V.		
Headwall	Hdwl.		
High Water	H.W.		

**JEFFERSON COUNTY ALABAMA
ENVIRONMENTAL SERVICES DEPARTMENT**

STANDARD
ABBREVIATIONS AND SYMBOLS











NOV. 1999

APPROVED: _____ STANDARD DRAWING NO. _____ SD3

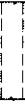


















ABBREVIATIONS

Storm Sewer	Stm. Sew.
Street	St.
Tangent to Curve	Tan. to C.
Temporary Bench Mark	T.B.M.
Township	T.
Valley Gutter	V.G.
Vertical	Vert.
Vertical Feet	V.F.
Vertical Point of Curve	V.P.C.
Vertical Point of Intersection	V.P.I.
Vertical Point of Tangent	V.P.T.
Vitrified Clay Pipe	V.C.P.
Water Meter	W.M.
Water Valve	W.V.
Wing Wall	W.W.
Yard	Yd.

NATURAL

	Trees. (Draw dot to scale of tree)
	Hedges or Shrubbery
	Shrub
	Flower Bed, Garden, or Rock Garden (Noted)
	Lake or Pond
	Swamp, Marsh, Etc.
	Flowing Stream (Arrow indicates direction of flow)
	Dry Ditch or Stream
	Earth
	Rock

STRUCTURES

	Unpaved Road or Driveway
	Paved Road or Driveway
	Paved Road with Gutter
	Drain with Headwall (Size and Type Structure Noted)
	Existing Bridge, Box Culvert, or Storm Drain (Size and Type Structure Noted)
	Walk Bridge
	Railroad Track Single
	Railroad Track Double
	Railroad Milepost
	Outdoor Advertising Sign
	Masonry Wall (Note Type)
	Mailbox
	Clothes Line and Poles (Noted)
	Well
	Levee or Earth Dam
	Wood Fence
	Hog Wire or Barbed Wire Fence
	Chain Link Fence
	Drop Inlet (Noted)

JEFFERSON COUNTY ALABAMA
ENVIRONMENTAL SERVICES DEPARTMENT

STANDARD

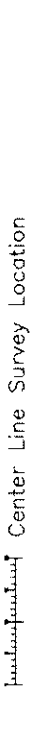
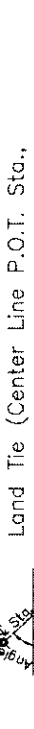
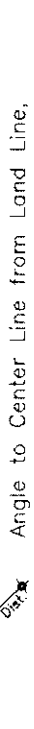
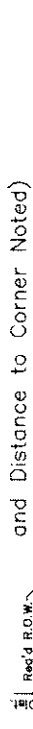

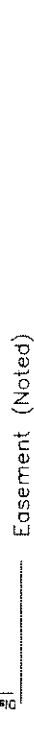
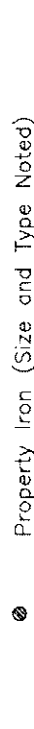

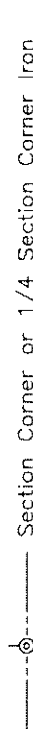
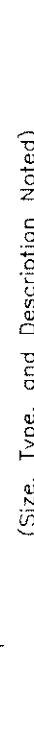
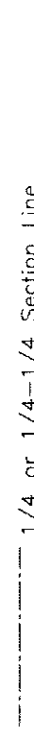
ABBREVIATIONS AND SYMBOLS

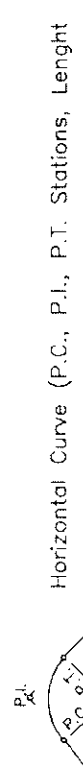
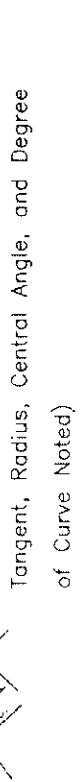
NOV. 1999

APPROVED: _____






















STANDARD DRAWING NO. _____ SD4

SURVEY

-  Center Line Survey Location
-  Land Tie (Center Line P.O.T. Sta.)
-  Angle to Center Line from Land Line, and Distance to Corner Noted
-  Right of Way (Type Noted--Acq'd, Req'd, Etc.) Easement (Noted)
-  Property Iron (Size and Type Noted)
-  Property Line
-  Section Corner or 1/4 Section Corner Iron (Size, Type, and Description Noted)
-  1/4 or 1/4-1/4 Section Line
-  Section Line
-  Right of Way Monuments (Noted for Existing)
-  Construction Limits



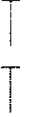






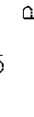
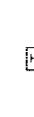












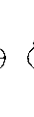


-  Horizontal Curve (P.C., P.I., P.T. Stations, Length, Tangent, Radius, Central Angle, and Degree of Curve Noted)
-  Vertical Curve (V.P.C., V.P.I., V.P.T. Stations, Elevation of V.P.I., Length, and % Grade on Tangents)

TRAFFIC CONTROL

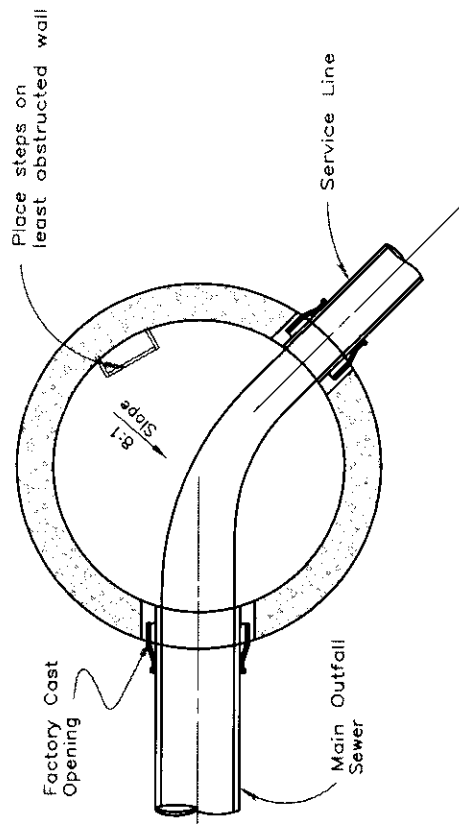
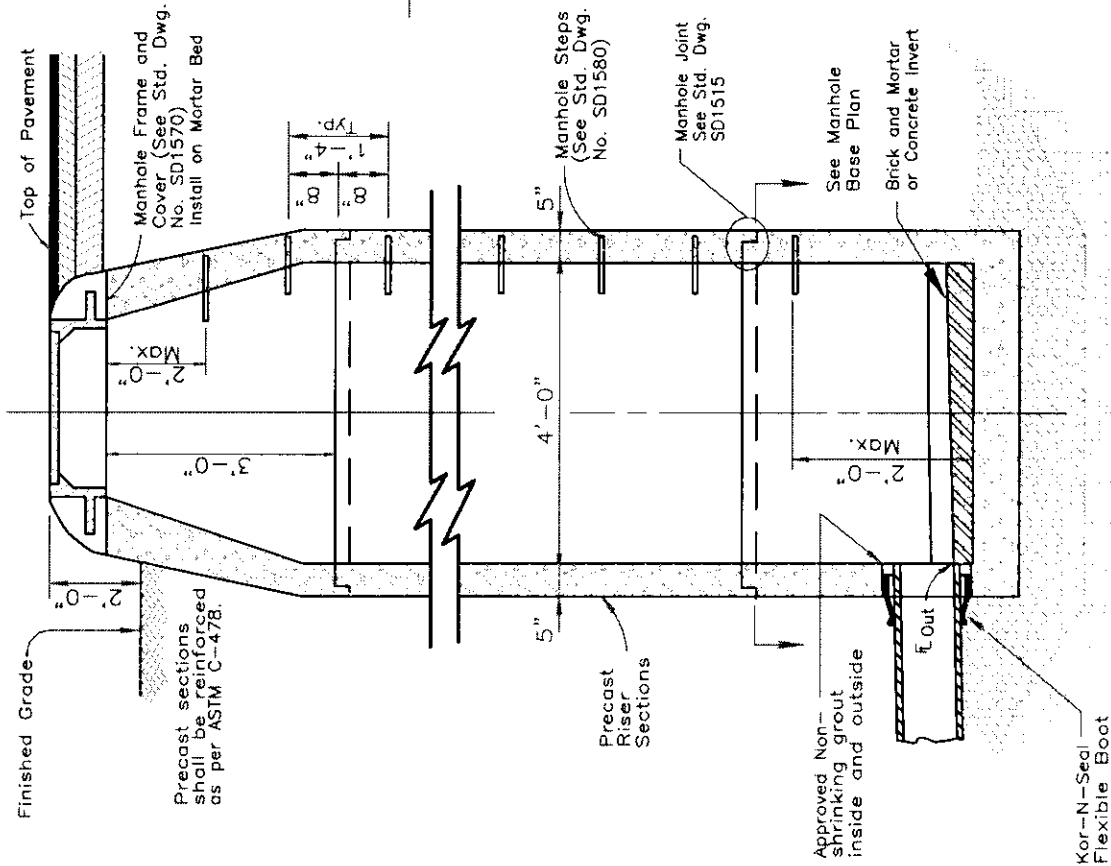
EXISTING	PROPOSED	
X		Traffic Signal Head
X		Traffic Signal Head with Back Plate (Number Shown)
X		Pedestrian Signal Head
		Steel Signal Pole with Mast Arm
		Pedestrian Push Button and Sign
		Controller Cabinet
		Stop Line
		Steel Signal Pole (Noted)
		Span Wire (Noted)
		Post Mounted Sign
		Conduit and Cable
		Portable Sign
		Cone
		Vertical Panel
		Type I, II, and III Barricades (Noted)
		Railroad Flashing Light Signals
		Flagger Station
		High Level Warning Device
		Drum
		Work Area
		Junction Box (Electrical)

DATE	REVISIONS	<p>JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT</p> <p>STANDARD ABBREVIATIONS AND SYMBOLS</p>
	NOV. 1999	
APPROVED:		STANDARD DRAWING NO. SD5

UTILITIES

-  Proposed Sanitary Sewer Manhole
-  Existing Sanitary Sewer Manhole
-  Existing Sanitary Sewer Gravity Line (Tick Upstream Side)
-  Existing Sanitary Sewer Force Line (Arrow Indicates Flow)
-  Utility Manhole (Note Type in Circle - P,T,Etc.)
-  Power Junction Box
-  Power Pole
-  Light Pole (Note Type)
-  High Voltage Transmission Pole or Tower
-  Underground Power Conduit
-  Overhead Power Lines
-  Telephone Junction Box
-  Telephone Pole
-  Underground Telephone Conduit
-  Overhead Telephone Lines
-  Combination Pole
-  Overhead Telephone and Power Lines
-  Guy Pole
-  Utility Pole Anchor
-  Gas Line Marker (Noted)
-  Gas Meter
-  Gas Line (Note Diameter of Pipe)
-  Valve (Noted Gas or Water)
-  Water Line (Note Diameter of Pipe)
-  Water Meter
-  Fire Plug

DATE	REVISIONS	JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT
	NOV. 1999	STANDARD ABBREVIATIONS AND SYMBOLS
APPROVED:		STANDARD DRAWING NO. SD6



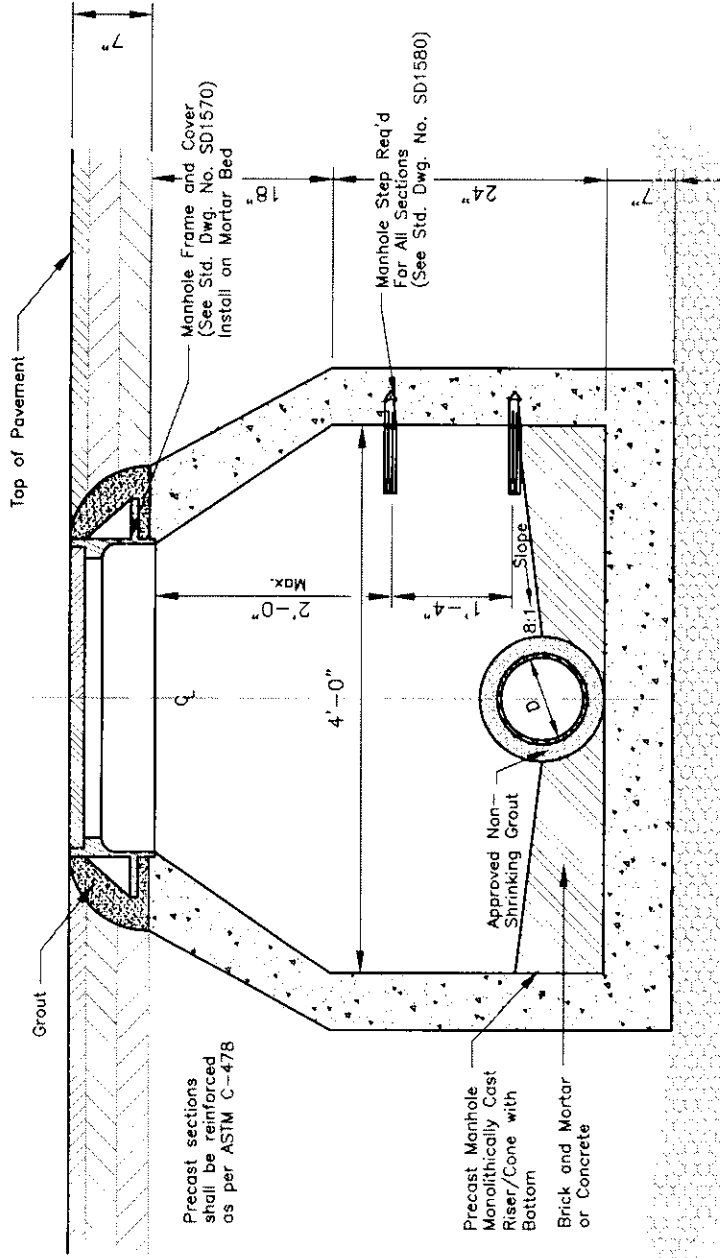
MANHOLE BASE PLAN
N.T.S.

NOTES:
1. Refer to base section on SD1500.

SECTION
N.T.S.

NOTES:
All manholes with pipe entering with diameter of 24" D.I.P. or less shall be supplied with Kor-N-Seal flexible boots or approved equal.
Base section shall be set on foundation of No. 57 compacted stone aggregate a minimum of 12" thickness and covering the entire bottom of the excavation for the manhole.

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
PRECAST TERMINAL MANHOLE	STANDARD DRAWING NO. SD1510
NOV. 1999	
APPROVED: _____	



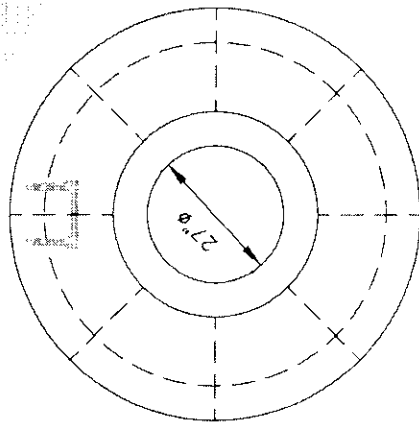
Base section shall be set on a foundation of No. 57 compacted stone aggregate with a minimum thickness of 12" covering the entire bottom of the excavation for the manhole.

Precast sections shall be reinforced as per ASTM C-478

Precast Manhole Monolithically Cast Riser/Cone with Bottom
Brick and Mortar or Concrete

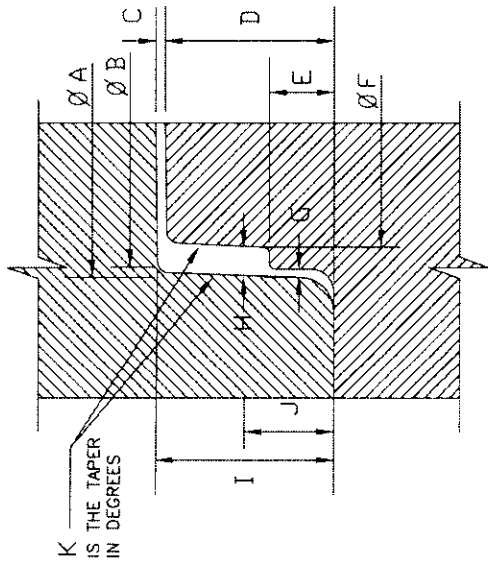
SECTION
N.T.S.

- NOTES:
1. See SD1500 for Flexible Boot requirements.



TOP VIEW
N.T.S.

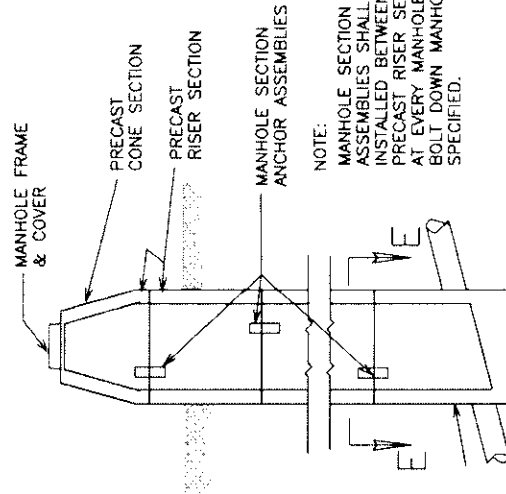
JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
48" ONE PIECE MANHOLE	NOV. 1999
STANDARD DRAWING NO. SD1511	APPROVED:



Dia.	Ø A	Ø B	C	D	E	Ø F	G	H	I	J	K
48	53.121	52.966	0.125	4.125	1.600	52.217	0.146	0.452	4.250	2.033	2°
60	67.512	67.315	0.160	5.24	2.68	66.450	0.150	0.500	5.394	3.268	1.8°
72	79.362	79.105	0.160	5.24	2.68	78.233	0.150	0.500	5.400	3.400	1.8°

PRECAST MANHOLE JOINT

N.T.S.



NOTE:
MANHOLE SECTION ANCHOR ASSEMBLIES SHALL BE INSTALLED BETWEEN ALL PRECAST RISER SECTIONS AT EVERY MANHOLE WHERE BOLT DOWN MANHOLE IS SPECIFIED.

MANHOLE JOINT STRAP DETAIL

N.T.S.

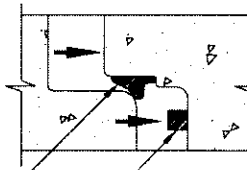
TYLOX-SUPER SEAL PRELUBRICATED GASKET TO BE PLACED FIRMLY AGAINST THE OFFSET ALL THE WAY AROUND THE SPIGOT OF THE MANHOLE.

SEE REQUIRED SIZE CHART FOR CONSEAL CS-231

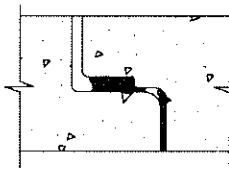
CONSEAL CS-231 REQ'D SIZE CHART

48" O.D.	3/8
60" I.D.	3/8
72" I.D.	3/8
84" I.D.	3/4
96" I.D.	3/4

OPEN MANHOLE JOINT

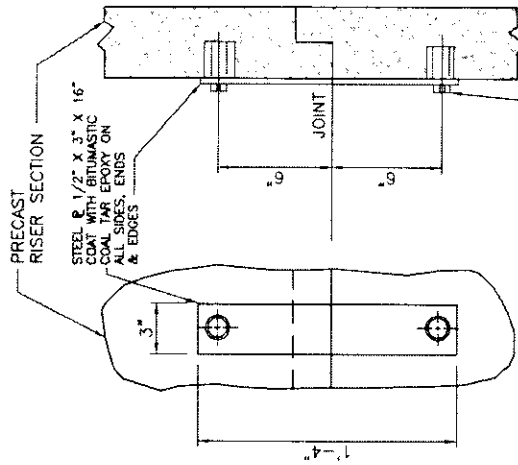


SEALED MANHOLE JOINT



GASKET DETAILS

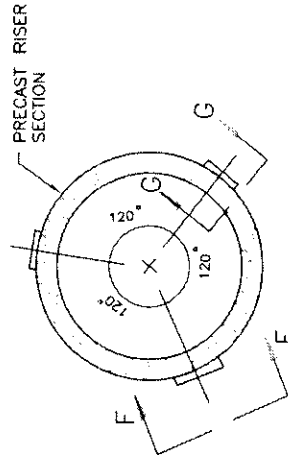
N.T.S.



3/4" Ø X 3" CINCH ANCHOR BOLTS
2" UNIT, TYPE 2. COAT HEADS OF BOLTS WITH BITUMASTIC COAL TAR EPOXY BEFORE BACKFILL.

SECTION F-F SECTION G-G

3 ANCHOR ASSEMBLIES REQUIRED PER JOINT 120" APART.



SECTION E-E

TYPICAL MANHOLE SECTION ANCHOR

JEFFERSON COUNTY ALABAMA
ENVIRONMENTAL SERVICES DEPARTMENT

PRECAST MANHOLE
JOINT DETAILS

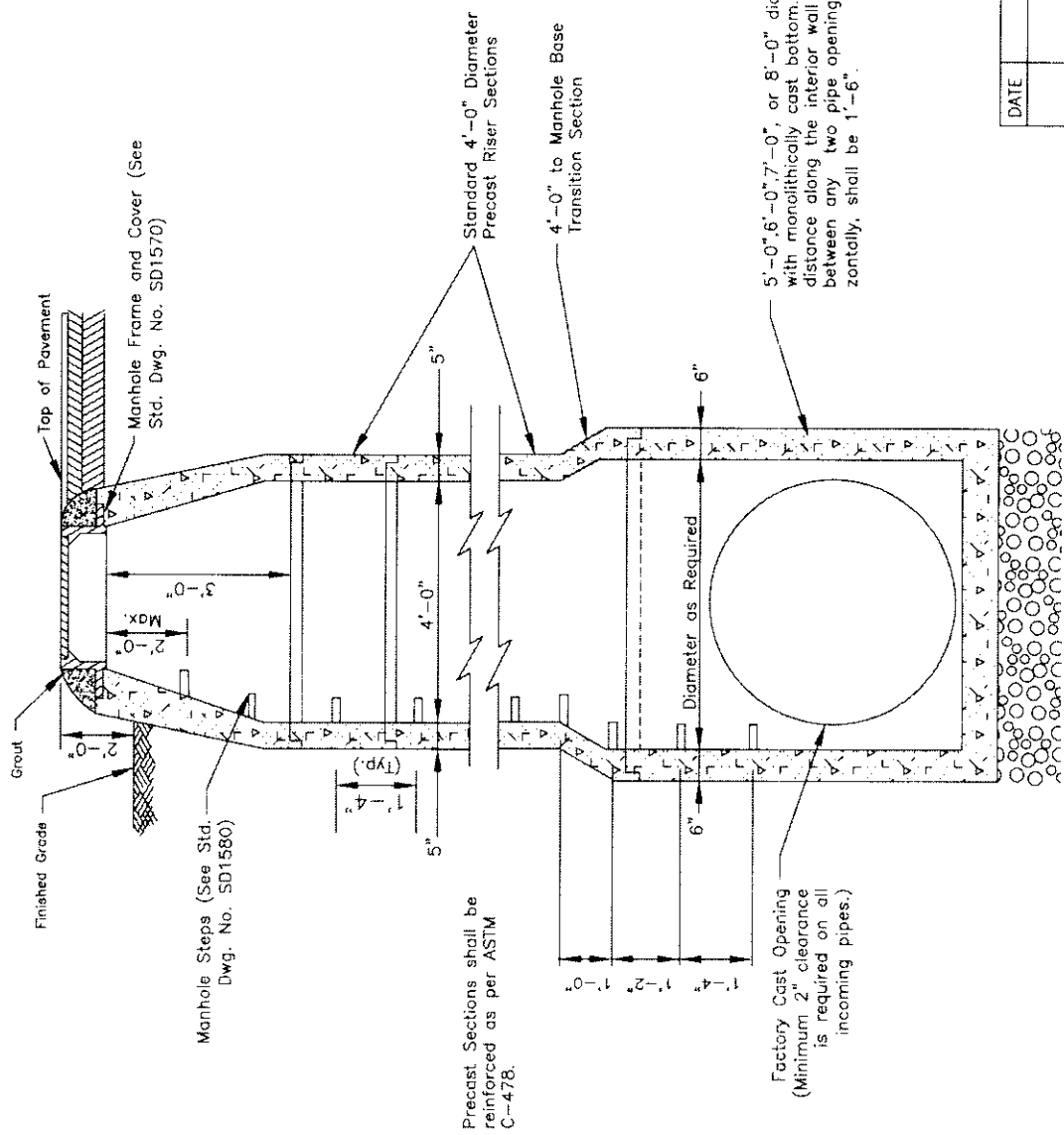
NOV. 1999

STANDARD DRAWING NO. SD1515

APPROVED:

PRECAST MANHOLE

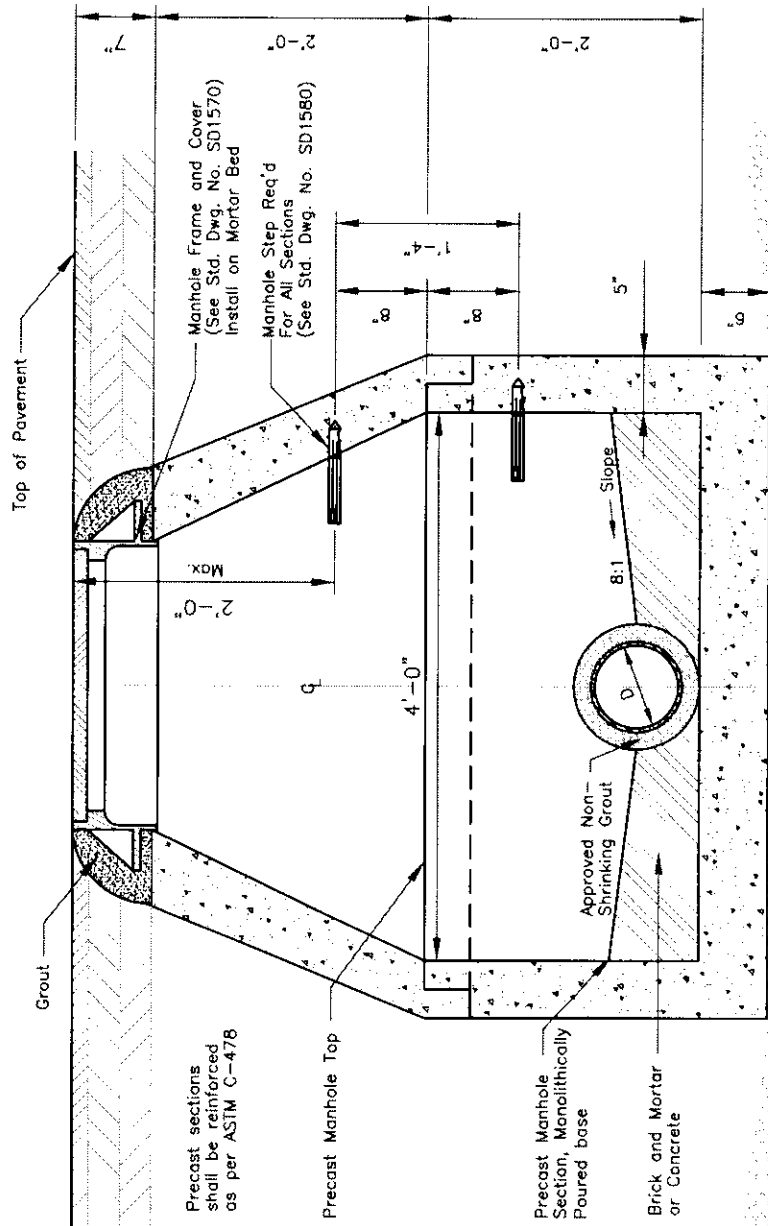
N.T.S.



SECTION
N.T.S.

Base section shall be set on foundation of No. 57 compacted stone aggregate a minimum of 12" thickness and covering the entire bottom of the excavation for the manhole.

DATE	REVISIONS	JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT
		PRECAST MANHOLE FOR PIPES 21"-42" DIAMETER
	NOV. 1999	
	APPROVED: _____	STANDARD DRAWING NO. SD1520



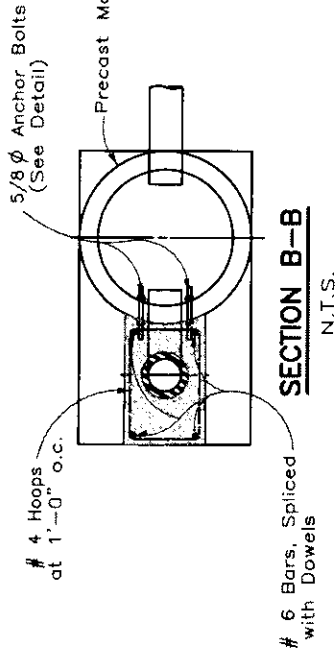
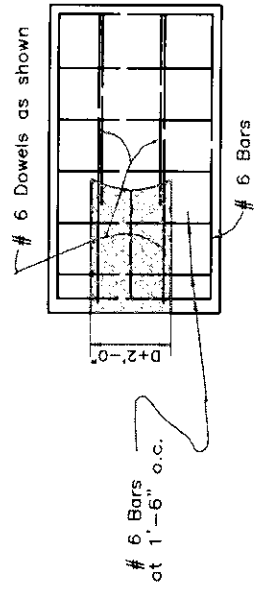
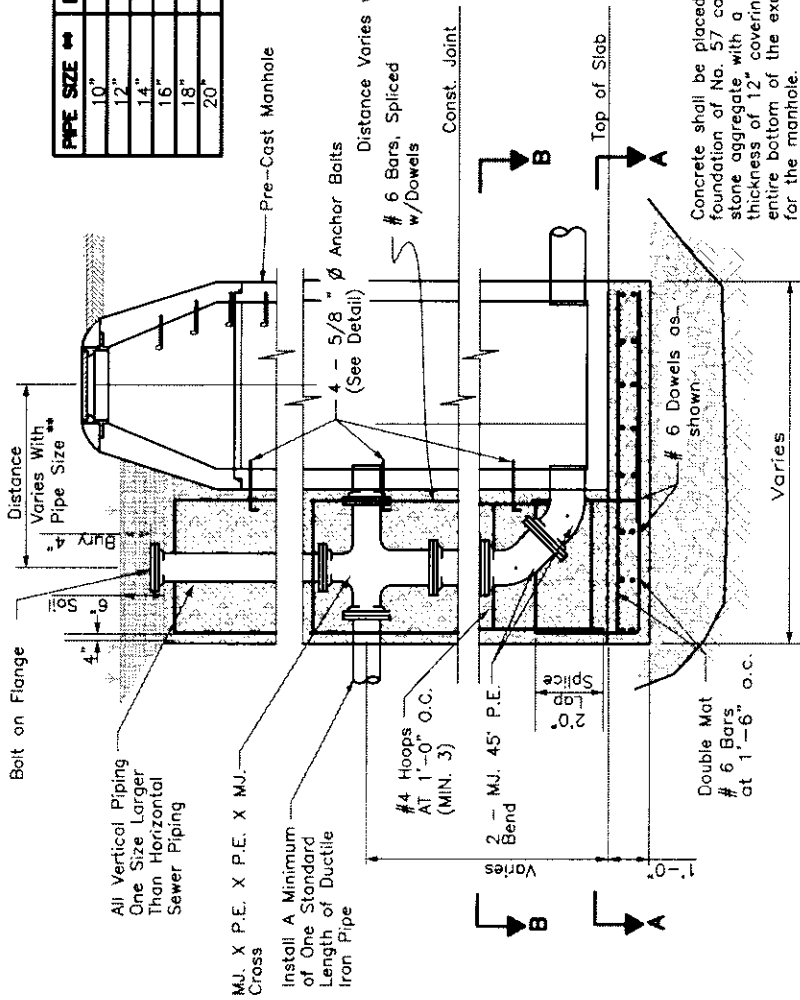
Base section shall be set on a foundation of No. 57 compacted stone aggregate with a minimum thickness of 12" covering the entire bottom of the excavation for the manhole.

SECTION
N.T.S.

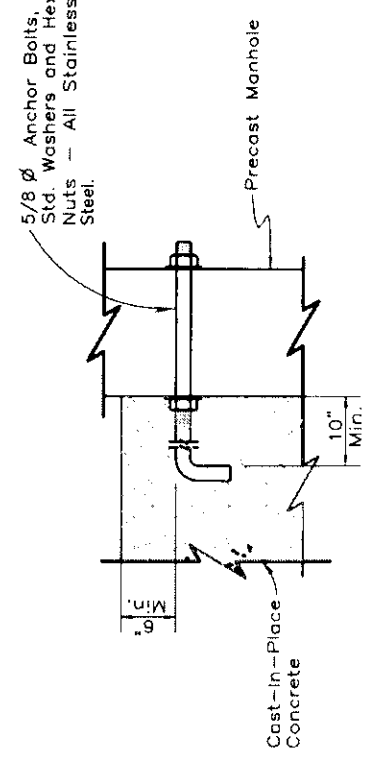
- NOTES:**
1. See SD1500 for Flexible Boot requirements.

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
MINIMUM DEPTH MANHOLE	
NOV. 1999	APPROVED: _____
STANDARD DRAWING NO. SD1530	

PIPE SIZE **	DISTANCE
10"	4'-5"
12"	4'-8"
14"	4'-8"
16"	4'-9"
18"	4'-11"
20"	5'-1"



SECTION AT ϕ OF PIPE
N.T.S.



ANCHOR BOLT DETAIL
N.T.S.

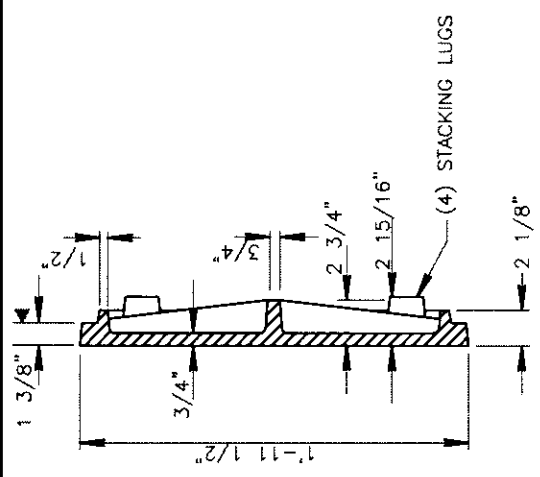
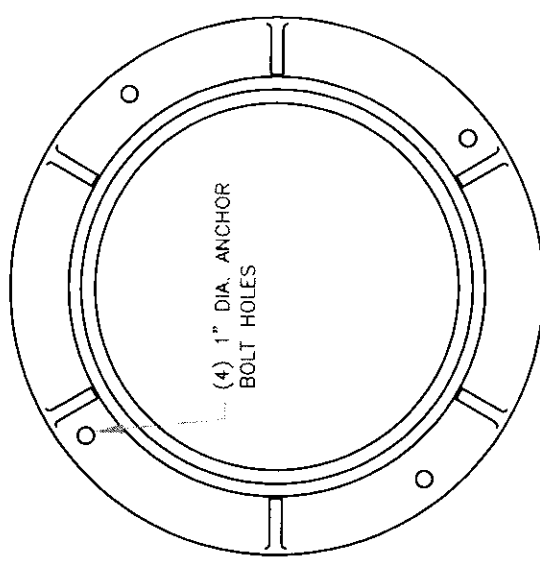
1. All bases to be poured monolithically.
2. This detail shall be extended for situations where there are two incoming pipes, except that the resulting base shall be poured monolithically.
3. Provide 3" of clear concrete cover to all reinforcing bars unless otherwise noted.
4. All cast-in-place concrete shall be Class "A".
5. Install one Standard Length of Ductile Iron Pipe upstream of Drop Manhole Structure.

JEFFERSON COUNTY ALABAMA
ENVIRONMENTAL SERVICES DEPARTMENT

DROP MANHOLE
(MEMPHIS TEE)
DETAILS FOR PIPES 18"
DIAMETER OR LESS

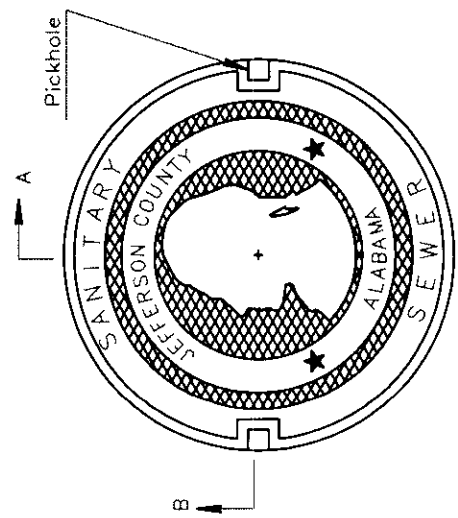
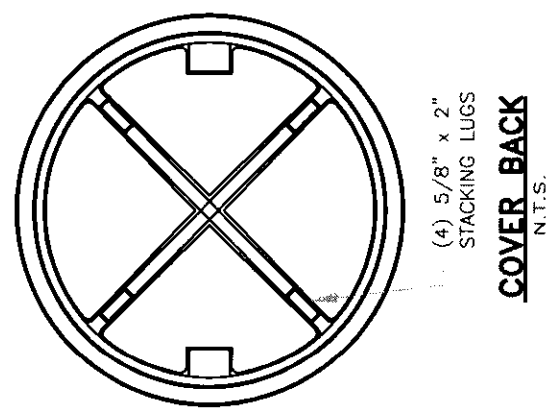
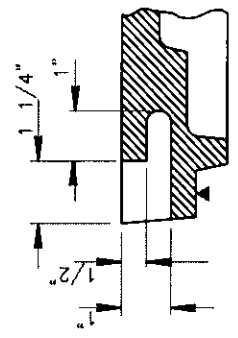
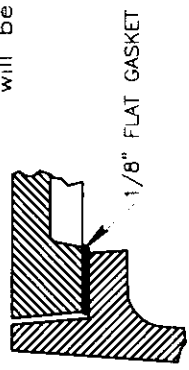
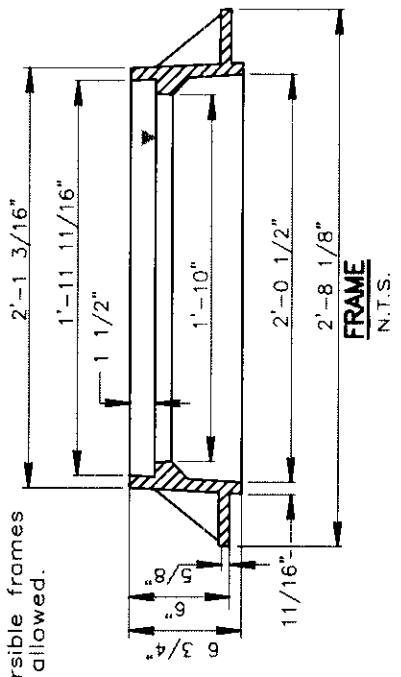
NOV. 1999

APPROVED: _____ STANDARD DRAWING NO. _____ SD1560



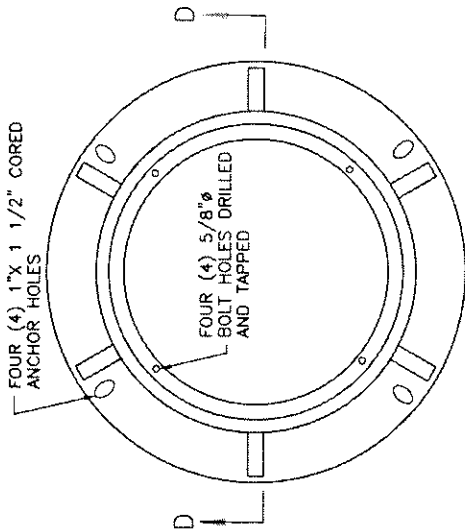
▼ MACHINED BEARING SURFACE

NOTE:
No reversible frames will be allowed.

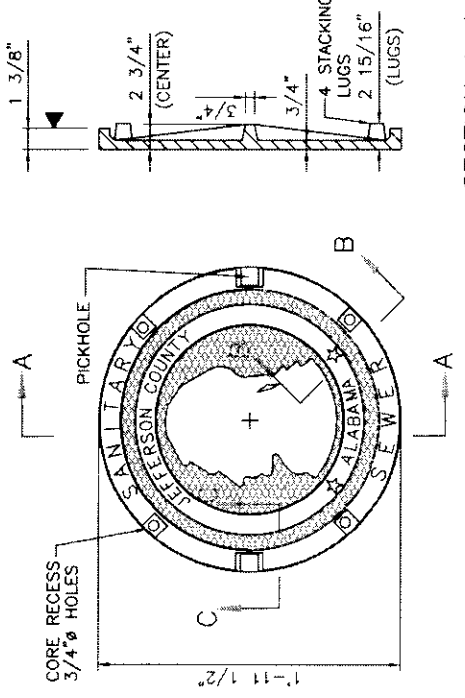


ESTIMATED WEIGHTS
FRAME 174 LBS.
COVER 124 LBS.

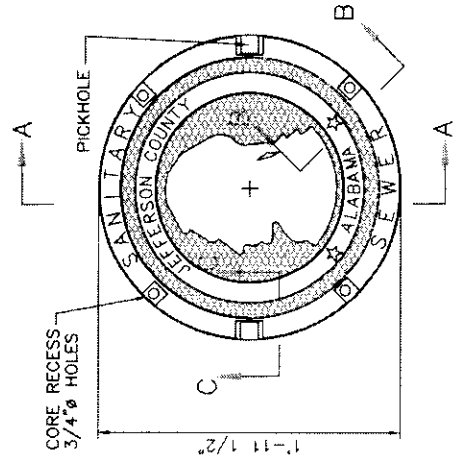
JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
STANDARD MANHOLE FRAME & COVER DETAILS	
APPROVED: _____	NOV. 1999
STANDARD DRAWING NO. SD1570	



SECTION A-A
COVER
N.T.S.



SECTION B-B
WATERTIGHT DETAIL
N.T.S.



SECTION C-C
PICKHOLE DETAIL
N.T.S.



SECTION D-D
FRAME
N.T.S.



SECTION E-E
TYPICAL MANHOLE SECTION ANCHOR



SECTION F-F
NOTE: 3 Anchor Assemblies Required Per Joint 120" Apart.

SECTION G-G

SECTION H-H

SECTION I-I

SECTION J-J

SECTION K-K

SECTION L-L

SECTION M-M

SECTION N-N

SECTION O-O

SECTION P-P

SECTION Q-Q

SECTION R-R

SECTION S-S

SECTION T-T

SECTION U-U

SECTION V-V

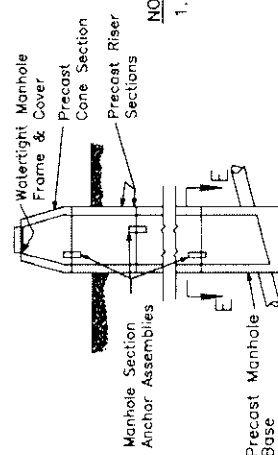
SECTION W-W

SECTION X-X

SECTION Y-Y

SECTION Z-Z

ESTIMATED WEIGHTS
FRAME 200 LBS.
COVER 105 LBS.



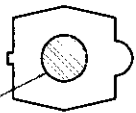
MANHOLE SECTION ANCHOR ASSEMBLY

Manhole Section Anchor Assemblies Shall be Installed Between All Precast Riser Sections At every Manhole Bolt down frame and cover Are Specified.

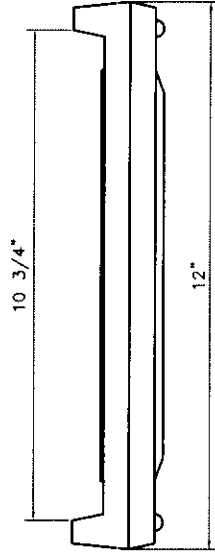
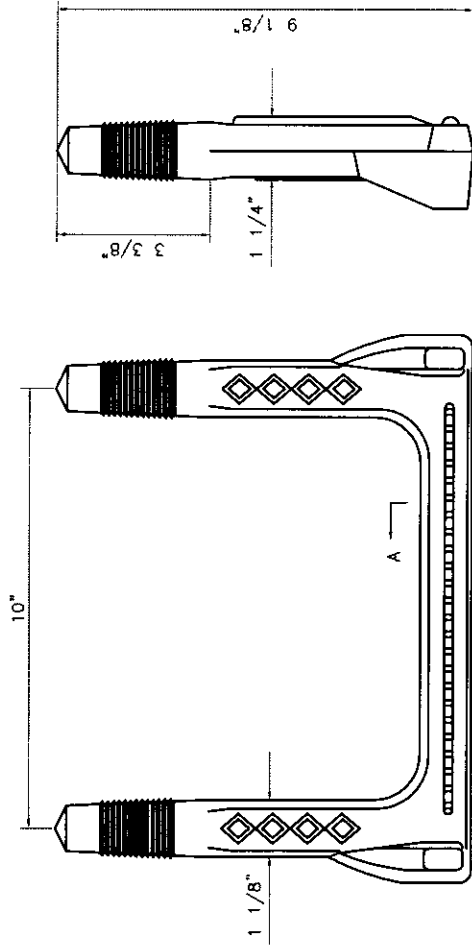
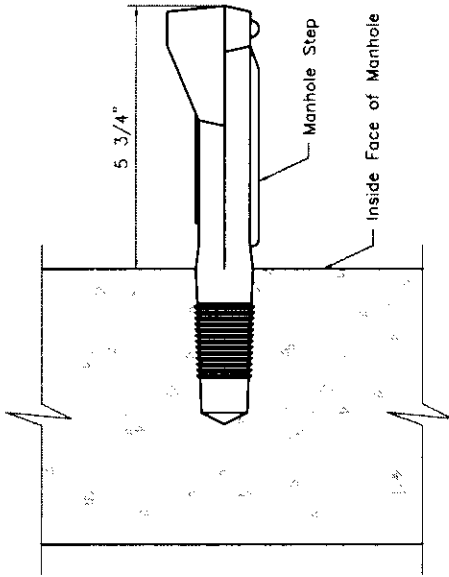
NOTES:
1. Manhole Section Anchor Assemblies Shall be Installed Between All Precast Riser Sections At every Manhole Bolt down frame and cover Are Specified.

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
BOLT DOWN MANHOLE FRAME & COVER DETAILS	
NOV. 1999	APPROVED: _____
STANDARD DRAWING NO. _____	SD1575

Copolymer Polypropylene Plastic
1/2" Grade 60 Steel Reinforcement



Section A



NOTES:

1. Manhole and inlet steps shall be plastic coated reinforced steel. Plastic coated manhole steps shall be polypropylene coated steel reinforcing rods with rod and pull out ratings meeting OSHA standards
2. For larger diameter manholes (deeper than 22') a caged aluminum ladder shall be used.
2. Manhole and inlet steps shall be installed at maximum 16" intervals.

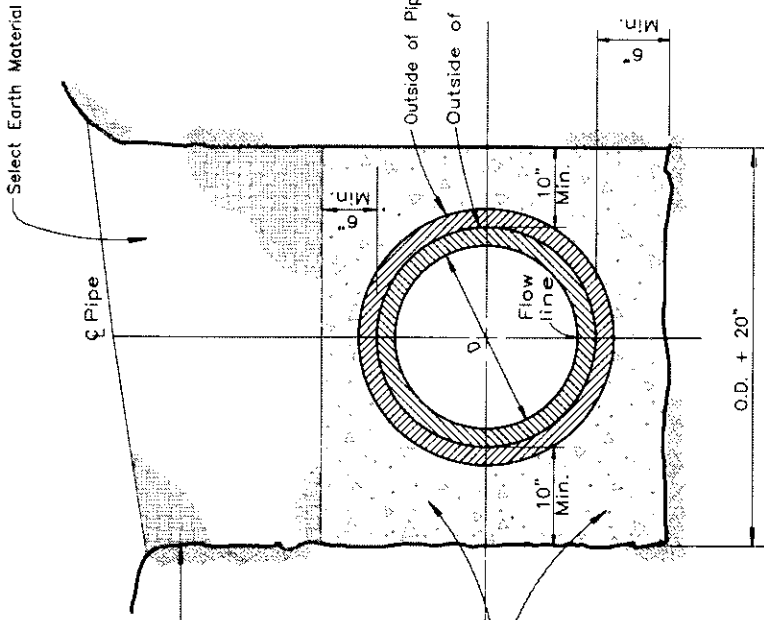
JEFFERSON COUNTY ALABAMA
ENVIRONMENTAL SERVICES DEPARTMENT

MANHOLE STEP DETAILS

NOV. 1999

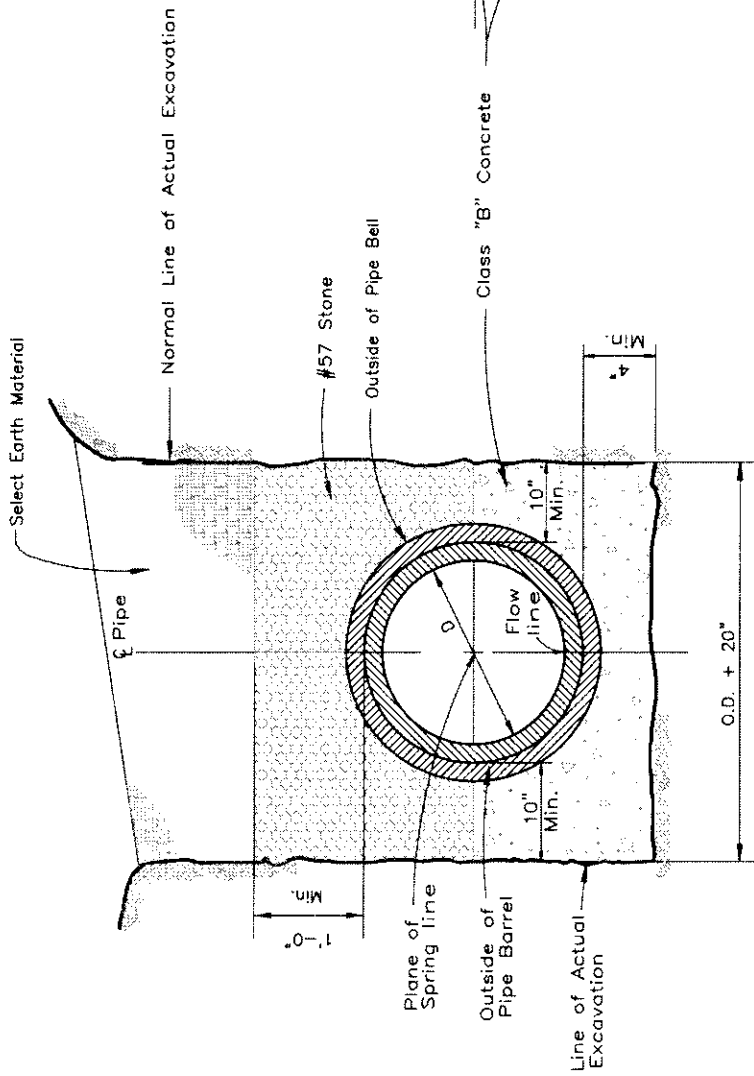
APPROVED:

STANDARD DRAWING NO. SD1580



CONCRETE ENCASEMENT

N.T.S.



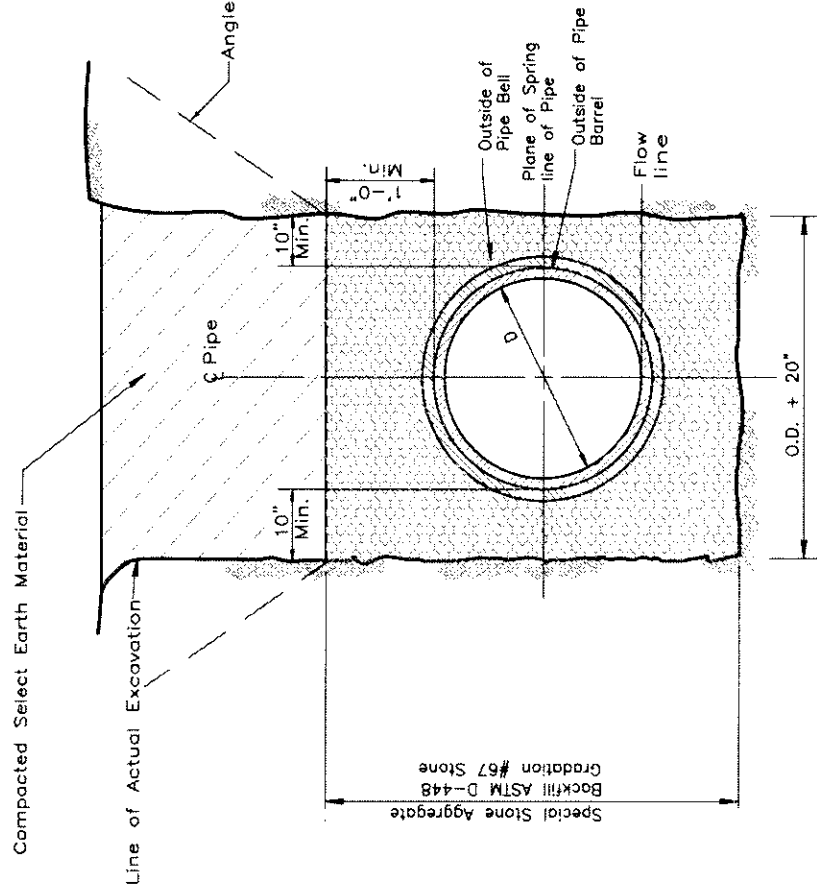
CONCRETE BEDDING

N.T.S.

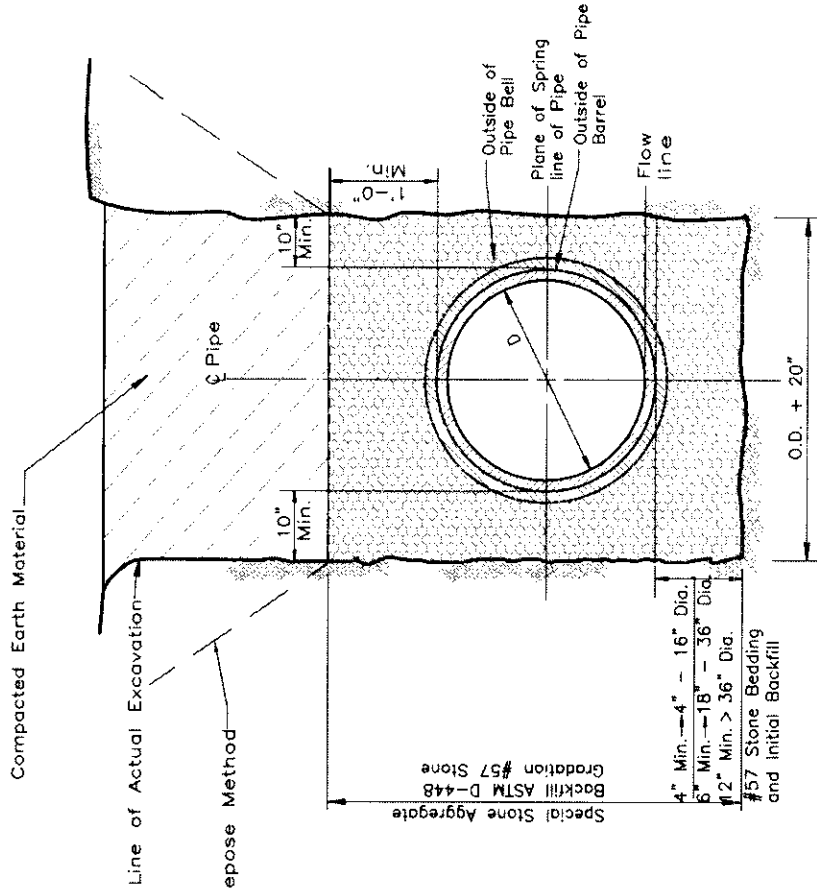
NOTES:

1. Concrete Bedding and Concrete Encasement shall be placed as designated on the Drawings or as directed by the County Inspector

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
CONCRETE BEDDING AND CONCRETE ENCASEMENT ALL TYPES OF PIPE	
NOV. 1999	STANDARD DRAWING NO. <u>SD2000_RCC</u>
APPROVED: _____	



C-900 PVC PIPE
N.T.S.

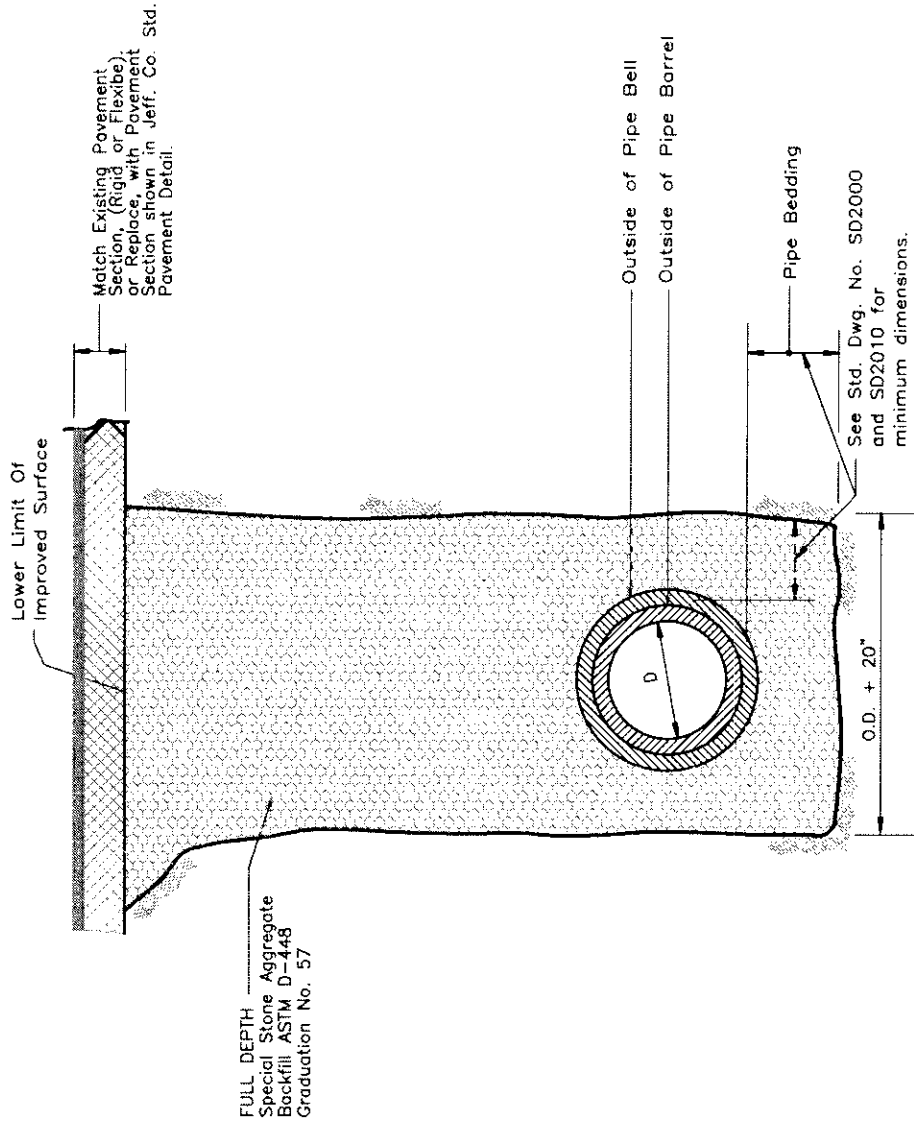


ALL OTHER PIPE
N.T.S.

NOTES:

1. Only acceptable granular material will be considered for Select Earth Material. Material must be compacted to 95% Standard Proctor Density and the results of the Standard Proctor Density test and the compaction test shall be submitted to the Engineer.
2. For Bedding under Paved Surfaces see Std. Dwg. No. sd2030.
3. All pipe shall have a minimum depth of 4" pipe bedding in a soil trench, and a minimum depth of 6" pipe bedding in a rock trench.

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
PIPE BEDDING AND BACKFILL DETAILS UNIMPROVED SURFACES	
	NOV. 1999
APPROVED: _____	STANDARD DRAWING NO. <u>SD2010_RCC</u>



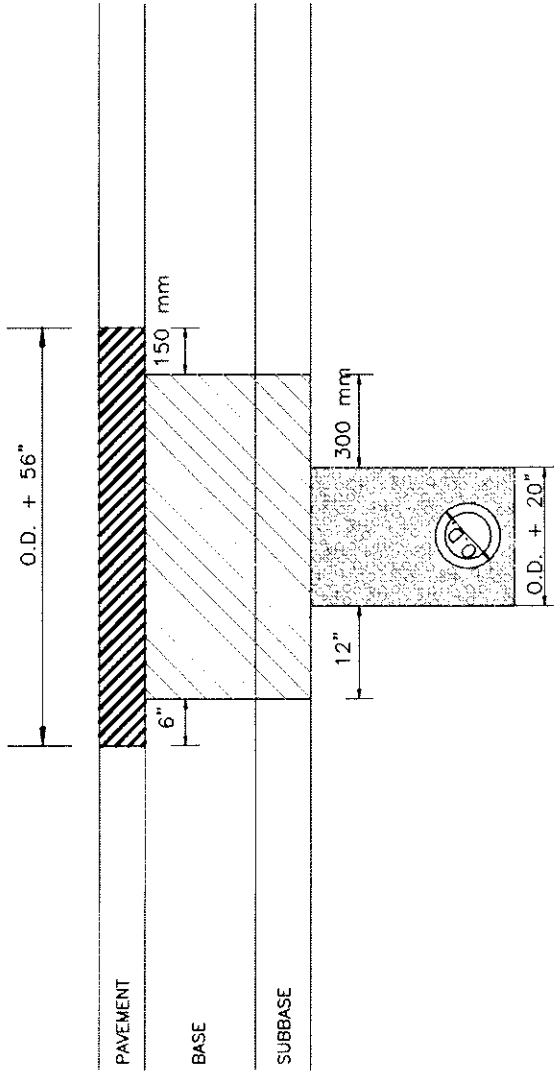
FULL DEPTH
Special Stone Aggregate
Backfill ASTM D-448
Graduation No. 57

See Std. Dwg. No. SD2000
and SD2010 for
minimum dimensions.

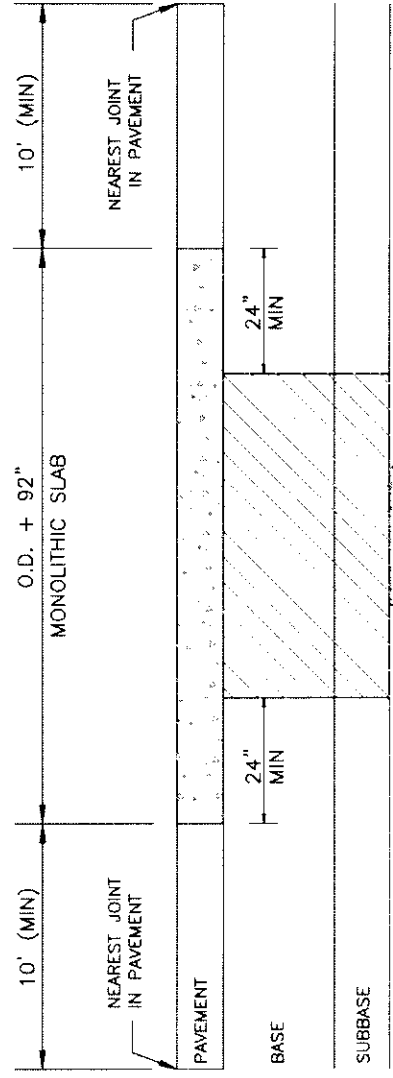
1. Trench configuration shown depicts the use "Trenchwall Shoring" Method,
which shall be used under all paved areas unless otherwise directed by the
Engineer.

1. The contractor shall refer to applicable "O.S.H.A. Regulations for
"Open Trench Excavations".

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
PIPE BEDDING AND BACKFILL DETAILS UNDER PAVEMENT	
NOV. 1999	STANDARD DRAWING NO. <u>SD2030 RCC</u>
APPROVED: _____	



(A) FLEXIBLE PAVEMENT

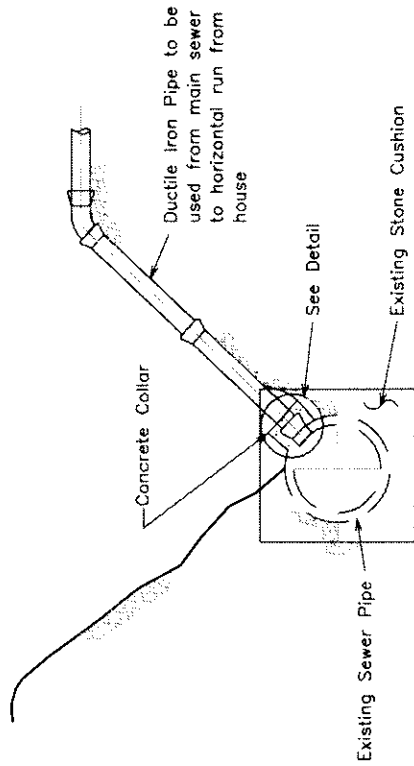


(B) RIGID PAVEMENT

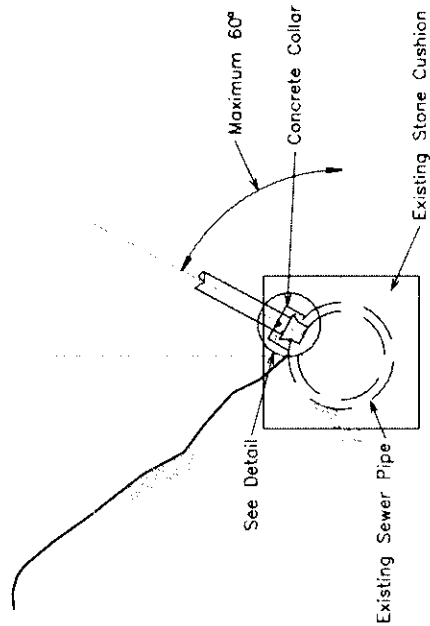
- GENERAL NOTES:**
1. ASPHALT CONCRETE PAVEMENT JOINTS SHALL BE MECHANICALLY SAWED.
 2. SURFACE TREATMENT PAVEMENT JOINTS SHALL BE LAPPED AND FEATHERED

- GENERAL NOTES:**
1. 3000 PSI CONCRETE, HIGH EARLY CEMENT, TO BE USED FOR PAVEMENT REPLACEMENT
 2. JOINTS TO BE MECHANICALLY SAWED.
 3. IF REINFORCED, REINFORCING STEEL TO BE REPLACED IN KIND. LONGITUDINAL STEEL TO BE BUTT WELDED TO EXISTING.

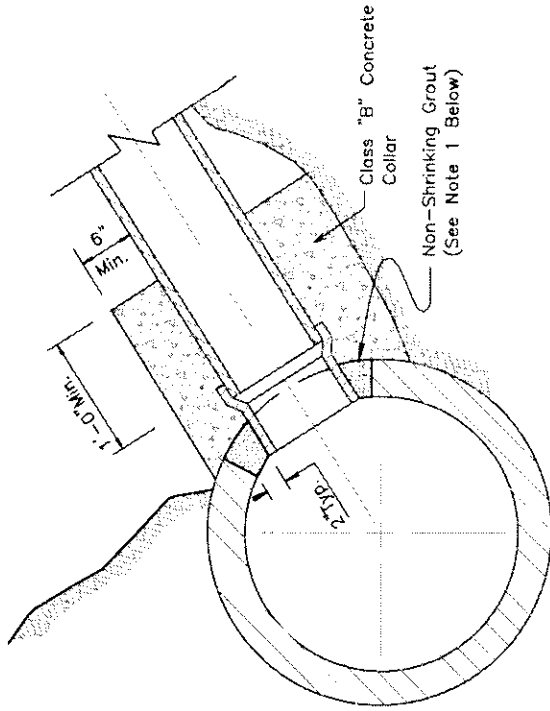
JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
REPLACEMENT OF ROADWAY STRUCTURE (WHERE PERMISSION HAS BEEN GRANTED FOR TRENCHED CROSSING)	
NOV. 1999	ALABAMA DEPARTMENT OF TRANSPORTATION
APPROVED: _____	STANDARD DRAWING NO. SD2035 RCC



**TYPICAL HOUSE SEWER CONNECTION
PIPE SIZES 16" OR LARGER**



**TYPICAL HOUSE SEWER CONNECTION
PIPE SIZES SMALLER THAN 16"**

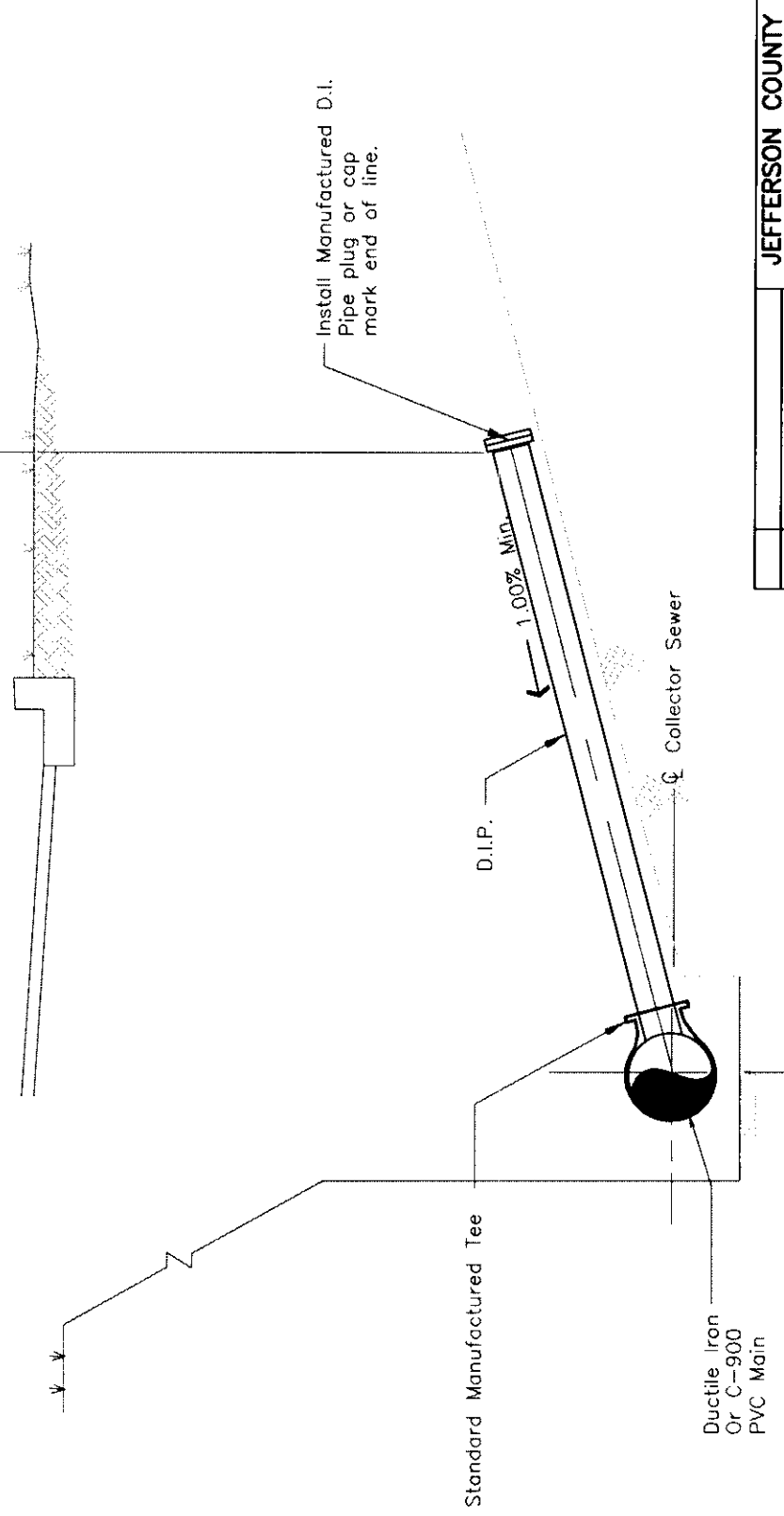


NOTES:

1. The opening shall be bored by the contractor to a sufficient size to permit inserting a tee saddle or short length of pipe of the required elevation and angle to allow at least two (2) inches space around the pipe. The space will be solidly filled with non-shrinking grout, waterplug, or approved equal. The new pipe shall be neatly trimmed and pointed up flush with the inside of the main sewer.
2. If there are reinforcing bars in the main sewer's wall, only those preventing insertion of the pipe may be cut. All others shall be bent into the concrete collar at the junction of the two pipes.
3. Manufactured pipe tees shall be required for new construction when indicated on the Plans or in the Specifications.

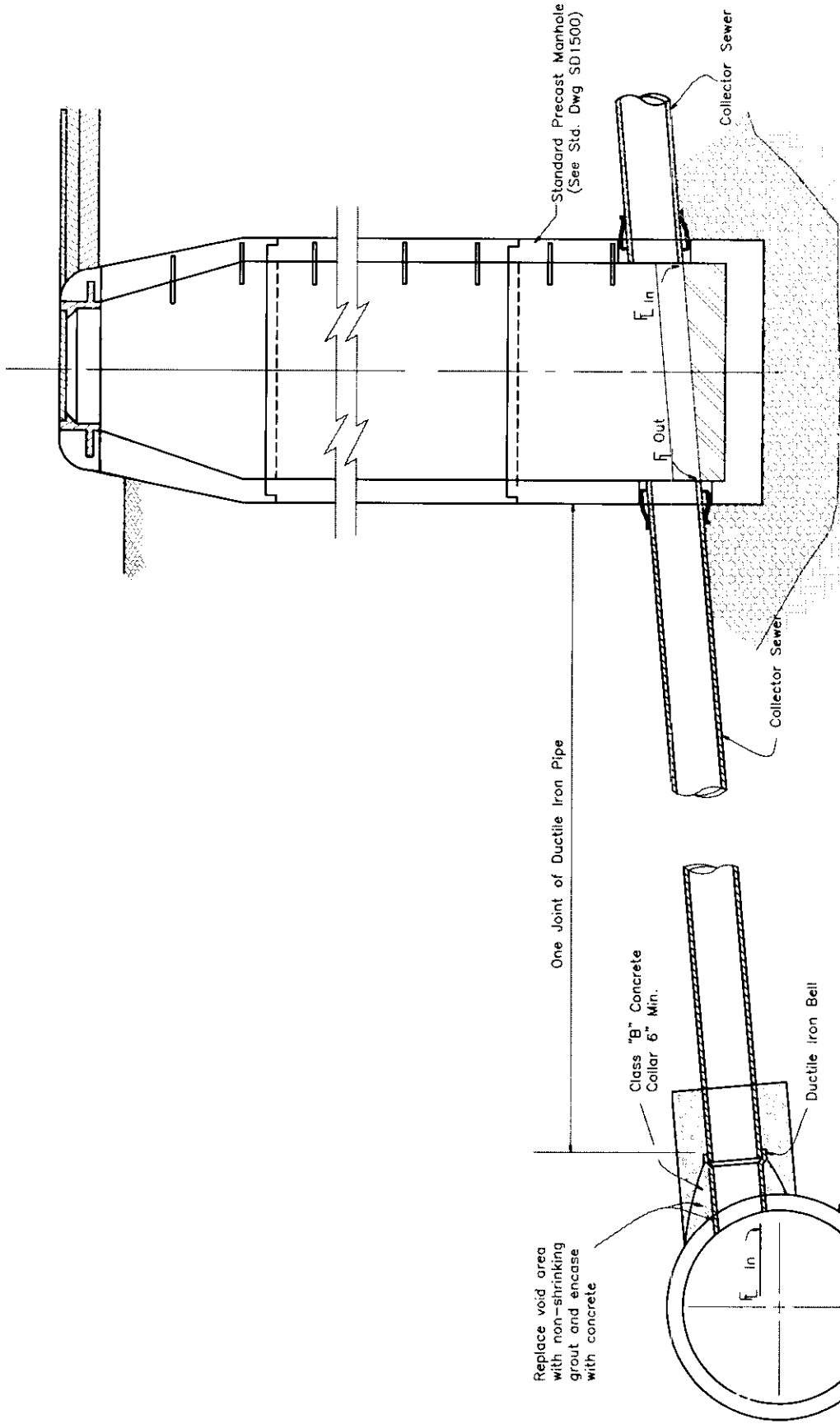
JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
HOUSE SEWER CONNECTION DETAILS FOR EXISTING SEWERS	
NOV. 1999	STANDARD DRAWING NO. SD2040
APPROVED: _____	

Notes:
 1. Stubouts for Service line located in street, roadway, or highway shall be ductile iron from the main to the property line.



SECTION
 NTS

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
4" & 6" STUB-OUTS FROM DUCTILE IRON OR C-900 PVC MAIN	
APPROVED: _____ NOV. 1999	STANDARD DRAWING NO. SD2044

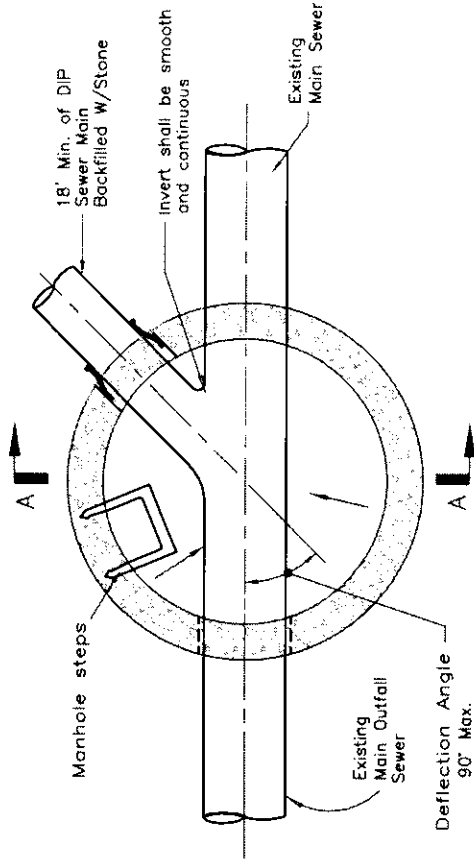


JEFFERSON COUNTY ALABAMA
ENVIRONMENTAL SERVICES DEPARTMENT

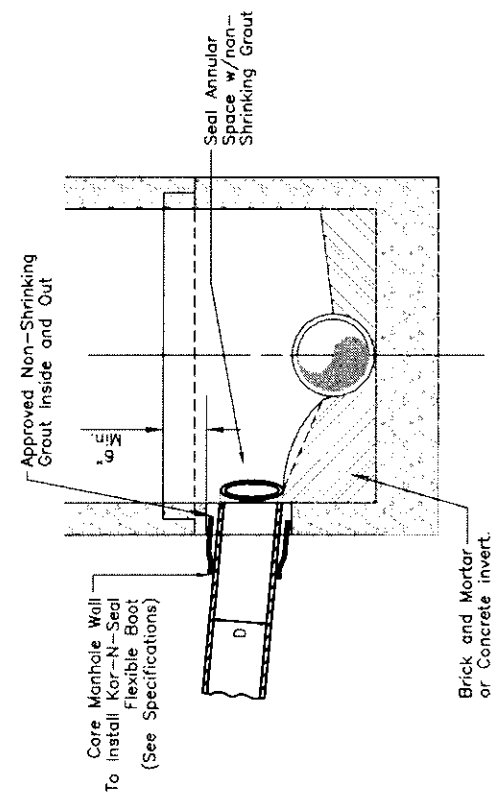
CONNECTION OF COLLECTOR
SEWER TO LARGE DIAMETER
TRUNK SEWER

NOV. 1999

APPROVED: _____
STANDARD DRAWING NO. SD2045



MANHOLE BASE PLAN
N.T.S.

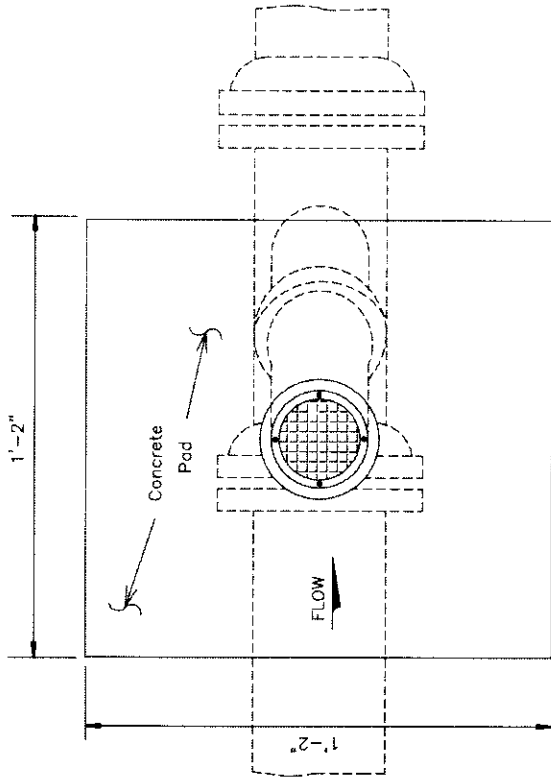
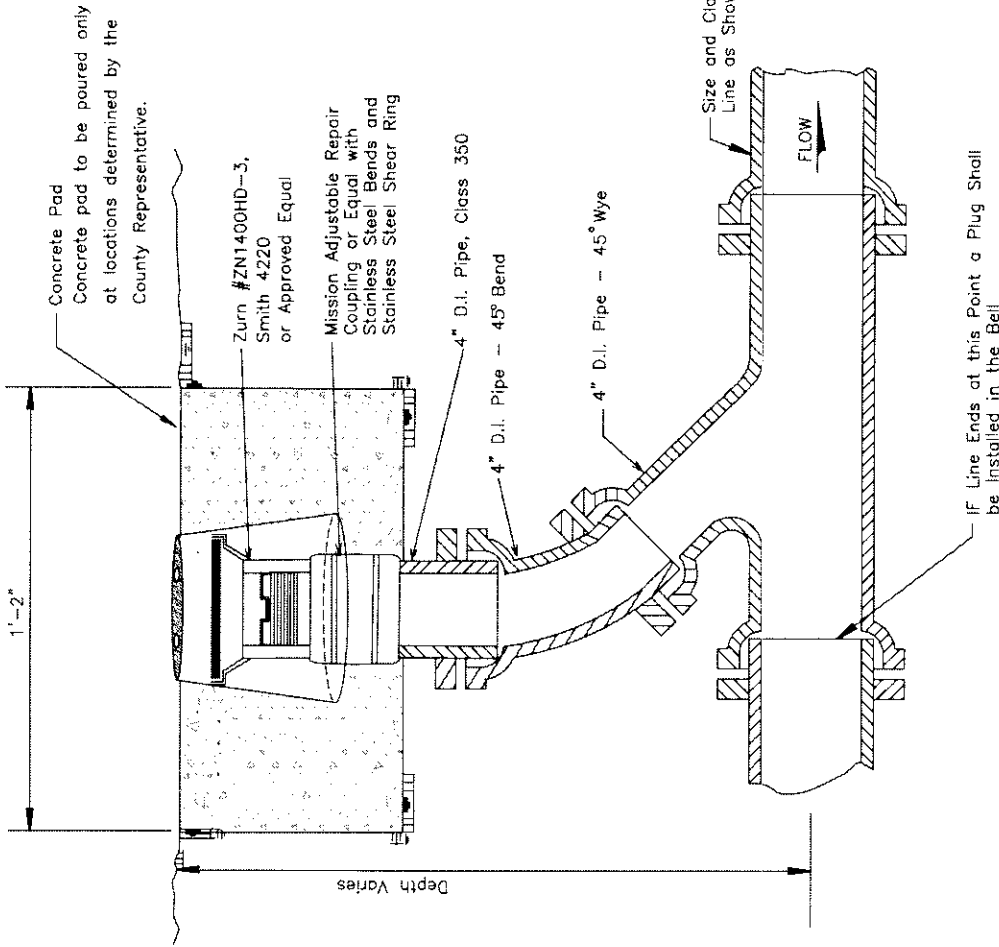


A-A SECTION
N.T.S.

Notes:

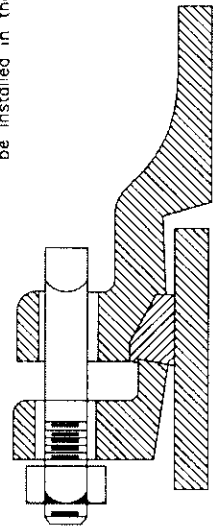
1. If inverts of the influent and effluent sewer pipes exceed 2 Ft. of difference, a Memphis Tee manhole must be constructed in accordance with Drawing No. SD1560.

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
CONNECTIONS 8" AND LARGER, TO EXISTING MANHOLES	
APPROVED: _____	NOV. 1999
STANDARD DRAWING NO. _____	SD2046



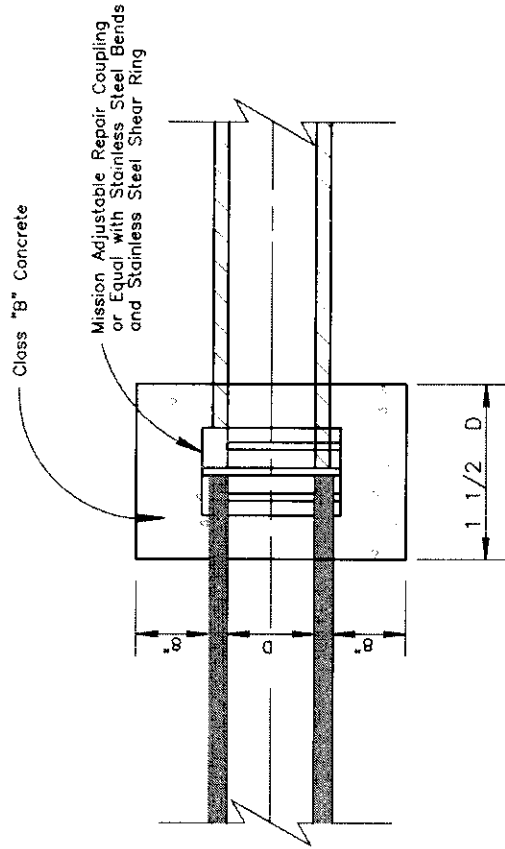
PLAN
N.T.S.

DATE	REVISIONS	JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT
		SANITARY SEWER SERVICE LINE CLEANOUT
	NOV. 1999	
APPROVED:		STANDARD DRAWING NO. SD2051



SD2051

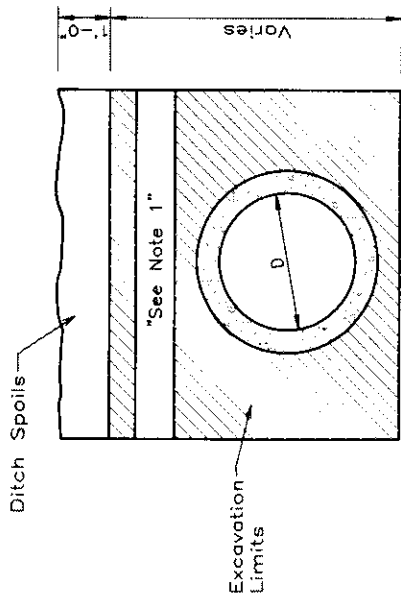
10-29-98 10:22AM



TYPICAL CONCRETE COLLAR
PIPE SIZES 12" OR LESS

N.T.S.

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
DETAILS OF CONCRETE COLLARS	
NOV. 1999	APPROVED: _____
STANDARD DRAWING NO. SD2060	



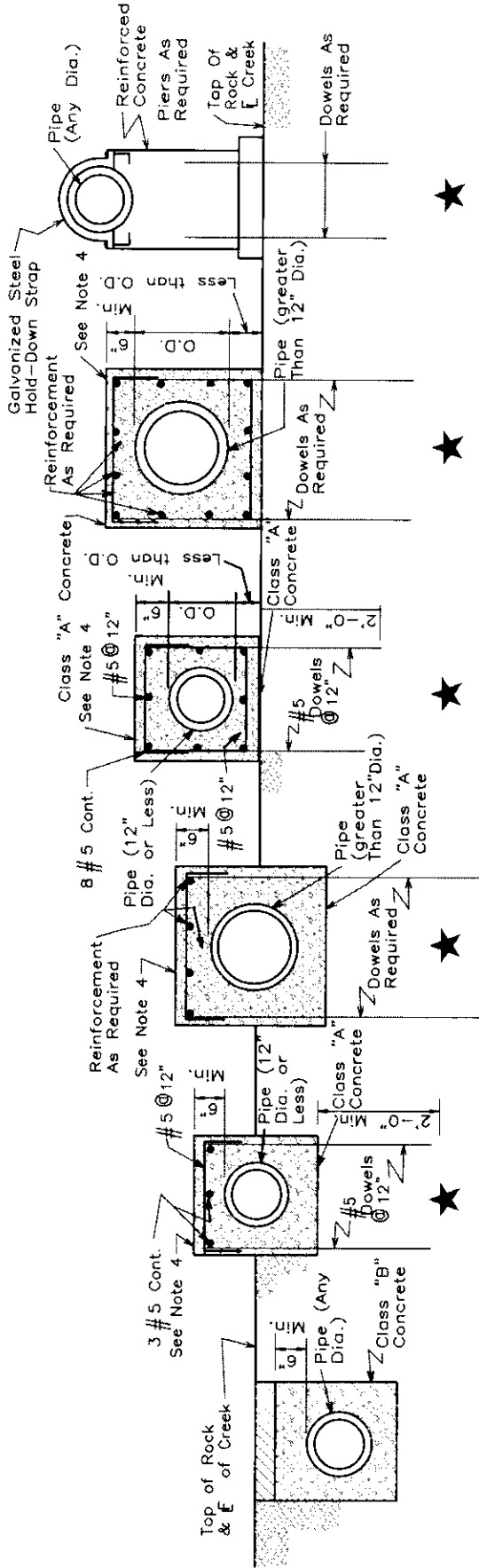
TYPICAL CLAY DITCH CHECK DETAIL

N.T.S.

Notes:

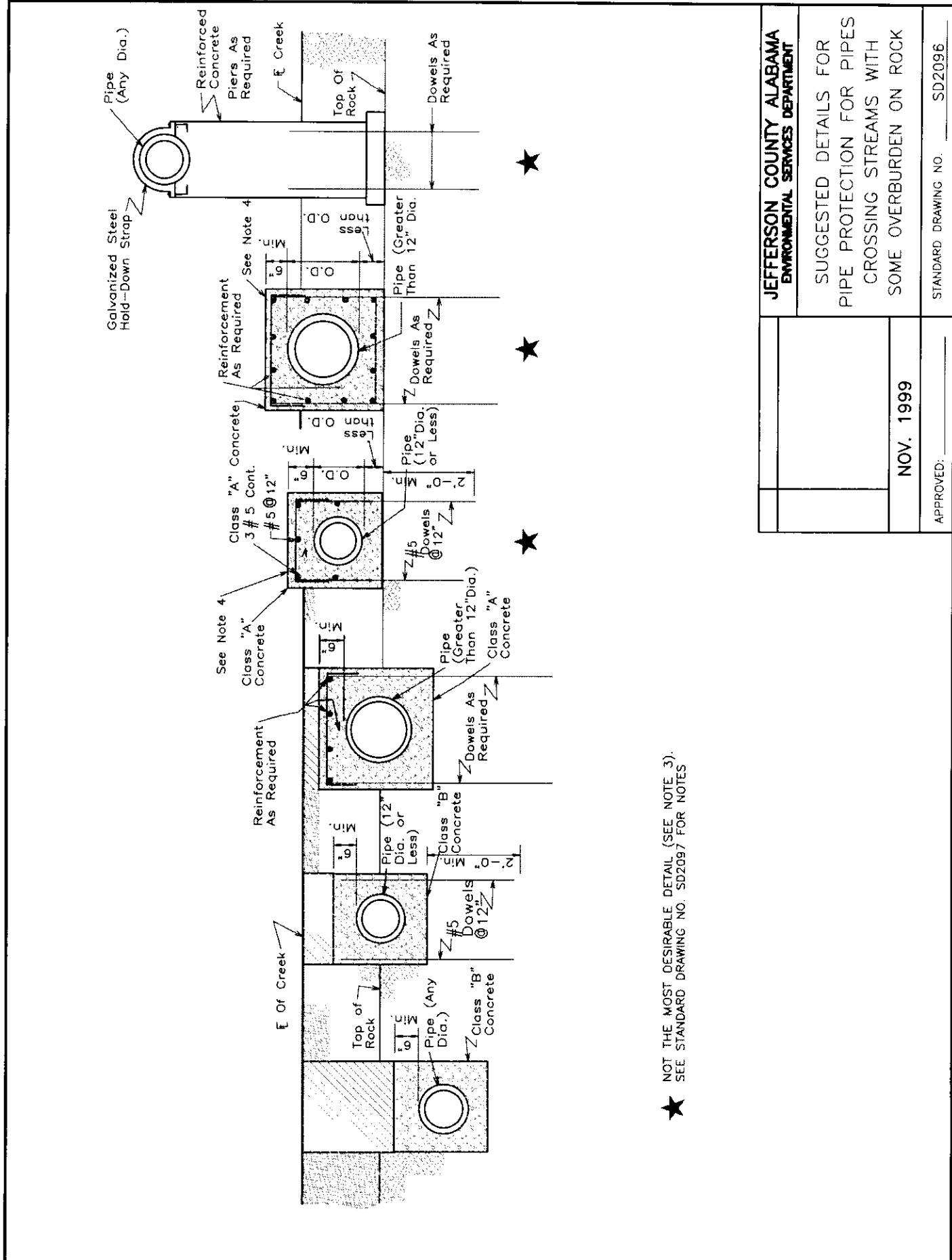
1. An impervious clay ditch check shall be required on the downstream side of all stream crossings. This ditch check shall be constructed for a length of 15' as measured along the centerline of the pipe and the full width of the trench.
2. The backfill shown shall exhibit the characteristics of a "GC" soil rating as classified by the Unified Soil Classification System (ASTM D-2487) and shall have a coefficient of permeability no greater than 0.001 Cm/Sec. as determined by (ASTM D-2434). The material utilized may vary from the above requirements if approved by the County Inspector; however, in any case, the contractor shall furnish tests indicating actual material characteristics. Tests are to be performed by an approved Independent Testing Facility utilizing the above methods. The minimum percentage of compaction for the backfill shall be 95% Proctor Density (ASTM D-1557).

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
DETAIL OF CLAY DITCH CHECK	
NOV. 1999	
APPROVED: _____	STANDARD DRAWING NO. SD2090



★ NOT THE MOST DESIRABLE DETAIL (SEE NOTE 3).
★ SEE STANDARD DRAWING NO. SD2097 FOR NOTES

JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
SUGGESTED DETAILS FOR PIPE PROTECTION FOR PIPES CROSSING STREAMS WITH NO OVERBURDEN.	
NOV. 1999	STANDARD DRAWING NO. SD2095
APPROVED: _____	



★ NOT THE MOST DESIRABLE DETAIL (SEE NOTE 3).
 SEE STANDARD DRAWING NO. SD2097 FOR NOTES

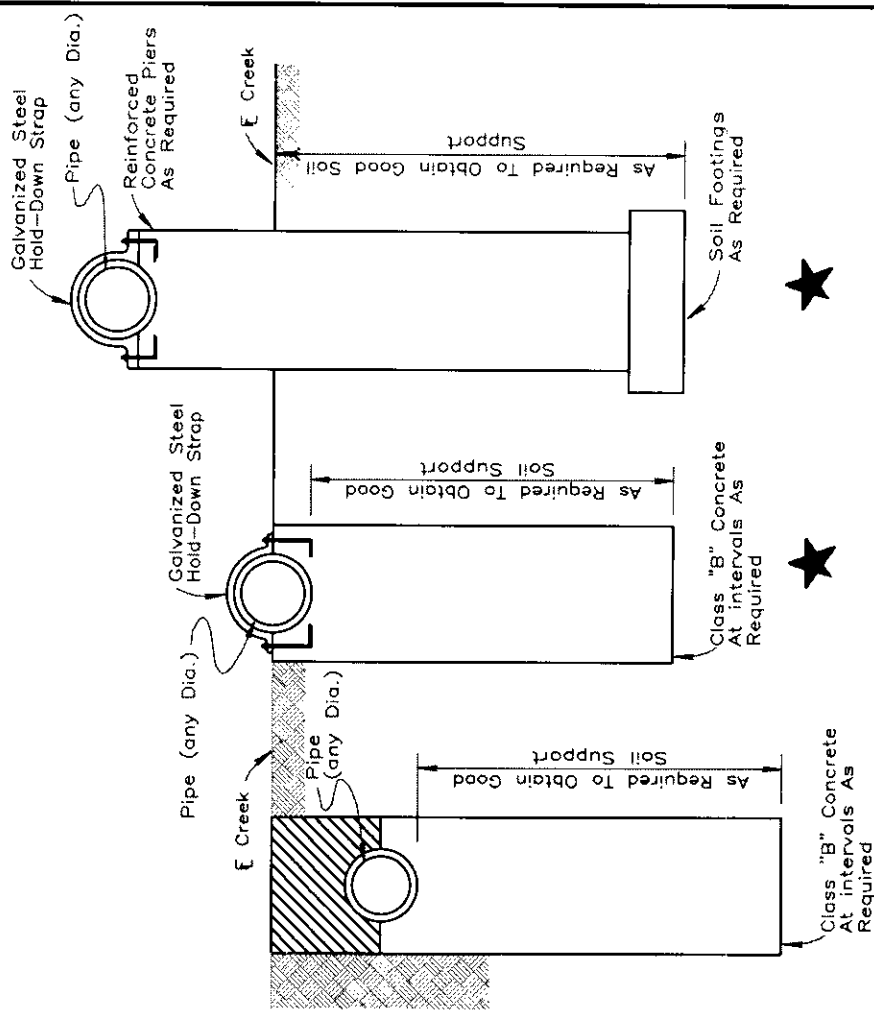
JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
SUGGESTED DETAILS FOR PIPE PROTECTION FOR PIPES CROSSING STREAMS WITH SOME OVERBURDEN ON ROCK	
NOV. 1999	STANDARD DRAWING NO. SD2096
APPROVED: _____	

NOTES: (FOR STD. DWG. NO. SD2095, SD2096, & SD2097)

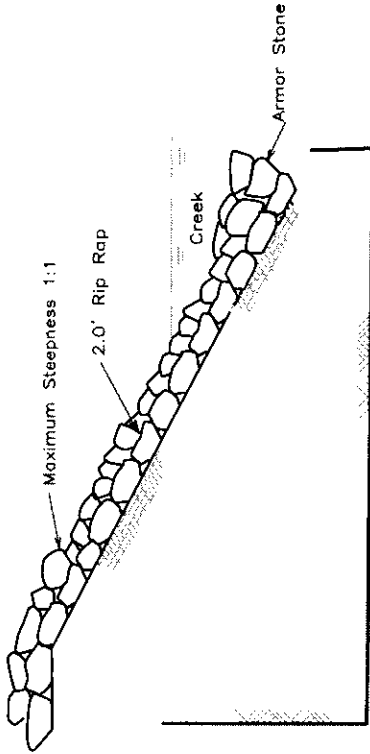
1. The intent of this drawing is to show "suggested" details only. The details shown, if properly designed and modified as required for the individual site conditions will be acceptable for most conditions. These details may not be appropriate at some sites.
2. All concrete, reinforcement, and other items shown "as required" shall be designed by a professional engineer registered in the State of Alabama to support all dead loads, live loads, streamflow pressure, buoyant forces, thermal forces, wind loads, and any other forces that may reasonably be expected to be placed on the structure.
3. Where pipe or pipe encasement would extend above the flow line of the creek alternate designs (inverted siphons, etc.) should be considered. The details shown here for those conditions are generally less desirable than a design which would eliminate all structures above the flow line of the creek. At some sites alternate designs may absolutely be required.
4. Where pipe encasement is to be used above the flow line of the creek the engineer may require the sides to be sloped and the tops to be rounded to prevent scour and to improve the flow characteristics of the creek.
5. Where pipe or pipe encasement is proposed to extend above the elevation of the flow line of the creek the design engineer will be required to supply calculations to show that the proposed construction is in compliance with all rules and regulations of the latest edition of the Flood Plain Ordinance of Jefferson County.
6. These details are to be superseded by all drawings, notes, etc. contained in the project plans or supplemental specifications.
7. Drawings of all pipe protection details, piers, hold-down straps, etc., bearing the seal of a Professional Engineer registered in the State of Alabama shall be submitted to the Jefferson County Public Works Department for review and approval.



NOT THE MOST DESIRABLE DETAIL (SEE NOTE 3)



JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT	
SUGGESTED DETAILS FOR PIPE PROTECTION FOR PIPES CROSSING STREAMS WITH NO ROCK BELOW	
NOV. 1999	STANDARD DRAWING NO. SD2097
APPROVED: _____	



TYPICAL SLOPE PROTECTION
(Rip Rap)

NOTES:

1. Special Slope Protection of various points along existing stream banks may be required at the option of the Engineer to insure the stability of the sanitary sewer pipe and manholes.
2. Stone for channel protection Rip Rap shall be selected stone from rock cuts or other approved sources or pieces of concrete. It shall consist of well graded stones weighing from 10 pounds to 200 pounds each with at least 50% weighing over 80 pounds. Both width and thickness shall be at least 1/3 the length for each stone. Not more than 10% by total weight shall weigh less than 10 pounds and not more than 10% by total weight shall weigh more than 200 pounds.

DATE	REVISIONS	JEFFERSON COUNTY ALABAMA ENVIRONMENTAL SERVICES DEPARTMENT
	NOV. 1999	SLOPE PROTECTION DETAILS
APPROVED:		STANDARD DRAWING NO. SD2500