Cullman County Water Department

Standards for Construction of the

Cullman County Water Department System

Adopted
October 10, 2006

Cullman County Water Department
Standards for Construction
Cliff Note Version

1. Submit detailed drawings for the development with submittal data for the waterline materials. Developer must understand that he must tie to at least a 6" water main. This water main may not be at the beginning of the development but the developer is responsible laying 6" pipe back to an existing 6" or larger pipe.
2. After approval of drawings and submittal data, begin construction of waterlines to the specifications of Cullman County Water Department. Notify our department 48 hours prior to beginning.
3. Complete the installation of all waterlines, valves, fire hydrants, services and main connections.
4. Pressure test according to Cullman County Water Department Specifications. Inspector must witness test.
5. Request for final inspection of the waterlines.
6. Correct any problems with the final inspection.
7. Request of construction closeout.
8. Submit correct as-built drawings.
9. Water Department will sign mylars only when all items are complete.

Note: This short version does not replace the Standards for Construction of the Cullman County Water Department System but is a tool to simply show the order in which things are to be completed.

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Section 1: Policies and Procedures

1.1 Applicability or Jurisdiction

All water facilities(hereinafter called Department Water Utilities, Water System, or Utility) that connect to the Cullman County Water Department 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 Department, and shall be subject to inspection by the Department as deemed necessary to insure compliance with the requirements contained herein.

These standards represent the approved construction practices and procedures for construction of Cullman County Water Department Utilities. Any special designs not covered by this document must be submitted to and approved by the Department before construction is allowed. 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 Department's Manager. The Department's Manager 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. The Department's Manager shall require that sufficient evidence or proof be submitted to substantiate any claim that may be made regarding the alternate.

These Standards are subject to change, and interested parties are advised to verify with the Department that they are using the latest version of the published document. Updates to these Standards are available at the Water Works Office.

1.2 Definitions

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.

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

A. ANSI American National Standards Institute

B. ALDOT State of Alabama Department of Transportation

C. ASTM American Society for Testing and Materials

D. ADEM Alabama Department of Environmental Management

E. AWWA American Water Works Association

F. EPA U.S. Environmental Protection Agency

G. NEMA National Electrical Manufacturer's Association

H. OSHA Occupational Safety and Health Administration

I. USGS United States Geologic Survey

AS-CONSTRUCTED DRAWINGS (sometimes termed AS-BUILT DRAWINGS): Construction Drawings that have been revised, based on field surveys of the installed utility and other data, to show significant changes made during construction and to indicate the constructed location of each service connection.

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

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.

COUNTY: Typically, Cullman County, Alabama or if water facilities are located in another County, it shall be that County.

DEPARTMENT: The Cullman County Water Department Owner of the water system for whom these regulations are developed and their authorized agents.

DEPARTMENT CONSTRUCTION INSPECTOR: An authorized representative of the Department assigned to observe the construction of all new utilities, repairs to existing utility lines, connections, and disconnections, and advise the Department of the conformance with these Standard Specifications.

DESIGN ENGINEER (ENGINEER): The engineer of record who performs detail design of the utility facility and prepares Construction Drawings and Specifications to be submitted to the Department for approval.

DRAWINGS (or PLANS): The official construction drawings or exact reproduction thereof which show and describe the work to be done.

EASEMENT - shall mean a grant of rights by the property owner for use of a strip of land for present and future purposes by the Department as deemed necessary to provide Department services.

FILL: A soil or broken rock material or embankment used to provide the bulk required to raise the elevation of an area.

MANAGER: The Cullman County Water Department Manager or his authorized agent.

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 Department 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 Department.

OWNER: The term "Owner" shall mean the company, organization, or developer who intends to design and construct or have the Department to construct the proposed water system facilities or improvements. The terms "Developer, Owner/Developer" equal "Owner" and shall be used interchangeably.

OWNER'S ENGINEER - Shall mean the licensed engineer or land surveyor and in good standing with the applicable State Board of Registration of Alabama who is the agent in his or her professional capacity of the owner of land which is proposed to be subdivided or which is in the process of being subdivided.

SERVICE LINE: Any water line or conduit located outside the building structure that connects the building's plumbing to the main water system. In reference to water it is typically a 3/4" line or larger.

SHALL: "Shall" is mandatory; "may" is permissive

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.

STATE: The State of Alabama.

STATION: A specific point on the centerline of a utility as shown on the drawings 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.

STUB OUT: A portion of the service line extended from the water main and then capped or dedicated for later use.

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.

TAP: The connection of the service line of a customer to the water line of the system.

WATER SYSTEM: All water lines, tanks, booster pump stations, meter and appurtenances that distributes water to the Department's customers.

1.3 Standard Reference Specifications

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

A. 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

B. Occupational Safety and Health Administration Publications
   1. Safety

C. American Railway Engineering Assoc.
   1. Part 5 Specifications for Pipeline or latest requirements

Any reference in the ANSI/AWWA or ASTM standards or specifications to "Owner" or "purchaser" is to be interpreted as "The Department."

1.4 Construction Drawings Review and Approval Process

The Department maintains the water system and must regulate any proposed additions or changes to the system. Prior approval of any projects affecting the water system is required. Construction Drawings are required to be prepared for all water system facilities to be built and connected to the Cullman County Water Department System. In the event a project is to be built that crosses or will connect to existing Cullman County Water Department System or encroaches in County or Department easements, drawings must be submitted to the Cullman County's Water Department for approval.

The Owner or the Owner's Design Engineer shall submit Construction Drawings and the complete development (subdivision, apartment complex, office complex, etc.) drawings to the following Department representatives; Water System Manager and local Fire Department. A total of three (3) sets will be sent to the Water System Manager. The Water System Manager or his authorized representative will review the Drawings submitted and if necessary, will return one (1) set of markup drawings and/or comments to the Design

Engineer for revision and resubmittal. The Design Engineer will provide three (3) corrected sets of original drawings to the Department. All plans will bear the seal of a Professional Engineer registered with the State of Alabama.

All water mains not located in right-of-ways must be located in easements dedicated to the Department in accordance with easement requirements herein. 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 Easements for the Department's general use. Minimum easement width is twenty (20) feet, ten (10) feet each side of the utility centerline. For easements with more than one utility, a minimum 30' width is required. Easement width shall be sufficient to permit excavation of the pipe to meet the minimum OSHA requirements. It is the Owner's responsibility to attain all easements. The Owner's Design Engineer will submit one (1) copy of all required deeds for review prior to execution. The Owner or Design Engineer will submit the original executed deeds and right-of-way accommodation permits to the Department. Deeds will be reviewed by the County and the Department and if acceptable, recorded in Probate Court. The County or Department will not accept deeds recorded by others.

The approval of the Utility Construction Drawings, indicates review of Construction Drawings for conformance with these Standards and accepted standards of quality. In no way, does the approval make the Department or its agents responsible for technical aspects of the design accuracy of the plans and specifications for present or future additions to the water improvements.

The approval of 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 approval.

1.5 Inspection

The Department will make inspections on the proposed projects while they are under construction. The Department will not accept the project nor ownership 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. The Owner will be responsible for a maintenance period of not less than one (1) year after the final acceptance has been issued regardless who installs the pipe and its components. The Owner and Design Engineer will be responsible for the accuracy of the design and installation after the system is operational and shall warrant it satisfactory operation. On work that the Owner/Developer installs, the Owner's Engineer shall be responsible for inspecting the approved public improvements, and shall certify to the Department that all such improvements were installed according to the approved plans and rules and regulations of the Department.

Upon completion of construction by Owner/Developer, the Design Engineer shall have the project surveyed to locate the constructed facilities on the As-Constructed Drawing(s). With information from the survey and from construction records, the Design Engineer will make revisions to the approved Construction Drawings, in accordance with

the document, to accurately show the actual facilities that were installed. The Owner and Engineer will supply the Department a certification letter on the installation of facilities. This letter is found on the following page. The Contractor shall be responsible for contacting the Water Department Manager prior to beginning work. The Department Construction Inspector or his agent may inspect any portion of the construction work for its conformance to these Rules and Regulations. Any testing required in the Specifications shall be witnessed by the Department Construction Inspector or his agent as required.

When an inspection report indicates work performed by Owner's Contractor and Engineer does not meet requirements of these standards, the Department will advise the Owner/Developer that the work is being completed at risk of not being accepted. The Department reserves the right to withhold future permits if the work is not brought up to standards.

1.6 Miscellaneous

Any proposed water facilities not specifically covered herein shall be submitted to the Department for its review. Before commencing with the preparation of construction drawings, the Department should be consulted, regarding specific design requirements for any non-routine facilities including pressure regulator, all tunnels, all bores, creek crossings, and any other water facility.

For any Department utility 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 Department to execute, all required Right of Way Accommodation Permits. Currently the State requires the Department rather than any private party or Owner/Developer to submit the application for permit agreements. Accordingly, by submittal of the permit the project Owner/Developer agrees to accept responsibility imposed by the State. The Owner/Developer is responsible for performing all duties imposed on the Department by the State. The Department'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 Department is not responsible for the State revoking an Accommodation Agreement after it has been issued.

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

All other permits required (i.e. County roadways, City streets, stormwater, etc.) will bear the same responsibility to the Owner/Developer as noted in the paragraphs above.

CULLMAN COUNTY WATER DEPARTMENT

REQUIRED LETTER - COMPLETION BY DEVELOPER'S ENGINEER

STATE OF ALABAMA)
)
_____ COUNTY)

The undersigned, _____, a licensed engineer in the State of Alabama, on behalf of _____(Developer), hereby certifies to the Cullman County Water Department pursuant to the standards for construction of water systems, that all required improvements have been fully and completely installed in easements or right-of-way as applied for and approved by the governing body of the Cullman County Water Department. Further, the undersigned engineer certifies that he or his firm has properly and adequately inspected the improvements to insure all improvements have been constructed in accordance with the standards set forth in the water regulations of the Cullman County Water Department as well as the construction standards of care and he knows of no defects in the improvements.

Project _____

(Printed Name of Developer's Engineer)

(Signature of Developer's Engineer)

BEFORE ME, the undersigned authority, a Notary Public in and for the said State and County, personally appeared _____, who, certifies that he/she executed the foregoing certification acknowledging that the same is true; and that after reading the same, and with a full understanding of the terms and effect thereof, executed the same as required by the subdivision regulations of the Cullman County Water Department.

SWORN TO AND SUBSCRIBED BEFORE ME, this the _____ day of _____, _____.

_____
NOTARY PUBLIC

(SEAL)
My Commission Expires:

Note: This form is to be used when Developer's Contractor performs any or all improvements.

Section 2: Requested Extension of Existing System

2.1 General

The Department will allow extensions of the water system from the existing system where the Department's and ADEM's minimum standard for pressure and quantity of water is available to and within the property boundaries where services is requested provided service is for areas within the Department's water service area and full payment of the cost for the extensions as may be required to render service. Mains can be extended along existing dedicated public roadways where finished grades have been established, or along roadways proposed for dedication to the use of the general public where grades have been established and constructed. Mains may be extended at the discretion of the Department along private roadways or easements where grades have been established and constructed subject to the prior execution of a specific easement document giving the County and Department specific rights of access for construction, operation, maintenance, etc. However, no main shall be extended along private roadways or to serve property which directly abuts a public roadway or to serve a single residence or premises. Extensions of mains may be made pursuant to one of the following applicable agreements:

A. Development agreement.
B. Existing commercial agreement.

Contracts for expansions must be made by written agreement as prepared by the Department. The Department shall determine the size, the type of contracting method, and type of facility installed and the point of connection to existing mains for the expansion. Expansions and extensions made under this regulation though paid by the applicant will remain the property and under control of the Department upon the Department's acceptance of facilities. The Department may further extend its distribution system beyond the terminus of any expansion made under this regulation.

Contractors hired to do any water improvements which shall be connected to the Department systems must be approved by the Department before work begins. When required, the contractor shall present to the Department satisfactory evidence that:

1. He has equipment, in good working order, adequate for performance of work.
2. He has within his organization, at the time, the construction management and supervisory personnel available for assignment to the project.
3. The construction management and supervisory personnel are skilled and experienced in the particular type of work to be undertaken on the project.
4. He has performed and completed similar work of similar magnitude in a satisfactory manner.
5. There are no outstanding claims with the Department on previous projects.
6. He is licensed under the Alabama Contractor's Licensing Board.

2.2 Development Extensions

For any connection utilizing a water main to the Department's water system, all plans and as-builts shall be submitted to the Department for review and approval. Though the general procedures are described below, more specific information are within these Standards. Plans will bear the seal of a Professional Engineer registered with the State of Alabama. In general, the plans shall have a cover sheet with a general location map and an overall of the proposed water system extension showing streets, roads by name, lots, section lines, etc. Plans shall be submitted on standard plan- prints (24" x 36").

Copies of the plans will be initially submitted as detailed in Section 1.4. The Department will review the plans and respond in writing to the corrections that need to be made. Three (3) sets of corrected plans will then be required by the Department along with a review, installation charge (if Department does work), and inspection fee for the proposed project. The Developer's contractor shall obtain an approved set of plans

which must remain on the job during construction. Two copies each of the plat layout and the as built drawings as performed by the Developer's contractor and/or Engineer and a copy of these drawings on CAD shall be submitted to the Department before any use of the mains or building permits are issued. The plat layout shall show all lots, their block and lot numbers, the lot frontage dimension, and all street names.

The plans used for review and the as built drawings shall show on an appropriate scale the proposed connection to the water or sewer systems, storm sewer locations, streets, lot lines, grades, elevations, other utilities such as gas, electrical and telephone, and other pertinent information. Plans will be approved in writing by the Department for a period of 180 days. If construction has not begun at the end of the 180 days, the plans shall be resubmitted and the review process and fees shall be repeated. The plans shall show all proposed title transfers to the Department and required easements for proper operation and maintenance, both those to be dedicated by plat and those to be dedicated by recorded document. Easements dedicated by plat shall contain the following statement on the plat; "Easements for water mains, if not previously dedicated, are hereby dedicated to Cullman County, Alabama and its successors and assigns for construction and access in the installation and maintenance of water lines and their appurtenances or other uses approved by the Department." Easements width shall be sufficient to permit excavation of the pipe to meet the minimum OSHA requirements and to permit maintenance on the line and in no case be less than 20 feet in width. If more than one pipeline is to be placed in an easement, a minimum of 30 feet easement is required. All easements must be approved by the Department which may require wider easements.

When work is performed by the Developer, the Developer's contractor and engineer shall notify the Department 72 hours in advance of beginning the construction of approved work. The Department and/or its agents will make inspections on the proposed project while it is under construction. Once the water main has been laid and successfully tested and all drawings submitted with all regulations being met by the developer, a letter of acceptance for the project will be issued by the Department. If all terms and conditions are met, the Department will assume ownership and responsibility of the lines. Regardless who installs the improvements, the Developer will be responsible for a maintenance period of not less than one (1) year after the approval letter has been issued. For the first year and at the Department's option, repairs if needed will be made by the Department and charged to the Developer.

When the Developer's Engineer designs and his contractor installs the improvements, the Developer's engineer is held to be in responsible charge of any job submitted to the Department for construction. The Department's personnel and/or its agents will also make inspections of the job and will bring to the attention of the construction superintendent on the job and/or the Developer's engineer any discrepancies that he may observe. This will in no way relieve the Developer's engineer and/or contractor from compliance with the Department's specifications and generally accepted standards of quality. The Department's personnel or its agents reserve the right to require changes or adjustments in the plans if field conditions and/or other conditions so warrant.

If the development requires an expansion of the water system for appurtenances such as pump stations, tanks, treatment facilities, and additional water sources, or if these items are required internal to the proposed development, the Department will use its engineer to design and choose the construction method to perform improvements pursuant to the following agreement. Developer shall deposit with the Department an amount equal to the estimated cost required to engineer and construct the proposed improvements by a licensed contractor plus any other additional expenses which are likely to be incurred by the Department during construction or which are required by the regulations or ordinances of the municipality or county having jurisdiction. This estimated cost shall be adjusted to actual cost when the project is completed by a licensed contractor. Upon completion of the expansion or as soon thereafter as practicable, the Department will furnish the depositor a statement of actual costs incurred in the installation of said expansion. In the event depositor's actual cost is less than the amount deposited with the Department, the Department will refund to the depositor the difference between the deposit and depositor's actual cost. In the event depositor's actual cost exceeds the amount previously deposited, the depositor will be required forthwith to make an additional deposit with the Department in the amount of the difference. In the event the Department performs the work with its own forces, the developer's initial fee will be the final fee unless changes are added or deleted. Then the developer will be charged additional or rebated a portion of the fee, depending on the change encountered. The rights given the Department hereunder are not exclusive and the Department shall have the right to pursue any and all legal remedies to collect any amount due the Department under the terms of this provision. No interest on deposited monies will be credited to the Developer.

2.3 Existing Commercial Extensions

Extensions or rerouting utilities for existing commercial establishments shall be designed and contracted to parties under the supervision of the Department. The entities requesting utility work shall pay a non-refundable "Extension of System Preparation Fee" per utility extended or rerouted. The fee shall initiate field investigation on the main extension which will include the cost estimate of the project. The fee will be applied toward any advance deposit requirements related to the main extension.

If the entity desiring water agrees to pay for the main extension, an agreement will be prepared. A deposit with the Department in an amount equal to the estimated cost required to design the proposed improvements will be made at this time. An additional deposit to the Department in an amount equal to the estimated cost of construction will be made prior to construction.

Upon completion of the expansion, and if the work was performed by a licensed contractor, the Department will furnish the depositor's statement of actual costs incurred in the installation of expansion. In the event the depositor's actual cost is less than the amount deposited with the Department, the Department will refund to the depositor the difference between the deposit and depositor's actual cost. In the event depositor's actual cost exceeds the amount previously deposited, the depositor will be required forthwith to make an additional deposit with the Department in the amount of the difference before service is provided. In the event the Department performs the work with its own forces, the depositor's initial fee will be the final fee unless changes are added or deleted. Then the developer will be charged additional or rebated a portion of the fee, depending on the change encountered. The rights given the Department hereunder are not exclusive and the Department shall have the right to pursue any and all legal remedies to collect any amount due the Department under the terms of this provisions. No interest on deposited monies will be credited to the depositor.

At the option of the Department, the format as outlined in Section 2.3 may be used for extensions to planned residential, industrial, and institutional facilities.

Section 3: Design Guidelines for Water Facilities

3.1 General

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. The Owner will select and contract with a qualified general contractor, licensed in the State of Alabama, to be responsible for constructing the project according to the Drawings and Specifications. The Contractor and Design Engineer will be responsible for coordinating inspections of the work as required by the Department for final acceptance. At the Department's option, it can elect to perform the work with the Owner paying the Department for the work it will be performing.

3.2 Surveys, Investigations and Drawings

A survey of the route of the proposed utility 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.

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 be industry standard and contain certain minimum items.

Land ties stamped, sealed and dated by an Alabama Registered Land Surveyor, shall show the location of the easements and right-of-way. 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 metes and bounds descriptions should be tied in a manner similar to their deed calls. Direct ties should be made whenever possible. 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.

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. Drawings shall be prepared using standard drafting practice on 24"x 36" sheets.

Pipe material shall be shown where a pipe material change occurs. All appurtenances shall be shown on the Drawings.

All property lines, subdivision block and lot numbers, rights-of-way, and required or utilized easements shall be shown. All 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 water mains, if not previously dedicated, are hereby dedicated to Cullman County, Alabama and its successors and assigns for construction and access in the installation and maintenance of water lines and their appurtenances or other uses approved by the Department". Streets shall be shown and named or numbered. Service lines and connections shall be shown

and stationed. Final drawings shall require the Contractor to furnish the Engineer with the exact service line location.

3.3 Easements, Right of Way and Property Deed Descriptions

All Easements and/or property required for all types of water appurtenances which will not be transferred to the Department by record map must be described and deeded to the Department. 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 Department. 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 utility centerline. If more than one pipe line is to be placed in an easement, a minimum of 30 feet easement is required. All easements must be approved by the Department. 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 utility alignment.

Property descriptions shall locate the property by commencing with a monumented land tie. It shall then traverse from the land tie to the centerline of the project utility alignment, then along the centerline utility alignment to the point of beginning of the property being described, then along the centerline utility 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 utility 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.

Easements may be required by the Department to extend a water line away from the development, i.e., to accommodate future extensions. These easements will follow the same rules as those utilities being installed under an active project.

Right-of-way will be a minimum of 50 feet or the prevailing County Highway Department standard if greater than 50 feet.

3.4 As-Constructed Drawings

Upon completion of construction, a survey shall be performed to verify the constructed facilities. Utility As-Constructed Drawings shall reflect all changes made to the approved Construction Drawings and should accurately show the actual utility facilities that were installed. As-Constructed Drawings shall be submitted on 4 mil polyester 24" x 36" drafting film with matte finish on both sides. Drawings shall be done with permanent black ink. All drawings shall also be submitted on CAD tape or compact disc compatible with AutoCad programs.

Meter boxes, hydrants, and valves on water lines and casing for water service lines shall have swing ties made to two (2) permanent geographic or constructed features and recorded on the drawings. Meter boxes will also have GPS readings of their location and provided to Department for its future use as well as included on As Construction Drawings. Final fire hydrant locations will be shown. Connection details to existing lines and stub-outs for future expansion will be detailed for future reference.

The Developer and his engineer will be held responsible for the information submitted on the final as-built plans as well and his technical design. They shall be responsible to make good to the Department's satisfaction any discrepancies shown on such as-builts that do not match with actual field conditions, i.e., the Developer's engineer and/or surveyor will be responsible for assuring that each lot in the development has a functioning water service.

3.5 General Design Criteria

In areas that have been filled 3 feet or greater and the proposed water line will be within the fill, ductile iron or polyethylene pipe shall be used. In fills greater than 8 feet where ductile iron is used, restrained joints shall be required. All carrier pipes installed in a bore or tunnel shall be restrained joint ductile iron pipe with spacers. All open cut paved areas or areas to be paved shall be backfilled with compacted #57 crushed stone.

Water mains shall be located within the street right-of-way whenever possible but not under a street unless the line is crossing perpendicular to the street. Where possible, water lines shall be looped and dead-end lines eliminated. The water main shall be located on the opposite side of the street from the gas main and underground power. The Department may require additional street right-of-way to facilitate the water main location. Standard water main size will be 8 inches and be constructed of polyethylene pipe SDR-9 or ductile iron. Do not use polyethylene pipe in areas and locations where organic solvents or petroleum products may exist from past exposures or could reasonably exist in the future. Standard sizes and thickness may be modified with Department approval with proper justification. Minimum water main sizing may depend upon Fire Department requirements or the Department's desire for an increased size for transmission mains. In a residential cul-de-sac with a dead-end line, a 6 inch main will be allowed past the last fire hydrant shown provided there are a minimum of ten (10) customers on the line. For special situations the Department may require a main smaller than 6 inch pipe. A 3 inch flushing hydrant (Mueller Post Hydrant) and a valve shall be provided at the end of all dead end lines. All service laterals under road will be a minimum 2 inch PVC casing (SDR 21 or 26) 2 feet outside of each curb or ditch. Final size will be based on expected lateral size and number. Pipe will not be installed in uncompacted fills.

Valves shall be installed on property lines near fire hydrants and/or spaced at intersections and key locations. Valves will be required at the intersection of the beginning of a street or cul-de-sac. In general, sufficient valves will be required at each intersection to isolate the water system for the least disturbance to the residents of the area in case of the need for main repair. Valves will be required at the end of the each dead end street or road which could be extended in the future. The valve and plug at a dead end shall be properly blocked and/or rodded. In no case shall a distance of 2,000 feet between valves be exceeded.

A valve will be required on each line to a fire hydrant. In a cul-de-sac a fire hydrant shall not be more than 800 feet from the last lot. Fire hydrants shall be shown, if possible, on property lines within the right-of-way of the proposed street, 1 foot more or less from the right-of-way. A fire hydrant shall be shown on the side of the street or intersection that would not interfere with a storm sewer or in a sidewalk. The spacing between fire hydrants in a residential area shall be 1,800 feet or less or as recommended by the Fire Department. All plans should be coordinated with the Fire Department for fire hydrant

location before review submittal. The spacing between fire hydrants in a commercial area shall be 1000 feet or less or as recommended by the Fire Department. Fire hydrants shall be a minimum of 40 feet from a structure for fire fighting capability. The above specifications may be more stringent to best suit the needs of the Fire Department serving the main's locations.

Fire service connections will not be authorized by the Department until the applicant has furnished detailed drawings of the premises, all appurtenances and the proposed fire service system which the connections will serve, along with the proper authorization to invoice the owner or his agent for all expenses incurred for the installation of the service connection. The applicant shall also furnish to the Department on request all information regarding the installation, alterations and operation of the fire service system. Service charges for the fire service system shall be as set forth in the Department Fee Schedule.

No water shall be taken through such private fire service connections except for the extinguishment of fire or for testing purposes. A customer must notify the Department in advance of conducting tests. Whenever leakage or unauthorized use of water occurs in a private fire service, the customer will be notified by the Department to have the leakage repaired or to discontinue the unauthorized use of water. Unauthorized use shall be discontinued immediately; the customer will be given fourteen (14) days from the date of notification to repair a leak. If unauthorized use continues or if leakage continues beyond the date specified to the customer, the street valve will be closed and service will be discontinued. All fire lines shall be valved at the Department's main and meter. Fire lines will be required to have a double detector check valve and be metered.

Ductile iron pipe shall be polyethylene wrapped in all areas determined to be corrosive in nature to the pipe material (i.e., railroad slag areas, swamps, etc.). Steel encasement installed by boring, tunneling or other acceptable means which excludes open cutting is required when crossing existing paved streets or roads, railroads, or those streets which have been completed in the subdivision. Encasements and mains shall cross the roadway and railroads as near as possible to perpendicular of the roadbed. In all cases the permitting agency shall have the final approval of the engineering and construction. All encasements under existing streets shall be bored.

Casing pipe and joints shall be of leakproof construction and capable of withstanding its design loading. All casing used for main line crossings shall be steel, welded joint, and large enough to permit the installation and/or removal of the carrier pipe. Carrier pipe shall be restrained joint ductile iron with spacers for support. The minimum diameter for casing shall be as follows:

PIPE SIZE	O.D. BELL	MIN. CASING O.D.	THICKNESS
3"	6.08"	10.50"	.25"
4"	7.22"	12.50"	.25"
6"	9.47"	14"	.25"
8"	12.00"	16"	.25"
10"	14.20"	18"	.25"
12"	16.35"	20"	.375"
14"	19.15"	24"	.375"
16"	21.36"	26"	.375"
18"	23.56"	28"	.375"
20"	25.80"	30"	.375"

3.6 Service Lines

Each water customer shall be required to provide all required information and sign a Users Agreement prior to the meter being installed. Water service furnished for a given lot shall be used on the lot only.

All service lines 1" or smaller in new subdivisions or developments shall be installed by the developer. This shall be done by tapping saddles and using type "K" soft copper tubing in roll form. Corporation stops shall be Ford F1000-3-G, curb stops shall be Ford B44-WG, and saddles shall be Ford S70 for polyethylene pipe and Ford 202B for ductile iron and asbestos cement pipes or as approved by the Department. All service lines shall be continuous with no splices. Service lines shall be installed to and including the meter box with curb stop and backflow preventor installed with meter box properly set for Department to place meter in. Meter boxes shall be plastic with cast iron reader lids unless otherwise specified by the Department. Water service lines from the Department main to the meter shall be copper. The Department may install its meter at or near the property line or, at the Department's option, on the consumer's property within three (3) feet of the property line. A suitable place for the meter shall be provided by the consumer. This place must be unobstructed and accessible at all times to the meter reader. The consumer's piping and apparatus shall be installed and maintained by the consumer in a safe manner. This shall be done in accordance with the Department's rules and regulations and in full compliance with ADEM Public Water Supply regulations.

The Department reserves the right to refuse service unless the consumer's lines and piping are installed in such a manner as to prevent cross-connections or backflow. See Backflow Prevention Policy in these regulations.

Water furnished by the Department shall be used for consumption by the consumer, members of his household and employees only. The consumer shall not sell water to any other person or permit any other person to use said water. Water shall not be used for irrigation, nor other purposes, except when water is available in sufficient quantity without interfering with regular domestic consumption in the area served. Disregard for this rule shall be sufficient cause for the refusal or discontinuance of service.

The consumer and/or property owner shall be held liable for any physical damage done to the Department's property caused by any vehicle, construction, excavation, landfill or any other action, whether ordered or controlled by the consumer and/or property owner or not. No action of the above will create an operation and maintenance problem for the Department's personnel. Duly authorized

agents of the Department shall have access at all reasonable hours to the premises of the consumer for the purpose of installing or removing the Department's property, inspecting piping, reading and testing meters, or for any other purpose in connection with the Department's service and facilities.

3.7 Miscellaneous

Easements for water must be allowed for future loop connection and continuation for future water extensions. 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.

Separation between sanitary sewers and underground power to water mains shall be a minimum of 10 feet horizontally. When crossing a water main, the top of the sanitary sewer and underground power shall be a minimum of 24 inches below the bottom of the water main. 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. Water lines will have 1foot clearance of crossing storm drains.

Water lines shall not run under pavement of any type unless it crosses a road at a perpendicular angle.

All utilities shall have a minimum of 30 inches of cover in non-traffic areas and 36 inches in paved areas subject to vehicular traffic.

All areas to receive fill shall be filled and compacted prior to the installation of any utility lines or any structure. See paragraph 3.5 for pipe material requirement. The following note shall be indicated on drawings indicating a water line location in areas of fill:

Note: All areas to receive fill shall be filled and compacted to 95% standard proctor density per the utility design drawings prior to the installation of the utility lines or any structures.

3.8 Design Quantity for Water

The water capacity to be provided for must be determined from careful analysis of the present and probable future quantities of domestic, commercial, and industrial water requirements. Estimated design flows for water shall be determined by the Developer and submitted to the Department for approval. When data is not known otherwise, the 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 flow from institutional and industrial establishments shall be determined from a study of similar establishments and submitted to the Department 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. The Owner/Developer must plan for future extension to vacant lands he plans to developer by installing adequate sized facilities.
4. Potable water for fire flow shall be based on the usage plus an allowance for fire flow. Fire flow will be as recommended by the Fire Department or as available by the system based on the hydraulics of the system. System hydraulics is based on the flow from the nearest tank serving the area without dropping residual pressure below 20 psi. Minimum line size for proposed lines within and outside of the proposed development may have to be upgraded which will be the responsibility of the developer.

Peak flow in the water system will be the fire flow or the average daily usage multiplied by a factor of 2.3, whichever is greater.

3.9 Special Designs

If development requires an expansion which will require items such as water booster stations, tanks, treatment facilities, wells or any other appurtenance which the Department deems special, the Department will use its engineer to design these facilities to insure compatibility with the Department's Water Utilities. The Department will have these items constructed with the Owner financing the project. In no case will the Department receive ownership of any facility where this rule is not followed.

3.10 Oversize Facilities

The Department may participate in the cost of "Oversized" improvements leading to or within a subdivision (i.e., water mains, pump stations, etc.,) if it is judged that such oversized improvements are necessary to serve larger areas of land not included in the subdivision or tract and unrelated to the Owner's future plans and if the cost of such required oversized improvement is an unreasonable burden to the subdivider. In this case, the subdivider shall not be required to pay the total cost of "Oversized" facilities, but shall participate in the cost of these improvements in the amount that the minimum size allowed by these specifications or the size required to serve his subdivision (whichever one is greater) would cost. The Department would participate by paying the difference in the required facilities and the oversized facilities. The Owner/Developer must pay for "oversized" facilities for his benefit for future development plans.

Section 4: Material Specifications for Water Lines

4.1 Materials - Polyethylene

The Department will allow the installation of high-density polyethylene piping for water distribution equal to DriscoPlex pipe manufactured by Performance Pipe. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. All pipe shall be marked or certified by the manufacturer that it meets or exceeds AWWA C906 and be marked per the requirements of C906. The Manufacturer's production facilities shall be open for inspection by the Department or their Authorized Representative. The Department shall approve qualified Manufacturers.

Black PE materials used for the manufacture of polyethylene pipe and fittings shall be PE 3408 high density polyethylene meeting ASTM D 3350 cell classification 345464C and shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F. Color material, when used, shall be the same except for meeting ASTM D 3350 cell classification 345464E. The material shall be listed and approved for potable water in accordance with NSF Standard 61. The Manufacturer shall certify that the materials used to manufacturer pipe and fittings meet these requirements.

Pipe sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906-99. Pipe shall be IPS for 4 and 6" and DIPS for 8" and above (all SDR-9), be black, and shall have three (3) equally spaced, blue color stripes co-extruded into the pipe outside surface. Stripes printed on the pipe outside surface shall not be acceptable.

MJ Adapters 4" thru 16" will be provided with Stainless Steel Stiffeners. MJ Adapters 14" and above shall be provided with Heavy Duty Back-up Ring Kits. All MJ adapters 18" and above must be provided with Stainless Steel Stiffeners.

Joints between plain end pipes shall be made by butt fusion. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. SDR's acceptable for polyethylene pipe are 7.3 and 9. Pipe shall be rated for a sustained working pressure of 200 psi minimum unless a higher rating is required by the Department.

Polyethylene pipe and fittings may be joined together or to other materials by means of (a) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (b) MJ Adapters or (c) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed. A stiffener shall be installed in the bore of the polyethylene pipe when an OD

compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. Branch connections to the main and other required fittings shall be made with ductile iron fittings.

4.2 Materials - Ductile Iron and Copper

All material used in the construction shall be new and unused manufactured in the United States. Ductile iron pipe shall meet AWWA and ANSI Specifications C-150, C-151, A 21.50, and A 21.15 respectively and be Class 350 as approved by the Department and manufactured by American or U.S. Pipe. Ductile iron pipe used on water mains shall be tar coated outside and cement lined inside with cement lining conforming to the requirements of ANSI 21.4 (AWWA C104). Pipe and fittings to be installed in buildings, galleries, other locations where such pipe and fittings will be permanently "exposed" shall have exterior coat of rust inhibitive primer and painted after installation. Ductile iron fittings shall meet AWWA Specifications C-110/A21.10. Fittings shall be ductile iron, Class 250, lined to match pipe, and mechanical joint with retainer glands used on 10" and larger water pipe. All water fittings will be braced with concrete. Flanges shall be equal to those required for connections to equipment and pressures encountered unless specified otherwise. Ductile iron pipe with mechanical or push-on joints shall conform to the requirements of ANSI A21.11 (AWWA C111). Ductile iron pipe with flanged joints shall conform to the requirements of ANSI A21.15. Flanges shall be ductile iron and shall conform to the properties specified for ductile iron fittings in ANSI A21.10.

Restrained joint ductile iron pipe and fitting shall meet specifications in this section and be a boltless restrained connection to protect against separation due to thrust. Pipe sizes 4" through 12" in diameter shall have an allowable deflection of 5°. Restrained joints shall be equal to American "Flex-Ring" or U.S. Pipe "TR-Flex.". Field lock gaskets will not be accepted.

Ductile iron joints shall be "push-on", meeting ASTM Standards D-3139. Pipe lengths shall not exceed 20 feet. Lubricant shall be nontoxic and have no effects on the gasket or pipe material. Gaskets shall meet ASTM F477 requirements. The gasket manufacturer's mark and year of manufacture shall be molded in the rubber. Gaskets shall be vulcanized natural or synthetic rubber. No reclaimed rubber shall be used. The Owner shall be supplied a certified copy of the manufacturer's quality control report.

As a minimum, the pipe shall have the following data applied to each piece:

1. Nominal Size
2. Type of Material
3. ASTM Standards
4. Manufacturer
5. National Sanitation Foundation Seal of Approval
6. Quality Control Code
7. Working Pressure Rating

All spigot ends shall be marked to indicate the distance the spigot end should be extended into the bell.

Copper pipe shall be seamless copper water tube meeting the requirements of AWWA Specifications 7S-CR for Type K copper water tube, Type K hard drawn, or of ASTM Specification Designation B88-61 for seamless copper water tube, Type K hard drawn.

4.3 Pipe Bedding, Backfill and Foundation Backfill Material

Aggregates used for pipe bedding and backfill shall be either crushed limestone or crushed dolomite. The use of slag will not be allowed. Crushed stone shall be ASTM D-448 No. 57 stone. No other screening size is acceptable. In no case is "crusher run", (unscreened gradations that include fine material), acceptable unless specifically called for.

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 water line. The decision regarding the suitability of a particular material for use as earth backfill will be at the sole discretion of the Department Construction Inspector but in no case shall stones as large than 2 inches contact or be within 1 foot of the pipeline.

Foundation backfill is a term used to describe a coarse stone aggregate which may be used at the direction of the Department 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.

4.4 Valves

Valves shall close clockwise with 3 turns per inch. Valves shall have mechanical joint or flange ends. Butterfly valves must be preapproved before using on a project.

Butterfly valves shall be of the rubber seated tight closing type and shall meet AWWA Standards C504 and be Class 250 suitable for underground service. The valve operator shall be suitable for underground service with permanent lubrication. The valve body and disc shall be ductile iron with stainless steel body seat, retainer ring, and screws. Each valve shall be hydrostatically tested in each direction with the disc closed at 250 PSI. The inside of the valve shall be epoxy coated.

Gate valves shall be resilient seated manufactured to meet the requirements of AWWA C509 and be suitable for 250 PSI main pressure. Valves shall have clear, unobstructed water way when fully opened and shall be at least as large as the pipe inside diameter for which it is intended. All internal surfaces shall be coated with epoxy to a minimum thickness of 8 mils. Said coating shall be non-toxic, impart no taste to water and shall conform to AWWA C550. Valves shall be provided with two O-rings located below the stem collar. The area between the O-rings shall be filled with lubrication to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. An anti-friction washer shall be located above the thrust collar. The sealing mechanism shall provide 0 leakage at the water working pressure when installed with the line flow in either direction and shall consist of a cast iron gate with a resilient seal bonded or mechanically attached. Further, it shall be designed such that no sliding of rubber on the seating surfaces is required to compress the rubber. It shall not effect the ability of the valve to seal when pressure is applied to either side of the gate. The gate shall be provided with a drain in the bottom to flush the internal cavity of foreign

material each time the valve is opened. All valves shall be Mueller and aqua grip glands shall be used on polyethylene pipe. Valves shall have cast iron valve boxes and concrete donuts or pads placed around the top of the box. Each valve except fire hydrant valves shall have concrete valve marker installed adjacent to valve box.

4.5 Fire Hydrants

Fire hydrants shall conform to the specifications of the American Water Works Association, C502. They shall be compression type traffic model with 5-1/4 inch valve opening. Hydrants shall have one 4-1/2 inch and two 2-1/2 inch steamer nozzles with threads to match fire department equipment. Hydrants shall have a bury of 3-1/2 feet or as required by pipe laying conditions. The fire hydrant extensions shall be by the same manufacturer as the fire hydrant type used. Fire hydrants shall be Mueller and/or match hydrants currently required by the Department. Fire hydrants must have 15 inch clearance from finished grade to the bottom of the 4-1/2 inch outlet.

4.6 Miscellaneous

Rods for connecting valves, fittings, fire hydrants, etc. to each other shall be threaded 3/4 inch steel rods (A-36). The rods shall be galvanized or coal tar epoxy coated. Eye bolts are required when rodding is required.

All concrete, including but not limited to thrust blocking, dead men, etc., shall have a 28 day compression strength of not less than 3000 pounds per square inch. All fittings must be wrapped in plastic before concrete thrust blocks are poured such that concrete is not poured on bolts and other accessories.

All meter pits will be installed by the contractor and must be approved by the Department prior to installation and prior to the Department accepting ownership.

Valves for tapping sleeves shall be flanged at one end for bolting to the tapping sleeve and equipped with mechanical joint outlet and meet specifications in this section. Tapping sleeves shall be ductile iron and split for installation on the pipe. For tapping PVC pipe, sleeves will be full body stainless steel wrap around type. Steel tapping sleeves will not be allowed.

The Contractor shall furnish and install valve boxes for all buried valves. Valve boxes shall be cast iron, screw type, with extension pieces as required to make up the length of box required from surface of ground to top of the valve body. Valve box lids shall be marked as to service.

Polyethylene encasement film shall be in tube form complying with ANSI/AWWA C105/A21.5. The polyethylene film shall be Class C.

Section 5: Construction Specifications for Utilities

5.1 General

During installation of utility lines, the Contractor will be required to conduct his operations in a safety conscious manner. The Contractor shall comply with all applicable safety requirements in the location of the construction area. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation. The Department nor its agents will not inspect for compliance with safety regulations and disclaims any responsibility to ensure the safety of workers employed by the Contractor. The Contractor shall locate all existing utilities before construction and insure the utilities are not damaged during construction.

The requirements of the Alabama State Highway Department "Standards for Accommodating Utilities on Highway Right-of-Ways" are hereby made a part of these specifications for all utility construction within right-of-way for roads or highways under the jurisdiction of the Alabama State Highway Department. For work within the dedicated City or County right-of-way, the Contractor will be required to have the respective permit or license from either of these agencies before construction within these right-of-ways is allowed. The Contractor shall abide by the requirements of these permits. The Contractor shall comply with all local, County and State regulations regarding site preparation, pollution, burning permit, erosion control and stormwater runoff.

The Department's personnel and/or agents shall be authorized to inspect all work and all material furnished, including preparations, fabrications and manufacture of the materials to be used. The Department's representative shall call the attention of the Contractor or Developer's engineer to any failure of the work or materials to conform to the specifications. He may reject material or suspend the work until any questions at issue can be referred to and decided by the proper authority. The presence of the Department's personnel and/or its agents shall in no way lessen the responsibility of the Contractor and/or Developer's engineer. It is the responsibility of the Contractor, Developer and his engineer to provide and assure the Department a quality finished product installed in accordance with all supplier's and manufacturer's standard procedure, and these specifications.

All work and materials shall be guaranteed for a minimum one (1) year period after final acceptance. The owner shall, at the Department's discretion, make necessary repairs during this time or pay the Department for making such repairs. The cost of repairs will be based on prices established by utility contractors, who are licensed by the State of Alabama as if they had performed the work.

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. Water and sewer pipe shall be laid with bells upgrade of the excavation. The bottom of the excavation for pipe and structures shall be true to the required shape and elevations shown on the Drawings or as required for installation. 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. All pipe shall be installed in accordance with the manufacturer's standard procedure.

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.

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 thoroughly compacted and inspected by the Department Construction Inspector. The Department 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.

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. Sheeting, shoring, or bracing materials shall be removed before backfilling unless otherwise directed by the Design Engineer. 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. In no case shall trench sheeting and bracing be removed until the trench has been backfilled one (l) foot above the top of the pipe.

When water lines cross open ditches, the crossing will maintain minimum cover or be protected with concrete if approved by the Department. Special slope protection is required on banks.

Rock encountered in trench excavation for utilities shall be removed for the overall width of the trench and to a depth of 6" minimum below the bottom of the bell of the pipe. The space excavated below the barrel and bell of the pipe shall be backfilled with pipe bedding, as specified herein. All overshot 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.

Backfilling around structures located in paved streets (present or future) shall be done utilizing ASTM D-448 No. 57 stone. 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. 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.

Installation of casing pipe shall be by the Jack and Bore Method with care being exercised to install the casing pipe to the proper line and grade as shown on the Drawings or required. 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. Failed bore attempts requires the casing to be left in placed, filled with sand and capped at exposed ends. 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. 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. Carrier pipe shall be ductile iron and have supports equal to Cascade.

After the utility 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. Vegetative cover shall match the existing cover before construction began but in no case will the cover be less than established grass.

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 Department Construction Inspector. Any loose material shall be compacted. No rip rap shall be placed on a slope greater than 1:1 nor where slides could occur.

5.2 Installation of Water Pipe and Appurtenances

The top of the pipe shall be a minimum of 30 inches below the surface. The pipe shall have a uniform bearing. Bell holes shall be dug so that the bell will clear the ground. The pipe shall be swabbed for cleanliness before lowering into the trench. Whenever pipe is cut it shall leave a smooth end at right angles to the axis. The end of the pipe shall be closed when the work is left temporarily. Angles or bends in the line shall be braced against movement by using concrete against undisturbed earth or rock. Rock or boulders shall be removed to a clearance of at least 6 inches from pipe, valves, and fittings. If the bottom of the trench is found to be unsuitable, the Contractor will remove the material, backfill and compact with a suitable base. If unsuitable material cannot be removed, the Contractor shall construct a foundation for the pipe as directed by the Department. Water lines that are installed with less than 30 inches of cover shall have special protection. No lines will have more than 42" of cover without special permission from the Department. Pipes having greater than 8 feet of cover from the finished grade to the top of pipe shall be the class and type of pipe as per manufacturer's specifications as well as the Department's special rules governing this installation. On taps 4 inches or larger, a ductile iron tapping sleeve will be used when the new pipe being installed is one-half or greater than the diameter of the pipe being tapped.

For pipes layed on steep slopes where erosion of the pipe trench could occur, concrete ditch checks shall be installed every 50' to 100' depending on the slope. See standard drawings for ditch checks.

Air relief will be installed on significant high points in the water system. These will be used when a service line cannot be installed to act as a natural air relief.

Streets shall be graded to within 6 inches of finished grade and the Developer's engineer will locate the back of curb and lot corners before the main is installed. These lot corner stakes must remain intact until the water laterals are installed.

If water service or mains must be shut off at any time during construction, the Department must be notified and those residences and businesses that are affected must be given as much advance warning as possible. If necessary, the Department may require the Contractor to make main connections during non-working hours i.e. late night, early morning, weekends.

Valves shall be set level on compacted earth and mechanical joints made in accordance with the manufacturer's recommendations. Valve boxes shall be set flush with the finished grade of the street or road. In nonpaved rural areas the valve boxes shall be slightly higher than the finished

grade. A circular 18 inches diameter concrete pad, 4 inches thick shall be placed around it. Valves will be rodded to fittings.

Fittings and fire hydrants regardless of type of bracing shall be blocked with concrete against undisturbed soil. The concrete shall be formed around the fitting in such a manner that the bolts and bolt holes are accessible. Bolts on mechanical joint fittings shall be torqued to the manufacturer's recommendations. Fire hydrants shall be set plumb. The steamer nozzle shall be between 15 inches minimum to 30 inches maximum above the finish grade of the surrounding area (i.e., ground within 10 feet of the fire hydrant). Gravel shall be used around weep holes. The hydrant base shall be blocked with concrete and connect the main to the valve and then the valve to the fire hydrant with anchor coupling throughout the fire hydrant header length. Fire hydrants headers shall be ductile iron.

New water mains and equipment through which water passes must be sterilized as required by the State Board of Health. The Contractor shall not allow any connection until the line has been tested, sterilized, and approved for use. Mains shall be flushed until water has moved through the length of pipe and is clear. To sterilize the system, chlorine shall be used. The chlorinated water shall be drawn off at fire hydrants and ends until an Ortho-Tolidin test shows strong chlorine. After all points show strong chlorination, the system shall remain full for 24 hours and then flushed out with potable water. Samples will be taken and submitted to the State Board of Health for analysis. Approval of samples shall be secured before placing the system in use.

On new construction, before the Department will change the service account name to the new property owners, the meter box and lines will be set to final grade of property. The Department will be paid to raise the meter after the initial installation in accordance with the supplemental regulations.

The Department shall not be liable for any damages to the customer's service line, plumbing, fixtures or property alleged to be caused by high pressure, by low pressure, or by fluctuation of pressure. It is the responsibility of the customer to provide at his expense any regulating devices or appurtenances required to adjust the pressure carried in the main serving his premises to a pressure suitable for his requirements. These devices cannot be installed in the Department's meter box.

For the final inspection before acceptance by the Department, all valve boxes shall be showing and the valve nuts shall be accessible. The Department personnel and/or its agents will be furnished as built drawings and a representative from the Contractor and/or Developer's engineer will check each valve to verify the valve's being in the "on" position. The Department shall provide locks for the one (1) inch locking curb stops on cul-de-sacs.

5.3 Additional Installation Requirements for Polyethylene Pipe

When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the Department or manufacturer within 7 days. Installation shall be in accordance with ASTM D 2774, AWWA C906, manufacturer's recommendations, and this specification. Any conflicts between specifications, the stricter recommendation will apply.

Mechanical joint and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. MJ Adapters and flanges shall be centered and aligned to the mating component before assembling and tightening bolts. In no case shall MJ gland or flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated, and flat washers should be used under the nuts. Bolts shall be evenly

tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer.

When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.

The width of the trench shall be sufficient for pipe not to touch the sidewalls of the trench. The Contractor will take into effect the uneven alignment of polyethylene and allow a safety factor in the trench width. The pipe must have a cushion of 6" to 12" from any rock in the trench. Stone bedding will not exceed 3/4" particle size.

Backfill and embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids. In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

All polyethylene pipe shall have a continuous #14 copper wire with insulation layed in the trench of the pipe for location purposed. Tracing tape is not allowed. Thrust restraint will be with concrete bracing against undisturbed soil on all bends, fire hydrants, terminal ends, etc.

The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

Generally polvethylene piping may be joined by thermal butt fusion or electrofusion. Polyethylene piping shall not be joined by solvent cements, adhesives (such as epoxies), or threaded-type connections. All joining methods shall be capable of conveying water at the test pressure of the piping system or pipe rating pressure whichever is greater. In situations where different kinds of polyethylene piping materials must be joined to each other, the manufacturers of the subject pipe or fitting should be consulted to determine the appropriate fusion procedures. Thermal fusion shall be conducted only by persons who have received training in the use of the fusion equipment in accordance with the recommendations of the pipe supplier or the equipment supplier.

Thermal butt fusion shall be portable, field-proven equipment with the ability to hold pipe or fittings in close alignment while the opposing butt-ends are faced, cleaned, melted, and fused together and then cooled under fusion parameters recommended by the pipe and fusion equipment supplier. Prior to attempting fusion of polyethylene pipe, personnel should verify that they have the

optimum range of fusion conditions, such as fusion temperature, interface pressure, and cooling time for the material being joined.

Electrofusion uses equipment to prepare the pipe surfaces by scraping, aligning of the pipe sections to be joined, and holding them in place through the heat-fusion and cool-down cycle. With the electrofusion joining method, fusion times and temperatures shall be included in the design of the equipment. There is no concern of different heat times or pressures between the polyethylene materials described in this standard. Dissimilar PE materials can be joined without concern for special handling by the operator. The procedures for dissimilar polyethylene materials are the same as for similar material being joined.

Section 6: Testing for Acceptance of Utilities

6.1 General

Upon completion of all or part of a water line and appurtenances, the Contractor will be required to test said utility for acceptability. The Contractor shall provide all necessary water, equipment, and instrumentation for water flushing before testing. All tests shall be conducted in the presence of the Department Construction Inspector. Preliminary tests not observed by the Department Construction Inspector will not be accepted. The Department Construction Inspector shall be notified at least 24 hours before any work is to be inspected or tested. All defective utility lines and appurtenances (those not passing the specified test) shall be repaired, or replaced, and retested until acceptable by the Department. Repairs shall be made to the standard of quality specified for the entire system.

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 Department. 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.

6.2 Testing of Water Mains

The Contractor shall furnish approved equipment. Testing shall be done in the presence of the Department Construction Inspector. Testing will be 1-1/2 times the normal operating pressure but not less than 200 pounds per square inch. The Department Construction Inspector shall determine the test pressure and test sections which shall be limited to a maximum of one mile. Tests with joints uncovered shall be maintained for a period to inspect the section, but in no case for less than two hours. Where the pipeline is backfilled, the test will be maintained for no more than eight (8) hours with hydrostatic test performed in accordance with AWWA C-600. Leakage shall not exceed the following:

Maximum Leakage per
1,000 Feet of Pipe in Gallons per Hour

Pipe Diameter	at 200 psi	at 250 psi
3 Inches	0.32 GPH	0.36 GPH
4 Inches	0.43 GPH	0.47 GPH
6 Inches	0.64 GPH	0.71 GPH
8 Inches	0.85 GPH	0.95 GPH
10 Inches	1.06 GPH	1.19 GPH
12 Inches	1.28 GPH	1.42 GPH
14 Inches	1.48 GPH	1.66 GPH
16 Inches	1.70 GPH	1.90 GPH
18 Inches	1.91 GPH	2.14 GPH
20 Inches	2.12 GPH	2.37 GPH

Tests shall be made with a pressure recording gauge as provided by the Department. The Contractor shall provide all piping for installing the gauge. Bacteriological testing on approved water mains will be required in accordance with Section 5.2.

6.3 Additional Requirements for Polyethylene Pipe

Hydrostatic leak testing shall be conducted and pneumatic pressure testing is prohibited. Before applying pressure, all piping and all components in the test section must be restrained. This means that if piping or parts move or separate during the test, it will not result in damage or injury. Never conduct leak tests on unrestrained piping. Heat fusion joints must be properly cooled before testing. Mechanical connections must be completely installed and tightened per manufacturer's instructions. If backfill provides restraint, it must be properly placed and compacted. Joints and connections may be exposed for inspection. End closures must be suitable for pressure service and pressure-rated for the test pressure. Ensure that all connections to test equipment are secure. Disconnect or isolate all low pressure filling lines and all other parts that are not to be subjected to test pressure. Restrain, isolate or remove expansion joints before leak testing.

The test pressure is measured at the lowest elevation in the test section. The test pressure is 150% of the system design operating pressure provided that all components in the test section are rated for the test pressure but not less than 200 psi. For leak testing purposes, the maximum allowable test pressure in polyethylene pipe is 150% of the pipe's pressure rating for the application and the application service temperature. When testing at pressures above system design pressure up to 150% of the system design pressure, the maximum test duration is eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax for at least eight (8) hours before pressurizing the test section again. Testing at excessive pressure or for excessive time may damage the piping system.

Fill the restrained test section completely with test liquid. Ensure that there is no air trapped in the test section. Use equipment vents or install temporary air releases at high points to remove air. Gradually pressurize the test section to test pressure, and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase. When the test pressure is equal or below the pipe pressure rating, use the following test procedure. Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid then if test pressure remains steady (within 5% of the target value) for one (1) hour, no leakage is indicated.

When the test pressure is greater than the pipe pressure rating, the following procedure is utilized. Immediately following the initial expansion phase, monitor the amount of make-up water required to maintain test pressure for three (3) hours. If the amount of make-up water needed to maintain test pressure does not exceed the amount in Table 2 for a 3-hour test, no leakage is indicated.

	Make-Up Water Allowance for Test Phase (U.S. Gal./100 ft. of pipe)		
Nominal Pipe size (in.)	*1-Hour Test*	*2-Hour Test*	*3-Hour Test*
1-1/4	0.06	0.10	0.16
1-1/2	0.07	0.10	0.17
2	0.07	0.11	0.19
3	.010	0.15	0.25
4	0.13	0.25	0.40
5-3/8	0.19	0.38	0.58
5	0.21	0.41	0.62
6	0.3	0.6	0.9
7-1/8	0.4	0.7	1.0
8	0.5	1.0	1.5
10	0.8	1.3	2.1
12	1.1	2.3	3.4
13-3/8	1.2	2.5	3.7
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.0	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
26	5.0	10.0	15.0
28	5.5	11.1	16.8
30	6.3	12.7	19.2
32	7.0	14.3	21.5
34	8.0	16.2	24.3

	Make-Up Water Allowance for Test Phase (U.S. Gal./100 ft. of pipe)		
Nominal Pipe size (in.)	*1-Hour Test*	*2-Hour Test*	*3-Hour Test*
36	9.0	18.0	27.0
42	12.0	23.1	35.3
48	15.0	27.0	43.0
54	22.0	31.4	51.7

At the conclusion of the test, carefully depressurize the test section by the controlled release of test liquid.

Section 7: Backflow Prevention Plan

7.1 General

A cross connection is defined as:

1. any physical connection whereby the Department's water supply is in any way connected with any other water system, whether public or private, or
2. any arrangement whereby water introduced through a customer's service to a premises can be back-siphoned or reintroduced into the Department's mains.

No cross connection of any kind shall be permitted between the water supply from the Department's main and the water supply from any other source.

No two (2) or more customer service pipes used for domestic service, fire service or for any other purpose shall be physically connected together in any manner whatsoever, unless specifically approved by the Department, and then only with approved backflow prevention devices on each service pipe.

No connection shall be made, nor facilities installed, whereby it would be possible for water once delivered to a customer's premises to be reintroduced into the Department's system.

Steam boilers shall not take a supply of water directly from the customer's service pipe and depend upon hydrostatic pressure in the said service pipe to furnish the supply to the boiler under working pressure. Boiler feed pumps, injectors or any other such device shall not be connected directly to the customer's service pipe. They shall be supplied through a connection to an intervening tank which shall receive water from the customer's service pipe so situated as to provide an air gap of not less than six inches (6") between the customer's service pipe and the overflow of the tank.

Fountains, swimming pools, aquariums and all similar facilities shall be so constructed that there shall be a six-inch (6") gap between the customer's service pipe which delivers water to them and the overflow of each such facility.

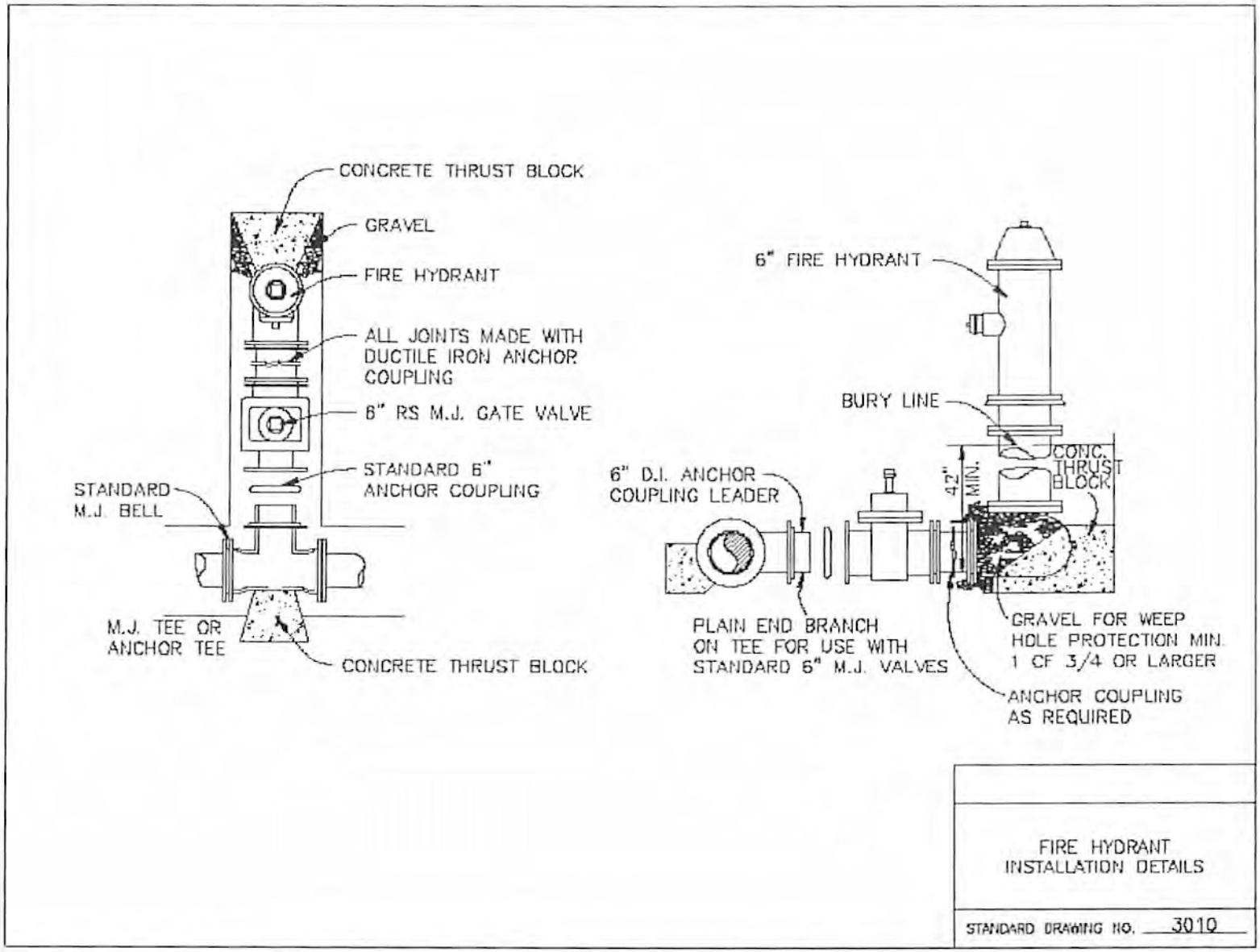
All hospitals, mortuaries, nursing homes, autopsy facilities, clinics, chemical and testing laboratories, plating plants, chemical and testing laboratories, planting plants, chemical companies, care washes, photograph processing plants, commercial laundries, and any other facilities designated by the Department, including premises supplied with industrial or auxiliary water, shall have an acceptable backflow preventer installed in the customer's service pipe between the meter and the first water outlet on the premises.

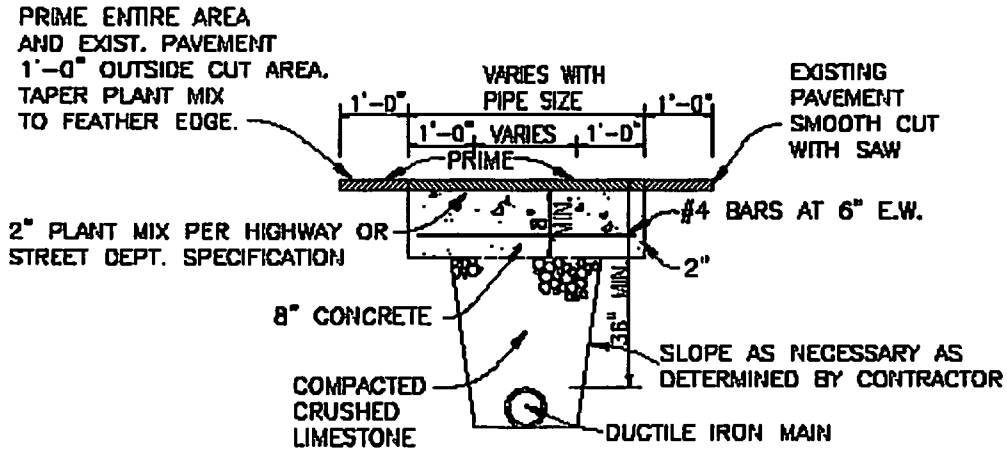
An approved backflow prevention device shall be installed on each service to a customer's water system where, in the judgement of the Department, an existing or potential health hazard to the water system exists in accordance with Section 3-1205, Regulations Governing Public Water Supplies, Alabama State Board of Health (adopted May 17, 1978) or latest revision(s).

In order to protect the potable water in the Department's mains which will be delivered to the general public, the Department reserves the right to require any customer to install and maintain by and at his expense a back-flow preventer device, or any other such device approved for that purpose by the water works.

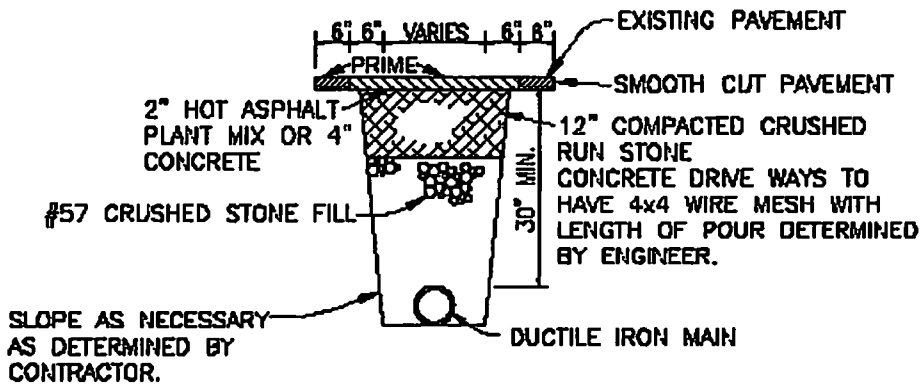
The Department shall deny or discontinue the water service to a customer if a required backflow prevention device is not installed or properly maintained when required by the Department. Water service shall not be restored to such premises until the deficiencies have been corrected or eliminated to the satisfaction of the Department in accordance with Section 3-1209, Regulations Governing Public Water Supplies, Alabama State Board of Health (adopted May 17, 1978).

Backflow preventers, when required, will be installed on the customer's service pipe as close to the meter setting as possible. Reduced pressure backflow preventers shall be installed above ground, except as otherwise specifically authorized by the Department. Vaults shall be constructed to provide drain outlets to the outside of the vault at grade level. The backflow preventer shall be positioned in the vault so the relief or vent opening is twelve inches (12") above grade level outside the vault. The drain outlet in the vault shall be a minimum of four (4) times the area of the reflief or vent opening on the backflow preventer, or at least four (4) such openings shall be provided, each having an area equal to the area of the relief or vent outlet. Sufficient clearance from the backflow preventer shall be provided on all sides to permit testing and maintenance without removal from the service pipe. All vaults shall have drain openings with positive drainage at ground level a minimum of twelve inches (12") below the relief or vent opening on the backflow preventer which will prevent the relief or vent opening from being submerged. In the event the piping inside the vault is wrapped or insulated to prevent freezing, care must be exercised to keep the relief or vent opening from being blocked or obstructed in any manner. All backflow preventers which are designed for field testing after installation in the service pipe shall be equipped with gate valves on both the inlet and the outlet side of the backflow preventer, and the gate valve or valves shall be equipped with test cocks which required by the applicable standard under which the backflow preventer is approved.


CONCRETE THRUST BLOCK
GRAVEL
FIRE HYDRANT
ALL JOINTS MADE WITH DUCTILE IRON ANCHOR COUPLING
6" RS M.J. GATE VALVE
STANDARD 6" ANCHOR COUPLING
STANDARD M.J. BELL
M.J. TEE OR ANCHOR TEE
CONCRETE THRUST BLOCK
6" FIRE HYDRANT
BURY LINE
42" MIN.
CONC. THRUST BLOCK
6" D.I. ANCHOR COUPLING LEADER
PLAIN END BRANCH ON TEE FOR USE WITH STANDARD 6" M.J. VALVES
GRAVEL FOR WEEP HOLE PROTECTION MIN. 1 CF 3/4 OR LARGER
ANCHOR COUPLING AS REQUIRED
FIRE HYDRANT INSTALLATION DETAILS
STANDARD DRAWING NO. 3010



STATE HWY.

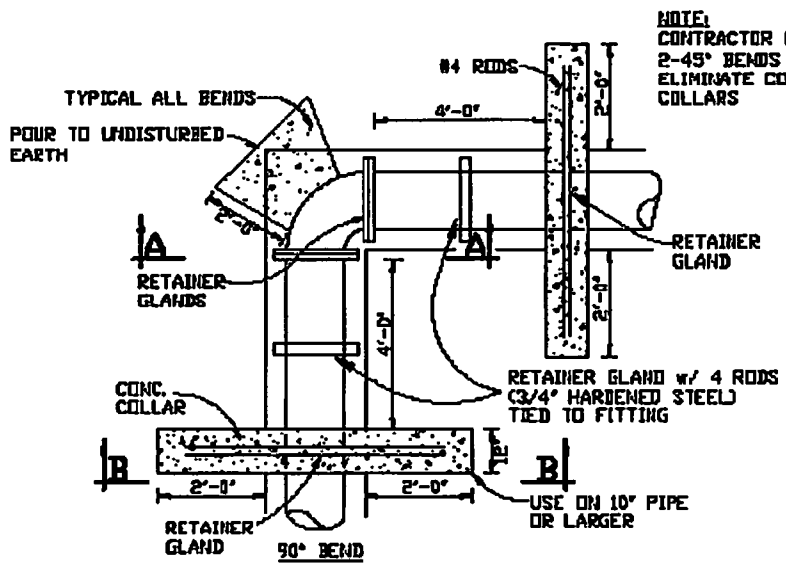


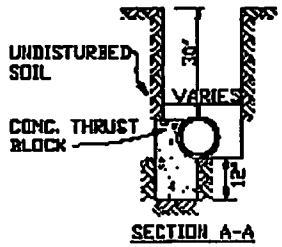
DRIVEWAYS & STREETS

SCALE N.T.S.

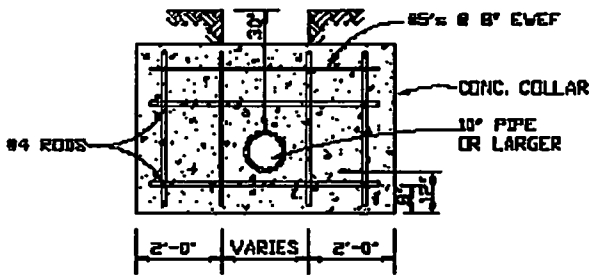
TYP. ROAD CROSSING
BY OPEN CUT

STANDARD DRAWING NO. 3011





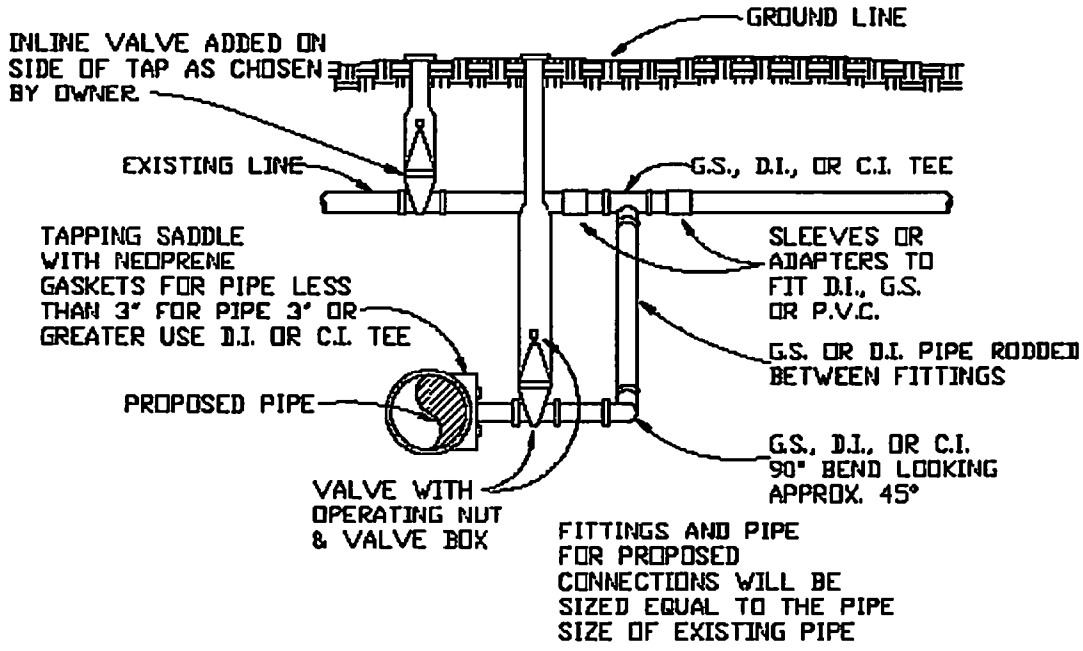
SECTION A-A



SECTION B-B

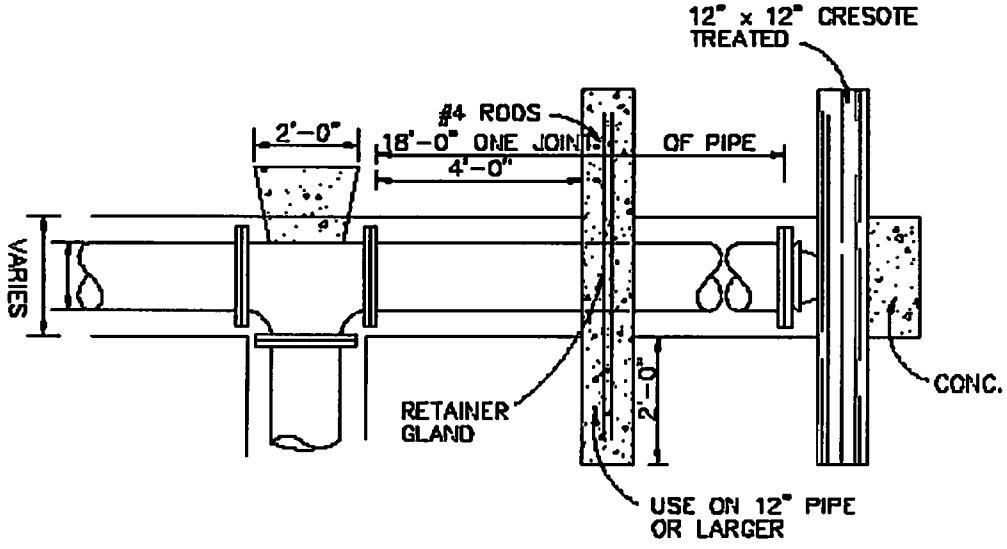
COLLAR AND THRUST
BLOCK DETAILS

STANDARD DRAWING NO. 3012



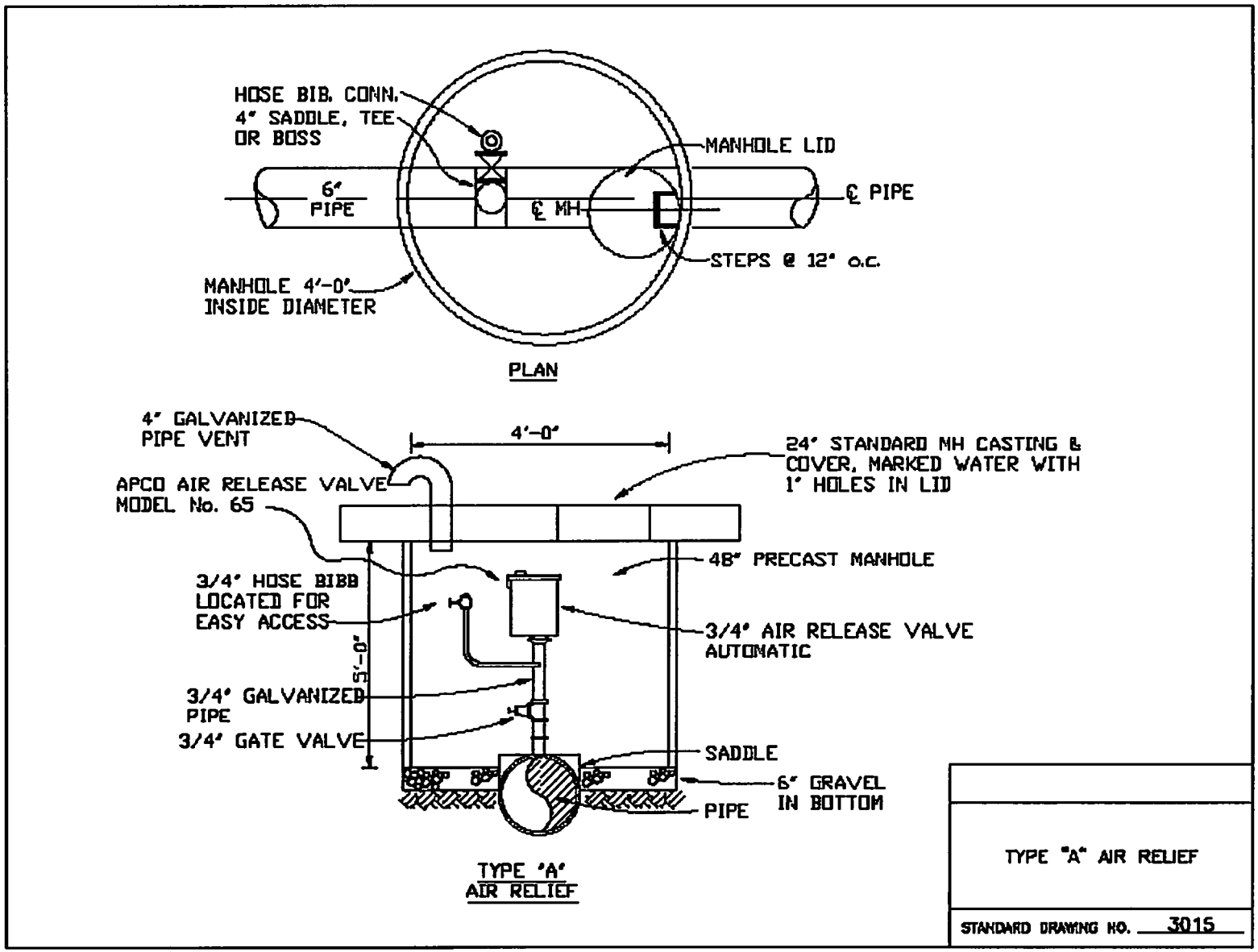
TYPICAL LOOP CONNECTION

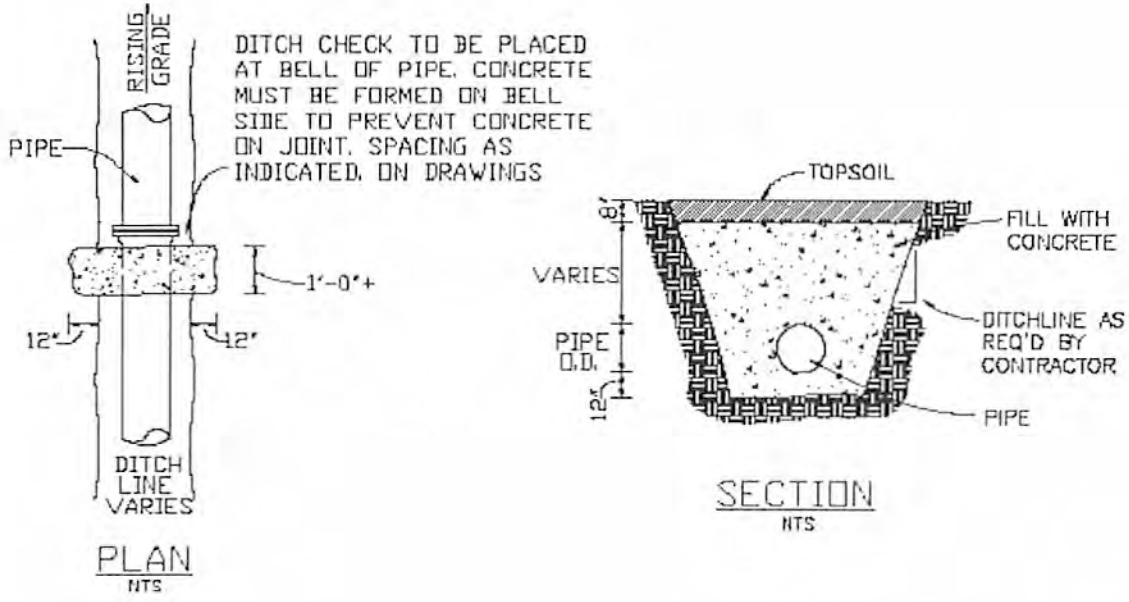
STANDARD DRAWING NO. 3013



TYPICAL DEAD
END AT TEE

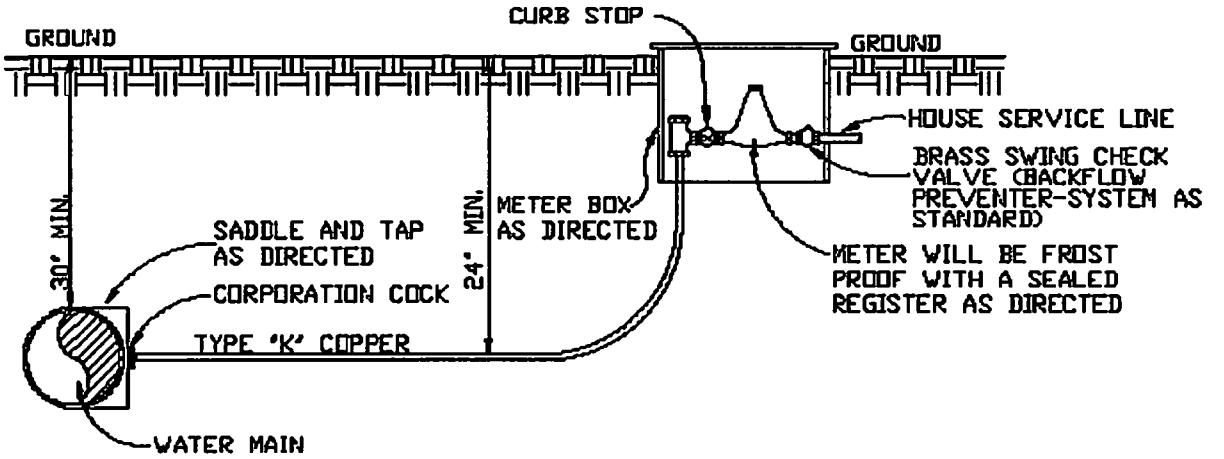
STANDARD DRAWING NO. 3014


HOSE BIB. CONN.
4" SADDLE, TEE
OR BOSS
MANHOLE LID
6"
PIPE
℄ MH
℄ PIPE
STEPS @ 12" o.c.
MANHOLE 4'-0"
INSIDE DIAMETER
PLAN
4" GALVANIZED
PIPE VENT
4'-0"
24" STANDARD MH CASTING &
COVER, MARKED WATER WITH
1" HOLES IN LID
APCO AIR RELEASE VALVE
MODEL No. 65
48" PRECAST MANHOLE
3/4" HOSE BIBB
LOCATED FOR
EASY ACCESS
3/4" AIR RELEASE VALVE
AUTOMATIC
5'-0"
3/4" GALVANIZED
PIPE
3/4" GATE VALVE
SADDLE
6" GRAVEL
IN BOTTOM
PIPE
TYPE 'A'
AIR RELIEF
TYPE "A" AIR RELIEF
STANDARD DRAWING NO. 3015



TYPICAL
DITCH CHECK

STANDARD DRAWING NO. 3016



TYP. METER INSTALLATION

STANDARD DRAWING NO. 3017