City of Cullman, Alabama

Standards for Construction of Water Distribution Systems

Date Authored: April 20, 2021

	Date Revised/Reviewed	Reviser/Reviewer Signature and Title	Responsible Official Signature and Title
X Revision □ Review	June 14, 2021		
X Revision □ Review	December 3, 2021		
X Revision □ Review	June 29, 2023		
□ Revision □ Review			
□ Revision □ Review			
□ Revision □ Review			

Table of Contents

Table of Contents 2
1.0 Policies and Procedures 4
1.1 Applicability or Jurisdiction 4
1.2 Definitions 4
1.3 Standard Reference Specifications 7
1.4 Construction Drawings Review and Approval Process 7
1.5 Inspection 8
1.6 Miscellaneous 8
2.0 Requested Extension of Existing System 11
2.1 General 11
2.2 Development Extensions 12
2.3 Existing Residential and Commercial Extensions 13
3.0 Design Guidelines for Water Facilities 15
3.1 General 15
3.2 Surveys, Investigations and Drawings 15
3.3 Easements, Right of Way and Property Deed Descriptions 16
3.4 As-Constructed Drawings 16
3.5 General Design Criteria 17
3.6 Service Lines 19
3.7 Miscellaneous 20
3.8 Design Quantity for Water 21
3.9 Special Designs 21
3.10 Oversized Facilities 21
4.0 Material Specifications for Water Lines 23
4.1 Materials 23
4.2 Pipe Bedding, Backfill and Foundation Backfill Material 24
4.3 Valves 24
4.4 Fire Hydrants 25
4.5 Miscellaneous 25
5.0 Construction Specifications for Utilities 26

5.1 General....26
5.2 Installation of Water Pipe and Appurtenances....28
6.0 Testing for Acceptance of Utilities....30
6.1 General....30
6.2 Testing of Water Mains....30
A. DIP or PVC Pressure Test....30
B. HDPE Pressure Test....31
7.0 Backflow Prevention Plan and Ordinance....33
7.1 General....33

1.0 Policies and Procedures

1.1 Applicability or Jurisdiction

All water facilities (hereinafter called City Utilities) that connect to the City Water Systems shall be designed in accordance with all criteria established herein. All materials, construction, and testing of such facilities shall be in accordance with these Standards, regardless of whether such facilities will be dedicated to the City, and shall be subject to inspection by the City as deemed necessary to ensure compliance with the requirements contained herein.

These standards represent the approved construction practices and procedures for water distribution systems within the City of Cullman. Any special designs not covered by this document must be submitted to the City for approval prior to commencement of construction. 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 City. The City shall approve any such alternate, provided they find 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 City 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 City that they are using the latest version of the published document. Updates to these Standards are available at the Department 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 Eleventh 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.

CITY: The City of Cullman, Alabama or City of Cullman Water Department and their authorized agents.

CITY CONSTRUCTION INSPECTOR: An authorized representative of Cullman, Alabama assigned to observe the construction of all new utilities, repairs to existing utility lines, connections, and disconnections, and advise the City 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 City 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 City as deemed necessary to provide City services.

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

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 City 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 City.

OWNER: The tense “Owner” shall mean the company, organization, Developer, or governmental agency who intends to design and 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.

PLUMBING INSPECTOR: An authorized representative of the City assigned to observe the installation of the internal plumbing of a building.

SANITARY SEWER: A sewer intended to carry wastewater and to which groundwater infiltration/stormwater inflow are not intentionally admitted.

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.

STORM SEWER (sometime termed “STORM DRAIN”): A pipeline intended to carry rainfall surface runoff and/or subsurface waters. There is a distinct difference between storm sewers and sanitary sewers. Storm sewers exclude flow from domestic wastewater and industrial waste.

STORM WATER: Rain water or any sort of runoff that does not come from sanitary sewers.

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.

SUPERINTENDENT: The Mayor of Cullman or his authorized agent.

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, wells, meter and appurtenances that distribute potable water to the 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
    a. Alabama Manual on Uniform Traffic Control Devices for Streets, and Highways
    b. Standard Specifications for Highway Construction
    c. Utility Manual
B. Occupational Safety and Health Administration Publications
    a. Safety

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

1.4 Construction Drawings Review and Approval Process

The City maintains its utility systems and must regulate any proposed additions or changes to these systems. Prior approval of any projects affecting the utility system is required. Construction Drawings are required to be prepared for all utility system facilities to be built and connected to the systems. In the event a project is to be built that crosses existing City utilities or encroaches in City easements, drawings must be submitted to the City’s Utilities 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 for Sketch Plat Review by the City’s Subdivision Official in accordance with the Subdivision Regulations. 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 City 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 City’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 City. Deeds will be reviewed by the City and if acceptable, recorded in Probate Court. The City 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 City or its agents responsible for technical aspects of the design accuracy of the plans and specifications.

The approval of Construction Drawings is valid for a period of 365 calendar days. If construction has not begun at the end of 365 calendar days the Drawings must be resubmitted for approval prior to starting construction. Drawings over 365 days representing projects for which construction has not yet begun are void unless indicated by an updated approval.

1.5 Inspection

The City will make inspections on the proposed projects while they are under construction. The City 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. The Owner and Design Engineer will be responsible for the accuracy of the design after the system is operational and shall warrant it satisfactory operation. The Owner's Engineer shall be responsible for inspecting the approved public improvements, and shall certify to the City that all such improvements were installed according to the approved plans and rules and regulations of the City.

Upon completion of construction, the Design Engineer shall have the project surveyed by an Alabama Licensed Surveyor to locate the constructed facilities on the As- Constructed Drawing(s). With information from the survey and from construction records, the Design Engineer or Surveyor will make revisions to the approved Construction Drawings, in accordance with the document, to accurately show the actual facilities that were installed. The Owner and Engineer will supply the City a certification letter on the installation of facilities. This letter is found within these Standards.

The Contractor shall be responsible for contacting the Water and/or Sewer Superintendent prior to beginning work. The City Construction Inspector or his agent may inspect any portion of the construction work for its conformance to these Standards. Any testing required in the Specifications shall be witnessed by the City Construction Inspector or his agent as required.

When an inspection report indicates the work does not meet requirements of these standards, the City will issue a stop-work order until corrections are made. The City 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 City for its review. Before commencing with the preparation of construction drawings, the City should be consulted, regarding specific design requirements for any non-routine facilities including pressure regulator, all tunnels, all bores, aerial or creek crossings, and any other water facility.

For any City utility proposed to be installed within State Highway right-of-way, the Alabama Department of Transportation (ALDOT) requires a Right of Way Accommodation Permit. For work performed by the Developer, the Design Engineer or Owner/Developer shall prepare all required Right of Way Accommodation Permits. By submittal of the permit application, the project Owner/Developer agrees to accept responsibility imposed by the State. The Owner/Developer is responsible for performing all duties imposed on the City by the State. The Design Engineer and/or Owner/Developer is responsible for accuracy of all information conveyed on the permit application. Further, the City is not responsible for the State revoking an Accommodation Agreement after it has been issued.

In the event a proposed City 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 submittal of the construction drawings for City 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 City's ability to properly maintain and operate said proposed facilities, or if the language contains any indemnification or hold harmless clauses the City 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.

CITY OF CULLMAN

REQUIRED LETTER - COMPLETION BY OWNER'S ENGINEER

STATE OF ALABAMA)

_____COUNTY)

The undersigned,_____, a licensed Engineer in the State of Alabama, on behalf of_____(Owner), hereby certifies to the City of Cullman pursuant to the Standards for Construction of Water Distribution 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 City of Cullman. Further, the undersigned Engineer certifies that he or his firm has properly and adequately inspected the improvements to ensure all improvements have been constructed in accordance with the standards set forth in the water regulations of the City of Cullman as well as the construction standards of care and he knows of no defects in the improvements.

Project_____

_____
(Printed Name of Owner's Engineer)

_____
(Signature of Owner'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 time; 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 City of Cullman, Alabama.

SWORN TO AND SUBSCRIBED BEFORE ME, this the___day of _____, _____.

(SEAL)

_____
(Signature of Notary Public)

My Commission Expires: _____

2.0 Requested Extension of Existing System

2.1 General

The City will allow extensions of the water system from the existing system where adequate pressure and quantity of water is available to and within the property boundaries where services is requested provided service is for areas within the City'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 City along private roadways or easements where grades have been established and constructed subject to the prior execution of a specific easement document giving the City 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 residential agreement.
C. Existing commercial agreement.

Contracts for expansions must be made on forms prescribed by the City. The City shall verify the size and type of existing 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 City upon the City's acceptance of facilities. The City 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 City systems must be approved by the City prior to the commencement of work. When required, the contractor shall present to the City 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. Those 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 City on previous projects.
6. He is licensed under the Alabama Contractor's Licensing Board.
7. He has obtained a City of Cullman business license.

2.2 Development Extensions

For any connection utilizing a water main to the City water system, all plans and as-builts shall be submitted to the City 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 City will review the plans and respond in writing to the corrections that need to be made.

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 City for a period of 365 days. If construction has not begun at the end of the 365 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 City 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 sanitary sewer or water mains, if not previously dedicated, are hereby dedicated to Cullman, Alabama and its successors and assigns for construction and access in the installation and maintenance of lines and their appurtenances or other uses approved by the City.” 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 and must be approved by the City.

The Developer’s contractor and engineer shall notify the City 72 hours in advance of beginning the construction of approved work. The City 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 City. If all terms and conditions are met, the City will assume ownership and responsibility of the lines.

The Developer and Contractor will be responsible for a maintenance period of not less than one (1) year after the approval letter has been issued. During the maintenance period, any repairs or utility locates will be the responsibility of the Developer and Contractor. For the first year and at the City’s option, repairs if needed may be made by the City and charged to the Developer. For multi-phase developments, letters of acceptance may be requested for each individual phase.

The Developer’s engineer is held to be in responsible charge of any job submitted to the City for construction. The City’s personnel and/or its agents will make inspections of the job and will bring to the attention of the 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 City's specifications and generally accepted standards of quality. The City'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 City will use its engineer to design and choose the construction method to perform improvements pursuant to the following agreement. Developer shall deposit with the City 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 City 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 City 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 City, the City 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 City in the amount of the difference. In the event the City 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 City hereunder are not exclusive and the City shall have the right to pursue any and all legal remedies to collect any amount due the City under the terms of this provision. No interest on deposited monies will be credited to the Developer.

2.3 Existing Residential and Commercial Extensions

Extensions or rerouting utilities for existing residential and commercial establishments shall be designed and contracted to parties under the supervision of the City. 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 City 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 City 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 City 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 City, the City 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 City in the amount of the difference before service is provided. In the event the City 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 City hereunder are not exclusive and the City shall have the right to pursue any and all legal remedies to collect any amount due the City under the terms of this provisions. No interest on deposited monies will be credited to the depositor.

3.0 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 City for final acceptance.

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. Control points 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 meets 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. Concrete collars, if required, 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 sanitary sewer or water mains, if not previously dedicated, are hereby dedicated to the City of Cullman, Alabama and its successors and assigns for construction and access in the installation and maintenance of sanitary sewer and water lines and their appurtenances or other uses approved by the City”. 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 City by record map must be described and deeded to the City. 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 City. 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 and must be approved by the City. 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 City 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.

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.

A letter of acceptance from the City **will not** be issued until receipt and approval of As-Constructed Drawings.

As-Constructed Drawings shall document horizontal and vertical locations of installed water distribution systems, utilizing survey-grade GPS, including all valves and hydrants. Maximum interval between measurements is 100 LF along the project alignment. 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 and their technical design. They shall be responsible to make good to the City'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.

The following note shall be attached to the drawings:

I (printed name) certify that this is a true and accurate sewer plan and profile and/or water utilities map with all requirements meeting the City of Cullman's standards, as field surveyed, for construction.

_____
(Signature of Engineer or Surveyor)

Alabama License or Registration No.: _____

3.5 General Design Criteria

In areas that have been filled that will included the proposed water line within the fill, ductile iron pipe shall be used. In fills greater than 8 feet, restrained joint pipe shall be used. 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 City 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 ductile iron or HDPE (DR-11, DIPS) pipe. Minimum water main sizing may depend upon Fire Department requirements or the City'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. A two-inch flush valve in a meter box shall be provided at the end of all dead-end lines. All laterals under road will be within a minimum 2-inch PVC casing (SDR 21 or 26), extending 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 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 400 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 1,000 feet or less or as recommended by the Fire Chief. All plans should be coordinated with the Fire Chief for fire hydrant location before review submittal. The spacing between fire hydrants in a commercial area shall be 500 feet or less or as recommended by the Fire Chief. Fire hydrants shall be a minimum of 40 feet from a structure for firefighting 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 City 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 City 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 City's Fee Schedule. Services will include installation of a valve at the City's main. The Developer will be responsible for all costs associated the fire service system on the customer-side of the valve.

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 City 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 City 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 City's main. Fire lines will be required to have a double detector check valve and detector check meter.

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. All service lines under roads must be encased in a minimum 2-inch I.D. PVC pipe.

Casing pipe and joints shall be of leakproof construction and capable of withstanding its design loading. All casing used for 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”	0.25”
4”	7 22”	12.50”	0.25”
6"	9.47”	14”	0.25”
8"	12.00”	16”	0.25”
10"	14.20”	18”	0.25”
12"	16.35”	20”	0.375”
14”	19.15”	24”	0.375”
16"	21.36”	26”	0.375”
18”	23.56”	28”	0.375”
20"	25.80”	30”	0.375”

3.6 Service Lines

Each water customer shall be required to sign a User’s Agreement prior to the meter being installed. Water service furnished for a given lot shall be used on the lot only. In new subdivisions or developments, long-side services may not be shared by two separate lots/customers. For lots with multiple tenants or customers, including apartments, individual meters shall be required; master meter assemblies are not allowed without written approval from the City. A common meter vault may be required by the City.

Services shall have a horizontal separation of 5 feet, minimum. When located near side lot lines, the Developer shall coordinate with local utilities to ensure that water services are located opposite of underground power transformer pads.

All service lines, 1" or smaller in new, residential subdivisions, shall be installed by the Developer. This shall be done by direct tapping the main and using PEX (200 psi-rated) with inserts at each fitting, equal to Rehau Municipex. All service lines shall be continuous with no splices. Developers shall provide and install meter boxes on each service line within the new development. Meter boxes shall be concrete with cast iron reader (AMR) lids unless otherwise specified by the City. The Developer shall set meter boxes flush with finished grade at or near the property line or, at the City’s option, on the consumer’s property within three (3) feet of the property line. Service lines shall be stubbed into the bottom of the meter boxes with nuts easily accessible. Prior to setting the meter boxes, the location of buried water service stubouts shall be marked; markers for water service stubouts shall be blue.

Tapping saddles will be allowed for connection to existing PVC and HPDE mains. For PVC mains, saddles shall be Ford S90, Style A hinged design or equivalent. For HPDE mains, saddles shall be Romac (202N-H) with spring washers or equivalent. Threads shall be CC for ¾” and 1” taps; IP (iron pipe) threads shall be provided for services greater than 1”. Corporation (F1000-3 or F1000-4) and curb stops (B43-332W or B43-444W) shall be Ford Meter Box or equivalent, as approved by the City with pack joint nuts.

Labor and materials for service line connections to existing water mains shall be provided by the City as set forth in the City's Fee Schedule. A suitable place for the meter assembly 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 City's rules and regulations and in full compliance with ADEM's Public Water Supply regulations.

The City 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 City 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 City's property caused by any vehicle, construction, excavation, land fill 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 City's personnel. Duly authorized agents of the City shall have access at all reasonable hours to the premises of the consumer for the purpose of installing or removing the City's property, inspecting piping, reading and testing meters, or for any other purpose in connection with the City'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 water mains shall be a minimum of 5 feet horizontally. When crossing a water main, the top of the sanitary sewer shall be a minimum of 24 inches below the bottom of the water main. If circumstance requires the sanitary sewer to be closer than 5 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 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 sewer or 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 and submitted to the City 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 City 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.
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 Chief upon review of the type of development (i.e., residential, commercial, industrial, etc.). In residential developments, the minimum needed fire flow is 750 gpm. 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 City deems special, the City will use its engineer to design these facilities to ensure compatibility with the City Utilities System. The City will have these items constructed with the Owner financing the project. In no case will the City receive ownership of any facility where this rule is not followed.

3.10 Oversized Facilities

The City 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 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 City would participate by paying the difference in the required facilities and the oversized facilities.

4.0 Material Specifications for Water Lines

4.1 Materials

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 City. 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 350, 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 or “grip” gaskets may be accepted with prior approval from the Owner. Grip gaskets, if allowed, shall be colored for easy identification.

The 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.

For water mains up to 10-inch diameter, high-density polyethylene (HDPE), DIPS, Type 4710, may be considered by the City. Dimension Ratio (DR) shall be DR-11, minimum, or as required by the City. Where DIPS is not available, IPS may be allowed. Fittings shall be ductile iron; connections shall be made with mechanical joint adapters and stainless-steel stiffeners.

Crosslinked polyethylene (PEXa) for water service piping, up to 1-inch, shall be UV-resistant blue, rated for 200 psi, equal to Rehau Municipex. Plastic inserts shall be included.

All water lines, regardless of material, shall include locator or “tracer” wire installed above the piping at a depth detectable by typical locator equipment. Tracer wire shall be blue, 10 AWG, solid construction. Warning tape shall be installed above water lines and tracer wire; tape shall have a minimum thickness of 4 mils and width of 3-inches, as manufactured by Rhino Marking and Protection Systems, Harris Industries, Inc. or approved equal.

4.2 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 for bedding and initial backfill 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 with the exception of final backfill in paved areas (top 18-inches) or bedding/initial backfill of polyethylene services.

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 City Construction Inspector.

Foundation backfill is a term used to describe a coarse stone aggregate which may be used 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.

4.3 Valves

Valves shall close clockwise with 3 turns per inch. Valves shall have mechanical joint or flange ends.

Gate valves shall be ductile iron, 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 zero 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 affect 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.

Brass ball valves shall be used on 2-inch water lines. Valve shall be as manufactured by Ford Meter Box, Model B11-777-NL, or approved equal.

4.4 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 American B-84-B and/or match hydrants currently required by the City. Fire hydrants must have 15-inch clearance from finished grade to the bottom of the 4-1/2-inch outlet.

4.5 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 compressive 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.

In new, residential subdivisions, all service lines and meter pits will be installed by the Developer’s contractor and must be approved by the City prior to installation of the City-provided meter and backflow preventer and prior to the City’s acceptance of 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. 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.

5.0 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 plan, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation. Neither the City nor its agents will 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 ensure 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 City’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 City’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 City’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 City 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 City’s discretion, make necessary repairs during this time or pay the City 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 City Construction Inspector. The City 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 (1) foot above the top of the pipe.

When water lines cross open ditches, crossing will maintain minimum cover or be protected with concrete if approved by the City.

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 ensure 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 restrained within the casing pipe. Failed bore attempts require the casing to be left in place, grout-filled 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 have supporting spacers equal to Cascade Waterworks Mfg.

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 City 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. 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 City. 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 City. 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 City’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 laid 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.

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 City must be notified and those residences and businesses that are affected must be given as much advance

warning as possible. If necessary, the City 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 or restrained 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 rods or anchor couplings shall connect the main to the valve and then the valve to the fire hydrant.

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-Tolidine 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 City 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 City will be paid to raise the meter after the initial installation in accordance with the supplemental regulations.

The City 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 City's meter box.

For the final inspection before acceptance by the City, all valve boxes shall be showing and the valve nuts shall be accessible. A representative from the Contractor and/or Developer's engineer will check each valve to verify the valve's being in the "on" position.

6.0 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 City Construction Inspector. Preliminary tests not observed by the City Construction Inspector will not be accepted. The City 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 City. 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 City. 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 City Construction Inspector. All piping shall be flushed with water to remove construction debris prior to testing. The section being tested will be sealed pressure-tight at each end with restrained valves, plugs or caps. The pipeline shall be filled with water and all air removed either at air release valves or through taps in to the pipe. Leakage shall not exceed the following:

A. DIP or PVC Pressure Test
   1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Owner, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
   2. Pressure Test shall be conducted within two (2) weeks of backfill installation.
   3. Contractor shall provide all equipment required to perform leakage and hydrostatic pressure tests.
   4. Test Pressure: Not less than 1.5 times the system design pressure or 50 psi in excess of maximum static pressure, whichever is greater.
   5. Conduct hydrostatic test for at least 2-hour duration on uncovered pipe and 8 hours for covered pipe.
   6. Test sections shall be limited to one (1) mile in length.
   7. No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
   8. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and

apply test pressure. At conclusion of tests, remove corporation cocks removed and plug resulting piping openings.

9. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
10. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test.
11. Repair or replace damaged or defective pipe, fittings, valves, hydrants, or joints discovered and repeat pressure test until results are satisfactory to the Owner.
12. Provide a copy of the pressure test chart to the Owner upon satisfactory completion.
13. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

$L = (SD\sqrt{P})/133,200$
L = allowable, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during leakage test, in pounds per square inch (gauge)

14. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

B. HDPE Pressure Test

1. Hydrostatic leakage testing shall comply with ASTM F2164. Joint leakage and any defective materials and/or workmanship shall be repaired or replaced by the Contractor at no additional cost to the Owner.
2. Pneumatic (compressed air) leakage testing of PE4710 pressure piping is prohibited.
3. Filling – Take all precautions to ensure that no air is trapped in the test section.
4. Pressure Test shall be conducted within two (2) weeks of backfill installation.
5. Contractor shall provide all equipment required to perform leakage and hydrostatic pressure tests.
6. Test Pressure: 50 psi in excess of the system design pressure, not to exceed 1.5 times the system design pressure.
7. Test sections shall be limited to one (1) mile in length.
8. Conduct hydrostatic test on covered pipeline. Heat fusion joints shall be completely cooled. Restrain all parts against lateral movement.
9. Test Procedure – Once air is removed and the test section is completely filled, water shall be added as required to maintain the test pressure for four (4) hours. At the end of this initial expansion period, the pressure shall be

reduced by 10 psi and monitored for one (1) hour during the test phase. Do not increase pressure or add make-up water.

10. If no visual leakage is observed and pressure during the test phase remains within steady (within 5.0% of the test phase pressure), a passing test is indicated.
11. If retesting is necessary, depressurize the test section for a minimum of eight (8) hours before retesting.
12. Repair or replace damaged or defective pipe, fittings, valves, hydrants, or joints discovered and repeat pressure test until results are satisfactory to the Engineer.
13. Provide a copy of the pressure test chart to the Owner upon satisfactory completion.

Bacteriological testing on approved water mains will be required in accordance with Section 5.2.

7.0 Backflow Prevention Plan and Ordinance

7.1 General

A cross connection is defined as:

1. any physical connection whereby the City'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 premise can be back-siphoned or reintroduced into the City's mains.

No cross connection of any kind shall be permitted between the water supply from the City'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 Water and Sewer 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 City'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, car washes, photograph processing plants, commercial laundries, and any other facilities designated by the City, 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 City, 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).

In order to protect the potable water in the City's mains which will be delivered to the general public, the City 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 City 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 City. Water service shall not be restored to such premises until the deficiencies have been corrected or eliminated to the satisfaction of the City 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 Water and Sewer 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 relief 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.