

# **Pelham, Alabama**

Standards for Construction of  
**Water Systems**

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Adopted \_\_\_\_\_

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## Section 1: 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 according to all Sections of this document, regardless of whether such facilities will be dedicated to the City, and shall be subject to inspection by the City as deemed necessary to insure compliance with the requirements contained herein.

These standards represent the approved construction practices and procedures for construction of City Utilities. Any special designs not covered by this document must be submitted to and approved by the City 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 City's Superintendent . The City's Superintendent 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 City's Superintendent 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 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.

**CITY**: The City of Pelham, Alabama or Pelham Water Works and their authorized agents.

**CITY CONSTRUCTION INSPECTOR**: An authorized representative of Pelham, 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 term "Owner" shall mean the company, organization, developer, or governmental agency who intends to design and construct the proposed sanitary sewer facilities or improvements. The terms "Developer, Owner/Developer" equal "Owner" and shall be used interchangeably.

**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 infiltration/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 Pelham 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 distributes 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
  - 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

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 the City Utility Systems and must regulate any proposed additions or changes to the system. 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 City Utility 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 to the following City representatives; City Engineer, Public Works Director, and Fire Chief. A total of two sets will be sent to the Public Works Director. The Public Works Director or his authorized representative will review the Drawings submitted and if necessary, will return one (1) set of markup drawings to the Design Engineer for revision and resubmittal. The Design Engineer will provide three (3) corrected sets of original drawings to the City. 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 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 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 on the following page.

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 Rules and Regulations. 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 advise the Owner/Developer that the work is being completed at risk of not being accepted. 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, 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. The Design Engineer or Owner/Developer shall prepare, for the City to execute, all required Right of Way Accommodation Permits. Currently the State requires the City 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 City by the State. The City'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 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 the construction drawings at the time they are submitted 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 PELHAM**

**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 Pelham 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 City of Pelham. 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 City of Pelham 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 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 City of Pelham, Alabama.

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

\_\_\_\_\_  
NOTARY PUBLIC

(SEAL)  
My Commission Expires:  
  
\_\_\_\_\_

## **Section 2: 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 determine the size 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 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 before work begins. 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. 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 City 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 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. Three (3) sets of corrected plans will then be required by the City along with a review 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 a copy of these drawings on CAD shall be submitted to the City 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 City 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 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 Pelham, 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 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. For the first year and at the City's option, repairs if needed will be made by the City and charged to the Developer.

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.

## **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 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. 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 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 Pelham, 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.

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. 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 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 Pelham rules and regulations, as field surveyed after construction.

Signature

Alabama Licensed Engineer or Surveyor  
Registration Number

### **3.5 General Design Criteria**

In areas that have been filled and the proposed water line will be within the fill, ductile iron pipe shall be used. In fills greater than 8 feet restrained joints 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 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 one

inch flush valve in a meter box shall be provided at the end of all dead end lines. All 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 2000 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 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 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, alternations and operation of the fire service system. Service charges for the fire service system shall be as set forth in the City 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 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.

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. 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:

<u>PIPE SIZE</u>	<u>O.D. BELL</u>	<u>MIN. CASING O.D.</u>	<u>THICKNESS</u>
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 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 direct tapping the main (no tapping saddles) and using type "K" soft copper tubing in roll form. Corporation and curb stops shall be A.Y. McDonald "T" Series or equivalent approved by the City. All service lines shall be continuous with no splices. Service lines shall be stubbed up approximately one foot above finished grade and wrapped in insulation to prevent freezing. Meter boxes equal to the number of services installed shall be delivered to the City Water Works Shop. Meter boxes shall be plastic with cast iron reader lids unless otherwise specified by the City. Water service lines from the City main to the meter shall be copper. The City may install its meter 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. 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 City's rules and regulations and in full compliance with ADEM 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 10 feet horizontally. When crossing a water main, the top of the sanitary sewer shall be a minimum of 24 inches below the bottom of the water main. If 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 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 insure 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 Oversize 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.

## Section 4: 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 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", U.S. Pipe "TR Flex, or Clow "Superlock". Field lock gaskets will not be accepted.

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.

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.

### 4.2 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 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 City Construction Inspector.

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

### **4.3 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.

### **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 Darling B84B 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 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 City prior to installation and prior to the City 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. 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 City 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 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 up grade 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. Sheet piling, 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, warning tape will be placed above the pipe for 30' each side of ditch banks. 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 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 place, 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 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 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 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 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 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 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-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 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. The City 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 City shall provide locks for the one (1) inch locking curb stops on cul-de-sacs.

## 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 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. Testing will be 1-1/2 times the normal operating pressure but not less than 150 pounds per square inch. The City 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:

<u>Pipe Diameter</u>	<u>Maximum Leakage per 1,000 Feet of Pipe in Gallons per Hour</u>		
	<u>at 150 psi</u>	<u>at 200 psi</u>	<u>at 250 psi</u>
3 Inches	0.28 GPH	0.32 GPH	0.36 GPH
4 Inches	0.37 GPH	0.43 GPH	0.47 GPH
6 Inches	0.55 GPH	0.64 GPH	0.71 GPH
8 Inches	0.74 GPH	0.85 GPH	0.95 GPH
10 Inches	0.92 GPH	1.06 GPH	1.19 GPH
12 Inches	1.10 GPH	1.28 GPH	1.42 GPH
14 Inches	1.29 GPH	1.48 GPH	1.66 GPH
16 Inches	1.47 GPH	1.70 GPH	1.90 GPH
18 Inches	1.66 GPH	1.91 GPH	2.14 GPH
20 Inches	1.84 GPH	2.12 GPH	2.37 GPH

Tests shall be made with a pressure recording gauge as provided by the City. 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.

## Section 7: Backflow Prevention Plan and Ordinance

### 7.1 General

A cross connection is defined as:

1. any physical connection whereby the Board'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 Board's mains.

No cross connection of any kind shall be permitted between the water supply from the Board'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 Board, 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 Board'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 Board, 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 Board, 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 Board's mains which will be delivered to the general public, the Board 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 Board 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 Board. Water service shall not be restored to such premises until the deficiencies have been corrected or eliminated to the satisfaction of the Board 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 Board. 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.

# **Standard Drawings and Details**

GENERAL NOTES:

- SAFETY IS THE RESPONSIBILITY SOLELY OF THE CONTRACTOR. THE CITY OF PELHAM (REFERRED TO AS THE CITY HEREIN) IS NOT RESPONSIBLE FOR SAFETY NOR THE MEANS AND METHODS OF THE CONTRACTOR. THIS APPLIES THROUGHOUT THE PROJECT.
- CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF PELHAM REGULATIONS AND PRACTICES.
- CONSTRUCTION DRAWINGS SHALL BE BASED ON STATE PLANE COORDINATES AND USGS DATUMS.
- NOTIFY MUNICIPAL CONSULTANTS, (822-0387) 48 HOURS IN ADVANCE OF BEGINNING CONSTRUCTION OR WHEN RETURNING TO WORK FOLLOWING A BREAK IN CONSTRUCTION ACTIVITIES GREATER THAN FOUR DAYS.
- AS-BUILT DRAWINGS ARE REQUIRED. NO CONNECTIONS TO CITY WATER OR SEWER MAINS WILL BE PERMITTED UNTIL COMPLETE AS-BUILT DRAWINGS ARE RECEIVED AND APPROVED BY THE CITY. DRAWINGS SHALL SHOW SEWER SYSTEM, LATERAL CONNECTIONS AND LOCATIONS, CONNECTIONS TO THE SYSTEM, STORM SEWER LOCATIONS, STREETS, LOT LINES, LOT DIMENSIONS, GRADES, ELEVATIONS, AND OTHER UTILITIES SUCH AS GAS, ELECTRICAL, TELEPHONE, WATER AND ALL OTHER PERTINENT INFORMATION ON AN APPROPRIATE SCALE. ENGINEER SHALL PROVIDE A DIGITAL COPY IN ACCEPTABLE AUTOCAD COMPATIBLE FORMAT AND A HARD COPY SUBMITTED ON MYLAR. AS BUILT DRAWINGS SHALL BE SEALED BY A REGISTERED ENGINEER OR LAND SURVEYOR AND SHALL CONTAIN THE FOLLOWING STATEMENT:  
  
I, \_\_\_\_\_, A REGISTERED ENGINEER AND/OR LAND SURVEYOR IN THE STATE OF ALABAMA CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED ON THIS DRAWING AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS DIRECTLY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE INFORMATION IS TRUE, ACCURATE, AND COMPLETE.  
  
SIGNED: \_\_\_\_\_ PE AND/OR LS NO. \_\_\_\_\_
- THE DEVELOPER SHALL PROVIDE A COMPLETE DESIGN AND CONSTRUCTION COST SUMMARY OF THE WATER AND/OR SEWER FACILITIES INSTALLED PRIOR TO AND AS A CONDITION OF ACCEPTANCE BY THE CITY.
- EASEMENTS FOR WATER AND SEWER UTILITIES, IF NOT PREVIOUSLY DEDICATED, ARE HEREBY DEDICATED EXCLUSIVELY TO THE CITY, ITS SUCCESSORS AND ASSIGNS FOR CONSTRUCTION AND ACCESS IN THE INSTALLATION, OPERATION, REPLACEMENT, AND MAINTENANCE OF WATER AND/OR SEWER LINES AND THEIR APPURTENANCES. ALL EASEMENTS TO BE MAINTAINED BY THE CITY SHALL BE A MINIMUM OF 20' WIDTH (30' WIDTH MIN. FOR MORE THAN ONE UTILITY) AND CLEARED AND GRADED SUITABLE FOR MAINTENANCE VEHICLE ACCESS. MAXIMUM LONGITUDINAL SLOPE OF EASEMENT IS 20 DEGREES. MAXIMUM CROSS-SECTIONAL SLOPE IS 10 DEGREES.
- PLANS ARE APPROVED FOR A PERIOD OF 180 DAYS. IF CONSTRUCTION IS NOT SUBSTANTIALLY UNDER WAY AT THE END OF 180 DAYS, PLANS ARE VOID AND NEW PLANS MUST BE SUBMITTED AND APPROVED. IF THERE ARE ANY VARIATIONS AFTER APPROVAL, PLANS SHALL BE RESUBMITTED TO THE CITY ENGINEER.
- THE CITY OR THEIR REPRESENTATIVE WILL INSPECT THE CONSTRUCTION AS IT PROGRESSES TO INSURE COMPLIANCE WITH SPECIFICATIONS, HOWEVER IT SHALL REMAIN THE SOLE RESPONSIBILITY OF THE DEVELOPER TO PROVIDE A COMPLETE SYSTEM, MEETING ALL REQUIREMENTS.
- CONTRACTOR(S) HIRED BY DEVELOPER TO INSTALL WATER AND/OR SEWER IMPROVEMENTS MUST BE LICENSED BY THE STATE LICENSING BOARD FOR GENERAL CONTRACTORS AND MUST BE ACCEPTABLE TO THE CITY.
- PLANS ARE NOT VALID WITHOUT A SIGNED APPROVAL STAMP FROM THE CITY. APPROVED PLANS MUST BE ON SITE AT ALL TIMES DURING CONSTRUCTION.
- PLANS SHALL SHOW THE EXISTING GROUND ELEVATION (GRADE) AND THE PROPOSED FINAL STREET ELEVATION OR GRADE.
- THE LOCATION AND TYPE OF EXISTING UTILITIES ARE APPROXIMATE. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING LINE LOCATIONS, SIZES, AND MATERIALS OF PIPE BEFORE ORDERING MATERIALS FOR CONNECTIONS.
- ALL CONNECTIONS TO EXISTING LINES TO BE COORDINATED WITH THE CITY OF PELHAM MINIMUM OF 48 HOURS IN ADVANCE TO MINIMIZE INTERRUPTION OF WATER/SEWER SERVICE.
- THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE APPROPRIATE AGENCY TWO WORKING DAYS BEFORE DIGGING COMMENCES TO VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES, DRAINAGE, AND OBSTRUCTIONS AS REQUIRED BY ALABAMA STATE LAW. ALABAMA ONE CALL, INC. MAY BE CONTACTED AT 1-800-292-8525, OR AT 252-4444 IN BIRMINGHAM. CONTRACTOR SHALL REPAIR AND/OR REPLACE IN-KIND ANY SUCH ITEMS THAT ARE DAMAGED BY HIS CREWS DURING CONSTRUCTION. NEITHER THE CITY OF PELHAM NOR THE UTILITIES ARE RESPONSIBLE FOR INFORMATION REGARDING LOCATION OR DEPTH THAT THEY PROVIDE TO THE CONTRACTOR. THE ACCURACY OF SUCH INFORMATION IS UNKNOWN AND IS NOT GUARANTEED. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE LOCATION OF ALL SUCH UTILITIES INCLUDING ALL SERVICE LINES TO HOUSES, RESIDENCES, AND/OR BUSINESSES, ETC.
- CONTRACTOR SHALL LOCATE AND UNCOVER ALL POTENTIALLY CONFLICTING UTILITIES BEFORE CONSTRUCTION GRADES OR DEPTHS ARE FINALIZED AND PIPE IS LAID.
- FITTINGS REQUIRED IN THE FIELD BUT NOT SHOWN ON THE DRAWINGS MUST BE AUTHORIZED BY THE CITY OR THEIR REPRESENTATIVE.
- CONCRETE THRUST BLOCKS REQUIRED AGAINST ALL FITTINGS AND ARE TO BE POURED AGAINST UNDISTURBED EARTH. ALL FITTINGS SHALL BE WRAPPED IN FELT PAPER OR PLASTIC BEFORE CONCRETE THRUST BLOCKS ARE POURED. ALL PIPE BRACING SHALL BE LEFT UNCOVERED UNTIL INSPECTED BY THE CITY. CONCRETE THRUST BLOCKS AND COLLARS MUST BE CURED A MINIMUM OF 5 DAYS PRIOR TO CUTTING AN EXISTING LINE OR APPLYING TEST PRESSURES TO THE NEW LINE.
- ALL RESTRAINED JOINT PIPE SHALL BE FULLY EXTENDED FROM THE ADJOINING PIPE BELL DURING INSTALLATION.
- CONTRACTOR SHALL COORDINATE WITH CITY BEFORE MAKING ANY HOT TAP CONNECTIONS TO EXISTING CITY MAINS (WATER OR SEWER). CONTRACTOR SHALL KNOW WHERE CLOSEST EXISTING ISOLATION VALVES ARE LOCATED IN CASE HOT TAP OPERATION FAILS.
- RESERVED.
- ALL ROCK SHALL BE UNDERCUT A MINIMUM OF 12" BELOW THE PIPE INVERT AND PIPE IS TO BE BEDDED IN STONE - SEE DETAILS. PIPE BEDDING MATERIAL SHALL BE #57 CRUSHED STONE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- ALL OPEN CUT TRAFFIC WAYS, ROADWAYS, PARKING LOTS, DRIVES, FUTURE DRIVES, ETC., AND ALL AREAS LYING WITHIN PRISM OF TRAFFIC WAYS SHALL HAVE PUGMIX/MOIST, TYPE "B" BACKFILL AS SPECIFIED IN SECTION 825 OF A.D.O.T. SPECIFICATION MANUAL AND COMPACTED TO 98% STANDARD PROCTOR DENSITY MINIMUM WITH VIBRATORY COMPACTOR (MAX. 8' LIFTS) FOR ITS ENTIRE TRENCH HEIGHT AND WIDTH TO PREVENT SETTLEMENT. ALL ASPHALT AND CONCRETE TO BE NEATLY SAW CUT.
- ALL CONSTRUCTION AND WORK ON PUBLIC R.O.W. (I.E., CITY STREETS, COUNTY ROADS, STATE R.O.W., ETC.) SHALL BE PROPERLY CONDUCTED TO CONFORM WITH THE CORRECT TRAFFIC BARRICADES, FLAG MEN, TRAFFIC SIGNALS, METAL PLATES, ETC. AS REQUIRED BY THE RESPECTIVE OWNERS. MINIMUM REQUIREMENTS SHALL BE CONFORMANCE WITH SECTION "6" OF THE ALABAMA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
- THE CONTRACTOR SHALL HAVE ON THE JOB, AND IDENTIFIED, A RESPONSIBLE FOREMAN IN CHARGE OF THE WORK. WHEN APPLICABLE THE CONTRACTOR SHALL HAVE HIS LICENSED PLUMBER IDENTIFIED.
- WATER AND SEWER MAINS CROSSING COUNTY, STATE, OR FEDERAL PAVED HIGHWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH EXISTING FEDERAL, STATE, OR COUNTY HIGHWAY REGULATIONS. THE CONSTRUCTION OF SANITARY SEWERS UNDER ANY RAILROAD SHALL MEET ALL EXISTING REQUIREMENTS AND REGULATIONS OF THE PARTICULAR RAILROAD INVOLVED, WITH THE EXCEPTION THAT THE SANITARY SEWER SHALL BE DUCTILE IRON PIPE MEETING THE REQUIREMENTS OF THESE SPECIFICATIONS.
- FOUNDATION BACKFILL IS A TERM USED TO DESCRIBE A COARSE STONE AGGREGATE WHICH MAY BE USED AT THE DIRECTION OF THE CITY 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 CRUSHED LIMESTONE. THE GRADATION OF STONE FOR FOUNDATION BACKFILL SHALL BE DETERMINED ON A CASE BY CASE BASIS.
- PAVEMENT WHICH MUST BE REMOVED FOR CONSTRUCTING THE WATER AND/OR SEWER LINES, MANHOLES, AND APPURTENANCES SHALL BE REPLACED AS SPECIFIED BY THE GOVERNING AUTHORITY.
- DUCTILE IRON PIPE SHALL BE POLYWRAPPED IN AREAS OF CORROSIVE SOIL. ANY AREA CONTAINING OTHER CORROSIVE MATERIALS (I.E., RAILROAD SLAG, ETC.) WILL ALSO REQUIRE THE POLYWRAPPING OF ALL DUCTILE IRON. POLYETHYLENE FILL SHALL BE CLASS C AND IN TUBE OR SHEET FORM COMPLYING WITH ANSI/AWWA C105/A21.5.

- ALL PIPE AND FITTINGS SHALL BE HANDLED IN SUCH A MANNER TO PREVENT BREAKAGE OF THE PIPE AND/OR ITS LINING. ANY DAMAGED PIPE SHALL NOT BE USED.
- THE END OF THE NEW WATER/SEWER PIPE SHALL BE PLUGGED WHEN THE WORK IS LEFT TEMPORARILY TO PREVENT DEBRIS, MUD, GRAVEL ETC. FROM ENTERING THE PIPE. ALL MATERIAL THAT ENTERS THE PIPE SHALL BE REMOVED IMMEDIATELY.
- ALL MATERIAL USED IN THE CONSTRUCTION SHALL BE NEW AND UNUSED. DUCTILE IRON PIPE SHALL MEET AWWA AND ANSI SPECIFICATIONS C-150, C-151, A 21.50, AND A 21.15 RESPECTIVELY. ALL DUCTILE IRON PIPE SHALL BE CLASS 350 UNLESS OTHERWISE NOTED. ALL WATER MAINS 4" AND LARGER SHALL BE DUCTILE IRON. DUCTILE IRON PIPE USED ON 8" SEWERS SHALL BE TAP COATED OUTSIDE AND CEMENT LINED INSIDE WITH CEMENT LINING CONFORMING TO THE REQUIREMENTS OF ANSI 21.4 (AWWA C104). COLLECTOR GRAVITY SEWERS LARGER THAN 8" AND ALL FORCE MAINS SHALL HAVE AN INTERIOR COATING OF INDURON PROTECTO 401 CERAMIC EPOXY (40 MILS THICK). WHERE ALLOWED BY THE CITY, GRAVITY SEWERS LESS THAN 12" IN DIAMETER MAY BE PVC, MINIMUM OF SDR 26.

SEWER MAIN CONSTRUCTION NOTES:

- ALL TESTING SHALL BE PER THE CITY'S TESTING STANDARDS. SEE NOTES REGARDING TESTING. ALL MANHOLES SHALL BE VACUUM TESTED. MANHOLES IN PAVED AREAS SHALL NOT BE TESTED UNTIL PAVEMENT IS IN PLACE. ALL GRAVITY SEWER AND FORCE MAINS SHALL BE PRESSURE TESTED. SEWER MAINS IN AREAS WITH OTHER UTILITIES SHALL NOT BE TESTED UNTIL OTHER UTILITIES (PHONE, GAS, POWER, ETC) ARE INSTALLED. ALL TESTING MUST BE PERFORMED IN THE PRESENCE OF THE CITY OR THEIR REPRESENTATIVE. ALL GRAVITY SEWERS SHALL BE VIDEO INSPECTED. A COPY OF THE VIDEO SHALL BE PROVIDED TO THE CITY FOR REVIEW PRIOR TO ACCEPTANCE. ANY DEFICIENCIES DISCOVERED SHALL BE REPAIRED TO THE STANDARD OF QUALITY SPECIFIED BY THE CITY AND THE LINE RE-VIDEOED IN ORDER FOR THE SEWER(S) TO BE CONSIDERED FOR ACCEPTANCE.
- PRECAST REINFORCED CONCRETE MANHOLES SHALL BE USED AND CONSTRUCTED IN ACCORDANCE WITH ASTM C-478. REINFORCED CONCRETE MANHOLES SHALL CONSIST OF MANHOLE BASE SECTIONS, RISER SECTIONS, TRANSITION SECTIONS, AND CONICAL SECTIONS. THE MANHOLE COMPONENTS SHALL BE CONFIGURED TO MINIMIZE THE NUMBER OF JOINTS REQUIRED PER MANHOLE. PORTLAND CEMENT CONCRETE USED IN THE PRECAST REINFORCED CONCRETE MANHOLES SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS. THE CONCRETE SHALL CONTAIN TYPE II PORTLAND CEMENT.
- CONICAL SECTIONS SHALL BE WET CAST, ECCENTRIC ONLY. CONCENTRIC SECTIONS WILL NOT BE ALLOWED. CONICAL SECTIONS SHALL TRANSITION FROM 48" DIAMETER TO A 27" CLEAR ACCESS OPENING AND BE EITHER 24", 36", OR 48" HIGH. WHERE BOLT DOWN MANHOLE FRAME AND COVERS ARE INDICATED ON THE DRAWINGS, CONICAL SECTIONS SHALL BE SUPPLIED WITH FOUR (4) STAINLESS STEEL ANCHOR BOLTS. STANDARD MANHOLES OF PRECAST CONCRETE CONSTRUCTION, AND OTHER MANHOLES OF PRECAST CONCRETE CONSTRUCTION HAVING ENTERING SEWERS OF 24" DIAMETER OR SMALLER SHALL HAVE PRECAST OPENINGS IN THE MANHOLE WALLS FOR INCOMING OR OUTGOING SEWERS AS INDICATED ON THE PLANS.
- MANHOLE TOP SECTION SHALL BE SUITABLE FOR MOUNTING CAST IRON MANHOLE FRAMES AND COVERS. RISERS SHALL BE FURNISHED IN SUITABLE INCREMENTS TO AN ELEVATION NOT MORE THAN 12 INCHES BELOW THE BASE OF THE CAST IRON FRAME AND COVER.
- MANHOLE JOINTS SHALL RECEIVE O-RING GASKET, MASTIC, AND MPED WITH APPROVED NON-SHRINKING GROUT ON BOTH INTERIOR AND EXTERIOR OF MANHOLE.
- MANHOLE AND INLET STEPS SHALL BE MADE OF STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC, MODEL PS1 PF, AS MANUFACTURED BY M.A. INDUSTRIES, INC. THEY SHALL BE INSTALLED AT MAXIMUM 16" INTERVALS. MANHOLE STEPS SHALL CONFORM WITH ROD AND PULL OUT RATINGS MEETING OSHA STANDARDS.
- ALL MANHOLES SHALL BE CONSTRUCTED IN A MANNER TO RENDER THEM WATER TIGHT. ANY VISIBLE LEAKS SHALL BE REPAIRED. THE CONCRETE FOUNDATION OF ALL MANHOLES SHALL SIT UPON UNDISTURBED SOIL OR APPROVED BEDDING MATERIAL. ALL INVERT CHANNELS SHALL BE SMOOTH AND ACCURATELY SHAPED TO A SEMICIRCULAR BOTTOM CONFORMING TO THE INSIDE OF THE ADJACENT SEWER SECTION. INVERTS SHALL BE FORMED DIRECTLY IN THE MANHOLE BASE. INVERTS SHALL EXTEND UP HALF OF THE DIAMETER OF THE PIPE. CHANGES IN THE DIRECTION OF THE SEWER AND ENTERING BRANCHES SHALL HAVE A TRUE CURVE OF AS LARGE A RADIUS AS THE SIZE OF THE MANHOLE WILL PERMIT.
- WHERE REQUIRED BY THE CITY OR INDICATED ON THE DRAWINGS AND IN ALL FLOOD AREAS, THE CONTRACTOR SHALL INSTALL MANHOLE JOINT STRAPS TO PREVENT FLOTATION. BOLTED TOGETHER MANHOLE JOINTS SHALL BE PERMANENTLY STRAPPED UTILIZING THREE (3) BITUMASTIC COATED OR STAINLESS STEEL STRAP ANCHORS LOCATED 120 DEGREES APART CIRCUMFERENTIALLY.
- MANHOLE FRAMES AND COVERS IN AREAS PRONE TO FLOODING, PONDING, OR IN HIGH RUNOFF AREAS SHALL BE WATER TIGHT. MANHOLES SHALL BE SET A MINIMUM OF 2' ABOVE FLOOD ELEVATIONS OR FINISHED GROUND, WHICHEVER IS HIGHER. MANHOLE COVERS OUTSIDE OF ROADWAY AREA NOT PRONE TO FLOODING, PONDING, OR HIGH RUNOFF SHALL BE SET 1' ABOVE FINISHED GRADE, UNLESS APPROVED OTHERWISE.
- DISTANCES BETWEEN MANHOLES SHALL NOT EXCEED 400' IN GENERAL, NOR 275' IN SUBDIVISIONS. A MANHOLE WILL BE REQUIRED AT ANY HORIZONTAL OR VERTICAL CHANGE IN SANITARY SEWER GRADE OR ALIGNMENT AND AT THE END OF EACH GRAVITY SANITARY SEWER MAIN.
- A SAMPLING MANHOLE IS REQUIRED ON THE LATERAL OF EACH BUSINESS OR INDUSTRY WHOSE DISCHARGES ARE NOT CONSIDERED "DOMESTIC" SEWAGE BY THE CITY INTO THE CITY'S MAINS. THE SAMPLING MANHOLE SHALL BE A MANHOLE PER THE CITY'S STANDARDS AND BE ACCESSIBLE AT ALL TIMES FOR CITY PERSONNEL AND LOCATED ON CITY, COUNTY, OR STATE R.O.W.
- MINIMUM SLOPE ON 8" GRAVITY SEWER SHALL BE 0.4% UNLESS REQUIRED OTHERWISE BY A CUSTOMER SEWER SERVICE AGREEMENT WITH THE CITY.
- DUCTILE IRON PIPE IS REQUIRED WHERE PIPE IS LOCATED UNDER STREETS OR OTHER HIGH LOAD AREAS, CREEK AND DRAINAGE CROSSINGS, GRAVITY SEWERS 12" AND LARGER, AT DEPTHS OF 10' OR MORE, SLOPES GREATER THAN 14.00%, BETWEEN STRUCTURES WHERE LOCATED IN AN EASEMENT, AND WHERE PERMITTED BY THE CITY, DEPTHS LESS THAN 3'.
- THERE SHALL BE A MINIMUM OF 3' COVER ON ALL SANITARY SEWER LINES.
- WHERE DUCTILE IRON PIPE CONNECTS INTO ANOTHER PIPE MATERIAL, A DUCTILE IRON MECHANICAL JOINT SLEEVE SHALL BE USED.
- ALL FILL AREAS CONTAINING SANITARY SEWER PIPE SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.
- SERVICE LATERALS CONNECTING TO THE CITY SEWER SYSTEM ARE OWNED AND SOLELY MAINTAINED BY THE OWNER OF THE PROPERTY BEING SERVED. THE CITY ASSUMES NO RESPONSIBILITY FOR SERVICE LATERAL MAINTENANCE.
- AT NO TIME SHALL SANITARY SEWER LINE BE ALLOWED TO PENETRATE A STORM SEWER.
- EACH PLATTED LOT SHALL HAVE ITS INDIVIDUAL SANITARY SEWER LATERAL. EACH DUPLEX, APARTMENT, OR CONDOMINIUM WHICH HAS THE POTENTIAL TO BE SOLD AS AN INDIVIDUAL LOT SHALL HAVE ITS SEPARATE SANITARY SEWER LATERAL. IF A SINGLE FAMILY DWELLING IS BUILT UPON SEVERAL LOTS, ONLY ONE SANITARY SEWER LATERAL WILL BE RECEIVED. IT IS THE INTENT THAT EACH SINGLE FAMILY OWNED UNIT SHALL HAVE ITS OWN SEPARATE SANITARY SEWER LATERAL. THE LATERAL SHALL BE A MINIMUM 4 INCH.
- LATERALS ENTERING A MANHOLE SHALL BE DUCTILE IRON.
- CONNECTIONS TO SERVICE LATERALS SHALL BE MADE USING A MECHANICAL JOINT SLEEVE WITH TRANSITION GASKETS AS REQUIRED OR A NO HUB COUPLING.
- TRENCHES FOR ALL SANITARY SEWER PIPE AND LATERALS SHALL BE NOT LESS THAN 12" OR MORE THAN 16" WIDER THAN THE OUTSIDE DIAMETER OF THE PIPE.
- ALL GRAVITY SANITARY SEWER MAINS SHALL BE LAID TO A TRUE AND ACCURATE GRADE USING A LASER.
- ALL STREETS OR ROADS SHALL BE GRADED TO SUBGRADE BEFORE SANITARY SEWER CONSTRUCTION BEGINS. NO SANITARY SEWER LATERAL SHALL BE INSTALLED UNTIL THE SUBDIVISION LOTS HAVE BEEN STAKED BY THE DEVELOPER'S ENGINEER.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING MARKING TAPE WITH ALUMINUM BACKING TWO FEET BELOW FINISHED GRADE. THIS TAPE SHALL BE MARKED "SEWER LINE."

- ALL BACKFILL SHALL BE FREE OF STUMPS, LIMBS, GARBAGE, OR OTHER DEBRIS, OR MATERIAL WHICH WOULD MAKE IT IMPOSSIBLE TO OBTAIN 98% COMPACTION STANDARD PROCTOR. A 98% COMPACTION WILL BE REQUIRED UNDER ALL STREETS ON SANITARY SEWER MAINS AND LATERAL TRENCHES. COMPACTION TO BE PER THE ALABAMA HIGHWAY DEPARTMENT STANDARDS. WHEREVER THE SUBGRADE IS BY NATURE TOO WET, SOFT, OR MUCKY IN THE OPINION OF THE CITY OR THEIR REPRESENTATIVE FOR THE PROPER INSTALLATION OF THE SEWER, HE MAY REQUIRE THE CONTRACTOR TO UNDERCUT THE DITCH AND BACKFILL WITH CRUSHED STONE OR GRAVEL THREE-QUARTER INCH SIZE OR LESS. THE STONE SO PLACED SHALL BE BROUGHT TO GRADE AND COMPACTED. AT ANY POINT ALONG THE EXCAVATION WHERE ROCK IS ENCOUNTERED, THE TRENCH SHALL BE EXCAVATED A MINIMUM OF ONE FOOT BELOW GRADE AND BACKFILLED TO GRADE WITH CRUSHED STONE OR OTHER APPROVED MATERIALS. NO ROCK SHALL BE REPLACED AS BACKFILL.
- ANY PROPOSED PIER DESIGN SHALL BE APPROVED BY THE CITY.
- SANITARY SEWER PIPE SHALL BE SUPPORTED UNDER ITS ENTIRE LENGTH, UNLESS SPECIFIC APPROVAL IS GIVEN BY THE CITY IN WRITING.
- DURING CONSTRUCTION OF SANITARY SEWER MAINS AND APPURTENANCES THE CONTRACTOR SHALL NOT ALLOW DIRT, DEBRIS, ETC. TO BE WASHED FROM THE NEW CONSTRUCTION INTO THE EXISTING SEWER MAINS.
- AT THE CITY'S OPTION, PIPE DEFLECTION MAY BE TESTED, AT CONTRACTOR'S EXPENSE, BY PULLING A MANDREL THROUGH THE PIPE.

WATER MAIN CONSTRUCTION NOTES:

- ALL CONNECTIONS TO EXISTING LINES TO BE COORDINATED WITH THE CITY OF PELHAM TO MINIMIZE INTERRUPTION OF WATER SERVICE.
- WATER MAIN SHALL HAVE A MINIMUM OF 30" OF COVER IN NON-PAVED AREAS AND A MINIMUM OF 36" IN PAVED AREAS UNLESS REQUIRED OTHERWISE.
- WATER MAIN SHALL HAVE A MINIMUM HORIZONTAL SEPARATION OF 5' FROM NEAREST SANITARY SEWER MAIN AND MAINTAIN A MINIMUM OF 18" VERTICAL CLEARANCE FROM THE BOTTOM OF THE WATER MAIN TO THE TOP OF THE SANITARY SEWER MAIN.
- WATER MAIN SHALL BE TESTED AND DISINFECTED PER THE CITY'S STANDARDS AND ADEM'S RULES AND REGULATIONS PRIOR TO PLACING IN SERVICE.
- ALL WATER MAINS SHALL BE DUCTILE IRON PIPE.
- ALL WATER MAIN FITTINGS SHALL BE DUCTILE IRON MECHANICAL JOINT FITTINGS WITH RESTRAINING GLANDS (EBAA IRON MEGALUGS OR EQUAL), CONCRETE THRUST BLOCKS, AND RODDED WHERE POSSIBLE. SEE ADDITIONAL NOTES REGARDING CONCRETE KICKERS.
- PIPE SHALL BE LAID ON RISING OR FALLING GRADES WITH SUFFICIENT DEPTH TO ELIMINATE AIR POCKETS THROUGHOUT PROJECT UNLESS AN AIR RELEASE VALVE IS SHOWN. NO ADDITIONAL AIR RELEASE VALVES WILL BE ADDED TO PROJECT WITHOUT APPROVAL OF THE ENGINEER.
- CONTRACTOR SHALL COORDINATE WITH OWNER BEFORE MAKING EACH HOT TAP CONNECTION TO EXISTING WATER MAINS. CONTRACTOR SHALL KNOW WHERE CLOSEST EXISTING ISOLATION VALVES ARE LOCATED IN CASE HOT TAP OPERATION FAILS. THE TAPPING SLEEVE AND VALVE AND ALL EQUIPMENT USED TO MAKE THE HOT TAP SHALL BE PROPERLY STERILIZED PRIOR TO BEGINNING THE HOT TAP OPERATION.
- RESTRAINED JOINT PIPE SHALL BE USED WITHIN CASINGS AND FILLS GREATER THAN 8'. RESTRAINED JOINT GASKETS MAY BE SUBSTITUTED FOR RESTRAINED JOINT PIPE AS DETERMINED BY THE CITY.
- ALL FILL AREAS SHALL BE COMPACTED TO A MIN. 95% SPD PRIOR TO THE INSTALLATION OF ANY UTILITIES.
- STREETS SHALL BE GRADED TO WITHIN 6" OF FINISHED GRADE AND THE DEVELOPER'S ENGINEER SHALL STAKE THE BACK OF THE CURB AND LOT CORNERS PRIOR TO WATER MAIN INSTALLATION.

STORMWATER BMP GENERAL NOTES:

THE FOLLOWING REQUIREMENTS ARE TO BE CONSIDERED MINIMUM STANDARDS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING EROSION AND SEDIMENT CONTROL IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL LAWS, CODES AND REGULATIONS. CONTRACTOR SHALL NOTE THAT THE PROJECT MAY BE LOCATED WITHIN THE ENVIRONMENTALLY SENSITIVE CAHABA RIVER WATERSHED. THE CONTRACTOR SHALL OBTAIN AN NPDES PERMIT FOR THE PROPOSED WORK AS REQUIRED BY THE ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (ADEM).

- THE CONTRACTOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES (BMP'S) FOR THE PREVENTION AND CONTROL OF NONPOINT SOURCES OF POLLUTANTS DURING AND AFTER PROJECT IMPLEMENTATION. THE CONTRACTOR, AT A MINIMUM, MUST IMPLEMENT BMP'S AS PROVIDED IN THE ALABAMA HANDBOOK FOR EROSION CONTROL, SEDIMENT CONTROL, & STORMWATER MANAGEMENT ON CONSTRUCTION SITES & URBAN AREAS, AS AMENDED, AND THE EPA STORMWATER POLLUTION PREVENTION FOR CONSTRUCTION ACTIVITIES-DEVELOPING POLLUTION PREVENTION PLANS AND BEST MANAGEMENT PRACTICES, AS AMENDED. THE EROSION CONTROL DEVICES SHOWN ON THE CITY APPROVED PLANS SHALL BE FOLLOWED AT ALL TIMES. ADDITIONAL BMP'S SHALL BE IMPLEMENTED AS NEEDED TO PREVENT EROSION AND SILTATION FROM THE SITE.
- TO THE EXTENT PRACTICAL, THE CONTRACTOR SHALL SCHEDULE HIS ACTIVITIES TO MINIMIZE THE AMOUNT OF AREA DISTURBED AT ANY ONE TIME.
- ALL STOCKPILE EXCAVATED MATERIAL SHALL BE GRASSED OR COVERED WITHIN 72 HOURS OF STOCKPILING. GRASSING AND FERTILIZATION OF STOCKPILED SOILS SHALL BE AS PER THE ALABAMA HANDBOOK FOR EROSION CONTROL, SEDIMENT CONTROL & STORMWATER MANAGEMENT ON CONSTRUCTION SITES & URBAN AREAS. SEED RATES SPECIFIED IN THE MANUAL SHALL BE DOUBLED.
- CONTRACTOR SHALL AS A MINIMUM INSPECT STORMWATER CONTROLS ONCE EVERY TWO WEEKS AND FOLLOWING A 1/2" OR GREATER RAINFALL IN ANY 24 HOUR PERIOD. SILT FENCING SHALL ALSO BE CHECKED WHEN WIND GUSTS EXCEED 25 MPH. DEFICIENCIES FOUND IN STORMWATER CONTROLS SHALL BE CORRECTED IMMEDIATELY. THE CONTRACTOR SHALL MAINTAIN A LOG OF ALL INSPECTION ACTIVITIES.
- THE CONTRACTOR SHALL INSTALL SILT FENCING AROUND THE PROJECT PERIMETER PRIOR TO COMMENCING PROJECT. IN THE EVENT THAT THE PROJECT REQUIRES TEMPORARY CHANNELIZATION OF STORMWATER RUNOFF, THE CONTRACTOR SHALL CONSTRUCT AND MAINTAIN APPROPRIATE BMP CONTROLS (SETTLING BASINS, CHECK DAMS, ETC.)
- PERMANENT VEGETATION OF ALL DISTURBED AREAS IS REQUIRED. ONCE ALL LAND DISTURBANCES HAVE CEASED & ALL DISTURBED AREAS ARE PERMANENTLY STABILIZED, EROSION CONTROL DEVICES SHALL BE REMOVED.
- THE CONTRACTOR SHALL REMOVE ANY SEDIMENT TRACKED ON PUBLIC ROADWAYS IMMEDIATELY.
- ALL DISTURBED AREAS LEFT INACTIVE FOR LONGER THAN 13 DAYS SHALL BE TEMPORARILY GRASSED OR COVERED TO PREVENT EROSION.
- PERMANENT TURF REINFORCEMENT MATS ARE REQUIRED ON ALL SLOPES 2:1 OR STEEPER, AS WELL AS ALL DITCH LINES & SIDES.

**Municipal Consultants, Inc.**  
909 Century Park South, Suite 212  
Birmingham, Alabama 35226  
(205) 822-0387

CITY OF PELHAM, ALABAMA

NOT VALID WITHOUT SIGNATURE

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**GENERAL**

UPON COMPLETION OF ALL OR PART OF A SEWER MAIN AND ITS APPURTENANCES, THE CONTRACTOR WILL BE REQUIRED TO TEST SAID UTILITY FOR ACCEPTABILITY. WATER AND SEWER MAINS IN AREAS WITH OTHER UTILITIES SHALL NOT BE TESTED UNTIL OTHER UTILITIES (PHONE, GAS, POWER, ETC.) ARE INSTALLED. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY WATER, EQUIPMENT, AND INSTRUMENTATION FOR TESTING. ALL TESTS SHALL BE CONDUCTED IN THE PRESENCE OF THE CITY'S CONSTRUCTION INSPECTOR. PRELIMINARY TESTS NOT OBSERVED BY THE CITY CONSTRUCTION INSPECTOR WILL NOT BE ACCEPTED. THE CITY CONSTRUCTION INSPECTOR SHALL BE NOTIFIED AT LEAST 48 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 BY 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. ALL OTHER TESTING NOT WITHSTANDING ANY VISIBLE LEAKS IN PIPE, MANHOLES, LATERALS OR APPURTENANCES MUST BE REPAIRED PRIOR TO ACCEPTANCE BY THE CITY.

IN ADDITION TO THE TESTING SPECIFIED HEREIN, ALL GRAVITY SEWERS SHALL BE VIDEO INSPECTED. A COPY OF THE VIDEO SHALL BE PROVIDED TO THE CITY FOR REVIEW AND ALL DEFICIENCIES SHALL BE REPAIRED TO THE STANDARD OF QUALITY SPECIFIED BY THE CITY IN ORDER FOR THE SEWER MAINS AND APPURTENANCES TO BE CONSIDERED FOR ACCEPTANCE.

**GRAVITY SEWER TESTING (MAIN LINES)**

ALL SEWER CONSTRUCTION SHALL BE BEDDED AND BACKFILLED TO PREVENT SETTLEMENT IN DITCHES AND HAVING TIGHT JOINTS WITH GASKETS FULLY COMPRESSED. SEWERS SHALL BE WATERTIGHT WITHIN THE ALLOWABLE LIMITS, AND SHALL HAVE NO VISIBLE LEAKS. PIPE SHALL BE LAID SO WHEN SIGHTING FROM MANHOLE TO MANHOLE IN ANY SECTION, THE WHOLE DIAMETER OF THE PIPE SHALL BE VISIBLE THROUGHOUT THE SECTION. ANY VISIBLE OR AUDIBLE LEAKS IN ANY SECTION OF THE SEWER OR APPURTENANCES SHALL BE REPAIRED. THE SEWER SHALL BE BLOCKED OFF IN SECTIONS TOTALING APPROXIMATELY 1,000 FEET DETERMINED BY THE MANHOLE SPACING AND TESTED FOR INFILTRATION. NO INFILTRATION IN EXCESS OF 50 GALLONS PER MILE PER INCH OF PIPE DIAMETER PER 24 HOURS WILL BE PERMITTED. ANY SECTION OF SEWER IN WHICH THE INFILTRATION IS GREATER THAN THAT SPECIFIED ABOVE SHALL BE EITHER REPAIRED OR REPLACED UNTIL IT MEETS THE REQUIREMENTS SPECIFIED.

ONLY LINES TESTED AFTER BACKFILLING TO FINAL GRADE WILL BE CONSIDERED FOR ACCEPTABILITY. HOWEVER, THIS TEST MAY ALSO BE USED BY THE INSTALLER AS A PRESUMPTIVE TEST TO DETERMINE THE CONDITION OF THE LINE PRIOR TO BACKFILLING. THE CONTRACTOR SHALL FURNISH ALL THE NECESSARY EQUIPMENT AND BE RESPONSIBLE FOR CONDUCTING ALL LOW-PRESSURE AIR TESTS. IN ADDITION, THE CONTRACTOR IS RESPONSIBLE FOR ANY NECESSARY REPAIR WORK ON SECTIONS THAT DO NOT PASS THE TEST. NO SEALANT SHALL BE USED IN ANY NEWLY INSTALLED SEWER. USING SEALANT IN A SEWER IS NOT THE EQUIVALENT OF A SOUND RESIN PIPE. PROPER STRUCTURAL REPAIR WORK IS REQUIRED BY THE CITY.

THE INFILTRATION QUANTITIES SPECIFIED ARE THOSE PERMISSIBLE WHEN WET WEATHER CONDITIONS PREVAIL AND THE PIPE IS SUBJECT TO A HIGH WATER TABLE. FURTHER, THE CONTRACTOR SHALL EMPLOY THE LOW-PRESSURE AIR TESTING PROCEDURE IN ORDER TO DETERMINE THE PROBABLE ACCEPTABILITY OF THE SEWERS WHEN OPERATING UNDER WET WEATHER CONDITIONS. THE "LOW-PRESSURE AIR TEST" SHALL GENERALLY CONFORM TO THE PROCEDURE THAT IS RECOMMENDED FOR TESTING SANITARY SEWERS AND IS AS FOLLOWS:

1. THE SECTION OF PIPE TO BE TESTED IS CLEANED AND PLUGGED AT EACH END. THE END OF ALL BRANCHES, LATERALS AND WYES ARE PLUGGED. EITHER MECHANICAL OR PNEUMATIC PLUGS (MANUFACTURED FOR THE INTENDED USE OF AIR TESTING) MAY BE USED. ALL PLUGS ARE TO BE BRACED TO PREVENT BLOW-OUT. TO FACILITATE TEST VERIFICATION BY THE SMCW CONSTRUCTION INSPECTOR, ALL AIR USED SHALL PASS THROUGH A SINGLE, ABOVE GROUND CONTROL PANEL. THE ABOVE GROUND AIR CONTROL EQUIPMENT SHALL INCLUDE A SHUT-OFF VALVE, PRESSURE REGULATING VALVE, PRESSURE RELIEF VALVE, INPUT PRESSURE GAUGE, AND A CONTINUOUS MONITORING PRESSURE GAUGE HAVING A PRESSURE RANGE FROM 0 TO 10 PSIG. THE CONTINUOUS MONITORING GAUGE SHALL BE NO LESS THAN 4 INCHES IN DIAMETER WITH MINIMUM DIVISIONS OF 0.10 PSIG AND AN ACCURACY OF ±0.04 PSIG. TWO SEPARATE HOSES SHALL BE USED TO: (1) CONNECT THE CONTROL PANEL TO THE SEALED LINE FOR INTRODUCING LOW-PRESSURE AIR, AND (2) A SEPARATE HOSE CONNECTION FOR CONSTANT MONITORING OF AIR PRESSURE BUILD-UP IN THE LINE. PLUG THE UPSTREAM END OF THE LINE FIRST TO PREVENT ANY UPSTREAM WATER FROM COLLECTING IN THE TEST LINE.
2. ADD AIR SLOWLY TO THE PLUGGED SECTION OF THE SEWER UNDER TEST UNTIL THE INTERNAL AIR PRESSURE HAS BEEN RAISED TO 4.0 PSIG GREATER THAN THE AVERAGE BACK PRESSURE OF ANY GROUNDWATER. AFTER THE PRE-SET PRESSURE HAS BEEN OBTAINED, ALLOW AT LEAST TWO MINUTES FOR AIR TEMPERATURE TO STABILIZE, ADDING ONLY THE AMOUNT OF AIR REQUIRED TO MAINTAIN THE PRE-SET PRESSURE, THEN CLOSE AIR SUPPLY VALVE.
3. WHEN THE PRESSURE DECREASES TO A GAUGE READING EQUAL TO 3.5 PSIG, START STOPWATCH. DETERMINE TIME IN SECONDS MARKING DROP OF 1.0 PSIG OF INTERNAL AIR PRESSURE.
4. REFER TO THE APPROPRIATE TABLE BELOW TO DETERMINE MINIMUM PERMISSIBLE PRESSURE HOLDING TIME IN SECONDS FOR PARTICULAR SECTION OF SEWER BEING TESTED IF IT CONTAINS ONE PIPE SIZE. IF THE TIME SHOWN IN THE TABLE BELOW FOR THE DESIGNATED PIPE SIZE AND LENGTH ELAPSES BEFORE THE AIR PRESSURE DROPS 1.0 PSIG, THE SECTION UNDERGOING TEST SHALL HAVE PASSED AND SHALL BE PRESUMED TO BE FREE OF DEFECTS. THE TEST MAY BE DISCONTINUED ONCE THE PRESCRIBED TIME HAS ELAPSED EVEN THOUGH THE 1.0 PSIG DROP HAS NOT OCCURRED. IF THE PRESSURE DROPS 1.0 PSIG BEFORE THE APPROPRIATE TIME SHOWN IN THE TABLE BELOW HAS ELAPSED, THE AIR LOSS RATE SHALL BE CONSIDERED EXCESSIVE AND THE SECTION OF PIPE HAS FAILED THE TEST.

**MINIMUM TEST TIME FOR PVC OR D.I. PIPE  
(PER UNI-BEL UNI-6-98)**

1 PIPE DIAMETER (in.)	2 MINIMUM TIME (min:sec)	3 LENGTH FOR MINIMUM TIME (ft)	4 TIME FOR LONGER LENGTH (sec/ft)	SPECIFICATION TIME FOR LENGTH (L) SHOWN (min:sec)						
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07

**PIPE DEFLECTION TESTING (MAIN LINES)**

ALL INSTALLED PVC GRAVITY SEWER IF REQUIRED BY THE CITY CONSTRUCTION INSPECTOR, SHALL BE TESTED FOR DEFLECTION BY THE CONTRACTOR. THE CONTRACTOR SHALL FURNISH ALL EQUIPMENT, LABOR, AND MATERIALS FOR MAKING THE TEST. TESTS SHALL BE MADE FROM MANHOLE TO MANHOLE. DEFLECTION SHALL BE TESTED BY A "GO", "NO-GO" MANDREL OR TEMPLATE WHICH IS SIZED TO SUCH DIMENSIONS THAT IT WILL NOT "GO" WHEN ENCOUNTERING A DEFLECTION GREATER THAN PERMISSIBLE. THIS TYPE OF MANDREL MUST BE OF SUCH DESIGN AS TO MINIMIZE THE POSSIBILITY OF ITS BEING HUNG UP IN THE PIPE BY SILT OR OTHER RESIDUES. A MANDREL SHALL BE SIZED TO PERMIT UP TO 5% DEFLECTION IN PIPE HAVING TYPICAL MAXIMUM DIMENSIONAL TOLERANCES.

A PULL AND RETRIEVAL ROPE IS REQUIRED ON THE MANDREL WITH A MARKER ATTACHED ON THE ROPE AT THE END OF THE PIPE WHERE THE MANDREL WILL EXIT TO DETERMINE THE LOCATION OF THE MANDREL IN THE LINE. IF THE MANDREL FAILS TO PASS THROUGH THE LINE, IT SHALL BE ASSUMED THAT THE DEFLECTION EXCEEDS 5% AND THE SECTION OR SECTIONS OF PIPE SHALL BE CORRECTED TO THE SATISFACTION OF THE SMCW CONSTRUCTION INSPECTOR.

IF A SECTION WITH EXCESSIVE DEFLECTION IS LOCATED, THE CONTRACTOR SHALL UNCOVER AND INSPECT THE PIPE AND REPLACE ANY DAMAGED PIPE. IF PIPE IS NOT DAMAGED, REPLACE AND THOROUGHLY TAMP THE HAUNCHING AND INITIAL BACKFILL AND REPLACE REMAINDER OF BACKFILL. IF THE SECTION STILL FAILS TO PASS THE DEFLECTION TEST, IT SHALL BE REPLACED WITH PIPE WHICH WILL PASS THE TEST. THE COST OF REPAIR OR REPLACEMENT AS WELL AS ACCEPTANCE RETESTING SHALL BE BORNE BY THE CONTRACTOR.

**ACCEPTANCE AND VACUUM TESTING OF MANHOLES**

ONLY MANHOLES TESTED AFTER BACKFILLING TO FINAL GRADE WILL BE CONSIDERED FOR ACCEPTABILITY. MANHOLES IN PAVED AREAS SHALL NOT BE TESTED UNTIL PAVEMENT IS IN PLACE. HOWEVER, THIS TEST MAY ALSO BE USED BY THE INSTALLER AS A PRELIMINARY TEST TO DETERMINE THE CONDITION OF THE MANHOLE PRIOR TO BACKFILLING. ALL MAIN AND SERVICE LINE CONNECTIONS WHICH THE MANHOLE ACCOMMODATES SHALL BE 100% COMPLETED PRIOR TO TESTING OF THE MANHOLE. REGARDLESS OF VACUUM TEST RESULTS, NO VISIBLE LEAKS WILL BE ALLOWED IN A MANHOLE.

1. PLUG ALL MANHOLE ENTRANCES AND EXITS OTHER THAN THE MANHOLE TOP ACCESS AND SERVICE LATERAL ENTRANCES USING SUITABLY SIZED PNEUMATIC OR MECHANICAL PIPELINE PLUGS. PLUGS SHOULD BE INSERTED A MINIMUM OF 12" BEYOND MANHOLE WALL. MAKE SURE SUCH PLUGS ARE PROPERLY RATED FOR THE PRESSURES REQUIRED FOR THE TEST. ALL PLUGS ARE TO BE BRACED TO PREVENT BLOW-OUT.
2. INSTALL THE VACUUM TESTER HEAD ASSEMBLY AT THE TOP ACCESS OF MANHOLE. ADJUST THE CROSS BRACE TO INSURE THAT THE INFLATABLE SEALING ELEMENT INFLATES AND SEALS AGAINST THE STRAIGHT TOP SECTION OF THE MANHOLE OR THE RING ASSEMBLY, IF POSSIBLE. (IF USING A "PLATE" STYLE MANHOLE TESTER, POSITION THE PLATE ON THE MANHOLE RING ASSEMBLY.)
3. ATTACH THE VACUUM PUMP ASSEMBLY TO THE PROPER CONNECTION ON THE TEST HEAD ASSEMBLY. MAKE SURE THE VACUUM INLET/OUTLET VALVE IS IN THE CLOSED POSITION. INFLATE SEALING ELEMENT TO THE RECOMMENDED MAXIMUM INFLATION PRESSURE.
4. START THE VACUUM PUMP AND ALLOW PRE-SET RPM TO STABILIZE. OPEN THE INLET/OUTLET BALL VALVE AND EVACUATE THE MANHOLE TO 10" HG. (APPROXIMATELY NEGATIVE 5 PSIG, 0.3 BAR).
5. CLOSE VACUUM INLET/OUTLET BALL VALVE AND MONITOR VACUUM FOR SPECIFIED TEST PERIOD (SEE TABLE BELOW). IF VACUUM DOES NOT DROP IN EXCESS OF 1" HG. IN THE TIME SPECIFIED, MANHOLE IS CONSIDERED ACCEPTABLE AND THE MANHOLE PASSES THE TEST. IF MANHOLE FAILS THE TEST, COMPLETE NECESSARY REPAIRS AND REPEAT TEST PROCEDURES UNTIL SATISFACTORY RESULTS ARE OBTAINED.

**VACUUM TEST TIMETABLE  
(24' MAXIMUM DEPTH)**

DIAMETER (INCHES)	ELAPSED TIME	ADDITIONAL TIME PER 2' OVER 24' DEEP
48"	60 SECONDS	5.0 SECONDS
60"	78 SECONDS	6.5 SECONDS
72"	96 SECONDS	8.0 SECONDS

**FORCE MAIN AND WATER MAIN TESTING**

THE CONTRACTOR SHALL FURNISH APPROVED EQUIPMENT. TESTING SHALL BE DONE IN THE PRESENCE OF THE CITY'S CONSTRUCTION INSPECTOR. TESTING WILL BE 1-1/2 TIMES THE NORMAL OPERATING PRESSURE BUT NOT LESS THAN 150 POUNDS PER SQUARE INCH. THE CITY'S 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 150 PSI	AT 200 PSI	AT 250 PSI
3 INCHES	0.28 GPH	0.32 GPH	0.36 GPH
4 INCHES	0.37 GPH	0.43 GPH	0.47 GPH
6 INCHES	0.55 GPH	0.64 GPH	0.71 GPH
8 INCHES	0.74 GPH	0.85 GPH	0.95 GPH
10 INCHES	0.92 GPH	1.06 GPH	1.19 GPH
12 INCHES	1.10 GPH	1.28 GPH	1.42 GPH
14 INCHES	1.29 GPH	1.48 GPH	1.66 GPH
16 INCHES	1.47 GPH	1.70 GPH	1.90 GPH
18 INCHES	1.66 GPH	1.91 GPH	2.14 GPH
20 INCHES	1.84 GPH	2.12 GPH	2.37 GPH

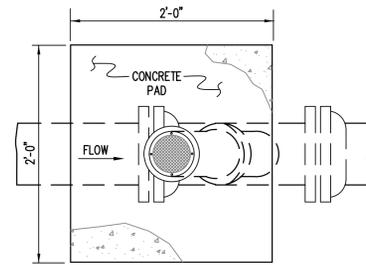
TESTS SHALL BE MADE WITH A PRESSURE RECORDING GAUGE AS PROVIDED BY THE CITY. THE CONTRACTOR SHALL PROVIDE ALL PIPING FOR INSTALLING THE GAUGE.



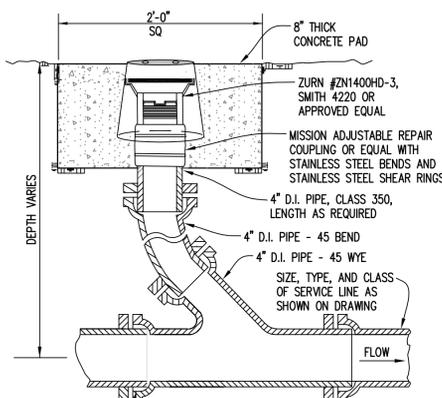
BAR = 1"

Drawing Project No.	Title	
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Sheet	XX	

NOTE:  
1. SOIL BENEATH CONCRETE PADS SHALL BE WELL COMPACTED (MIN. 98%-100% STANDARD PROCTOR). NO SETTLEMENT ALLOWED.



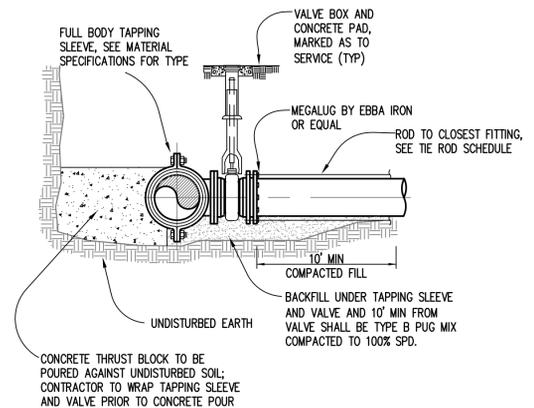
PLAN



SECTION

**SEWER SERVICE CLEANOUT DETAIL**

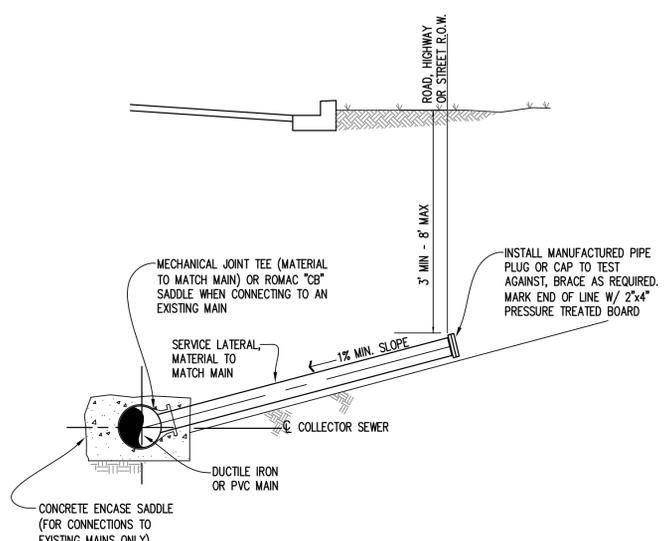
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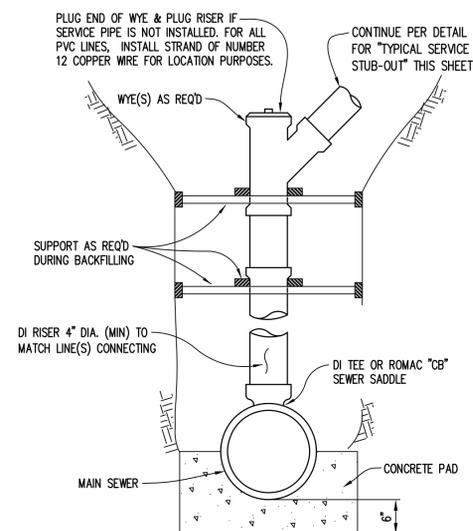
NOTE: ALL FITTINGS AND VALVES SHALL HAVE MEGALUG RESTRAINING GLANDS AND RODDED THROUGHOUT.

**TYPICAL HOT TAP CONNECTION**

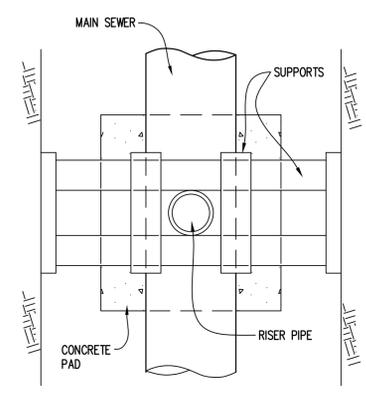
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TYPICAL SERVICE STUB-OUT



ELEVATION

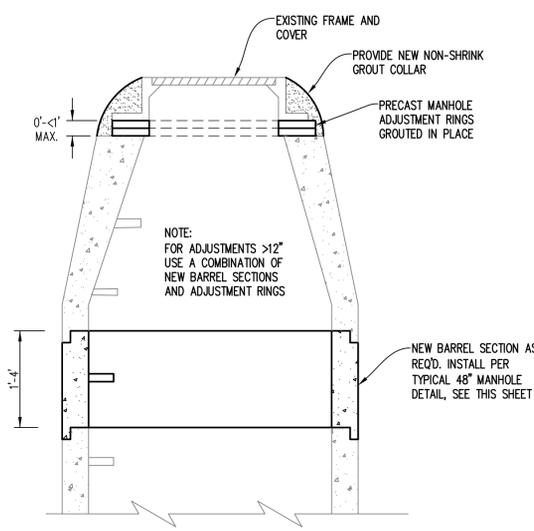


PLAN

**RISERS REQUIRED FOR DEEP CUTS**

**SERVICE & COLLECTOR SEWER CONNECTIONS DETAIL**

SCALE N.T.S.

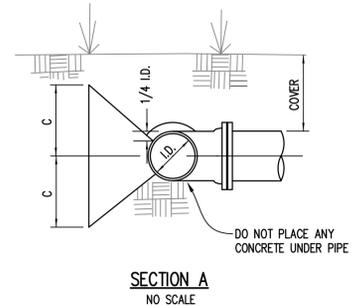
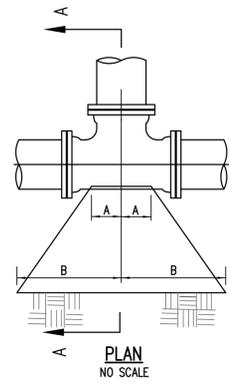


**TYPICAL MANHOLE RAISING DETAIL**

SCALE: N.T.S.

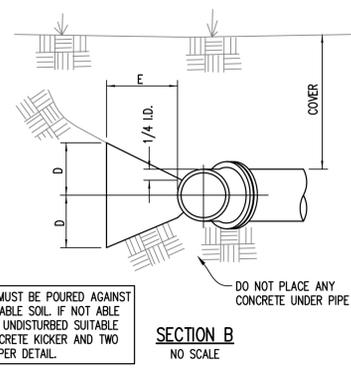
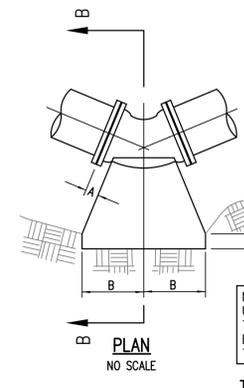
BAR = 1"

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**TYPICAL CONCRETE BRACING FOR TEES**

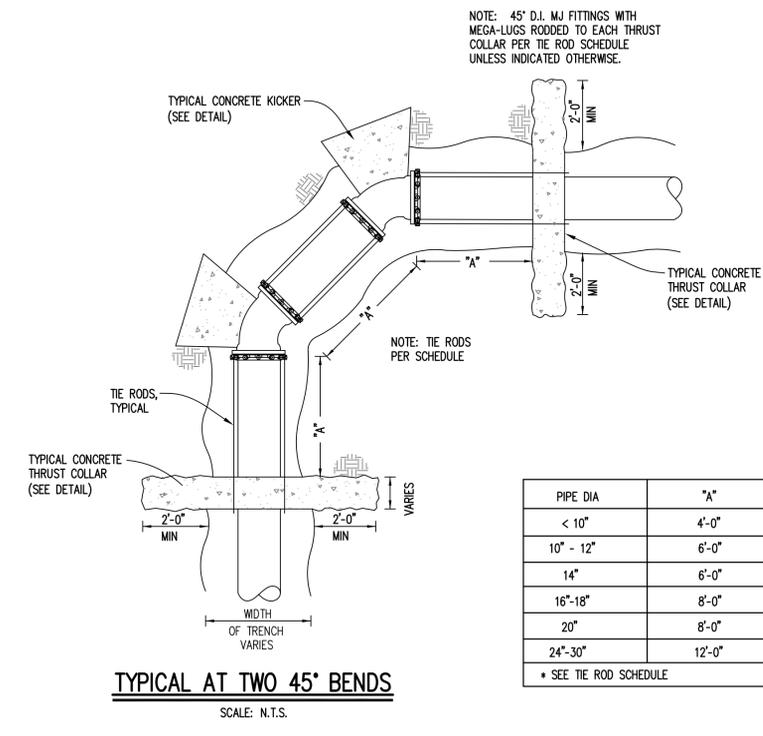
PIPE DIA.	A	B	C	MIN. COVER
4"	5"	1'-0"	1'-0"	2'-6"
6"	6"	1'-0"	1'-0"	2'-6"
8"	8"	1'-6"	1'-6"	2'-6"
10"	10"	2'-0"	2'-0"	3'-0"
12"	10"	2'-0"	2'-0"	3'-0"
14"	1'-0"	2'-6"	2'-6"	3'-0"
16"	1'-0"	3'-0"	3'-0"	3'-0"
18"	1'-2"	3'-6"	3'-6"	3'-6"
20"	1'-4"	3'-6"	3'-6"	3'-6"
24"	1'-7"	4'-6"	3'-6"	3'-6"



NOTE: CONCRETE MUST BE POURED AGAINST UNDISTURBED SUITABLE SOIL. IF NOT ABLE TO POUR AGAINST UNDISTURBED SUITABLE EARTH, POUR CONCRETE KICKER AND TWO THRUST COLLARS PER DETAIL.

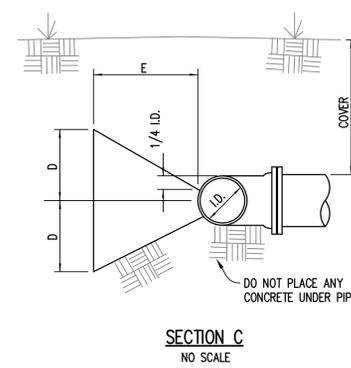
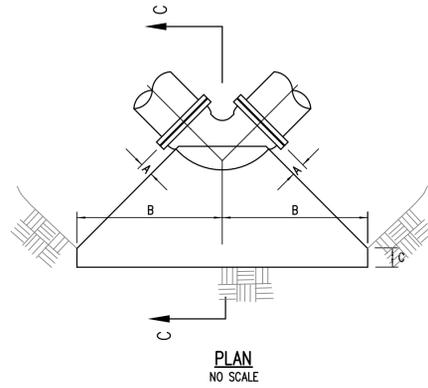
**TYPICAL CONCRETE BRACING FOR 45° BENDS**

PIPE DIA.	A	B	C	D	E	MIN. COVER
4"	4 1/2"	1'-0"	1'-0"	1'-0"	1'-0"	2'-6"
6"	4 1/2"	1'-0"	9"	1'-0"	1'-2"	2'-6"
8"	4 1/2"	1'-6"	3"	1'-0"	1'-2"	2'-6"
10"	4 1/2"	1'-6"	-	1'-6"	1'-6"	3'-0"
12"	6"	2'-0"	-	2'-0"	2'-0"	3'-0"
14"	6"	2'-6"	-	2'-0"	2'-0"	3'-0"
16"	6"	2'-6"	-	2'-6"	2'-0"	3'-0"
18"	6"	3'-0"	-	2'-6"	2'-0"	3'-6"
20"	6"	3'-0"	-	3'-0"	2'-6"	3'-6"
24"	7"	3'-6"	-	3'-6"	2'-10"	3'-6"



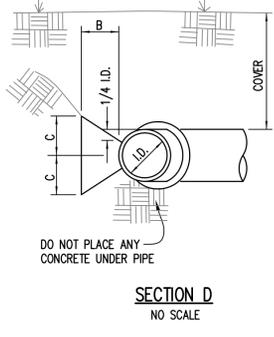
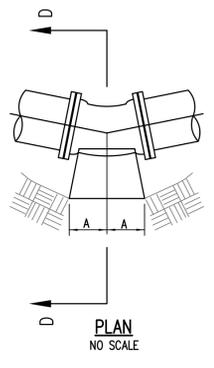
PIPE DIA.	"A"	# RODS*
< 10"	4'-0"	2
10" - 12"	6'-0"	4
14"	6'-0"	5
16"-18"	8'-0"	6
20"	8'-0"	7
24"-30"	12'-0"	8

\* SEE TIE ROD SCHEDULE



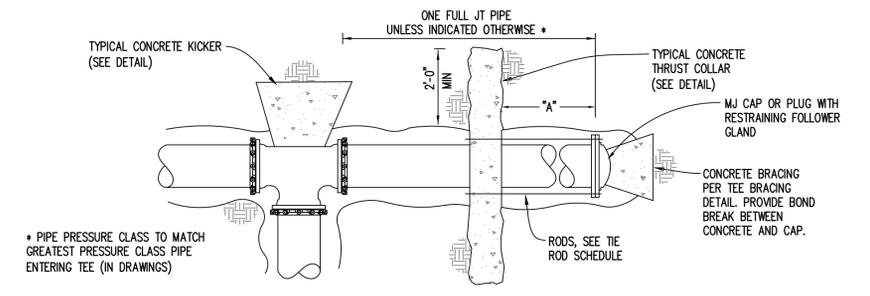
**TYPICAL CONCRETE BRACING FOR 90° BENDS**

PIPE DIA.	A	B	C	D	E	MIN. COVER
4"	4-1/2"	1'-0"	1'-8"	1'-0"	2'-0"	2'-6"
6"	4-1/2"	1'-6"	1'-7"	1'-0"	2'-0"	2'-6"
8"	4-1/2"	2'-0"	1'-6"	1'-6"	2'-6"	2'-6"
10"	4-1/2"	2'-0"	1'-1"	2'-0"	2'-6"	3'-0"
12"	4-1/2"	2'-6"	1'-0"	2'-6"	2'-6"	3'-0"
14"	6"	3'-0"	1'-2"	2'-6"	2'-6"	3'-0"
16"	6"	3'-6"	1'-0"	3'-0"	2'-6"	3'-0"
18"	6"	4'-0"	10"	3'-6"	3'-0"	3'-6"
20"	6"	4'-6"	11"	3'-6"	3'-0"	3'-6"
24"	7"	5'-6"	8"	3'-6"	3'-0"	3'-6"

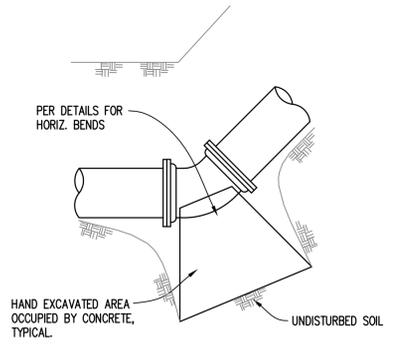
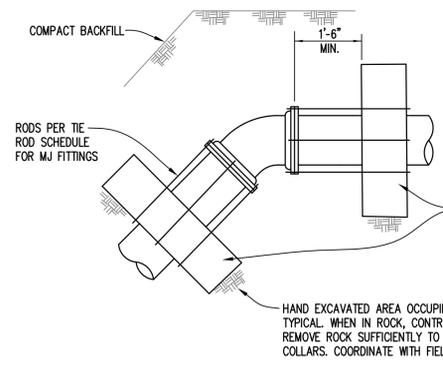


**TYPICAL CONCRETE BRACING FOR 11 1/4° & 22 1/2° BENDS**

PIPE DIA.	22 1/2° BENDS				11 1/4° BENDS		
	A	B	C	MIN. COVER	A	B	MIN. COVER
4"	6"	1'-0"	6"	2'-6"	6"	1'-0"	2'-6"
6"	1'-0"	1'-0"	6"	2'-6"	1'-0"	1'-0"	2'-6"
8"	1'-0"	1'-0"	1'-0"	2'-6"	1'-0"	1'-0"	2'-6"
10"	1'-0"	1'-6"	1'-0"	3'-0"	1'-0"	1'-0"	3'-0"
12"	1'-6"	2'-0"	1'-0"	3'-0"	1'-0"	1'-6"	3'-0"
14"	1'-6"	2'-0"	1'-6"	3'-0"	1'-6"	1'-6"	3'-0"
16"	2'-0"	2'-0"	1'-6"	3'-0"	1'-6"	1'-6"	3'-0"
18"	2'-0"	2'-6"	2'-0"	3'-6"	1'-6"	2'-0"	3'-6"
20"	2'-6"	2'-6"	2'-0"	3'-6"	1'-6"	2'-0"	3'-6"
24"	2'-6"	3'-0"	2'-6"	3'-6"	2'-0"	2'-0"	3'-6"



**TYPICAL CONCRETE KICKER DETAILS**  
SCALE: N.T.S.



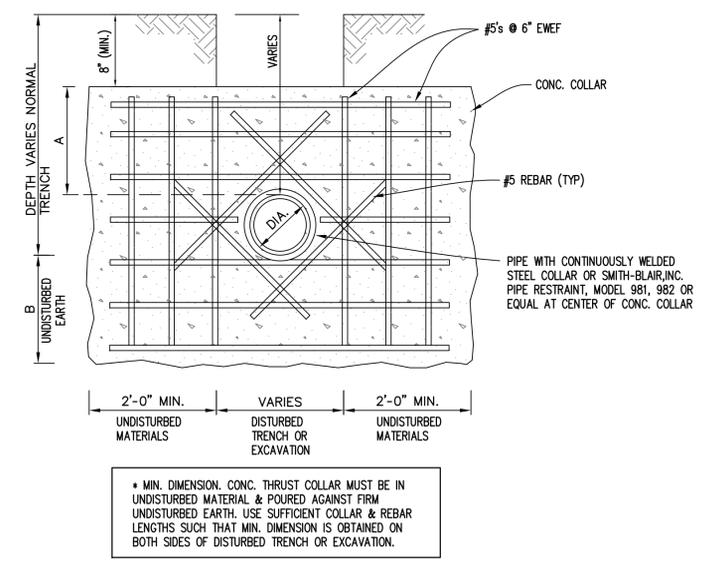
**CONCRETE BRACING FOR VERTICAL BENDS DETAIL**  
SCALE: N.T.S.

**GENERAL NOTES:**

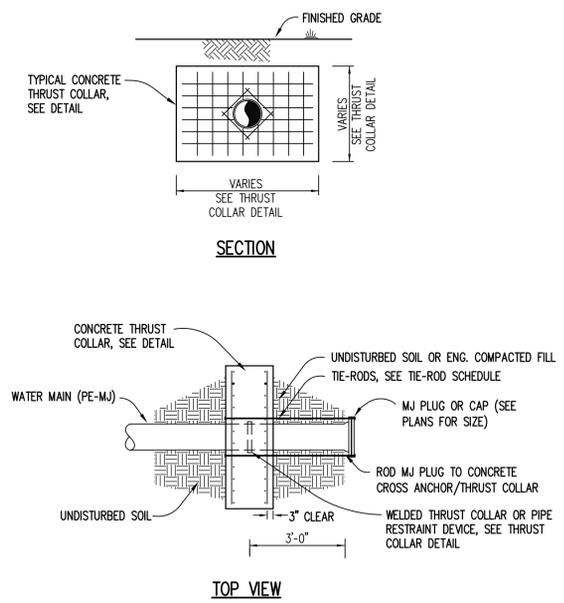
- GENERAL DIMENSIONS SHALL BE CONSIDERED AS MINIMUMS, CONTRACTOR SHALL BE RESPONSIBLE FOR INCREASING DIMENSIONS AS REQUIRED FOR ACTUAL FIELD CONDITIONS ENCOUNTERED. CONTRACTOR TO ENSURE ALL THRUST RESTRAINT IS ADEQUATE.
- ALL CONCRETE FOR THRUST RESTRAINT SHALL BEAR AGAINST FIRM UNDISTURBED SOILS.
- CONTRACTOR SHALL WRAP ALL ACCESSORIES BOLTS, NUTS, CONNECTIONS, ETC. IN PLASTIC SUCH THAT THEY CAN BE REMOVED WITHOUT THE NEED FOR CONCRETE REMOVAL.
- UNLESS INDICATED OTHERWISE IN PLANS, ALL FITTINGS SHALL BE MJ WITH RESTRAINING FOLLOWER GLANDS. RESTRAINING FOLLOWER GLANDS SHALL BE MEGA-LUG OR EQUAL. RETAINER GLANDS NOT ALLOWED.

NOTE: ENSURE ALL THRUST COLLARS ARE POURED AGAINST FIRM UNDISTURBED SOILS. HAND EXCAVATED AREA OCCUPIED BY CONCRETE, TYPICAL. WHEN IN ROCK, CONTRACTOR SHALL REMOVE ROCK SUFFICIENTLY TO KEY IN THRUST COLLARS. COORDINATE WITH FIELD ENGINEER.

PIPE DIA. (IN.)	A (IN.)*	B (IN.)*	THICK.(IN.)	#MATS STL
0 - 12	12	12	12	1
14 - 24	18	18	18	2
>24	24	24	24	2



**THRUST COLLAR DETAIL**  
SCALE: N.T.S.

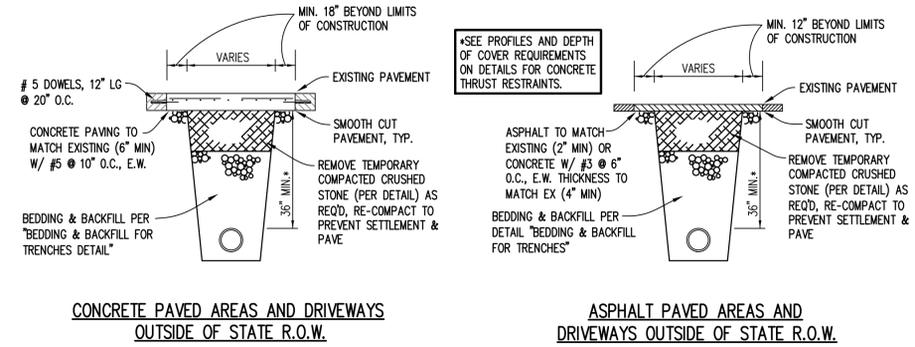


**CROSS ANCHOR ASSEMBLY**  
SCALE: N.T.S.

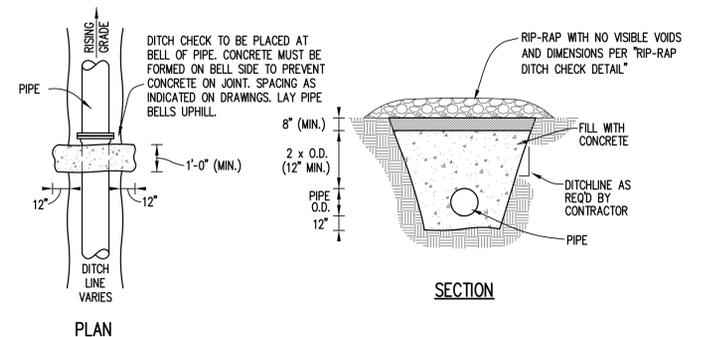
TIE ROD SCHEDULE		
TEST PRESSURE	250 PSI OR LESS	
PIPE DIA. (IN.)	TIE RODS	
	DIA. (IN.)	NO. REQ'D
2	5/8	2
3	5/8	2
6	3/4	2
8	3/4	2
10	3/4	4
12	3/4	4
14	3/4	5
16	3/4	6
18	3/4	6
20	3/4	7
24	3/4	8
30	1	8
36	1	10
42	1-1/4"	10
48	1-1/4"	12

NOTE:  
1. TIE RODS SHALL CONFORM TO ASTM A193 GRADE B7 AND NUTS SHALL CONFORM TO ASTM A194 GRADE 2H.

**TIE-ROD SCHEDULE**  
SCALE: N.T.S.



**TYP. ROAD/DRIVEWAY CROSSING BY OPEN CUT DETAIL**  
SCALE: N.T.S.



**TYPICAL CONCRETE DITCH CHECK DETAIL**  
SCALE: N.T.S.

	TYPE 1 AND 2 TRENCH			TYPE 3 TRENCH	TYPE 4 AND 5 TRENCHES		GRAVITY LINES			PAVED AREAS		
	DI	CONC	PVC		DI	CONC	PVC	DI	CONC	PVC	DI	CONC
TOP FILL	4	4	4	4	4 OR 5	4	4	4	5**	5**	5**	
FINAL BACKFILL (6"-12" LIFTS)												
INITIAL BACKFILL (6" LIFTS)	3	3	3	3	3	3	3	3	5	5	5	
HAUNCHING (6" LIFTS)	2	2	1	2***	1	2	2	1	5	5	5	
BEDDING (6" LIFTS)	2*	1*	1	2***	1	1	1	1	1	1	1	
FOUNDATION MATL. (WHEN REQ'D)												

NOTE: IN AREAS WHERE ROCK IS ENCOUNTERED, 12" MIN. CRUSHED STONE IS REQUIRED UNDER ALL TYPES/KINDS OF PIPE

\* BEDDING NOT REQUIRED FOR PRESSURE MAINS UNLESS IN AREAS OF ROCK EXCAVATION OR UNSUITABLE SOIL; BELL HOLES REQ'D FOR PIPES GREATER THAN 4" DIA.

\*\* TEMPORARY PUG-MIX BACKFILL REQ'D UNTIL PAVEMENT PLACEMENT IS COMPLETE.

\*\*\* PIPE BEDDED IN 6-INCH MINIMUM LOOSE SOIL UNDER THE PIPE. BACKFILL CONSOLIDATED TO TOP OF PIPE. ALL BACKFILL IS NATIVE MATERIAL FREE OF 1" & LARGER ROCKS AND FOREIGN MATERIAL (APPROXIMATELY 80% STANDARD PROCTOR, AASHTO T-99). WHEN ROCK IS ENCOUNTERED USE 12" STONE UNDER PIPE. BELL HOLE MUST BE EXCAVATED FOR EACH JOINT OF PIPE.

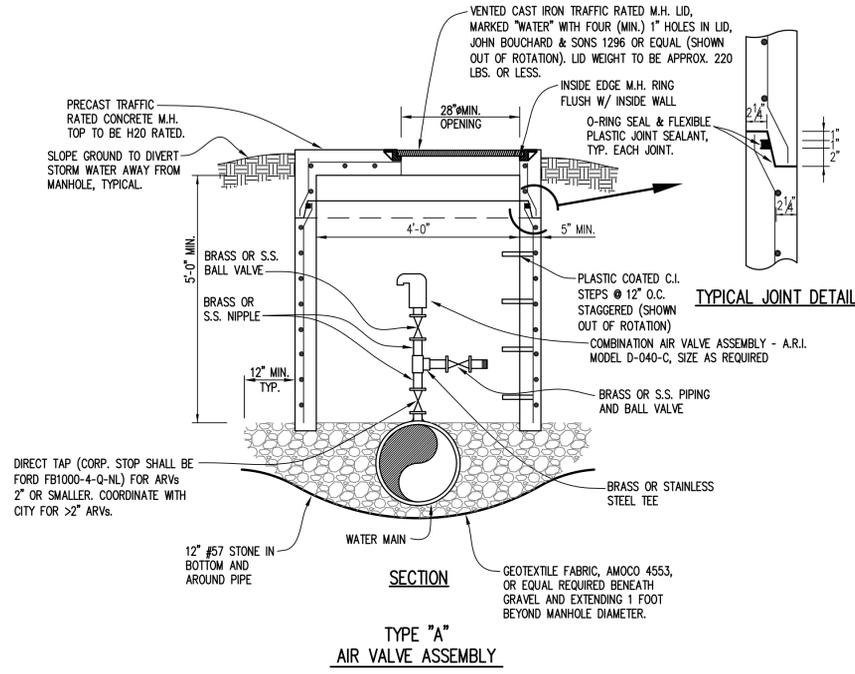
**BEDDING AND BACKFILL FOR TRENCHES DETAIL**  
SCALE: N.T.S.

MATERIALS	DESCRIPTION
1	CRUSHED STONE, ASTM-448 NO. 57 OR 67 GRADATION. FOR PVC USE NO. 67 STONE ONLY.
2	SELECT EXCAVATED MATL. REASONABLY DRY (WITHIN LIMITS REQ'D FOR COMPACTION) NO STONES GREATER THAN 1" DIA.
3	EXCAVATED MATL. REASONABLY DRY (WITHIN LIMITS REQ'D FOR COMPACTION) NO STONES GREATER THAN 12" DIA.
4	SELECT TOPSOIL MATL. TO SUPPORT VEGETATION, NO STONES GREATER THAN 1/2" DIA.
5	CRUSHED STONE, MOIST "PUG-MIX" PER ALDOT SECTION 825

STANDARD NOTES:  
A. ALL MATERIALS SHALL BE COMPACTED TO A MINIMUM 95% STANDARD PROCTOR DENSITY AT 2%± OPTIMUM MOISTURE CONTENT TO PREVENT SETTLEMENT, UNLESS STATED OTHERWISE.  
B. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE OSHA REGULATIONS FOR "OPEN TRENCH EXCAVATIONS".

PROJECT NOTES:  
A. TYPE 3 TRENCH REQUIRED FOR PRESSURE MAINS UNLESS NOTED OR REQUIRED OTHERWISE.

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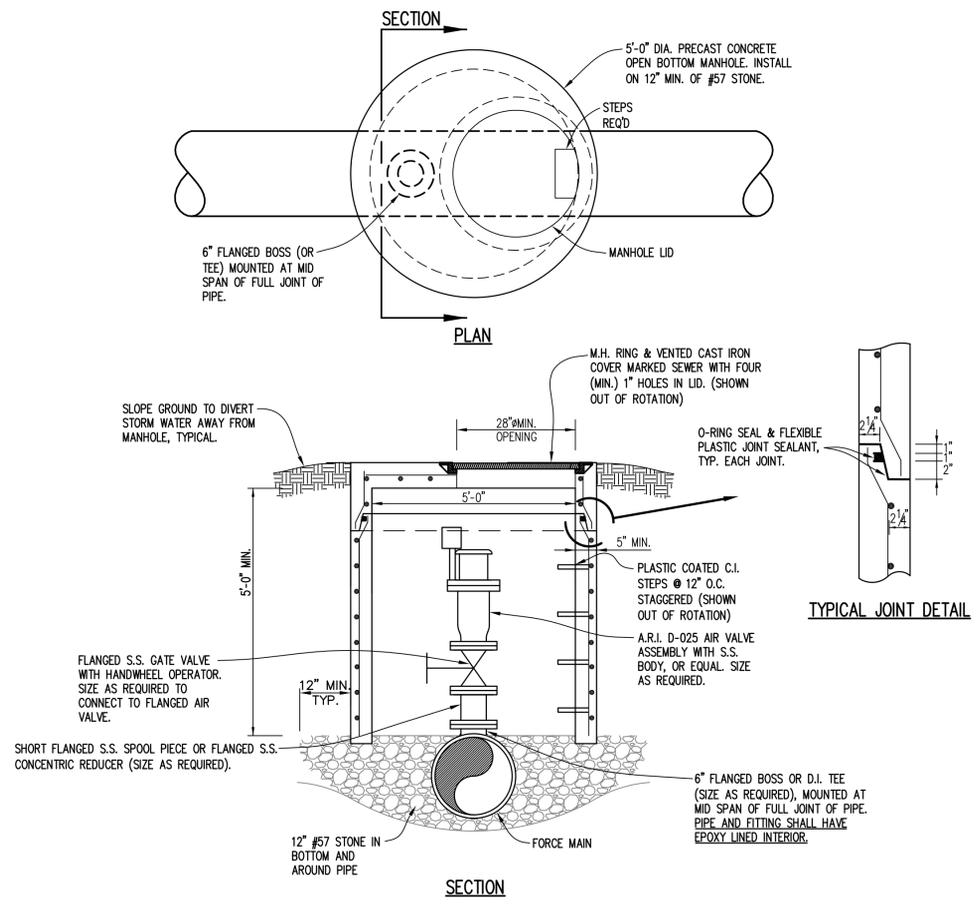


**SECTION**  
**TYPE "A"**  
**AIR VALVE ASSEMBLY**

- GENERAL AIR VALVE ASSEMBLY NOTES**
1. PLACE ALL AIR VALVE ASSEMBLIES ON HIGH POINT OF LINES. COORDINATE FINAL PLACEMENT WITH ENGINEER.
  2. AIR VALVE ASSEMBLIES MUST BE ON FULL JOINT AND IN MIDSPAN OF PIPE. CONTRACTOR MUST LAY PIPE SUCH THAT AIR VALVE ASSEMBLY WILL BE ON HIGH SPOT.
  3. ALL COMPONENTS OF THE AIR VALVE ASSEMBLIES SHALL BE RATED FOR 250 PSI MINIMUM. ALL AIR VALVES SHALL BE RATED FOR 250 PSI.
  4. ALL AIR VALVES AND AIR VALVE ASSEMBLY COMPONENTS SHALL BE NSF 61 APPROVED.
  5. FOR AIR RELIEF VALVES SMALLER THAN 1.5", A JUMBO CONCRETE METER BOX MAY BE INSTALLED IN LIEU OF MANHOLE IF ACCEPTABLE TO THE CITY.

**TYPICAL AIR VALVE ASSEMBLY FOR WATER**

SCALE: N.T.S.



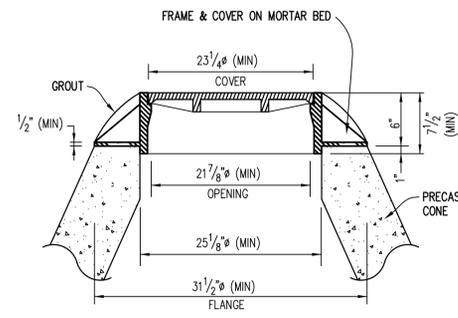
**SECTION**

- NOTES:**
1. PLACE ALL ARV ASSEMBLIES ON HIGH POINT OF LINES AS INDICATED, COORDINATE FINAL LOCATION WITH ENGINEER.
  2. ARV ASSEMBLIES MUST BE ON FULL JOINT AND IN MIDSPAN OF PIPE. CONTRACTOR SHALL LAY PIPE SUCH THAT ARV ASSEMBLY IS LOCATED AT HIGH POINT.
  3. ALL BOLTS AND HARDWARE SHALL BE STAINLESS STEEL. CONTRACTOR SHALL APPLY ANTI-SEIZE SPECIFICALLY DESIGNED FOR S.S. TO ALL BOLTS AND HARDWARE.
  4. ALL DUCTILE IRON PIPE AND FITTINGS SHALL HAVE INTERIOR INDURON PRTOECTO 401 EPOXY LINER (OR EQUAL).

**TYPICAL FORCE MAIN AIR RELEASE VALVE ASSEMBLY DETAIL**

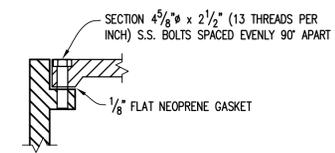
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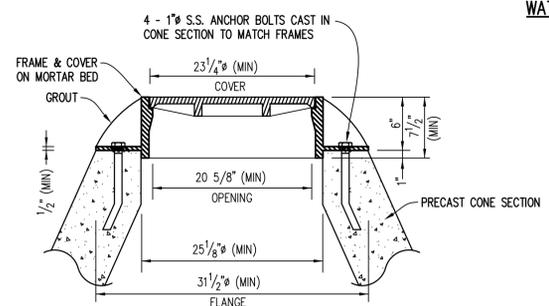


**STANDARD**

- NOTES:**
- CONTACTING/SEALING SURFACES OF FRAME AND COVER SHALL BE MACHINED.
  - MINIMUM WEIGHTS:  
FRAME - 180 LB  
COVER - 120 LB
  - UNLESS INDICATED ON PLANS, ALL COVERS SHALL BE NON-VENTED.
  - COVER PATTERN SHALL STATE "SANITARY SEWER" AND BE APPROVED BY THE OWNER.



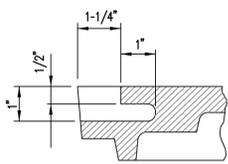
**WATERTIGHT DETAIL**



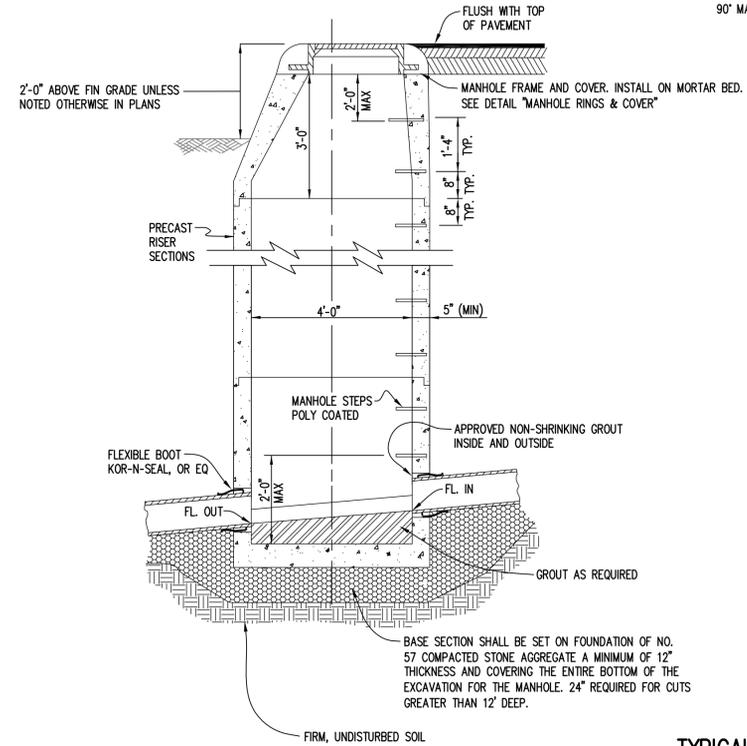
**WATERTIGHT**

**TYPICAL MANHOLE RINGS AND COVERS**

SCALE: N.T.S.

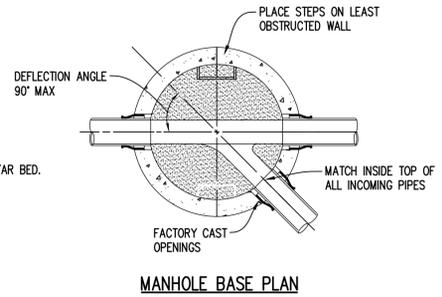


**PICKHOLE DETAIL**

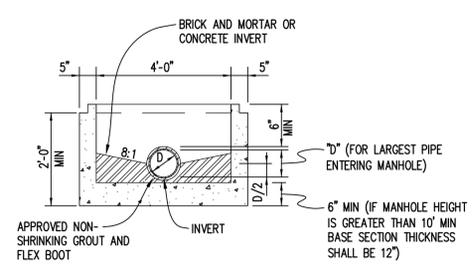


**TYPICAL 48" MANHOLE DETAIL**

SCALE N.T.S.



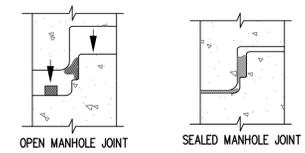
**MANHOLE BASE PLAN**



**BASE SECTION**

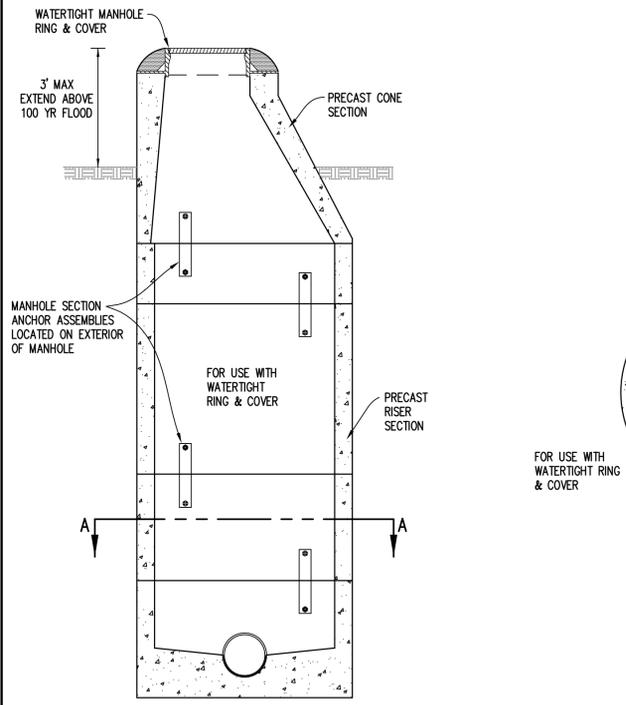
**TYLOX-SUPER (OR EQ) SEAL SIZE CHART**

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



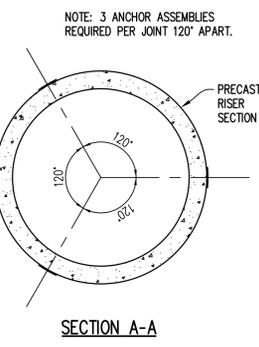
**JOINT DETAIL TYP ALL SIZES**

- NOTES:**
- ALL MANHOLES WITH PIPE ENTERING WITH DIAMETER OF 24" D.I.P OR LESS SHALL BE SUPPLIED WITH KOR-N-SEAL FLEXIBLE BOOTS OR APPROVED EQUAL. LINES > 24" SHALL HAVE A-LOK (OR EQ) FLEX BOOTS CAST INTO MH WALLS, GROUT CONN (2" MIN CL OPNG) ONLY WHEN CALLED FOR IN PLANS
  - PRECAST SECTIONS SHALL BE REINFORCED PER ASTM C-478
  - UNLESS OTHERWISE INDICATED ON PLANS OR PROFILES, ALL MANHOLES SHALL BE 48" DIAMETER
  - ALL MANHOLE JOINTS SHALL HAVE MASTIC, O-RING GASKET, AND NON SHRINKING GROUT (INTERIOR AND EXTERIOR).
  - MANHOLE ANCHOR STRAPS ARE REQUIRED ON ALL MANHOLES GREATER THAN 8' DEEP, SEE DETAIL

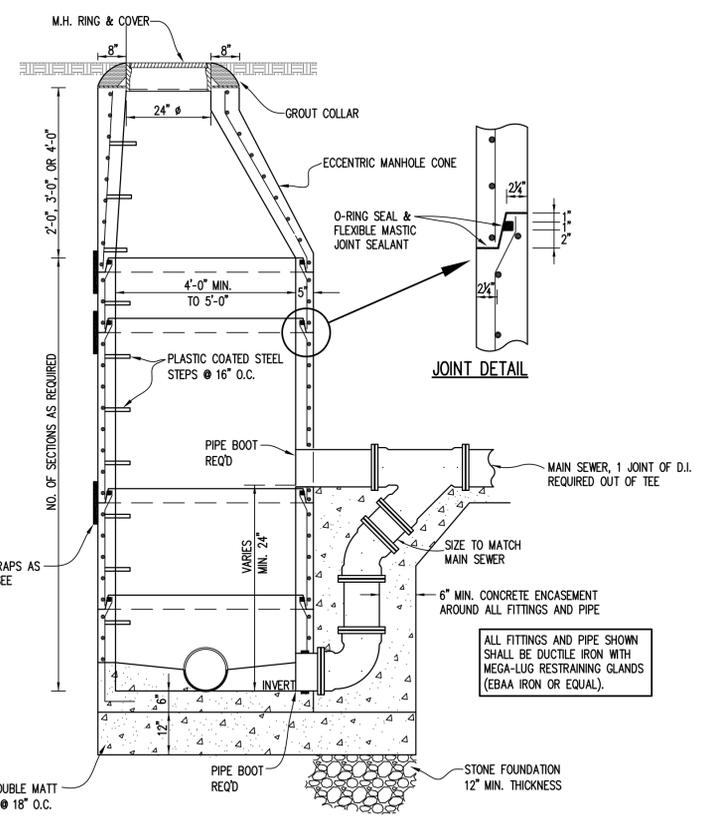


**WATER TIGHT MANHOLE DETAIL**

SCALE: N.T.S.



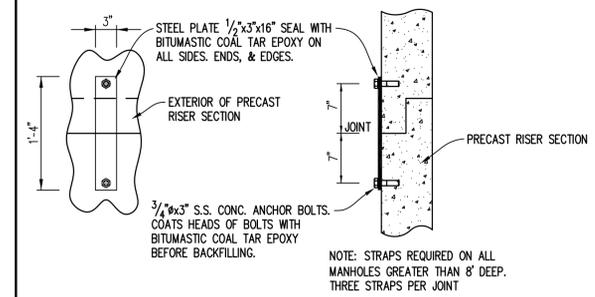
**SECTION A-A**



**ELEVATION**

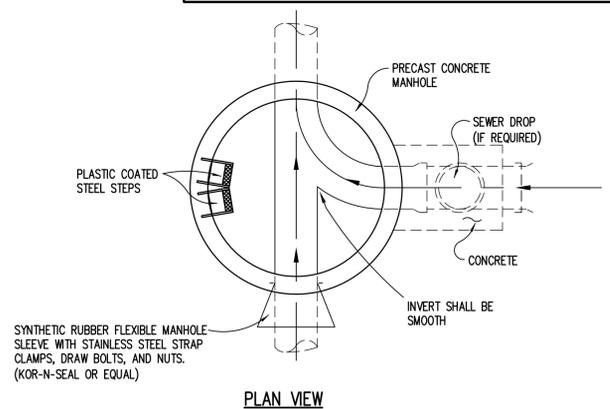
**TYPICAL MANHOLE WITH DROP INLET DETAIL**

SCALE: N.T.S.



**MANHOLE ANCHOR STRAPS**

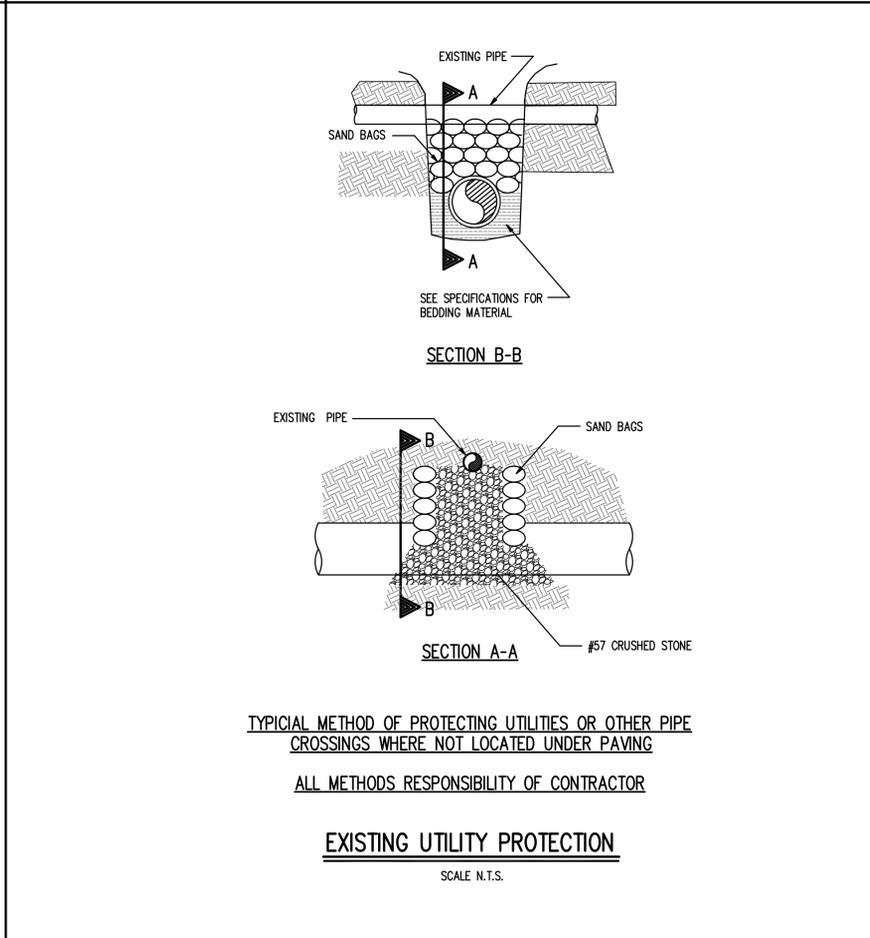
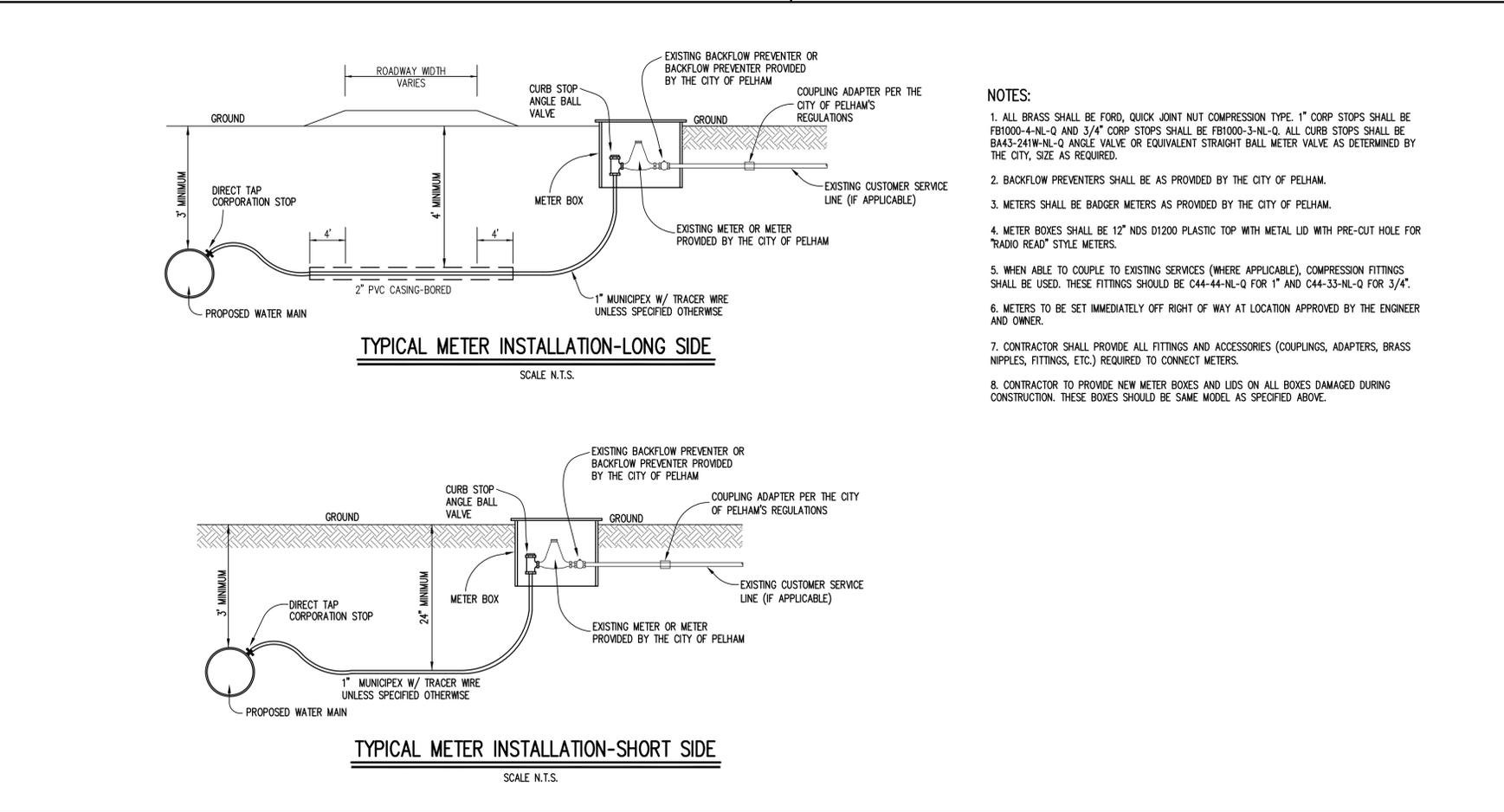
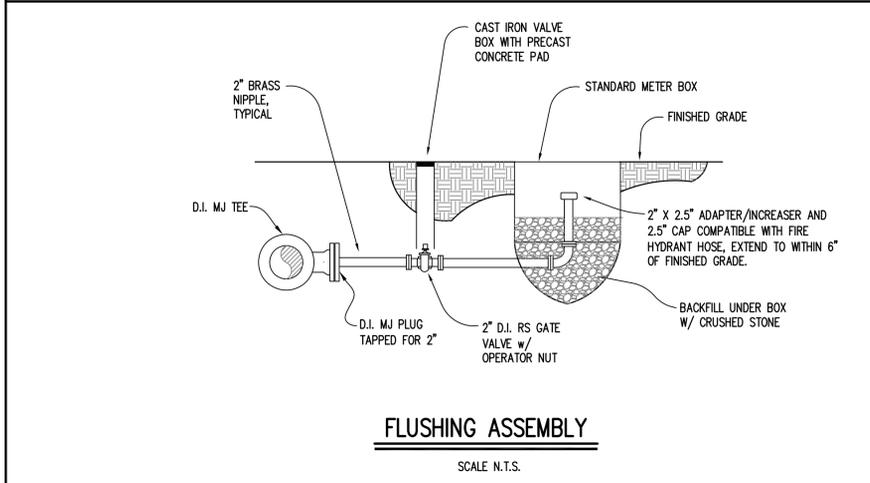
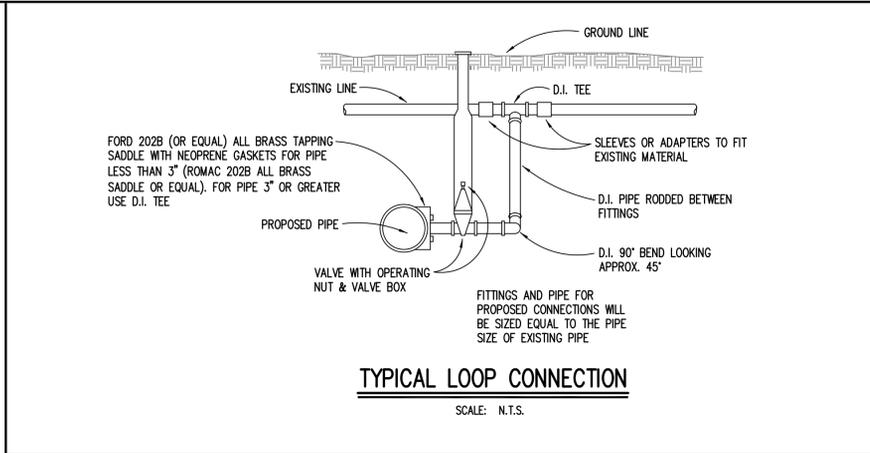
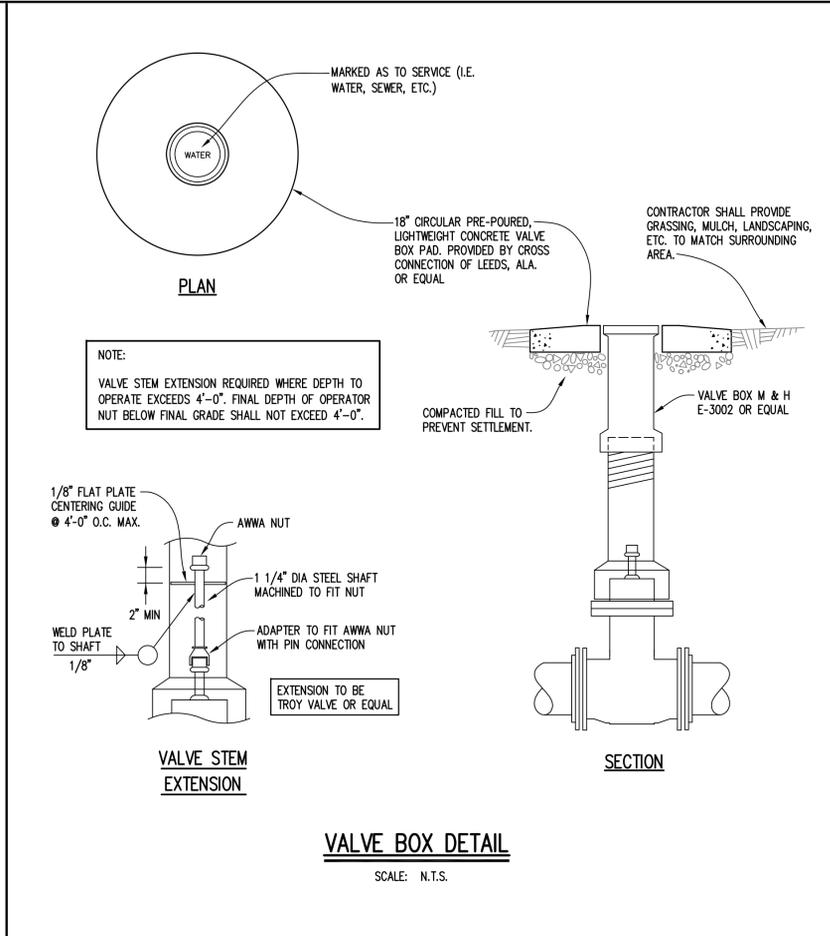
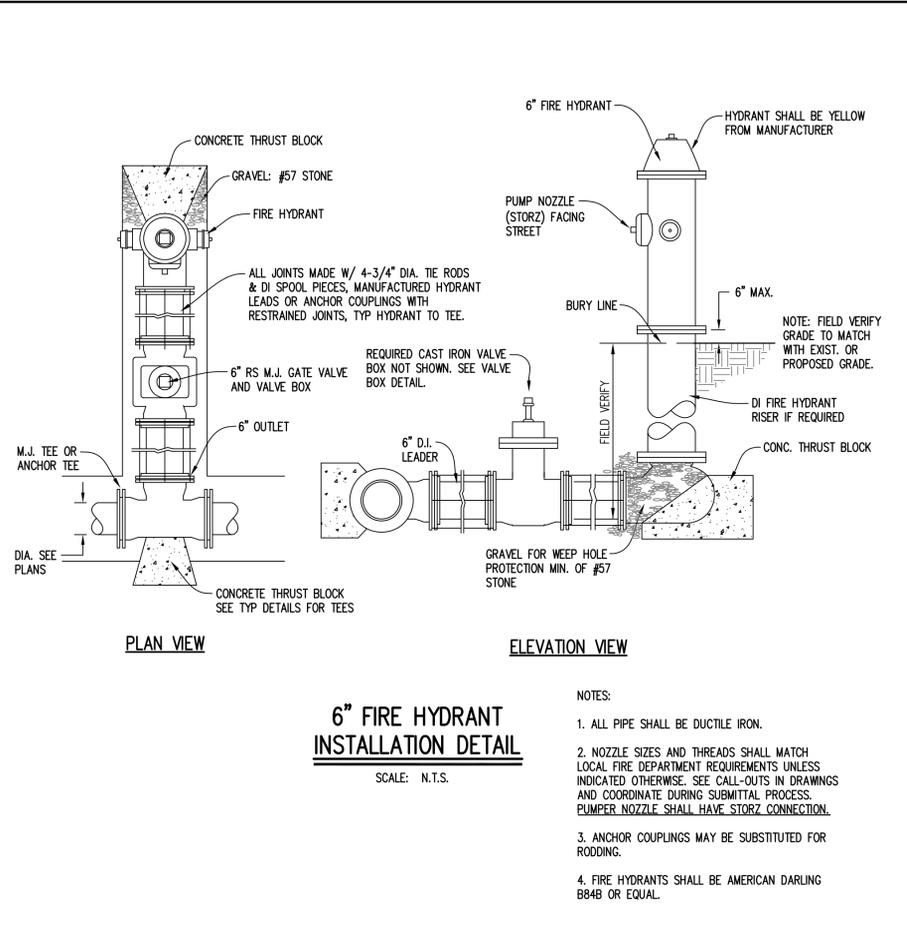
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**PLAN VIEW**

BAR = 1"

Drawing Project No. Date Scale Sheet	Title <b>STANDARD WATER &amp; SEWER DETAILS</b>	
	10 - 17	AS SHOWN
	XX	



<b>Municipal Consultants, Inc.</b> 300 Cahoon Park, South, Suite 212 Birmingham, Alabama 35228 (205) 862-1087	
<b>CITY OF PELHAM, ALABAMA</b>	
Title <b>STANDARD WATER &amp; SEWER DETAILS</b>	
Drawing Project No.	10 - 17
Date	AS SHOWN
Scale	XX
Sheet	XX