2022

Specification Requirements for the Construction of Water Main Extensions and Sewer Line Extensions

PUBLIC WORKS DEPARTMENT

CITY OF GENTRY, ARKANSAS

06/07/2022

GENTRY WATER WORKS
STANDARD SPECIFICATIONS

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SECTION 1 - GENERAL REQUIREMENTS

1.1 Description

This part of the specification stipulates general requirements for the preparation of reports, plans, specifications, methods of construction, inspection, testing, and final approval of any proposed water and/or sanitary sewer lines, appurtenances, or other structures that are within the jurisdiction of the City of Gentry Water and/or Wastewater Department. Any deviations from the requirements set forth herein these specifications will be approved only by written authorization from the City of Gentry Water and/or Wastewater Department. Special conditions may arise on any project that are not covered in these specifications or that may require special handling. In cases of such special conditions, complete detail as to materials, method of construction, or other procedures shall be submitted to the City of Gentry Water and/or Wastewater Department for review and approval.

Standard construction details are incorporated and made a part of these specifications and shall become a part of the standard requirements for water and sewer line construction. The Standard Details are included in the appendices at the back of these specifications. Any omissions from these specifications or construction details are to be referred to the Recommended Standard for Sewage Works and Recommended Standards for Water Works referred to as the "10-State Standards". The Standards shall apply as a minimum standard in all cases.

Where reference is made to a particular industry specification (ASTM, etc.), it is hereby understood that reference is made to the latest specification revision in effect.

All materials and equipment for the construction of sanitary sewer and appurtenances and potable water and appurtenances governed by these specifications shall be of domestic manufacture. The use of any materials or equipment not manufactured in the United States of America must be approved in writing by the City of Gentry Water and/or Wastewater Department.

1.2 Disclaimer

These specifications are intended to set forth minimum standards of quality for the construction of water and sewer facilities which are to be accepted by City of Gentry Water and Waterworks Department. These specifications do not replace the Engineer's specifications and contract documents; however, construction of all water and sewer facilities must meet these standards of quality as a minimum.

The City of Gentry Water and/or Wastewater Department shall not be responsible nor shall it bear any liability for the Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, nor, shall the City of Gentry Water and/or Wastewater Department be responsible for any actions resulting from direction of the project by the Engineer.

The City of Gentry Water and/or Wastewater Department shall not be responsible for the acts or omissions of the Contractor or any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the work. Nothing contained in these specifications shall be construed as an endorsement or warranty by the City of Gentry Water and/or Wastewater Department of any product, material, or workmanship. The City of Gentry Water and/or Wastewater Department shall not be responsible, nor shall it bear any liability or the failure of any material or method of construction.

1.3 Definitions

City of Gentry Water and/or Wastewater Department - The department of the City of Gentry under the jurisdiction of the City of Gentry, herein after referred to as "Department", having full and complete authority to manage, operate, improve, extend and maintain the Department's water works and distribution system and the sanitary sewage collection and transport system.

Superintendent - The superintendent of the City of Gentry Water and/or Wastewater Department.

Developer - Individual, partnership, corporation, or other legal entity such as an improvement district desiring to construct water and/or sanitary sewer facilities for immediate or contemplated future inclusion in the City of Gentry Water and/or Wastewater Department 's systems.

Engineer - Individual licensed to practice engineering in the State of Arkansas who is responsible for the preparation of reports, plans, specifications and inspection of the work.

Contractor - The person, firm, or corporation with whom the Developer has entered into an agreement to construct the water and/or sewer facilities.

Resident Inspector - An authorized representative of the Engineer responsible for the inspection of construction for compliance with approved plans and contract documents.

Mainline - Those parts of the sewer collection pipe system and/or water distribution pipe system that are maintained by the City of Gentry Water and/or Wastewater Department and provide service to individual private connections. The minimum diameter of all new mainline construction is eight inches.

The term "**as specified**" shall mean as specified by the City of Gentry Water and/or Wastewater Department in plans, proposals, other specifications, and written or oral instructions.

The term "**or equal**" shall mean that the proposed material or item shall perform adequately the duties intended by the general design and is of same or equal design, substance, and junction to that specified by using the name of a product, manufacturer, or vendor. Use of the term "or equal" shall mean any party proposing to substitute an "**equal**" shall obtain an approval of the Department. The City of Gentry Water and/or Wastewater Department shall make final determination of such items or materials judged by to be "equal".

The term "**these specifications**" shall refer to City of Gentry 'Specification Requirements for the Construction of Water Main Extensions and Sewer Line Extensions". Latest revisions, written by the City of Gentry Water and/or Wastewater Department and adopted by the City of Gentry, Arkansas. It is the responsibility of the Contractor, Engineer, Developer, or Owner, etc., to obtain copies of, and to comply with, the latest revision of these specifications.

Abbreviations used throughout theses specifications have meanings as follows:

ASTM	American Society for Testing and Material
AASHTO	American Association of State Highway and Transportation Officials
ARDOT	Arkansas Department of Transportation
ANSI	American National Standard Institute
AWWA	American Water Works Association
CI	Gray Cast Iron
CS or CC	AWWA (Mueller Corporation Stop) Thread
DI	Ductile Iron
FIP	Female Iron Pipe
IP	Iron Pipe
MIP	Male Iron Pipe
PE	Polyethylene
psig	pounds per square inch (gauge)
SSPC	Steel Structures Painting Council

SECTION 2 - JURISDICTION

2.1 Description

This section defines the areas where these specifications apply. These specifications apply to all areas presently being served or proposed to be served with potable water and/or sanitary sewer service by the City of Gentry Water and/or Wastewater Department.

2.2 Area of Jurisdiction

These specifications shall be adhered to for all extensions or expansions of potable water and sanitary sewer including the following:

2.2.1 All extensions of public water mains

2.2.2 All extensions of public sanitary sewer mains

2.2.3 Fire protection systems (from the public main to the discharge side of the backflow prevention device)

2.2.4 Backflow prevention systems

2.2.5 Irrigation systems (from the public main to the discharge side of the backflow prevention device)

2.2.6 Private sanitary sewer systems

2.2.7 Private sanitary sewer pretreatment systems

These specifications govern all areas now served or to be served by the City of Gentry Water and/or Wastewater Department. These areas include the City Limits of Gentry, Arkansas, as may be changed from time to time, and any area outside of the City approved for service. A request for a main line extension outside the City must be submitted for approval to the Water and/or Wastewater Department and proper city officials before submittal to Arkansas Department of Health. Gentry Water and Wastewater Department must sign off on all water and sewer plans before submittal to the Arkansas Department of Health or the Arkansas Department of Environmental Quality

All plans for private commercial plumbing (commercial & industrial building plumbing, process plumbing, fire protection, irrigation, etc.) must be submitted to City of Gentry Water and/or Wastewater Department for determination of the adequacy of proposed backflow prevention. Plumbing permits will not be issued by the Gentry Building Inspection Department until City of Gentry Water and/or Wastewater Department has approved proposed backflow prevention devices.

SECTION 3 - PLANS AND SPECIFICATIONS

3.1 Description

This section covers the requirements for submission of plans and specifications to City of Gentry Water and/or Wastewater Department in order to obtain approval.

3.2 Pre-Design Meeting

To prevent waste of valuable resources and un-necessary re-designs, the consulting engineer and developer will be required to meet with City of Gentry Water and/or Wastewater Department personnel as designated to discuss proposed utility extensions before detailed plans are prepared. Those representing the development are encouraged to bring site locations maps, layout drawings, sketches, preliminary plans or any other document that will provide adequate understanding of what is proposed. The City of Gentry Water and/or Wastewater Department will provide input as to what is required from the development for water and/or sewer extensions and/or service connections.

3.3 Preliminary Report

When requested by City of Gentry Water and/or Wastewater Department, the Engineer shall prepare and submit a preliminary engineering report prior to approval of construction plans. The

report shall conform to accepted engineering criteria including the requirements of the Arkansas Department of Health and the Arkansas Department of Environmental Quality and shall contain data and facts as may be required by the Manager.

The size, scope, and contemplated land use of the proposed development as well as other relevant circumstances will be considered in determining the need for a preliminary report.

3.4 Construction Plans and Specifications

No water or sewer main extension may be approved for connection to City of Gentry Water and/or Wastewater Department 's water system or sewer system which was constructed prior to approval of construction plans by City of Gentry Water and/or Wastewater Department or which was not constructed in accordance with approved plans. Construction plans shall conform to the requirements herein. Specifications prepared by the project Engineer shall be in accordance with these specifications and requirements as a minimum. The submission of construction plans for approval shall be accompanied by a letter from the Engineer stating that materials and workmanship will be in accordance with these specifications and standard details.

All plans shall be drawn to a scale suitable for adequately showing the facilities proposed except as stipulated herein. All plans and profiles of sewer lines shall be drawn to scale with the profile vertical scale at 1" = 10' and plan horizontal scale for water and/or sewer lines of 1" = 50' or larger. All drawings shall be on 24" x 36" or 22" x 34" sheets. All elevations shall be based on Mean Sea Level. An overall project map shall accompany the construction plans. The project map shall be a minimum 24" x 36" size and shall be drawn to a scale of 1" = 100' or larger. It shall depict the entire project and show all proposed water and/or sewer lines properly labeled as to size and pipe material. All other utilities shall be shown along with the proposed road profile if applicable. A vicinity map at a scale of 1" = 2000' shall be furnished indicating location of the project in relation to arterial streets and major highways. All plans not prepared in accordance with this paragraph, without prior waiver of requirements, will not be reviewed or approved.

3.5 Changes From Approved Plans

Any changes from the approved construction plans and specifications must be authorized by the Manager or authorized representative of City of Gentry Water and/or Wastewater Department prior to the start of their construction.

3.6 Design Considerations

As a minimum, design and layout shall meet the scale requirements referred to above in 3.4. In addition, the following principals shall be adhered to:

3.6.1 Sanitary Sewer Mains:

3.6.1.1 No gravity sewer main conveying raw sewage shall be less than eight inches in diameter.

3.6.1.2 Where the difference in invert elevation between any two pipes, entering a manhole is 2.0 feet or more, an external drop connection shall be utilized as shown on the standard detail sheets. Inside drop connections are not permitted. Drop manholes or manholes where force mains connect must be coated with an epoxy coating system as specified in Part 5 Section 5 Paragraph 5.4 of these specifications.

3.6.1.3 The minimum earth cover for sanitary sewer mains shall not be less than 36 inches unless exception granted in writing by City of Gentry Water and/or Wastewater Department.

3.6.1.4 Where the earth cover over the pipe bells cannot be maintained at least 2.5 feet or 30 inches the pipe material shall be ductile iron pipe as specified in Part 3, Division 1, Section 1 of these specifications. Sewers buried to depths of 20 feet or greater shall be ductile iron pipe only.

3.6.1.5 Sewer pipe material shall be of the types listed in Part 3 of these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless approved in writing by City of Gentry Water and/or Wastewater Department.

3.6.1.6 Location and depth of main extensions to serve parcels of property shall be planned so as to facilitate operation, maintenance, and extension.

3.6.1.7 All sewer main extensions without regard to length shall terminate in a standard manhole. Manholes to be spaced no greater than three hundred feet (300') and shall occur at changes in direction or grade.

3.6.1.8 All service connections to new sewer mains shall be made with wyes of the same material as the sewer main.

3.6.1.9 Services shall terminate at the edge of rights-of-way and/or dedicated public utility easements ten feet (10') down slope from the lowest elevation "front to back" property line.

3.6.1.10 In no case shall a residential building be allowed to connect to the same sewer service or building sewer of another private residential building. Each building structure shall have separate sewer line services from the point of the utility source and in no case be interconnected with the plumbing system of another

privately-owned property.

3.6.2 Water Distribution Mains

3.6.2.1 The minimum inside diameter (I.D.) for public water mains shall be four (4") inches within city limits unless hydraulic analysis determines that adequate demand flow can only be obtained through a water main in size greater than a four (4") inches. Three (3") inch diameter water main will be allowed in the rural areas of the system (outside city limits) on a case by case basis and must meet all appropriate hydraulic standards. Water main pipe materials shall be of types listed in Part 2 – Potable Water Construction. Materials not specifically authorized in these specifications are forbidden for use in the system unless approved in writing from the Superintendent.

3.6.2.2 Fire hydrants shall be installed so that spacing between hydrants shall not be greater than 600-feet within single-family and two-family residential developments. In commercial, mixed use, and multi-family residential developments fire hydrant spacing shall not be greater than 600-feet. The Fire Department may require additional hydrants and closer spacing during plan review. Fire hydrants placed in subdivisions should be installed at the lot lines to avoid conflicts with driveways. Fire Hydrants may be required at each street intersection and intermediate points between intersections. In rural areas within the city limits, fire hydrants shall be installed so that spacing between hydrants shall not be greater than 600-feet or as directed by the Fire Department. All fire hydrant location shall be approved by the Fire Department. New building construction shall not begin until a working Fire Department approved fire hydrant is available for fire protection.

3.6.2.3 All main extensions without regard to length shall terminate in a fire hydrant unless otherwise approved by the Manager or other authorized City of Gentry Water and/or Wastewater Department personnel. The termination shall be made with mj tee, fire hydrant assembly connected to tee branch and gate valve with plugged discharge connected to the run of the tee.

3.6.2.4 The minimum earth cover shall not be less than 36 inches for mains and 30 inches for services.

3.6.2.5 A hydraulic analysis of the water distribution system may be required. The analysis shall depict design flows and residual pressures in the mains. Additional design data may be required, if in the opinion of City of Gentry Water and/or Wastewater Department, it is necessary for review and approval of plans.

3.6.2.6 Sufficient valves shall be provided on water mains to minimize inconvenience, facilitate expansion and minimize sanitary hazards during repairs, as determined by City of Gentry Water and/or Wastewater Department. Valves should be located at not more than 500 foot intervals in commercial and residential districts or 800 foot intervals in other districts within city limits. In rural areas where customers are separated by large distances and where future development is not expected, valve spacing should not exceed one-half (1/2) miles. Also, if possible, valves shall be provided so that no more than 20 residential water services shall be affected by main line shut downs. When installed at intersections, valves shall be installed on each branch line or location of future branch lines at that intersection.

3.6.2.7 All taps on existing mains for water main extension shall be approved and inspected by the City of Gentry Water and/or Wastewater Department. The Developer/Contractor shall be required to provide all equipment, material and labor to excavate for the tap, prepare the water main for tapping, and to connect the water main extension to the existing water main. The Developer/Contractor will install all services up to and including meter yoke, meter box, frame, and cover.

3.6.2.8 Water pipe materials shall be of types listed in Part 2 of these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless approved in writing by City of Gentry Water and/or Wastewater Department.

3.6.2.9 In new development water mains and services and sewer mains and services shall be positioned per the City of Gentry Standard Details of these specifications and in the City of Gentry Subdivision Utility Placement Specification.

3.6.2.10 In no case shall a residential building be allowed to connect to the same water service or building water of another private residential building. Each residential unit shall have separate water service from the point of the utility source and in no case, shall be interconnected with the plumbing system of another privately-owned property.

3.6.2.11 Where water mains terminate a future use valve shall be installed past fire hydrants and blow-offs. Piping shall extend to a minimum of 10' past the hydrant or blow-off and have proper thrust block.

3.7 Approval

Two (2) sets of complete construction plans shall be furnished to the Department after approval. A statement by the Engineer, that work will conform to these specifications and that professional construction inspection will be provided, must accompany the plans. A Construction Progress Schedule and Engineer Inspection Schedule may be required prior to commencing construction. Design data for all sewer extensions shall be furnished for the Department's review.

All plans must be submitted to and receive approval for construction from the Arkansas Department of Health before any utility work is started.

3.8 Conformity

All plans, specifications, and construction procedures shall conform to the standards as established by City of Gentry Water and/or Wastewater Department. All plans and specifications shall be prepared under the supervision of a Professional Engineer licensed in the State of Arkansas. The Engineer's seal and signature shall be placed on all plans and specifications. Plans will not be reviewed unless the Engineer's seal and signature are in place.

3.9 "As Built" Drawings (Plans of Record)

Upon completion of the project as shown on the final plans and specifications, two (2) complete sets of blue or black line prints "as-built" drawings shall be furnished to the Department for record purposes by the same Engineer who prepared and submitted the construction plans and specifications. The size and scale of the drawings shall be as outlined in Part 1. The "as-built" drawings shall show both in plan and elevation (MSL), the exact location, dimensions, size and type of pipe supplied of all facilities constructed. In addition, the as-built drawings should reflect the location, width, and type (i.e., water, sewer, or utility) of easement. In addition to the paper copy of "as-built" drawings, electronic "CAD" files along with GPS coordinates for each appurtenance (meter can, water valve, manhole cover, etc.…) shall be supplied in an electronic format. No service shall be established without the submission and acceptance of the required as built plans.

3.9.1 Sanitary Sewer

All service taps and manhole stub outs must be shown on the "as-built" plans. Each service line shall be referenced with the sewer main stations in lineal feet and dimensioned to at least two reference points such as a power pole, hydrant, or a recognizable landmark, if available. The depth of the end of each service line shall be four feet below finish grade. GPS coordinates must be noted on the "as-built" drawings.

3.9.2 Water Distribution

All meter boxers with an indication of whether it is a single service, valves, and blow-offs must be shown on the "as-built" plans. Meter boxes shall be referenced by dimensioning to at least one lot corner. Valves and blow-offs shall be referenced by dimensioning to at least two permanent objects. GPS coordinates must be noted on the "as-built" drawings.

SECTION 4 - INSPECTION AND LAYOUT

4.1 Description

This section covers the requirements of inspection and layout for the construction of water and/or sanitary sewerage facilities.

4.2 Responsible Engineer

The Engineer who prepared and submitted the construction plans and specifications shall be responsible for construction layout, general direction, and resident inspection as described in more detail in the following sections. Continuous project responsibility shall be an express condition of plan approval. The Engineer's responsibility shall extend through submittal of "as-built" plans and full acceptance of the project by City of Gentry Water and/or Wastewater Department for maintenance.

4.3 General Direction

All water and/or sanitary sewerage facilities proposed shall be constructed under the general direction of the Engineer. General direction shall consist of, but not be limited to, periodic visits to the construction site to observe the progress and quality of the executed work to determine if the work is proceeding in accordance with the approved plans and specifications and with the standards set forth by City of Gentry Water and/or Wastewater Department.

Any defects, deficiencies or irregularities in the work found by the Engineer or reported by the resident inspector shall be reported to City of Gentry Water and/or Wastewater Department. Such actions, as deemed appropriate, and as approved by City of Gentry Water and/or Wastewater Department, shall be taken to correct such deficiencies.

All work performed subject to these requirements shall at all times be subject to the general inspection of City of Gentry Water and/or Wastewater Department. The frequency of visits and the number of hours required for City of Gentry Water and/or Wastewater Department personnel shall be governed by the quality of inspection being performed by the Engineer and resident inspector.

4.4 Resident Inspection

To insure conformance with the approved plans and specifications, resident inspection is required

and shall be performed by qualified personnel under the direct supervision of the Engineer. The name of the resident inspector shall be furnished to City of Gentry Water and/or Wastewater Department prior to start of construction. It shall be the responsibility of the resident inspector to safeguard City of Gentry Water and/or Wastewater Department 's interests by checking the construction work for compliance with the approved plans, specifications, and other standards. Any defects, deficiencies, or irregularities shall be reported to the Engineer. A job diary shall be kept outlining all aspects of the construction project and shall be made available to City of Gentry Water and/or Wastewater Department on a weekly basis.

4.5 Construction Layout

The layout and staking of the construction work shall be completed by trained and qualified survey personnel. The Engineer shall be responsible for verification of the Job Layout. Such layout and staking shall consist of alignment and grade stakes as required to construct the proposed extensions as approved for construction. The use of construction lasers is required for gravity sewer construction.

Where mains and service lines are adjacent to or under proposed streets, or which are located in areas where the final grade of the site has not been established before installation, the water main or service line shall be staked for grade to insure a minimum cover of 36-inches for water mains and 36-inches for sewer mains after completion of all dirt work.

4.6 Preconstruction Conference

City of Gentry Water and/or Wastewater Department requires a preconstruction conference for all water and/or sewer projects. The conference will be held to discuss the scope of the project and other aspects such as scheduling, insurance, work hours, contractual commitment between Developer and Contractor, or other project aspects as City of Gentry Water and/or Wastewater Department may deem necessary. It is the Engineer's responsibility to contact City of Gentry Water and/or Wastewater Department to schedule said meeting.

4.7 Contract Requirements

Before any construction starts, the Developer or Owner of the proposed project, or his designated agent, will be required to enter into a "special contract for the extension of facilities".

4.8 New Connection Fees

City of Gentry Water and/or Wastewater Department may, from time to time, set fees for the connection of water or sewer service. The developer/owner shall pay all such fees as required prior to the establishment of service.

4.9 Plan Review Fees

City of Gentry Water and/or Wastewater Department may, from time to time, establish fees to cover the review of plans and inspection of construction. All such fees are payable in advance of plan

review.

SECTION 5 – RULES & REGULATIONS

5.1 Description

This section covers such rules and regulations as required by law for the completion of plans, specifications, and construction work on any and all proposed water and/or sanitary sewerage facilities.

5.2 Laws, Regulations, and Ordinances:

All Federal, State, County, and City Laws, Regulations, or Ordinances shall be complied with on all projects. This shall include, but is not limited to, obtaining of approval from the Arkansas Department of Environmental Quality. Responsibility for submission to, and approval by the Arkansas Department of Health and the Arkansas Department of Environmental Quality shall be the Engineer's, including payment of any applicable fees.

5.3 Permits and Licenses:

All permits and licenses required by any Federal, State, County, or Local Governing Body shall be obtained in strict accordance with the requirements of the governing agency. When required by the licensing agency, the Department will assist in application for permits and licenses, but the cost of any permit fee, or bond required will be borne by the Developer.

5.4 Performance and Payment Bond:

All corporations, firms or individual laying or installing water and/or sewer lines, except when being laid by City of Gentry Water and/or Wastewater Department personnel, shall have a contractor's license, specific water and/or sewer utility construction experience and shall post a performance and payment bond, in a form acceptable to City of Gentry Water and/or Wastewater Department for the amount of the contract to guarantee performance of the job in accordance with the plans and specifications within the time prescribed for such completion and for a period of one year after acceptance and becoming a part of the municipal system.

SECTION 6 - EXISTING UTILITIES

This section covers the requirements with respect to existing public or private utilities.

6.1 Proximity:

All plans shall be drawn in such a manner that all known utilities are shown using the best available information including utility maps, field surveys, or other sources of information. Water and sewer lines shall be kept, where possible, a minimum horizontal distance 5' from all underground utilities with the following exception. A minimum horizontal distance of 10 feet shall be maintained between water and sanitary sewer lines and appurtenances including edge of manholes.

Exceptions shall be only as authorized by the Arkansas Department of Health, Division of Engineering.

6.2 Crossing of Water and Sewer Lines:

Water Mains necessarily in close proximity to sewers must be placed so that the bottom of the water line will be at least 18-inches above the top of the sewer at its highest point. If this distance must unavoidably be reduced, the water line or the sewer line must be encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing. Any joint in the encasement pipe is to be mechanically restrained. The encasement pipe may be vented to the surface if carrying water or sewer under pressure. Where a water line must unavoidably pass beneath a sewer line, at least 18 inches of separation must be maintained between the outside of the two pipes in addition to the preceding encasement requirement. Exceptions to this must be approved in writing by the Arkansas Department of Health.

SECTION 7 - EASEMENTS

7.1 Description:

This section covers the requirements of easements for the purpose of maintaining water and/or sanitary sewers lines where the proposed lines will be on private property or where the lines would not be within public rights-of-way. For utility placement of sewer in new subdivision/development construction see "City of Gentry Installation of Sanitary Sewer in Subdivision"

7.2 Width of Easement:

Where water and/or sanitary sewer lines are not placed in public rights-of-way, a permanent easement shall be acquired for the Department and dedicated for all purposes necessary to operate and maintain main lines. The permanent easement shall have a minimum width of 25-feet or the width of the maximum depth to pipe flow line, whichever is greater. Common utility easements will be accepted provided that the easement is wide enough to accommodate the above requirements. An additional 30-feet will be granted as a temporary construction easement. For easements where extra depth is required, the easement shall be 2 times the depth over 12.5-feet or whichever is greater.

Where practicable, easements of maximum width possible will be provided to allow access to all manholes, fire hydrants, valves, and other appurtenances. Temporary construction easements of adequate width must be provided for off-site extensions.

7.3 Filing For Record

An example of a typical easement can be provided by the City of Gentry. Easements shall be prepared in the same manner as the typical and submitted to City of Gentry Water and/or Wastewater Department for approval before being filed for record. Any proposed easement not approved by City of Gentry Water and/or Wastewater Department will not be accepted. Easements shall be properly executed and recorded by the developer. It is the responsibility of the

Developer and Engineer to discover the necessity of any easements and to obtain same. One copy of the approved recorded easement or dedicated plat must be submitted to City of Gentry Water and/or Wastewater Department before construction will be accepted. All easements shall be in favor of the City of Gentry. Easements as shown on recorded plat shall be considered as public easements and adequate for this purpose.

7.4 Plans:

Construction plans should reflect the type, location, and dimensions of all proposed easements. As-built plans should reflect the type, location, and dimensions of all dedicated easements. Existing easements, as they relate to new construction, shall also be shown.

7.5 Engineer's Statement:

The Engineer must provide a statement that all utility construction was performed within the easements provided by the development.

SECTION 8 - FINAL INSPECTION AND ACCEPTANCE

8.1 Description:

This section covers the requirements for final inspection and acceptance of the water and/or sanitary sewerage facilities upon completion of the project.

8.2 Acceptance Testing:

Methods of acceptance testing are outlined for potable water construction in Part 2, Division 3 and for sanitary sewer construction in Part 3, Division 3 of these standard specifications. All tests shall be conducted in the presence of the Engineer, the Contractor, and a representative of City of Gentry Water and/or Wastewater Department. The Engineer shall schedule said tests with City of Gentry Water and/or Wastewater Department at least twenty-four hours in advance of proposed testing times. All water and/or sewer services shall be in place before the mainline is tested. All tests shall be conducted during the normal working hours of City of Gentry Water and/or Wastewater Department.

8.3 Final Inspection:

Before water and/or sanitary sewer extensions are accepted for maintenance and service connections to these extensions approved, a final inspection will be made by City of Gentry Water and/or Wastewater Department personnel in the presence of the Engineer. The final inspection will not be conducted until "as-built" plans are submitted.

Final inspection will be made at the request of the Engineer. A list of material and workmanship defects, if any, will be forwarded to the Engineer. Defects noted must be corrected before acceptance. Improvements found not as depicted on the submitted "as-built" plans shall be rejected.

8.4 Maintenance Bond:

Upon completion of the project and after all defects have been corrected in accordance with the final inspection, a maintenance bond in a form acceptable to City of Gentry Water and/or Wastewater Department for an amount equal to 50% of the construction cost shall be submitted to City of Gentry Water and/or Wastewater Department (see City of Gentry for sample form). The bond shall be for a period of not less than one year and shall cover all defects in materials and workmanship. The bond shall be binding on the owner, developer, or the contractor. If, in the judgment of City of Gentry Water and/or Wastewater Department construction of extensions which total less than five hundred (500) linear feet meet the applicable specifications stated herein the maintenance bond may be waived.

8.5 Acceptance:

No connection of customer facilities or other utilization of main extensions will be permitted by City of Gentry Water and/or Wastewater Department until a letter of acceptance is issued. The acceptance letter will not be issued until the following requirements are met:

8.5.1 Receipt of two copies of approved "as-built" plans and profiles of main extensions.

8.5.2 Satisfactory correction of all defects noted in final inspection.

8.5.3 Receipt of maintenance bond if applicable.

8.5.4 Receipt of all required easements.

8.5.5 Receipt of Engineer's certification that all improvements have been constructed in accordance with the approved plans and specifications.

8.5.6 Receipt of an affidavit from the Owner or Developer that all materials, supplies and labor bills have been paid.

8.5.7 Receipt of Engineer's report outlining the total capital cost for water and/or sewer facilities, including all engineering fees.

8.5.8 Testing requirements, including bacteriological samples, have been certified as acceptable.

8.5.9 Payment of all applicable fees.

8.5.10 Engineer's certification that all main extensions are located in dedicated easements.

8.6 Inspection Before Expiration of Maintenance Bond:

An inspection will be made by City of Gentry Water and/or Wastewater Department before the expiration of the maintenance bond. A list of any defects in material or workmanship found during this inspection will be forwarded to the Developer's engineer. If corrections are not made within a reasonable period of time, a claim will be filed with the bonding company. As soon as defects found during this inspection are corrected, City of Gentry Water and/or Wastewater Department will issue full acceptance of the project for maintenance. The City may reserve the right to have sewer gravity mains inspected by remote video inspection vehicle. Tracer wires shall be tested for conductivity to provide location of all pressure pipe lines.

8.7 Use of Completed Portions:

Portions of the project completed will not be allowed to be put into service without written approval from the Department. Approval for the use of completed portions of the project will be granted only in the best interest of the Department. Use of completed portions of an incomplete project does not constitute acceptance of the project by City of Gentry Water and/or Wastewater Department.

SECTION 9 - SERVICE CONNECTION

9.1 Description:

This section describes certain requirements with respect to service line locations.

9.2 Minimum Size and Location of Services:

9.2.1 Sewer Services:

All service stubs wyes on new sewer mains shall be installed at the time of main line construction to facilitate connection of anticipated services to the sewer. All service stubs shall terminate with watertight plug or watertight cap. Unless anticipated service requires a larger line, all service stubs shall be 4" nominal diameter. Sewer services shall terminate at approximately 9-feet from back of curb and will be 1-foot past edge of sidewalk. This shall be done by burying a 6-foot steel tee post at the end of the service stub and buried to be above finished grade of the lot to identify location of sewer service. The tee post shall be green in color. All bends and fittings shall be Schedule 40 from residence to main.

Sewer service connections to existing sewer mains must be made with sewer service tapping saddle. **City of Gentry Water and/or Wastewater Department must be contacted prior to design and construction for the type of saddle currently utilized.** The Contractor must expose the existing sewer main. City of Gentry Water and/or Wastewater Department personnel must install the tapping saddle and make the tap on the sewer main.

Each living unit (i.e...duplexes, triplexes, etc.) shall have separate sewer service lines. Apartment complexes shall be evaluated on a case by case basis by City of Gentry Water and/or Wastewater Department. Also, commercial property shall be required to install a separate sewer service per unit. The location shall be shown on the "as-built" drawings both in distance from manholes and in distance from property corners along the street right-of-way line or lot line. Service stubs shall be installed to provide sufficient vertical clearance from other utilities.

9.2.2 Water Services:

All water services shall be installed on the water main to facilitate connection of anticipated services. All water service meter boxes shall be within the dedicated easement or right-of-way. Unless anticipated services require a larger line, all service lines shall be 1" nominal diameter.

The meter box shall be field adjusted to final grade and installed to be 6" above the rough grade and 2" – 3" above bedding and sod. Failure to do this may be sufficient reason to refuse utility service. All meter box adjustments or service repairs or replacements, due to lot development shall be the responsibility of the Developer or Owner.

Each living unit (i.e...duplexes, triplexes, etc.) shall have separate water service lines with a minimum separation of 18". Apartment complexes shall be evaluated on a case by case basis by City of Gentry Water and/or Wastewater Department. Also, commercial property shall be required to install a separate water service per unit. Meter setter shall be centered inside the meter box. No cfo will be permitted until approved by the City of Gentry Water and/or Wastewater Department. Irrigation systems shall be installed with a separate meter service contained in its own meter box.

SECTION 10 - FACILITY EXTENSION

10.1 General

10.1.1 Fees

Any person (APPLICANT) who requests the installation of facilities must pay all costs connected with the installation, including applicable connection fees, except under certain circumstances where the installation includes facilities in excess of those required to serve the APPLICANT'S property determined by City of Gentry Water and/or Wastewater Department (see Section 11 - "Participation")

10.1.2 Changeability

The information furnished herein is subject to change, may not apply under certain circumstances and is not binding upon City of Gentry Water and/or Wastewater

Department. City of Gentry Water and/or Wastewater Department is not bound except by written contract.

10.1.3 Construction Permission

No facilities may be constructed that are not in accordance with this document or City of Gentry Standard Specifications.

10.2 Requirements

10.2.1 Mains Twelve Inches or Smaller

A water or sewer main must be adjacent to property which requires service. If a main is not available or deemed inadequate by City of Gentry Water and/or Wastewater Department to provide the level of service necessary for the project, the main extension policy will be applied as if no main exists.

10.2.2 Cost of Extension

Unless the Commission participates in the cost of installation (see Section 11), it will be necessary for the APPLICANT to pay the cost of the extension of an adequately sized water main or sewer main to the property from a main on the existing system, where adequate capacity is available.

Where the property requiring service cannot be reached, as described in Section 10.2.1, it is considered that no main exists and main extension must be made before service can be provided.

10.2.3 Installation of Domestic Services Adjacent to Main

APPLICANT will be required to install domestic (and sometimes sprinkler and irrigation, if applicable) services to serve APPLICANT'S property adjacent to the main being installed.

10.3 Exceptional Requirements

It may be necessary for the applicant to install additional facilities other than water or sewer mains (i.e., tanks, pumps, lift stations, etc.) If hydraulic conditions warrant such, or such as required by City of Gentry Water and/or Wastewater Department, no water or sewer main extensions, either inside or outside the city, will be allowed until the time that additional facilities have been installed.

10.4 Plans Affecting Major Streets and Drainage

Plans which affect major streets and drainage may require approval by Gentry Planning Commission and the Gentry City Council.

10.5 County

Work within the County or within County road Right-of-Way within Gentry's Planning Jurisdiction may require Gentry Planning Commission approval in addition to the approvals required by the County. A survey may be required to determine location of property lines and re-setting of property pins.

10.6 Road Bore and Cut Permits *(Permits Required Before Work Begins)*

U.S. or State highway crossings (Bores) shall be installed in accordance with the requirements of the Arkansas Department of Transportation (ADOT) Utility Accommodation Policy and the detail shown on the Standard Detail Sheet. Permits shall be issued to City of Gentry Water and/or Wastewater Department before work begins.

City / County Paved Road Crossings (Bores) shall be installed in accordance with the requirements of the City of Gentry, other municipality or the Benton County Road Department and the Standard Details.

10.7 Arkansas Department of Health

All plans for the installation of potable water and sanitary sewer facilities must be approved by the Engineering Division of the Arkansas Department of Health (ADH) before construction can begin. Said plans must be approved by City of Gentry Water and/or Wastewater Department before submittal to ADH.

10.8 Arkansas Department of Transportation

All plans for the installation of water facilities within federal or state highway right-of-way are subject to prior approval and permitting.

10.9 Right-of-Way Requirements

If not installed in public right-of-way, the APPLICANT must furnish an easement acceptable to the Department. The required Right of Way Easement form must be acquired from the city for utility access in accordance with Ordinance No. 15-729 and 15-730 or the most recent ordinance passed. The most recent ordinance issued shall govern and can be obtained from the offices of the City of Gentry.

10.10 Easement Extensions

Easements for both water and sewer shall be acquired so that they extend across the entire property from property line to property line.

SECTION 11 - PARTICIPATION

11.1 General

11.1.1 Need for Greater Capacity

Under certain circumstances, City of Gentry Water and/or Wastewater Department may determine that it is in the public interest that distribution/collection facilities be installed which have a capacity greater than that required for a particular tract or development. In such circumstances:

11.1.1.1 City of Gentry Water and/or Wastewater Department may pay a portion of additional installation cost; or,

11.1.1.2 The APPLICANT may pay the additional installation cost; or,

11.1.1.3 The APPLICANT and City of Gentry Water and/or Wastewater Department may share in the additional installation cost.

11.1.2 Cost Participation

All cost participation is subject to approval by the Department and commitments to participate shall not be made prior to such approval and prior to execution of main extension contracts.

11.1.3 Limiting Participation

In the event budgetary constraints require limiting participation, priority shall be granted those extensions located within the city limits of Gentry.

11.1.4 Applicant Will be Notified of Options Available

11.2 Requirements for Participation

11.2.1 Considerations

The following will be carefully considered in deciding when facilities are installed which merit participation:

11.2.1.1 Minimum criteria for water facilities established by the Department;

11.2.1.2 Type development proposed or anticipated within the general service area;

11.2.1.3 Anticipated rate of development;

11.2.1.4 Projected total demand (both fire and domestic);

11.2.1.5 Hydraulic gradient and characteristics of system;

11.2.1.6 Department's Master Plan for distribution/transmission facilities and collection;

11.2.1.7 Budgetary constraints.

These considerations shall be applied to the general service area rather than a specific development or tract within the general service area.

11.2.2 Size of Mains

If, after determining the size mains required for a tract of development in accordance with the above criteria, City of Gentry Water and/or Wastewater Department desires to have larger mains installed, City of Gentry Water and/or Wastewater Department may participate in an amount represented by the cost differential between the main sizes required and those installed subject to the following limitations.

11.2.2.1 Limited to mains which are intended to "pass through" the development to provide transmission capacity to another area.

11.2.2.2 Single-Family and Low Density Multi-Family Residential limited to mains larger than 8 inches in diameter.

11.2.2.3 High Density Multi-Family, Commercial and Industrial-limited to mains larger than 12 inches in diameter.

11.2.3 What City of Gentry Water and/or Wastewater Department May Pay

11.2.3.1 Last Lot - Installing main necessary to extend from the point of termination of mains required to provide service to all lots or tracts within a development, if other improvements such as streets, storm sewers, sidewalks, etc. are extended (on both sides of the street) to the development boundary. In the case of phased development by a common development entity, the development entity will be required to make such extensions without cost to the Department.

11.2.3.2 Cost of installing main across "gaps" which exist as a result of mains being extended to adjacent properties from opposite directions.

11.2.3.3 Other locations as may be determined by City of Gentry Water and/or Wastewater Department.

11.2.4 Participation Determination

The amount of participation will be determined by City of Gentry Water and/or Wastewater Department employing whichever method described below yields the lesser amounts.

11.2.4.1 Application of unit prices received by the APPLICANT in the case of facilities installed under a "Special Contract for Distribution or Collection System Facilities".

11.2.4.2 Application of unit prices received by the Department for constructing of facilities of a similar nature.

11.3 City of Gentry Water and/or Wastewater Department Master Plan

In some cases there may be a need for a water or sewer main as a part of City of Gentry Water and/or Wastewater Department Master Plan. If this pipe line exceeds a reasonable cost to the Applicant, as determined by the City, and if funds are available, City of Gentry Water and/or Wastewater Department may, on City approval, move up the construction date if the Applicant makes an acceptable "contribution in aid of construction". And extension made under these conditions will require a contract.

SECTION 12 - TAP FEES AND CONNECTIONS

12.1 General

Tap Fees to be latest fees established by the City of Gentry Water and/or Wastewater Department. Fee schedules will be required.

12.1.1 Water

12.1.1.1 Fee schedules may be obtained from City of Gentry office. Some services may cost more than the published rate, due to local conditions. All services will be charged, as determined by City of Gentry Water and/or Wastewater Department.

12.1.1.2 Applicant may be required to pay a deposit before work starts.

12.1.2 Sewer

12.1.2.1 Sewer connection fees schedules may be obtained from the City. Some services may cost more than the published rates due to local conditions, as determined by City of Gentry Water and/or Wastewater Department.

12.1.2.2 This cost does not include excavation. The builder and/or owner is responsible for excavation of sewer line.

12.1.3 Building Service Lines

Building service line construction is not included in service tap construction and fees.

12.1.4 Large Tap Fees

Large tap fees must be paid for prior to the tap being made. A rate schedule for large tap fees is available on request from City of Gentry Water and/or Wastewater Department.

12.2 Connection Fees

Connection fees help defray costs of water and sewer system improvements. Connection fees are collected by City of Gentry Water and/or Wastewater Department prior to the establishment of service. All connection fees are set aside in a separate fund to help pay for water and sewer main extensions, transmission mains, tanks, pumping stations, treatment works, or any other legal purpose. If water or sewer service only is required, the connection fee will be collected at the time the "Application for Service" is submitted to City of Gentry Water and/or Wastewater Department. Connection fees are separate and in addition to tap fees.

12.2.1 Water Connection Fees

The current rate schedule may be obtained at City of Gentry Water and/or Wastewater Department business office.

12.2.2 Sewer Connection Fees

The current rate schedule may be obtained at City of Gentry Water and/or Wastewater Department business office.

12.2.3 Multiple Unit Housing

Water connection fees for multiple unit housing will be assessed on a per unit basis. Sewer connection fees will be assessed on a case by case basis.

12.2.4 Fees Are Subject To Change Without Notice

Water and Sewer Connection Fees are subject to change without notice.

12.2.5 City of Gentry Water and/or Wastewater Department Bound by Written Contract Only

City of Gentry Water and/or Wastewater Department is not bound except by written contract.

12.2.6 Failure to Collect Fees

Failure to collect connection fees at the time service is made does not constitute a waiver of such fees.

PART 2 - POTABLE WATER CONSTRUCTION

DIVISION I –MATERIALS

SECTION 1 - DESCRIPTION

1.1 General

These specifications are intended to set a standard of quality and design for all material used in the construction of water mains and appurtenances. Projects that would necessarily involve materials other than those included in this specification shall be subject to the approval of City of Gentry Water and/or Wastewater Department.

1.2 Approved Manufacture

All materials must be approved by City of Gentry Water and/or Wastewater Department. All materials shall be of Domestic (United States of America) manufacture unless approved by the City of Gentry Water and/or Wastewater Department.

1.3 References

Any reference to specifications published by other agencies shall refer to the latest edition or revision of such specifications.

1.4 No Lead Content

Components in contact with potable water shall comply with latest requirements of the Federal Safe Drinking Water Act and shall contain no lead.

SECTION 2 - POTABLE WATER PIPE

2.1 General

All pipe furnished shall be designed for the distribution of potable water. Lubricant furnished for push-on joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material and shall not impart taste or odor to water. The lubricant containers shall be labeled with the manufacturers' name.

2.2 Flanged Ductile Iron Pipe

The pipe shall have cement mortar lining and seal coat in accordance with ANSI A21.4 / AWWA C104. The pipe and flanges shall conform to ANSI A21.15 / AWWA C115, Class 250 psi.

2.3 Ductile Iron Pipe, 6"- 36"

Pipe shall conform to ANSI A21.51 / AWWA C151 and shall have cement mortar lining and seal

coat conforming to ANSI A21.4 / AWWA C104. Joints shall conform to ANSI A21.11 / AWWA C111/ and ANSI Specification A21.51 and may be mechanical joint or push-on joint unless otherwise specified.

2.4 PVC C900 DR 18 and DR 14, 4" - 12"

Polyvinyl Chloride (PVC) Pressure Pipe shall conform to ANSI/AWWA C900 Latest Edition.

Four-inch (4") diameter pipe through twelve-inch (12") diameter pipe shall be nominal pipe size and shall have Dimension Ratio (outside diameter) / (wall thickness) of eighteen (DR-18) or fourteen (DR-14) for PVC 1120 pipe conforming to the requirements of the applicable sections of AWWA C 900, Type Ci. Adapters for fitting PVC pipe to the fittings or cast-iron pipe shall be recommended by the pipe manufacturer.

Pipe shall be in standard laying lengths of twenty feet (20') plus or minus one inch (+ OR - 1") with maximum of sixteen percent (16%) of each size in random lengths of not less than ten feet (10') each. Provisions shall be made for expansion and contraction at each joint by use of a gasket type joint.

2.5 PVC ASTM 2241 SDR 21 AND SDR 17, 3"

Polyvinyl Chloride (PVC) Pressure Pipe shall conform to ASTM D2241 Latest Edition.

Three-inch (3") diameter pipe shall be nominal pipe size and shall have a Standard Dimension Ratio (outside diameter) / wall thickness of twenty-one (21) or seventeen (17) for PVC D2241 pipe conforming to the requirements of the applicable sections of ASTM D2241.

Pipe shall be in standard laying lengths of twenty feet (20') plus or minus one inch (+ OR - 1") with maximum of sixteen percent (16%) of each size in random lengths of not less than ten feet (10') each. Provisions shall be made for expansion and contraction at each joint by use of a gasket type joint.

SECTION 3 - WATER PIPE FITTINGS

3.1 Mechanical Joint Fittings:

Three-inch (3") diameter through twenty four-inch (24") diameter fittings shall be 350 pounds per square inch working pressure mechanical joint ductile cast iron fittings conforming to AWWA Specification C110, and ANSI Specification A21.53, with double cement-mortar lining conforming to AWWA Specification C104, and ANSI Specification A21.4. All ductile iron fittings shall be installed with Mechanical Joint Restraints.

3.1.1 Mechanical Joint Retainer Glands

Joint restraints, when used at anticipated locations of thrust, shall be nominal pipe size

and shall be mechanical joint restraint, MJR Joint Gland Pack, by Tyler Pipe, or approved equivalent, or ductile iron mechanical joint retainer gland, Mega Lock Retainer Gland, by Tyler Pipe, or approved equivalent. If mechanical joint retainer glands are used, then the number and minimum size set screws shall be as follows:

Size Gland	Size Set Screw	Number Set Screws
3″	5/8″	4
4″	5/8″	4
6"	5/8″	6
8"	5/8"	9
10"	5/8"	16
12"	5/8"	16
16"	5/8"	24
20"	5/8"	28
24"	5/8"	32

3.1.2 Swivel Hydrant Adapters and Tees

Swivel hydrant adapters and tees shall be designed for a working pressure of at least 250 psi and to fit standard mechanical joint fittings (AWWA C110). One end of the swivel adapter and the branch of the tee shall be provided with a gland that may be rotated 360 degrees on the fitting. Lengths of swivel adapter shall be as specified.

3.1.3 Tapping Sleeves

Sleeves shall be designed for a working pressure of at least 200 psi. A test plug shall be furnished through the body for hydrostatic pressure testing on sleeves 4-inch and larger. Stainless Steel mechanical type sleeves are required for taps unless approved in writing by City of Gentry Water and/or Wastewater Department.

Tapping sleeve tees shall be designed for a working pressure of at least 200 psi. A test plug shall be furnished through the body for hydrostatic pressure testing on sleeves four inch (4”) and larger. Cast iron mechanical type sleeves are required for taps on pipes of the same diameter. The outlets shall conform to ANSI B16.1, Class 125 flanges designed to accept tapping valves. Sleeves shall be designed to properly fit the type and class of pipe specified. Sleeves shall be steel. Steel sleeves shall be stainless steel. All bolts, nuts, and washers shall be corrosion-resistant alloy. Sleeves that are designed in such manner that the watertight seal around the outlet is achieved by a gasket placed between the sleeve body and the pipe barrel shall be provided with a recess in the sleeve body to accommodate the gasket.

3.1.4 Steel Couplings

Couplings shall be mechanical type with follower rings and gaskets designed for a working pressure of at least 225 psi and to properly fit the type and class pipe specified, steel couplings shall be stainless steel or epoxy-resistant alloy. The bolts and coating shall conform to paragraph 3.1 above.

3.2 Mechanical Joint Compact Fittings

Mechanical joint compact or light weight fittings shall be ductile iron conform to the requirements of ANIS A21.53 / AWWA C153, latest revision, for "Ductile Iron Compact Fittings, 3 inch through 24 inch, for Water and Other Liquids". All fittings shall have a minimum pressure rating of 350 psi and shall have a standard thickness cement mortar lining in conformance with ANSI A21.4 / AWWA C104. Joints shall conform to ANSI A21.11 / AWWA C111, latest revision. All fittings shall be furnished with gaskets, bolts, nuts, and iron glands.

SECTION 4 - WATER SERVICES

4.1 Tapping Saddles:

All 1" service saddles shall be designed for a minimum working pressure of 200 psi. A rubber gasket shall be provided between the casting and pipe surface. Straps and bolts shall be high strength corrosive resistant alloy steel. Taping saddles to be installed on water mains shall be double strap coated Smith & Blair Tapping Saddle or approved equal. The outlet threads shall be compatible with AWWA CC 100 type 1" corporation stops.

4.2 Corporation Stops

Corporation Stops shall conform to AWWA C800 (latest edition) without a positive stop. The inlet shall be AWWA CC 100 tapered threads and the outlet shall be a compression coupling. The corporation stops shall be Ford Brass F1000-NL or approved equal with precision machined castings and compatible with conventional tapping machines.

4.3 Service Tubing

Service tubing shall be SDR 9 high density polyethylene such as "Drisco" pipe with 250 psi working pressure. Pipe stiffeners shall not be used with polyethylene service tubing.

Polyethylene pipe for service connections shall be normal pipe size, copper tubing size (CTS), shall have a maximum Standard Dimension Ratio (outside diameter) / (wall thickness) of nine (SDR-9) and shall be high density polyethylene tubing conforming to the requirements of the applicable sections of PE 3408, ASTM D3350, ASTM D12478, ASTM D638, ASTM D256, and ASTM F1248, Series 5100 Ultra Line pipe, by Driscopipe or approved equivalent.

4.4 Service Meter Sets

All Service Taps Must Be Made on the Main During Construction. Service lines must terminate at the location shown on the plans. Each living unit *(i.e...single family, duplexes, triplexes, commercial properties, etc.)* shall have single meter sets. Meter will be installed five (5) feet from the property line and/or two (2) feet behind sidewalk. Apartment complexes shall be evaluated by City of Gentry Water and/or Wastewater Department on a case by case basis. Single meter sets must be approved by City of Gentry Water and/or Wastewater Department. Double meter sets will not be allowed by City of Gentry Water and/or Wastewater Department. All irrigation systems shall be fed by their own meter source.

4.4.1 Single Meter Set

Single meter sets shall be comprised of the following components:

Meter Box -

Shell - ¾" Meter, 18" Diameter ADS meter pit with a minimum length of thirty inches (30")
- 1" Meter, 30" Diameter PVC Pipe
- 2" Meter or greater, ADS N12 36"x36" Dual Wall – HDPE Pipe

Lid - shall be eighteen-inch (18") diameter (nominal) cast iron water WM-18 meter box lid, by Vestal Lids. Thirty-inch (30") and thirty-six (36") inch diameter cast iron water meter box lid, by Vestal Lids. Meter boxes for meters sized 2" and greater shall have a 18"x36" cast iron adapter ring manufactured by SIP Industries.

Bottom – 3" Compacted SB-2 Base

Service components –

One – Ford VBH 72-7W-44-44-NL Setter

One - Ford C86-34-NL ¾" Coupling

One - ¾" Brass FIP 45° Bend

One - Ford B43-232W-NL $^{5}/_{8}$" Meter Ball Valve

One - Ford H531-323-NL ¾" Straight Check Valve

One - ¾" x 6" Brass Nipple

One – Plastic Stiffner

See Meter Set Detail.

4.4.2 Curb Side Shut-Off Valve & PRV

An 18”x30” NDS water meter box with extension manufacture by Dallas Specialty Mfg. shall be used for ball valve and PRV after the meter for plumber to install and placed on top of 3” thick compacted SB-2 or clean gravel. Plastic or stainless steel ball valves shall be accepted. The PRV shall be manufactured by Watts and approved by the City of Gentry Water and/or Wastewater Department. The box shall be installed with the top 6” above the rough grade of the ground and 4” above bedding and sod.

SECTION 5 - WATER VALVES

5.1 Gate Valve Manufacturers

Valves conforming to these specifications will be accepted from the following manufacturers:

A. Mueller Company, Decatur, Illinois

B. American AVK, Minden, Nevada

C. Or of Equal Specifications.

5.2 Gate Valves, 2" through 18" with Resilient Seat:

Resilient seat gate valves, two inches (2”) through twelve inches (12”), shall be nominal pipe size and shall be American Water Works Association approved for water systems. Gate valves shall have resilient seat with vulcanized rubber-coated cast iron wedge, non-rising stem, vertical-mounting “O”-ring stem seal, two inch (2”) square operating nut opening counter-clockwise, standard bell ends to accommodate mechanical joint type gaskets and glands for pipe connections, thermoplastic epoxy-coated body, bonnet, seal plates and shall have an unobstructed thru-conduit flow path for full flow capacity. Resilient seat gate valves shall be manufactured in accordance with the applicable sections of AWWA C-509 with coatings in accordance with the applicable sections of AWWA C-550. A 4” thick concrete pad shall be installed beneath each gate valve installed.

Valves equivalent to these specifications will be accepted from the following manufacturers:

- Mueller Company, Decatur, Illinois
- American AVK, Minden, Nevada

5.3 Butter Fly Valves

5.3.1. General

All butterfly valves shall be manufactured in accordance with the latest revision of AWWA C504 for Class 150B service. All valves shall be either Henry Pratt

Groundhog as manufactured by the Henry Pratt Company or Gentry Water and or Sewer Department approved equal. Valves in sizes 3-24” shall have 304 stainless steel trim as standard.

5.3.2. Valve Body

Valve body shall be constructed of cast iron ASTM A-126 Class B and conform to AWWA C504 in terms of laying lengths and minimum body shell thickness. End connections shall be as specified on the plans.

5.3.3. Valve Disc

Valve disc shall also be made from cast iron ASTM A-126 Class B in sizes 20" and smaller. Sizes 24" and larger shall be built from ductile iron in conformance to ASTM A-536. Disc shall be furnished with Type 316 stainless steel seating edge to mate with the rubber seat on the body.

5.3.4. Valve Seat

Valve seat shall be Buna-N rubber located on the valve body. In sizes 20" and smaller, valves shall have bonded seats that meet test procedures outlined in ASTM D-429 Method B. Sizes 24" and larger shall be retained in the valve body by mechanical means without use of metal retainers or other devices located in the flow stream.

5.3.5. Valve Shaft

The shaft shall be Type 304 stainless steel conforming to ASTM A-276. Shaft seals shall be standard self-adjusting split V packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.

5.3.6. Valve Bearings

Bearings shall be sleeve type that is corrosion resistant and self-lubricating.

5.3.7. Valve Actuators

Actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft. lbs. against the stop. The traveling nut shall engage alignment grooves in the housing. The actuators shall have a built in packing leak bypass to eliminate possible packing leakage into the actuator housing.

5.3.8. Painting

The Valve Interior and Exterior Surfaces except for seating shall be coated with

Ameron Amerlock 370 in accordance with AWWA C550 and C504. All internal and/or external surfaces shall be covered with a polyamide cured epoxy coating applied over a sand blasted “new white metal surface" per SSPC-SP10 to a minimum of 6 mils in compliance with AWWA C550.

5.4 Air Release Valves

Air-Release Valves - shall be APCO No. 220-S, or equal, or as specified. See Standard Details.

SECTION 6 - VALVE BOXES

6.1 Valve Boxes (Standard Depth and Extra Depth)

Valve Boxes for Gate Valves set for all depths shall consist of 6” diameter AWWA C900 DR-18 PVC pipe with mushroom lid engraved with “W”. Depth shall be enough to cover gate valve and shall be aligned to enable adequate operation of the valve with an appropriately sized T wrench.

SECTION 7 - FIRE HYDRANTS

7.1 Required Fire Hydrant Features

Fire hydrants shall be Traffic Model fire hydrants conforming to AWWA C502 or latest revision, and equipped as follows:

Working Pressure	Minimum 150 psi
Size of Valve Opening	Minimum 5-1/4"
Diameter of Inlet Connection	6"
Type of Inlet connection	Mechanical Joint
Number & Size of Hose Connection	2 @ 2-1/2" & 1 @ 4-1/2"
Nozzle Arrangement	All in same horizontal plane
Nozzle Cap Chains	Each cap
Operating Threads	Oil W/O-Ring Seals
Seat Rings	Bronze to Bronze
Direction to Turn to Open	Left (counterclockwise)
Color of Hydrant	Red
Shape & Size of Operating Nut & Nozzle Cap Nut	5-sided, 1 ½" from flat to point
Operating Nut	Bronze

7.2 Approved Fire Hydrants

Fire hydrants shall be traffic model Mueller Centurion # A-423 or approved equal. Hydrants shall be red in color and powder coated by Manufacturer.

When fire hydrants are installed on four-inch (4") diameter potable water mains, the fire hydrant shall be two-way fire hydrant; that is, it shall be void of the pumper connection and have only two (2) two and one-half inch (2-1/2") diameter hose connections. All other applicable previously specified items for fire hydrants shall be the same.

If fire protection water demand merits, and alternate fire hydrant with a main valve of not less than five and one quarter inches (5-1/4") in diameter should be considered and used. All other previously specified items for fire hydrants shall be the same.

7.3 Design Specifications

The hydrant shall be of the dry top design. Stem threads shall be sealed from the waterway in both the open and closed position. The thrust collar of the operating nut and the thrust collar bearing surfaces of the bonnet shall be automatically lubricated each time the hydrant is operated or thrust collar bearing surfaces of the bonnet shall be bronze brushed to reduce corrosion. A weather cap shall be provided.

7.4 Blow-Off Assembly:

Blow off/line flush valve hydrant, when used, shall be two-inch (2") diameter, nonfreezing, self-drainage type with two inch (2") diameter female iron pipe thread inlet, two and one-half inch (2-1/2") diameter NST male discharge nozzle capped and chained traffic break away design and locking cap Model No. 77 Main guard Hydrant by the Kupferle Foundry Company or approved equivalent. The assembly shall include a 3" gate valve and then reduce to 2" to tapped cap to be removed as part of future extensions.

The blow-off assembly shall extend one foot (1') above grade and be installed within a 24" Box with 24" lid and shall include a T-post brace be installed within the box to support the blow-off.

7.5 Fire Hydrant Placement

Fire hydrants shall be installed so that spacing between hydrants shall not be greater than 600-feet within single-family and two-family residential developments. In commercial, mixed use, and multi-family residential developments fire hydrant spacing shall not be greater than 600-feet. The Fire Department may require additional hydrants and closer spacing during plan review. Fire hydrants placed in subdivisions should be installed at the lot lines to avoid conflicts with driveways.

In rural areas within the city limits, fire hydrants shall be installed so that spacing between hydrants shall not be greater than ½ mile or as directed by the Fire Department.

Fire hydrant placement shall be approved by the Fire Department. New building

construction shall not begin until a working Fire Department approved fire hydrant is available for fire protection.

SECTION 8 – POLYETHYLENE MATERIAL FOR PIPE ENCASEMENT

8.1 PVC SDR-26 Pipe Encasement

Polyethylene material for the encasement of ductile iron pipe shall be SDR-26 and conform to ASTM D 2241 in accordance with ASTM D 1784.

SECTION 9 - TRACE WIRE FOR NON-METALLIC PIPE

9.1 Trace Wire

Trace wire shall be insulated 10-gauge solid copper wire and must be placed in the water main and sewer force main trench above the pipe. Trace wire must not be placed against, or taped or fastened to the pipe. Trace wire shall be tested to prove connectivity and location for entire length(s) of installed utility mains. All trace wire splices and connections shall be made with direct bury lug water-proof locking manufactured connectors. Wire connectors shall be split, bolt type connectors No. 90120 Dryconn manufactured by King Innovation, or approved equivalent.

SECTION 10 - WATER AND SEWER LINE SEPARATION

10.1 Protection of Water Supplies

There shall be no physical connections between the potable water supply system and a sewer, or appurtenance there to which permit the passage of any sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer manhole.

10.2 Vertical Separation

Water mains crossing sewer lines shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer with preference to the water main located above the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

If this distance must unavoidably be reduced, the water line or the sewer line must be encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing. Any joint in the encasement pipe is to be mechanically restrained. The encasement pipe may be vented to the surface if carrying water or sewer under pressure. Where a water line must unavoidably pass beneath a sewer line, at least 18 inches of separation must be maintained between the outside of the two pipes in addition to the preceding encasement requirement. Exceptions to this must be approved in writing by the Arkansas Department of Health.

10.3 Horizontal Separation

Sewers, manholes, wet wells, etc., shall be laid at least ten (10) feet horizontally from any existing or proposed water main and vice versa. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten-foot separation, the Arkansas Department of Health, Division of Engineering, may allow deviation on a case by case basis, if supported by data and pertinent facts from the Engineer and agreed to by City of Gentry Water and/or Wastewater Department.

DIVISION II - POTABLE WATER CONSTRUCTION PROCEDURES

SECTION 1 - DESCRIPTION

1.1 General

This part of the specifications shall set forth minimum acceptable construction procedures for the installation of potable water facilities under the jurisdiction of City of Gentry Water and/or Wastewater Department. Construction procedures other than those outlined in this specification shall meet with the approval of the Department. Complete specifications covering any unusual or special construction procedure not listed in this specification shall be submitted to the Department for approval prior to the beginning of construction.

SECTION 2 - EXCAVATION

2.1 Trench Excavation - General

The trench shall be excavated so that the pipe can be laid to the alignment and depth required, and it shall be excavated only so far in advance of the pipe laying as set out elsewhere in these specifications. Unless otherwise indicated, the Contractor shall excavate by open cut.
The trench shall be so braced and drained that the workmen may work therein safely and efficiently. It is essential that the discharge of any trench dewatering pumps be conducted to natural drainage channels, drains, or storm sewers. The contractor shall be responsible for any discharge permits that may be required.

The contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part.

The Contractor shall perform excavation in areas of existing underground utilities, footings, etc., with such diligence and care as to not damage the existing facilities and/or operations.

All excavation shall be dewatered before any construction is begun. Concrete shall be placed only upon dry firm foundation material and pipe shall be laid only in dry trenches.

2.1.1 Trench Depth

Trenches for potable water mains shall be excavated to at least 6 inches below the grade required to provide proper alignment, pipe embedment and minimum earth cover. All water mains shall have at least 36 inches cover. All excavation below the established pipe grade shall be backfilled to the proper grade with pipe bedding material. All pipe bedding material shall be tamped so as to provide a uniform and continuous bearing support for the pipe at every point along the pipe barrel.

2.1.2 Bell Holes

The bedding material under each bell shall be excavated or shaped sufficiently to allow the pipe to rest throughout its length. Bell hole excavation shall also be sufficient to allow proper placing of the joint compound, where joint compound is used. No weight of dirt or pipe shall be supported by the bell of the pipe.

2.1.3 Trench Width

The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified. The trench width shall not exceed the maximum widths shown on the Standard Detail Sheet in the Appendix at any point from the trench bottom to a point 12 inches above the barrel of the pipe.

If the contractor over excavates the trench, he shall provide additional pipe bedding gravel or concrete necessary to prevent crushing of the pipe due to excessive earth loads.

2.1.4 Trench Length

City of Gentry Water and/or Wastewater Department shall have the right to limit the amount of trench excavated in advance of the pipe laying. In general, such excavation shall not exceed 300-feet, and trench excavated to grade shall not exceed 100-feet. Open trenches shall be filled at the end of each work day and shall not be left unattended.

2.1.5 Pipe Clearance in Rock

Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least 6 inches below and 12 inches on each side of all pipe, valves, and fittings for all pipe diameter sizes. Every trench in rock shall be fully opened at least 50 feet in advance of the place where pipe is being laid or concrete or masonry work is in progress.

2.1.6 Excavation in Poor Soil and Refilling to Grade

Where the bottom of the trench is found to be unstable soils or to include ashes, cinders, all types of refuse, vegetable or other organic materials, or large pieces of fragments of inorganic material which in the judgment of City of Gentry Water and/or Wastewater Department Engineer should be removed, the Contractor, at his own expense, shall excavate and remove such unsuitable material to the width and depth ordered by City of Gentry Water and/or Wastewater Department Engineer.

Before the pipe is laid, the sub-grade shall be made by backfilling with crushed stone (ADOT Class 8) in 6 inch un-compacted layers. The layers shall be thoroughly tamped by hand or machine to the density of adjacent undisturbed soil so as to provide a uniform and continuous bearing and support for the pipe at every point between the bell holes.

2.1.7 Wet Excavation

When water or unstable soil is encountered in the bottom of the trench, the Contractor will be required to excavate below grade a minimum of six inches, and the trench will be brought back to grade with ADOT Class 8 crushed stone or crushed stone with no particles larger than 3/4-inch. The layers shall be thoroughly tamped and formed to provide a uniform and continuous bearing and support for the pipe at every point between the bell holes. Pipe shall not be installed in standing water unless specifically approved by City of Gentry Water and/or Wastewater Department personnel. The placement of soil berms across the trench at no more than 100-feet spacing may be required to prevent water flowing along the trench.

2.1.8 Removal of Water and Muck

The Contractor shall provide sufficient pumps and other necessary equipment to keep the trench free of water which may accumulate. If the bottom of the trench becomes soft and muddy, the Contractor shall remove all such soft material and replace it with bedding material as described above in paragraph 2.1.6.

2.1.9 Deviations Occasioned by Other Structures

Whenever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the Engineer shall have the authority to change the plans and order a deviation from the line and grade only after approval of the change by City of Gentry Water and/or Wastewater Department , or the Engineer may arrange with the owners of the structures in conflict for the removal, relocation or reconstruction of the obstruction.

2.1.10 Bracing and Shoring

The sides of any excavation on trenches over five (5) feet deep, or when deemed necessary, shall be properly supported with shielding, bracing, shoring, or sheeting

as the need may be. When sheeting and shoring are used, the materials shall be of a quality equal to or greater than that described in the OSHA Construction Safety and Health Regulations Standards. Such bracing, shoring, or sheeting shall be withdrawn the work progresses in such a manner as not to endanger life and property and to allow for backfilling of the trench in accordance with these specifications.

In case the excavation is close enough to buildings or other foundations as to endanger their stability by removing such bracing, then they shall be made secure and left in place, and the line trench shall be backfilled and thoroughly tamped with the bracing in place.
Where the trench walls are sloped away from the trench to prevent slides or cave-ins, it will be permissible to cut the trench banks on a slope above an elevation two (2) feet above the crown of the pipe. It is the responsibility of the contractor to maintain the excavation free from slides or cave-ins, safe for workman and to comply with federal labor requirements for trench safety. No observation of any project by the Engineer or representative of City of Gentry Water and/or Wastewater Department will reduce the Contractor's responsibility. Contract document shall include all OSHA requirements.

2.1.11 Use of Explosives

In the event the use of explosives is necessary for the efficient prosecution of the work, the Contractor shall notify the Engineer in advance of their use and shall exercise every precaution to protect completed work, neighboring property, or other underground structures. Any damage to public or private property resulting from the use of explosives shall be the liability of the Contractor. It shall be the responsibility of the Contractor to obtain all necessary permits.

The Contractor shall notify all owners of neighboring property or public utility property of intention to use explosives at least eight hours before blasting is done close to such property. Any observation of this project by a representative of City of Gentry Water and/or Wastewater Department does not in any way reduce the responsibility of the Contractor for damage resulting in the use of explosives. In all cases, where explosives are necessary, the Contractor shall obtain appropriate permits from governmental agencies prior to their use.

2.1.12 Disposal of Excavated Materials

The excavated material shall be placed by the Contractor at such a distance away from the trench to allow workmen and equipment along the side of the trench and to prevent cave-in, side stuffing, heaving, etc., of the excavated trench. Excavated material shall be piled adjacent to the work to be used for backfilling, if suitable. All excavated material which is unsuitable for backfilling and any excess material shall be disposed of in a manner approved by the Engineer.

SECTION 3 - PIPE EMBEDMENT, PROTECTION COVER & TRENCH BACKFILL

3.1 General

This section covers the minimum requirements for embedment, pipe protection cover and backfill of potable water lines.

3.2 Pipe Embedment

All pipe shall be bedded in materials containing a significant percentage of fine particles and maximum particle size of ¾-inch. ADOT Class 8 crushed stone is acceptable. Other crushed stone products such as chips or grit are acceptable as long as there is no standing water in the trench. Materials excavated from trenches can be used for pipe embedment if and only if said materials are mechanically screened or processed with grinding/screening equipment so that maximum particle sizes are ¾-inch or less.

Unless otherwise specified and/or shown on the construction drawings, and/or directed by the Field Engineer, all underground piping shall have a compacted fine granular (maximum particle size of ¾ inch) bedding material (bedding sand or limestone quarry screenings) placed in the bottom of the trenches, the entire width of the cut, with a depth of six (6) inches below the outside of the bottom of pipe. The Contractor shall place this compacted fine granular material around the outside of the pipe encompassing at least the lower one-fourth (1/4) to lower one-half (1/2) of the perimeter of the pipe.

3.3 Pipe Protection Cover

All pipe shall have a protective covering of the same material as used for embedment. The pipe protection cover shall extend to a minimum of 12-inches above the top of the pipe.

3.4 Trench Backfill and Compaction Methods

Backfilling of pipelines shall include the refilling and consolidation (compaction) of the fill in the excavation up to the surrounding ground surface or road grade at crossings. All pipeline trench backfill shall be placed in layers of appropriate thickness not to exceed 12" and compacted by hand or approved mechanical methods. All trench backfill (except that under paved areas) shall be compacted to a minimum density of 85% of the maximum density of the adjacent undisturbed soil as determined in accordance with ASTM D2922. Trench backfill shall proceed concurrently with pipe installation. There shall be no more than two full joints of pipe exposed in a trench at all times. The Contractor shall not backfill the trenches until the underground piping systems, as installed, conform to the requirements specified in the several sections and construction drawings covering the installation of the various underground systems. Where, in the opinion of the Field Engineer, damage is likely to result from withdrawing sheeting, the sheeting hall be left in place. The Contractor shall not leave untreated sheeting in place beneath structures or pavements. Trenches improperly backfilled shall be reopened by the Contractor to the depth required for proper compaction, then refilled and compacted as specified. The Contractor shall place backfill material around and over the pipe in six inch (6”) maximum thickness compacted layers and shall compact with suitable tampers to the density of the adjacent soil or graded as hereinafter specified until

there is a cover of not less than one foot (1') over underground lines The backfill material used for this one foot (1') over underground lines, shall be compacted fine granular (maximum particle size of ¾ inch) backfill material (bedding sand or limestone quarry screenings). The backfill material from the top of the one foot (1') over the underground lines shall consist of earth, sandy clay, sandy silt, sand and gravel, or other approved material free from stones larger than three inches (3") in any dimension, except that where the pipe's exterior is coated for protection against corrosion, the backfill material shall be free from stones larger than one inch (1") in any dimension. Special care shall be taken not to damage the exterior coating of pipes. The meaning of "density of the adjacent soil" will be interpreted as ninety-five percent (95%) maximum laboratory dry density at the optimum moisture content, as defined by the standard Proctor test (ASTM D698).

The trench, excavated area around manholes, fittings, and other appurtenances shall be backfilled with excavated material free from rock larger than three inches, cinders, ashes, refuse, vegetable, or organic material, frozen soil, or other deleterious materials that in the opinion of the Engineer or City of Gentry Water and/or Wastewater Department are unsuitable.

Backfill material placed in the excavated trench shall be compacted by the Contractor with the use of hand rammers, mechanical motor driven tampers, flat wheel, pneumatic tire, or by any other method which will produce the degree of compaction required for the area in which the backfilling is located. Proper caution shall be exercised by the Contractor when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as a method of compaction. The Contractor shall maintain optimum moisture content of fill materials to attain required compaction density.

An independent testing laboratory, when specified, shall perform testing at intervals not exceeding two hundred feet (200') of trench for the backfill and furnish copies of test results as specified.

3.5 Backfilling Procedures

The Contractor shall place backfill material in layers not exceeding the compacted thickness specified, and each layer shall be compacted to the minimum density specified as applicable to that particular area as follows:

3.5.1 Paved Areas

Where pipelines are placed under existing or proposed paved areas including adjacent shoulder areas, the pipe bedding, protection cover and trench backfill to sub-grade elevation shall be class 8 crushed stone, placed in six inches (6") thick compacted to 95% Modified Proctor.

3.5.2 Improved and Sodded Areas

Backfill shall be placed in twelve inch (12") thick compacted layers and compacted to the density of the adjacent soil. This requirement applies to the areas more than five feet (5') away from any structure.

3.5.3 Areas Not to be Landscaped

Backfill shall be placed in twelve-inch (12”) thick compacted layers and compacted to the density of the adjacent soil. The surface shall be mounded over and left in a uniform and neat condition satisfactory to the Field Engineer.

3.6 Compaction Methods

Backfill material placed in the excavated trench shall be compacted by the Contractor with the use of hand rammers, mechanical motor driven tampers, flat wheel, pneumatic tire, or by any other method which will produce the degree of compaction required for the area in which the backfilling is located. Proper caution shall be exercised by the Contractor when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as a method of compaction. The Contractor shall maintain optimum moisture content of fill materials to attain required compaction density. An independent testing laboratory, when specified, shall perform testing at intervals not exceeding two hundred feet (200’) of trench for the backfill and furnish copies of test results as specified.

3.6.1 Permanent Repairs

All permanent repairs of streets, roads, alleys, sidewalks, or other public rights-of-way shall meet with the construction requirements of the governing agency or private owner and shall meet with the requirements of all local ordinances, regulations, permits, or codes governing the repairs to roads, streets, or other public rights-of-way

3.6.2 Temporary Surfacing

Methods of temporary surfacing shall meet with the requirements of the governing agency or private owner and shall meet the requirements of all local ordinances, regulations, permits, or codes governing the temporary repairs to roads, streets, and other public rights-of-way or, as otherwise approved to adequately maintain traffic and proper drainage.

3.7 Street Right-of-Ways

For open cut crossings of County Roads, City Streets and paved driveways the pipe bedding, protection cover and trench backfill to sub-grade elevation shall be class 8 crushed stone compacted to 95% Modified Proctor. The entire trench shall be backfilled with said crushed stone to the subgrade elevation under all pavements and graveled shoulders. Areas with vegetative cover within street and road right-of-ways will be backfilled with said crushed stone to a point 12 inches below finish grade. The remaining 12-inches shall be backfilled with the soil materials removed from the trench or top soil as required to enable re-establishment of vegetative cover.

3.8 Service Lines

Water service lines shall be bedded, protected and backfilled in the same manner as pipe as described in the preceding paragraphs. Water service line crossings shall be encased in PVC pipe or HDPE pipe. 2-inch pipe encasement is allowed for a single 1-inch service crossing. 3-inch pipe encasement is allowed for two 1-inch service crossings at the same location. Water service encasement shall extend a minimum of 2-feet behind back-of-curb where no sidewalk is present. Water service encasement shall extend a minimum of 1-foot past sidewalk where sidewalk is present.

SECTION 4 - PIPE INSTALLATION

4.1 Description

This section covers the laying of pipe for potable water lines. All materials shall be in accordance with these specifications.

4.2 General

4.2.1 Alignment and Grade

All water mains shall be laid and maintained to the required lines and grades as shown on the plans with fittings, valves and hydrants, and other appurtenances at the required locations, spigot centered in bells, and all valve and hydrant stems plumb.

4.2.2 Ductile Iron Pipe

Ductile iron pipe and ductile iron pipe fittings shall be installed in accordance with AWWA C-600, or latest revision, (Installation of Ductile Iron Water Mains and Their Appurtenances).

4.2.3 PVC Pipe

PVC pipe shall be installed in accordance with AWWA C-605, or latest revision, (Underground installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings).

4.3 Weather/Temperature Restriction

Pipe installation shall not take place until the temperature is at least 32° Fahrenheit and rising. Pipe installation shall cease when temperatures are 35° Fahrenheit and falling.

4.4 Water Pipe Laying

All pipe and fittings shall be installed to the line and grade as detailed on the plans. Subject to the approval of City of Gentry Water and/or Wastewater Department, other fittings may be added to

or substituted for those shown on the plans, should the need therefore arise during construction. This permissive stipulation in no way shall relieve the Contractor of the responsibility for furnishing and installing all fittings required for a complete and proper installation of pipeline as detailed on the plans.

All dirt and other foreign matter shall be removed from the inside of pipe and fittings before they are lowered into the trench. They shall be kept clean during and after placement and care shall be taken to keep dirt out of the jointing space. At the end of each day's work, or when pipe laying is discontinued for an appreciable period, or, if the ditch is muddy, or if it begins to rain open ends of pipe shall be closed with a watertight plug or cap firmly secured in place.

All pipe and fittings shall be lowered carefully into the trench in such a manner as to prevent damage to pipe, fittings or linings. Neither pipe nor fittings shall be dropped or dumped into the trench.

Cutting of pipe, where needed, shall be done in a neat and workmanlike manner without damage to pipe or pipe lining.

Unless otherwise directed by the Engineer, pipe shall be laid with bell ends facing in the direction of laying. For lines on an appreciable slope, bells shall, at the direction of the Engineer, face upgrade. Whenever necessary to deflect pipe from a straight line in either the horizontal or vertical plane, to avoid obstructions, or for other allowable reason, the degree of deflection of any joint shall be not greater than that which will provide adequate gasket space entirely around the spigot end of pipe. The joint opening shall be approximately 1/8 inch. Joint Deflections shall not exceed the maximum recommended by the pipe manufacturer or 5 degrees, whichever is less.

4.5 Potable Water Service Lines, Polyethylene

All water service lines shall be sleeved in an adequately sized PVC encasement pipe when in road right-of-ways or when under paved areas. All service lines shall have a minimum earth cover of 30 inches over the top of the pipeline. Polyethylene water services lines shall be used. The polyethylene water service line shall be "Drisco" DR 9, 250 psi. Pipe stiffeners shall not be used with polyethylene service pipe.

4.6 Borings and Casings Under Streets, Roads, Highways, and Railroad Crossings

When indicated on the construction drawings and specifications that street, road, and highway crossings for water mains are to be cased, the casing shall be installed by the jacking and boring method or directional bore method, and shall be installed in accordance with the Arkansas Department of Transportation specifications.

Excavation of approach pits and trenches within right-of-way of street, road, or highway shall be of sufficient distance from paving to permit traffic to pass without interference. Backfill for approach pits and trenches within right-of-way shall be tamped in layers not greater than six inches (6") thick for entire length and depth of trench or pit. The Contractor shall compact backfill to ninety-five percent (95%) of maximum laboratory dry density obtained at optimum moisture as

determined by the Standard Proctor Test (ASTM D698). Mechanical tampers may be used after cover of six inches (6") has been obtained over top of barrel of pipe.

The Contractor shall accomplish boring operation using commercial type boring rig, and hole shall be bored to proper alignment and grade and within two inches (2") of same diameter as largest outside joint diameter of the casing pipe installed. Install casing pipe in hole immediately after bore has been made, and in no instance, shall hole be left open while unattended.

In the event subsurface operations result in failure or damage to pavement within one (1) year of construction, the Contractor shall make necessary repairs to pavement at no additional cost to the City of Gentry. In the event paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, the Contractor shall repair or replace disturbed or broken area at no additional expense to the City of Gentry.

Steel casing joints shall be butt-welded and welds shall be full-penetration, single butt-welds in accordance with AWWA C-205 and AWS D7-0-62. PVC pipe will be accepted as casing pipe for bores constructed in the city and under city owned roads.

SECTION 5 - PIPE JOINTS

5.1 Description

This section covers the installation of pipe joints. Joint materials shall be as supplied and or recommended by pipe manufacturer.

5.2 Pipe Joint Installation

All pipe joints other than those specified herein shall be made in strict accordance with the manufacturer's recommendation and as approved. All joints shall be made watertight in accordance with the latest ASTM Standards. Excavation for bells or other joint protrusions shall be made to insure that the bottom of the pipe firmly rests against the bedding for entire length of the pipe.

5.3 Pipe Joint Lubricant

Lubricant furnished for push-on joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material and shall not impart taste or odor to water. The lubricant containers shall be labeled with the manufacturers' name.

5.4 Installation of Slip-Type or Push-On Joints

Prior to jointing, the bell and spigot end of the pipes shall be cleaned thoroughly by whatever means necessary to remove all foreign matter and attain the required cleanliness. A wire brush shall be used as necessary. Particular care shall be exercised to clean the gasket seat. Joints shall be made in strict accord with the recommendations of the pipe manufacturer. The rubber gasket shall be cleaned and inserted in the gasket seat within the bell. Apply lubricant in accordance with the

manufacturer's recommendations. The spigot end of the pipe shall be inserted in the bell of the pipe to which connection is being made, and forced to a firm contact with the shoulder of the bell. When this initial insertion is made, the alignment of the added pipe shall deviate from true alignment not more than 5 degrees for 4-inch pipe, not more than 3 degrees for 12-inch pipe; deviations for intermediate size pipes shall be in conformance with the stated maximum deviations.

5.5 Installation of Mechanical Joints

Pipe employed in making mechanical joints shall have a complete pipe wall thickness cross-section. Beveled or tapered pipe ends shall not be inserted into mechanical joints. Beveled or tapered pipe ends shall be removed with the pipe end cut square or at 90° to the pipe centerline axis. The spigot end of pipe and the bell of fitting and the rubber gasket shall be cleaned thoroughly as specified for pipe joints in paragraph 5.3 above. The glands shall be cleaned in a like manner. After the gland and gasket are placed on the spigot end of the pipe, a sufficient distance from the end to avoid fouling the bell, the spigot end shall be inserted in the fitting bell to firm contact with the bell shoulder. The rubber gasket then shall be advanced into the bell and seated in the gasket seat. Care shall be exercised to center the spigot end within the bell. Mechanical Joint Restraint shall be required on all Ductile Iron Fittings.

The gland shall be brought into contact with the gasket, all bolts entered, and all nuts made hand tight. Continued care shall be exercised to keep the spigot centered in the bell. The joints shall be made tight by turning the nuts with a wrench, first partially tightening a nut, then partially tightening the nut 180 degrees there from and working thus around the pipe with uniformly applied tension until the required torque is applied to all nuts. Joint deflections shall not exceed the maximum recommended by the pipe manufacturer.

Required torque ranges and indicated wrench lengths for standard cast iron bolts are as stated in the following table:

Pipe Size (Inches)	Bolt Size (Inches)	Range of Torque (Foot Pounds)	Length of Wrench (Inches)
6-24	3/4	75 - 90	10
30-36	1	100 - 120	14

The torque loads may be applied with torque-measuring or torque indicating wrenches, which may also be used to check the application of approximate torque loads applied by a man trained to give an average pull on a definite length of regular socket wrench.

SECTION 6 - PIPE FITTINGS

6.1 Description

This section covers the installation of pipe fittings, valves, plugs, caps, etc. for water lines and the installation of pipe fittings for water mains.

6.2 Pipe Fitting Installation

All pipe fittings shall be installed in strict accordance with the manufacturer's recommendations. Joints caused by the installation of fittings shall meet with the requirements of SECTION 5 - PIPE JOINTS. All pipe fittings shall meet with requirements of Part 2, Division 1.

6.3 Thrust Blocking for Pipe Fittings

All plugs, caps, tees, and bends shall be provided with reaction backing or shall be restrained joint pipe. The fitting must be braced against unexcavated earth at the end of the trench with 3000 psi PC concrete as shown in the Standard Details. Locking retainer glands may be required, as determined by City of Gentry Water and/or Wastewater Department. See the Standard Details.

6.4 Fire Hydrant Installation

All fire hydrants shall be installed at the location shown on the plans or at the direction of the Engineer and shall be installed in accordance with the Standard Details as set forth in these specifications.

6.4.1 Examination of Materials

Prior to installation, all hydrants shall be inspected for direction of opening, cleanliness of inlet elbow, handling damage, and cracks.

6.4.2 Placement

All hydrants shall stand plumb and shall have their nozzles with, or at right angles to, the street with the pumper nozzle facing the curb. Hydrants shall be set to established grade as specified on the standard details with the pumper nozzle centerline at least 18 inches above the final grade, unless otherwise directed by City of Gentry Water and/or Wastewater Department.

6.4.3 Location

Unless otherwise shown on the plans, hydrants shall be placed as follows: When placed beyond the curb, valves and hydrants shall be located out of paved or sidewalk areas and so that no portion of the hydrant or nozzle cap is within 18 inches of the gutter face of the curb. When set in the lawn space between the curb and sidewalk, or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 12 inches of the sidewalk. The location of all hydrants and appurtenances shall be within the street right of way or dedicated utility easement. There must be a minimum of 8 feet clearance on all sides of a fire hydrant from any appurtenance or structure.

6.4.4 Connection to Mains

Each hydrant shall be connected to the main with a 6-inch ductile iron pipe Swivel Tee branch, independent six (6) inch gate valve as shown on the Standard Detail of these specifications, and anchor coupling extending 12" – 14". The valve shall be installed plumb and shall not be allowed to rotate from plumb during placement in the trench.

6.4.5 Hydrant Drainage

Whenever a hydrant is set in any soil, pervious or impervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with sand over the reaction backing to at least 6 inches above the waste opening in the hydrant, and to a distance 1 foot around the barrel. No drainage system shall be connected to a sewer.

6.4.6 Thrust Blocking for Hydrants

All plugs, caps, tees, and bends shall be provided with reaction backing or shall be restrained joint pipe. The fitting must be braced against unexcavated earth at the end of the trench with 3000 psi PC concrete as shown in the Standard Details. Locking retainer glands may be required, as determined by City of Gentry Water and/or Wastewater Department. See the Standard Details.

6.5 Locking Retainer Glands

Locking retainer glands or other necessary means of thrust restraint shall be installed at designated locations where, in the opinion of City of Gentry Water and/or Wastewater Department, they are needed.

6.6 Location of Valves

Valves in water mains shall be located as shown on the plans and PVC valve boxes with concrete collars shall be set 1″ above finished grade. Each gate valve shall be placed on a 4″ thick concrete pad. Valves shall not be installed in sidewalks or where sidewalks are to be constructed. At intersections valve shall be placed on each branch line. If the depth of bury exceeds 4 feet, an operator extension shall be provided with the box to enable the operation of the valve with a standard 4 foot T wrench

6.7 Valve Boxes

A PVC valve box shall be provided for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve with the box cover flush with the surface of the finished pavement or 1" above grade as may be directed in unpaved areas. Valve boxes shall be installed as shown in the Standard Details.

6.8 Valve Box Collar

Valve box lids outside of paved areas shall have a 18-inch diameter or 18-inch square cast-in-place concrete collar placed around them. Grout/mortar shall be used as necessary to ensure that the concrete collar firmly adheres to the valve box. After the valve box lid has been adjusted to approximately 1" above finish grade, the collar shall be centered on the valve box lid and shall be 6 inches thick. The top of the pad shall be flush with the top of the box and 1" above the surrounding ground. Collars shall not be constructed until cleanup has been completed and the soil has been compacted.

6.9 Dead Ends

All dead ends on water mains shall have ductile iron plugs or caps and be suitably restrained and/or blocked as shown on the plans or directed by the Engineer. Blow off assemblies are not allowed as a means of flushing at the end of dead ends lines unless approved in writing by City of Gentry Water and/or Wastewater Department. Fire hydrants meeting the requirements of Part 2, Division 1, Section 7, will be required in all cases unless otherwise approved by City of Gentry Water and/or Wastewater Department.

6.10 Dead End Future Use Valves

In areas where a line terminates and future extensions may occur, the line shall terminate with a future use valve assembly with adequate blocking as shown on the detail. All future use valves installed on water mains at the end of a line shall be installed with PVC or Ductile Iron coupling extending a minimum of 12" past the valve with a cap. The entire thread extending through each bolt hole shall be covered with a sufficient amount of nuts to cover entire thread.

DIVISION III - POTABLE WATER MAIN TESTING

SECTION 1 - DESCRIPTION

1.1 Description

This section outlines the testing of pipe materials, joints, and/or other materials incorporated into the construction of water mains and force mains to determine leakage and water tightness. All pressure pipelines shall be tested in accordance with AWWA C600 and AWWA C605, latest edition, and as specified herein.

The City of Gentry will provide to the Contractor water for filling lines and making tests inside and outside the city limits in an amount listed on Ordinance No. 19-803 or the latest ordinance passed. The latest ordinance can be located by contacting the City of Gentry.

1.2 General

All newly constructed water and/or sewer mains, appurtenances and ancillary construction must be tested before City of Gentry Water and/or Wastewater Department can accept same for operation

and maintenance. Testing for materials and construction methods shall be at the Developer's expense. City of Gentry Water and/or Wastewater Department has the authority to require any test outlined in these specifications as well as additional testing if in the opinion of City of Gentry Water and/or Wastewater Department the situation warrants further testing to demonstrate that the quality of materials and construction procedures meet the requirements of these specifications. Water main testing shall not take place until all sewer testing has been completed.

Trace wire shall be tested to prove connectivity and location for entire length(s) of installed utility mains.

In all cases, pressure lines shall be tested hydrostatically. All tests shall be made in the presence of the Engineer and a representative of City of Gentry Water and/or Wastewater Department. All required tests must be successfully passed before new utilities can be accepted by the Department. All testing must be scheduled at least 24-hours in advance with City of Gentry Water and/or Wastewater Department. See Part 2, Division 3 for potable water and sewer force main testing requirements. The cost of all testing made at the request of the Department will be borne by the Developer/Contractor.

SECTION 2 - HYDROSTATIC TESTING

2.1 Pressure Test

The pressure test shall be made at one hundred fifty percent (150%) of the designated working pressure of the pipe at the point location of testing or one hundred twenty-five percent (125%) of the designated working pressure of the pipe at the highest elevation point along the test section of the pipe, whichever is greater. The duration of the test shall be two (2) hours after the line has been brought up to test pressure. Should any test of pipe in place disclose leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowance.

2.2 Leakage Test

The leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of water that must be supplied into the newly laid pipeline, or any valved segment thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipeline has been filled with water. Leakage shall not be measured by a drop in pressure in a test segment over a period of time. Leakage is not acceptable. If any test of constructed pipe indicates leakage, the Contractor shall, at his own expense, locate and make repairs as necessary.

Hydrostatic Testing Ductile Iron Pipe And Cast Iron Pipe

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{S\ D\sqrt{P}}{148{,}000}$$

L= Allowable Leakage (gallons per hour)
S = Length of Pipe Tested (feet)
D = Nominal Diameter of Pipe (inches)
P = Average Test Pressure During Test (psig)

When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallon/hour/inch diameter of nominal valve size shall be allowed.

When the hydrants are in the test section, the test shall be made against the closed hydrant.

Hydrostatic Testing PVC Pipe

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$Q = \frac{L\ D\sqrt{P}}{148{,}000}$$

Q= Allowable Leakage (gallons per hour)
L = Length of Pipe Tested, in Feet
D = Nominal Diameter of Pipe (inches)
P = Average Test Pressure During Test (psig)

When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallon/hour/inch diameter of nominal valve size shall be allowed.

When the hydrants are in the test section, the test shall be made against the closed hydrant.

2.3 Tapping Sleeve & Valve

Tapping sleeves and valves must be installed and pressure tested before the tap is made on the existing pipeline. The test shall be conducted with the tapping valve closed and a second time with the tapping valve open. The sleeve must be supplied with pipe thread testing port and plug to allow connection of testing apparatus. The exterior of the tapping sleeve must be visible during the test. The test must be conducted at least 1.5 times the normal static pressure in the existing pipeline but no less than 200 psi. The test pressure shall be maintained for 15 minutes and there shall be no visible leakage. The pipeline tap shall be performed only after the pressure test has been successfully completed and the testing apparatus is disconnected from the testing port. City of Gentry Water and/or Wastewater Department personnel must observe tapping sleeve pressure tests.

2.4 Visible Leakage

All visible leaks are to be repaired regardless of the amount of leakage.

2.5 Acceptance of Installation

New water main construction must be free of leakage. New water main construction will not be accepted if leakage is present.

SECTION 3 - DISINFECTION OF POTABLE WATER LINES

3.1 General

All newly installed water mains shall be disinfected in accordance with ANSI/AWWA C-651, (Continuous Feed Method), and as specified herein. Only City of Gentry Water and/or Wastewater Department personnel are allowed to operate valves in or attached to existing water mains. Samples will be collected by a representative of the Gentry Water and/or Wastewater Department. Any sample collected by the contractor without approval from the Gentry Water and Wastewater Department will be rejected and deemed failed.

3.2 Methods

All pipes are to be disinfected after laying. Disinfection is completed by holding a chlorine solution of at least 50 ppm strength in the pipe for 24 hours. At the end of the 24 hour period, the treated water shall contain no less than 25 ppm of chlorine throughout the length of the main.

As the heavily chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect new appurtenances and pipe branches. Extreme care should be taken by the Contractor to prevent heavily chlorinated water from flowing back into water mains in active service. The cost of the water and chemicals shall be borne by the Developer.

3.2.1 Discharge of Highly Chlorinated Water

The contractor shall be responsible for the procurement of all necessary permits and compliance with same as required by ADEQ, EPA, or the U.S. Corps of Engineers.

3.3 Flushing

After the lines have been disinfected, they shall be thoroughly flushed until chlorine residual measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use, or less than 1ppm.

3.4 Sampling

Two sets of consecutive bacteriological samples shall then be collected from each respective segment of the new main and shall be submitted to the Arkansas Department of Health for analysis. The time interval between consecutive samples should be at least 24 hours. The samples shall be collected by the City of Gentry Water and/or Wastewater Department and submitted to the Arkansas Department of Health (ADH). The results shall be mailed to City of Gentry Water and/or Wastewater Department from ADH.

The lines shall not be placed in service until the results of two consecutive daily samples showing negative report for coliform bacterial (safe) are received by the Engineer or Contractor and are submitted to City of Gentry Water and/or Wastewater Department.

3.5 Adjustment to Final Grade

All meter boxes, valve boxes, fire hydrants, or any other water main appurtenance purposed to remain at the surface shall be adjusted to match final grade as shown on the appropriate detail or directed by the City of Gentry Water and/or Wastewater Department.

PART 3 – SANITARY SEWER CONSTRUCTION

DIVISION I – SANITARY SEWER MATERIALS

SECTION 1 - SANITARY SEWER PIPE

1.1 Description

All gravity sewer pipes shall be Ductile Iron, Polyvinyl Chloride (PVC) Type PSM or approved equal. The minimum acceptable size of all gravity sewer mains is eight (8") inch diameter. All pipe installed shall be of the type, size, class, and thickness as indicated in these specifications and on the design plans. The strength of pipe used shall be based on standard engineering design principles and manufacturer or trade association recommendations. Only pipe materials listed in this section shall be used for sanitary sewer mains and service lines unless specifically authorized by the Utilities Director of City of Gentry Water and/or Wastewater Department.

1.2 Ductile Iron Gravity Sewer Pipe, 8" - 36"

Ductile iron pipe shall conform to ASTM Standard A 746-82 (Ductile Iron Gravity Sewer Pipe) or ANSI/AWWA C 151/A 21.54-81 or latest revision. Pipe shall be pressure class 350 or thickness class 50 whichever classification provides the greatest wall thickness. Pipe shall be lined with American Polybond lining, 401 Epoxy ceramic, or approved equal. Pipe shall be manufactured with the type joints specified. Joints shall conform to ANSI/AWWA C111/A21.11 and may be mechanical joint or push-on joints unless otherwise specified.

1.3 Polyvinyl Chloride (PVC) Gravity Sewer Pipe

All Pipe segments shall be straight and true in alignment and shall be furnished in thirteen (13) feet lengths. Provision shall be made for expansion and contraction at each joint by use of a gasket type joint and integral bell.

1.3.1 PVC Gravity Sewer Pipe 8" - 15"

PVC pipe for gravity sewers shall conform to the latest revision of ASTM Designation D3034 (Type PSM) and shall be a minimum Standard Dimension Ratio (SDR) of 26. The pipe shall have minimum pipe stiffness (F/dY) of 115 psi at 5% deflection as defined in ASTM D2412.

1.3.2 PVC Gravity Sewer Pipe 18" – 36"

PVC pipe for larger gravity sewers shall be PS115 conform to the latest revision of ASTM Designation D3034 (Type PSM) and shall have minimum pipe stiffness (F/dY) of 115 psi at 5% deflection as defined in ASTM D2412.

1.4 Cell Classification

Plastic pipe shall be made of a plastic having a cell classification of 12454-B or approved equal as defined in ASTM D1784. All pipe and fittings shall be tested in accordance with ASTM Designations D 2412, D 215D, and D 2444.

1.5 Sanitary Sewer Service Lines

1.5.1 General

Service lines are defined as that portion of the sanitary drainage system which extends from the city sewer main to the stub out at the property line. The owner is responsible for adequate operation and maintenance of this line per Arkansas State Plumbing Code. All service lines shall meet with the requirements of this section of the specifications for pipe and joint material except as outlined below. Service lines shall be bedded as required for mains.

Each living unit (i.e...single-family, duplexes, triplexes, etc.) shall have separate sewer service lines. Apartment complexes shall be evaluated on a case by case basis by City of Gentry Water and/or Wastewater Department. Also, commercial property shall be required to install a separate sewer service per unit.

The minimum size of any service line shall be 4-inch nominal diameter. Sizes of service lines for multi-family or commercial applications shall be as a minimum as required by the Arkansas State Plumbing Code unless otherwise directed by City of Gentry Water and/or Wastewater Department.

Service lines may be constructed of Schedule 40 polyvinyl chloride (PVC) pipe, or ductile iron pipe.

1.5.2 Ductile Iron Pipe Service Lines

Ductile iron pipe shall be used for sewer service lines connected to ductile iron sewer mains and shall meet the requirements of Paragraph 1.2 above. For new sewer main construction service line connections to ductile iron sewer mains shall be made with cast iron fittings.

1.5.3 PVC Service Lines

Plastic pipe for sanitary sewer services shall be Schedule 40 PVC pipe. For new sewer main construction service line connections PVC sewer mains shall be made with PVC fittings.

1.5.4 Sewer Service Tapping Saddles

City of Gentry Water and/or Wastewater Department must be contacted prior to

design and construction for the type of tapping saddle currently utilized for new service connections on existing sewer mains.

1.6 Pipe Joints

All joints shall be as shown on the plans and as specified herein.

1.6.1 Ductile Iron Pipe Joints

All joints shall be push-on or mechanical, unless otherwise specified, and shall conform to the requirements of ANSI/AWWA C111/A21.11-80.

1.6.2 Polyvinyl Chloride (PVC) Pipe Joints

Joints shall be push-on, elastomeric gasket type conforming to ASTM D3212 and ASTM F-477. The use of solvent or chemically welded joints is prohibited for any use in the sewer system.

1.7 Steep Grades

Ductile iron pipe shall be used on all sewer or force main pipe when the grade is fifteen percent (15%) or greater. Sewers or force mains on twenty percent (20%) slopes or greater shall be anchored securely with concrete anchors or equal, spaced as follows:

1.7.1 20% to 35% Grade

Not over 36 feet center to center on grades 20 percent and up to 35 percent;

1.7.2 35% to 50% Grade

Not over 24 feet center to center on grades 35 percent and up to 50 percent;

1.7.3 Grades >50%

Not over 16 feet center to center on grades 50 percent and over.

1.7.4 Anchor Block

See Standard Details for Anchor Block Detail

1.8 Sewer Pipe Fittings

1.8.1 Standard Fittings

When SDR 26 PVC plastic pipe is utilized for gravity sewer mains all bends and fittings shall be SDR 26 PVC. When ductile iron pipe is utilized for gravity sewer

mains all bends and fittings shall be ductile iron. Ductile iron fittings shall be employed in force main construction.

All bends, tees, plugs, adapters, or other fittings shall meet with the requirements of the type of pipe used and all joints shall meet with the requirements for the joints listed above. PVC sewer bends or other fittings shall be one piece molded construction with:

1.8.1.1 Elastomeric gaskets conforming to ASTM D3212

1.8.1.2 Self-cleansing sanitary flow

1.8.1.3 Design meeting ASTM D3034 standards

1.8.2 Special Fittings

All special fittings shall be in accordance with the pipe manufacturer's recommendations as approved. Connections between different kinds of pipe shall be detailed on the plans and shall be as such to provide self-cleaning sanitary flow and watertight joints and connections.

SECTION 2 - MANHOLES

2.1 Description

This section covers materials to be used in the construction of standard manholes, drop manholes, and watertight manholes.

2.2 Concrete

Concrete used in the construction of manholes shall conform to the requirements of Part 4, Section 9-Concrete and Reinforcing Steel.

2.3 Mortar

Mortar shall be composed of one (1) part Portland cement to two (2) parts fine aggregate, by volume. Cement and fine aggregate shall conform to the requirement of Part 4, Section 9 Concrete and Reinforcing Steel. Masonry cement shall be strictly prohibited for use in any part of manhole construction.

2.4 Brick Manholes

Brick manholes are explicitly prohibited for use in the municipal sanitary sewage collection system.

2.5 Precast Manholes

Precast manholes are explicitly prohibited for use in the sanitary sewage collection system. City of Gentry Water and/or Wastewater Department may allow the use of a precast manhole only in the event that extreme circumstance may warrant said use. Written approval from City of Gentry Water and/or Wastewater Department must be obtained before a precast manhole can be purchased and/or brought onto a construction site.

2.6 Cast-in-Place Manholes

Cast-in-place manholes shall be constructed of 3000 psi (at 28 days) concrete conforming to the requirements of Part 4, Section 9- Concrete and Reinforcing Steel.

2.7 Drop Type Manholes

External drop manholes will not be utilized without prior written approval of City of Gentry Water and/or Wastewater Department. Internal drop manholes are not allowed. Pipe and fitting materials used in the construction of drop manholes shall conform to the requirements of Section 1.8 above and all other applicable parts of this specification. Drop manholes or manholes where force mains terminate must be lined with an epoxy coating system per Part 5 – Sanitary Sewer Pumping Stations, Section 5, of these specifications.

2.8 Manhole Rings and Covers

All castings for manhole rings and covers shall be American made and must be of the best quality gray cast iron, free from cracks, holes, scale, shrinkage, distortion, and other defects which might make them unfit for their intended use. They shall be of workmanlike finish, shall be non-rocking, shall have all bearing surfaces machined smooth and shall be of such quality that a blow from a hammer will produce an indentation on a rectangular edge of the casting without flaking of the metal.

Manhole rings and lids shall have a combined weight of not less than 250 lbs. and shall have a minimum access (inside diameter) of 24 -inches. The manhole lids shall be of solid construction without any openings or any type except two (2) concealed pick holes which shall be located on direct opposite sides of the manhole lid. The concealed pick holes shall be of such design as not to allow infiltration into the manhole. Manhole lids shall have "SANITARY SEWER" cast on the lids.

2.8.1 Traffic Model Manhole Rings and Lids

Castings shall be as specified above except the minimum weight shall be 400 lbs. 540 lbs. rings and lids may be required by City of Gentry Water and/or Wastewater Department in certain situations.

2.8.2 Watertight Manhole Rings and Covers

Watertight manhole rings and covers where required on the plans shall be approved on a case-by-case basis.

2.9 Water Stops

Water stops for pipe connections to manholes shall be Fernco Concrete Manhole Adapters, or equal, furnished in the appropriate size for the type and class of pipe used. Water stops are required for all sewer pipes entering or exiting manhole walls or bases.

Water stops are required for all lift station concrete base slab/wall joints. Water stops for these joints shall be six-inch (6") PVC dumbbell water stop with a one-fourth inch (1/4") thick web, and five-eighths inch (5/8") diameter molded bulbs on top and bottom, Style 747 by Greenstreak, or approved equivalent.

DIVISION II - GRAVITY SEWER MAIN CONSTRUCTION

SECTION 1 - GRAVITY SEWER LINES

1.1 General

Each joint of pipe shall be inspected carefully before being placed in the trench. Any joint found to be cracked, or otherwise damaged as to impair its usefulness, shall be plainly marked in such a manner that the marking will not rub or wash off. Damaged joints shall be removed from the site as soon as feasible.

All sewer pipes shall be laid with the bell up-stream. Each pipe shall be laid to plan line and grade, or to line and grade directed by the Engineer, using laser grade light. Care shall be taken that each spigot is centered properly in the bell of the proceeding pipe and properly seated, and each pipe is solidly bedded. As the work progresses, the pipes shall be cleaned of all dirt and other foreign matter. They shall be maintained clean until accepted or put in service. At the end of each day's work, and when for any reason the laying of pipe will be discontinued for an appreciable period, the open ends of pipe line shall be closed temporarily with a watertight plug or cap.

The cutting of pipe for any reason shall be done in a neat and workmanlike manner without damage to pipe or pipe lining.

Pipe shall be lowered carefully into the trench in such manner the spigot and bell will not become contaminated. Spigot and bell shall be checked for cleanliness immediately before insertion of spigot into bell.

Proper facilities shall be provided for lowering joints of pipe into trenches. Under no circumstances shall pipe be laid in water and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Full responsibility for the diversion of drainage and for dewatering of trenches during construction shall be borne by the Contractor.

Spigot and bells shall be cleaned thoroughly before the application of lubricant and attachment of the preformed joint gasket. Application of lubricant and attachment of the gasket shall be in strict accordance with the manufacturer's recommendations.

Pipe shall not be placed in the trench without excavating for bells so that the entire barrel of the pipe is uniformly supported on the pipe bedding.

Pipe shall be supported to proper line and grade, and secured against upheaval or floating during the placement of concrete bedding, when required.

The trench shall be excavated so that the pipe can be laid to the alignment and depth required, and it shall be excavated only so far in advance of the pipe laying as set out elsewhere in these specifications.

The trench shall be so braced and drained that the workmen may work therein safely and efficiently. It is essential that the discharge of any trench dewatering pumps be conducted to natural drainage channels, drains, or storm sewers. The contractor shall be responsible for any discharge permits that may be required.

The contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part.

All excavation shall be dewatered before any construction is begun. Concrete shall be placed only upon dry firm foundation material and pipe shall be laid only in dry trenches.

Pipe shall not be installed unless ambient temperature is at least 32° F and rising.

1.2 Connection to Existing Sewer Mains

Connection to existing sewer lines shall not be made until the newly constructed facilities meet with all required standards on construction, pass all required tests, and are approved by City of Gentry Water and/or Wastewater Department for connection.

1.3 Trench Depth

Trenches for sewer mains shall be excavated to at least 6 inches below the grade required to provide proper alignment, pipe embedment and minimum earth cover. All sewer mains shall have at least 36 inches cover. All excavation below the established pipe grade shall be backfilled to the proper grade with pipe bedding material. All pipe bedding material shall be tamped so as to provide a uniform and continuous bearing support for the pipe at every point along the pipe barrel.

1.4 Bell Holes

The bedding material under each bell shall be excavated or shaped sufficiently to allow the pipe to

rest throughout its length. Bell hole excavation shall also be sufficient to allow proper placing of the joint compound, where joint compound is used. No weight of dirt or pipe shall be supported by the bell of the pipe.

1.5 Trench Width

The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified. The trench width shall not exceed the maximum widths shown on the Standard Detail Sheet in the Appendix at any point from the trench bottom to a point 12 inches above the barrel of the pipe.

If the contractor over excavates the trench, he shall provide additional pipe bedding material or concrete necessary to prevent crushing of the pipe due to excessive earth loads.

1.6 Trench Length

City of Gentry Water and/or Wastewater Department shall have the right to limit the amount of trench excavated in advance of the pipe laying. In general, such excavation shall not exceed 300-feet, and trench excavated to grade shall not exceed 100-feet.

1.7 Pipe Clearance in Rock

Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least 6 inches below and 12 inches on each side of all pipe, valves, and fittings for pipes 24 inches in diameter or less, and 12 inches for pipes larger than 24 inches in diameter. Every trench in rock shall be fully opened at least 50 feet in advance of the place where pipe is being laid or concrete or masonry work is in progress.

1.8 Excavation in Poor Soil and Refilling to Grade

Where the bottom of the trench is found to contain unstable soils or to include ashes, cinders, all types of refuse, vegetable or other organic materials, or large pieces of fragments of inorganic material which in the judgment of City of Gentry Water and/or Wastewater Department and/or Engineer should be removed, the Contractor, at his own expense, shall excavate and remove such unsuitable material to the width and depth ordered by City of Gentry Water and/or Wastewater Department and /or Engineer.

Before the pipe is laid, the sub-grade shall be made by backfilling with acceptable bedding materials 6-inch to 8- inch un-compacted layers. The layers shall be thoroughly tamped by hand or machine to the density of adjacent undisturbed soil so as to provide a uniform and continuous bearing and support for the pipe at every point between the bell holes.

1.9 Wet Excavation

When water or unstable soil is encountered in the bottom of the trench, the Contractor will be required to excavate below grade a minimum of six inches, and the trench will be brought back to

grade with crushed stone with no particles larger than ¾-inch. The layers shall be thoroughly tamped and formed to provide a uniform and continuous bearing and support for the pipe at every point between the bell holes. The placement of soil berms across the trench at no more than 100-feet spacing may be required to prevent water flowing along the trench.

1.10 Removal of Water and Muck

The Contractor shall provide sufficient pumps and other necessary equipment to keep the trench free of water which may accumulate. If the bottom of the trench becomes soft and muddy, the Contractor shall remove all such soft material and replace it with bedding material as described above in 1.8.

1.11 Deviations Occasioned by Other Structures

Whenever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the Engineer shall have the authority to change the plans and order a deviation from the line and grade only after approval of the change by City of Gentry Water and/or Wastewater Department , or the Engineer may arrange with the owners of the structures in conflict for the removal, relocation or reconstruction of the obstruction.

1.12 Bracing and Shoring

The sides of any excavation, when deemed necessary, shall be properly supported with shielding, bracing, shoring, or sheeting as the need may be. Such bracing, shoring, or sheeting shall be withdrawn as the work progresses in such a manner as not to endanger life and property and to allow for backfilling of the trench in accordance with these specifications.

In case the excavation is close enough to buildings or other foundations as to endanger their stability by removing such bracing, then they shall be made secure and left in place, and the line trench shall be backfilled and thoroughly tamped with the bracing in place.

Where the trench walls are sloped away from the trench to prevent slides or cave-ins, it will be permissible to cut the trench banks on a slope above an elevation two (2) feet above the crown of the pipe. It is the responsibility of the contractor to maintain the excavation free from slides or cave-ins and safe for workman and to comply with federal labor requirements for trench safety. No observation of any project by the Engineer or representative of City of Gentry Water and/or Wastewater Department will reduce the Contractor's responsibility. Contract documents shall include the mandate for compliance to all OSHA requirements related to trench/excavation safety.

1.13 Use of Explosives

In the event the use of explosives is necessary for the efficient prosecution of the work, the Contractor shall notify the Engineer in advance of their use and shall exercise every precaution to protect completed work, neighboring property, or other underground structures. Any damage to private property resulting from the use of explosives shall be the liability of the Contractor. It shall

be the responsibility of the Contractor to obtain all necessary permits.

The Contractor shall notify all owners of neighboring property or public utility property of intention to use explosives at least eight hours before blasting is done close to such property. Any observation of this project by a representative of City of Gentry Water and/or Wastewater Department does not in any way reduce the responsibility of the Contractor for damage resulting in the use of explosives. In all cases, where explosives are necessary, the Contractor shall obtain appropriate permits from governmental agencies prior to their use.

1.14 Disposal of Excavated Materials

Excavated material shall be piled adjacent to the work to be used for backfilling, if suitable. All excavated material which is unsuitable for backfilling and any excess material shall be disposed of in a manner approved by the Engineer.

1.15 Installation of Sanitary Sewer in Subdivision

Sanitary Sewer in new subdivisions shall be installed along the center of the street per the City of Gentry Subdivision Utility Placement Specification. Connections shall be made with 4" diameter schedule 40 service lines with 6" diameter encasement. Encasement shall extend 9' past the back of curb and 1' past the sidewalk. Tee posts shall be buried where service line terminates per the typical detail.

SECTION 2 - PIPE EMBEDMENT, PROTECTION COVER & TRENCH BACKFILL

2.1 General

This section covers the minimum requirements for embedment, pipe protection cover sanitary sewer lines.

2.2 Pipe Embedment

All pipe shall be bedded in materials containing a significant percentage of fine particles and maximum particle size of ¾-inch. Other crushed stone products such as chips or grit are acceptable.

2.3 Pipe Protection Cover

All pipe shall have a protective covering of the same material as used for embedment. The pipe protection cover shall extend to 6-inches above the top of the pipe.

2.4 Trench Backfill

Backfilling of pipelines shall include the refilling and consolidation (compaction) of the fill in the excavation up to the surrounding ground surface or road grade at crossings. All pipeline trench backfill shall be placed in layers of appropriate thickness not to exceed 12" and compacted by hand

or approved mechanical methods. All trench backfill (except that under paved areas) shall be compacted to a minimum density of 85% of the maximum density of the adjacent undisturbed soil as determined in accordance with ASTM D2922. Trench backfill shall proceed concurrently with pipe installation. There shall be no more than two full joints of pipe exposed in a trench at all times.

The trench, excavated area around manholes, fittings, and other appurtenances shall be backfilled with excavated material free from rock larger than three inches, cinders, ashes, refuse, vegetable, or organic material, frozen soil, or other deleterious materials that in the opinion of the Engineer or City of Gentry Water and/or Wastewater Department are unsuitable.

Where sanitary sewer main is installed beneath a proposed road within a subdivision and benching of the trench is required, crushed stone shall be used for the first 12" as stated in 2.2 and 2.3. Select fill shall be permitted as backfill for the remainder of the trench

2.5 Paved Areas

Where pipelines are placed under existing or proposed paved areas, the pipe bedding, protection cover and trench backfill to sub-grade elevation shall be ASTM Class 67 or ADOT Class 8 crushed stone with a maximum particle size of ¾".

2.6 Street Right-of-Ways

For open cut crossings of County Roads, City Streets and paved driveways the pipe bedding, protection cover and trench backfill to sub-grade elevation shall be ASTM C33 gradation Class 67 or ARDOT Class 8 crushed stone with a maximum particle size of ¾". The entire trench shall be backfilled with the class 67 crushed stone to the subgrade elevation under all pavements and graveled shoulders. Areas with vegetative cover within street and road right-of-ways will be backfilled with the class 67 stone to a point 12 inches below finish grade. The remaining 12-inches shall be backfilled with the soil materials removed from the trench or top soil as required to enable re-establishment of vegetative cover.

2.7 Service Lines

Sewer service lines shall be bedded, protected and backfilled in the same manner as pipe as described in the preceding paragraphs.

SECTION 3 - MANHOLES

3.1 General

This section covers the construction methods for manholes, drop manholes, and watertight manholes. Generally, manholes shall not be poured when temperatures are below freezing unless concrete insulation blankets are employed to prevent the concrete from freezing.

3.2 Excavation and Backfill

3.2.1 Excavation

Excavation for manholes shall be of such dimension and depth as to allow the construction of the manhole as shown in the Standard Details. The area of excavation for the base shall be only that necessary to provide an adequate base with its sides and bottom poured against undisturbed earth. All over excavation below the required grade shall be filled with concrete poured monolithically with the base. Up to 3-inches of crushed stone leveling course may be placed in the excavation.

3.2.2 Base

The concrete base shall have a minimum thickness of eight (8) inches below the invert and shall be poured on undisturbed earth. The base shall be poured monolithically with the barrel. The base shall have a minimum diameter of two (2) feet greater than the outside of the finished manhole barrel.

3.2.3 Backfill

Backfilling of pipelines entering manhole connections shall be done in accordance with the requirements of the pipe material and backfilling around manholes up to 12 inches above the base will be done with pipe protection cover. Backfill of manholes shall be compacted to a density of not less than 90% modified proctor as defined in AASHTO Designation T-180. 90% density shall be obtained the entire depth of excavation except that in public streets or roadways where a density of 95% shall be obtained.

Backfill around manholes shall not be completed until adequate strength has been obtained to support the backfill without damage to the manhole. Backfill will not be allowed on manholes until the concrete is at least 48 hours old except as approved by City of Gentry Water and/or Wastewater Department. Manholes must be vacuum tested prior to backfilling.

3.3 Inverts

The invert of the manhole shall be hand placed and shaped from the concrete poured for the base prior to the initial set of the concrete base. The invert shall be shaped and smoothed so that the manhole will be self-cleaning and free of areas where solids may be deposited as sewage flows through the manhole and from service lines. The sidewall depth of the invert shall be approximately half the diameter of the abutting pipe and the shape shall approximate the bottom half of the pipe. The bottom flow line of the invert shall connect the flow line of all main sewer pipes entering the manhole bottom. Inverts shall be shaped, formed, and brushed smooth from the concrete poured for the base prior to the initial set of the base. Inverts shall be smooth.

No pipeline will be laid entirely through the manhole barrel and broken out. In all cases the pipe or pipes shall extend entirely through the manhole wall so that a joint occurs approximately three (3) feet outside the manhole wall. The pipe may extend through the barrel into the manhole no more than 4" and the invert must be shaped throughout from all inlet pipes to the outlet pipe. The invert shall be shaped to permit the entry of inflatable plugs and TV-grout seal equipment.

Additional smoothing of manhole inverts may be necessary. City of Gentry Water and/or Wastewater Department will allow Strong QSR for invert repair and manholes smoothing. Mortar for smoothing inverts shall be mixed in the proportions by volume of one (1) part cement to two (2) parts sand. If carefully done, mortar may be mixed in a mortar box. Mortar shall have a workable consistency, but shall be as dry as feasible.

3.4 Connections to Manholes

Pipe connections to manholes are a constant source of potential trouble. In order to insure that pipe will not break immediately adjacent to the manhole, excavation for the manhole bottom shall be limited to the area to be filled with concrete. The contractor shall support the pipe stub entering the manhole all the way to un-disturbed earth by backfilling under the pipe and up to mid-spring line with concrete. A water stop sleeve or collar shall be used on all pipes entering manhole walls.

3.5 Manhole Barrels

The minimum thickness of manhole barrels shall be 8 inches. The barrel shall be poured monolithically with the base. The manhole barrel shall be of such construction so that the finished manhole will have an inside diameter of four (4) feet plus or minus (½) inch. Other than shallow manholes, (I.E., manholes less than 4 feet in depth), the top segment or cone shall be concentric. Manhole shall have heavy duty manhole frames and covers designed for a minimum traffic or wheel load of sixteen thousand (16,000) pounds.

3.6 Forms

Prior to setting the forms in place, any water that may have accumulated in the excavated area shall be pumped out and the concrete base thoroughly cleaned, if required, of dirt and debris. All concrete shall be poured in the dry. The forms shall be removed after the initial set of the concrete so that holes may be cut in the manhole base. After these pipes have been put in place, the barrel shall be repaired using a grout mixture. If honeycombing of the barrel is found to be present after removal of the forms they shall be repaired as directed by the Engineer. Manholes with excessive honeycombing will not be accepted by City of Gentry Water and/or Wastewater Department.

3.7 Manhole Height

Manholes are to be built to the established final grade unless otherwise noted on the plans or directed by the Engineer. The manhole rings and covers shall be attached preferably by being cast into the top of the manhole or by being grouted to the completed manhole. If manhole rings are grouted to completed manholes, a key way shall be formed in the top of the manhole outside of

where the manhole ring will rest. Construction joints with formed key way are required should the entire barrel of the manhole not be poured monolithically.

Mortar for grouting manhole rings to manholes shall be mixed in the proportions by volume of one (1) part Portland cement to two (2) parts sand. Masonry cement is prohibited for use. Tops of the manhole rings covers shall be level except in public rights of way where the top shall be set flush with pavement, sidewalks, or other surface areas.

3.8 Drop Manholes

Drop manholes shall not be utilized without prior written approval by City of Gentry Water and/ or Wastewater Department

External Drop manholes will be allowed with prior written approval by City of Gentry Water and/or Wastewater Department. Internal drop manholes will not be allowed. If approved in writing, external drop manholes shall be constructed at all manholes where the difference in invert elevation between incoming and outgoing sewers is 2.0 feet or more. Drop manholes shall be constructed of the same material and dimensions as are standard manholes, the only difference being in the inlet arrangements as shown in the Standard Details. Drop manholes or manholes where force mains connect must be coated with an epoxy coating system as specified in Part 5-Section 5-Paragraph 5.4 of these specifications.

3.9 Sealed Manholes

Construction of watertight manholes shall be of the same materials and dimensions as are standard manholes, the only difference being in the manhole ring and lid to have water tight seal.

3.10 Manhole Details

All manholes shall be constructed in accordance with the standard manhole details in Part 6 – Standard Details.

3.11 Connection to Existing Manholes

3.11.1 Construction Complete and Approved Before Connection

Connection to existing manholes shall not be made until all other manholes and sewer lines have been completed, cleaned, tested, inspected, and approved for connection by City of Gentry Water and/or Wastewater Department unless specifically allowed by City of Gentry Water and/or Wastewater Department.

3.11.2 Diversion of Sewage

When the flow of sewage must be diverted around construction, the Contractor shall intercept the sewage flow at the existing manhole, at the first upstream manhole from the construction, and shall provide suitable pumping equipment and manpower and

rerouting conduit to pump the sewage around the involved construction in a safe and sanitary manner. Discharge shall be into an appropriate manhole downstream from the construction.

3.11.3 Connection to Existing Manhole by Concrete Hole Saw

Connection to the existing manhole shall be made using a circular diamond tip concrete cutting hole saw. If the area is to be broken out, break-out shall be in small increments and with sharp tools to minimize damage to the manhole. Subject to these requirements, the details of making this connection, including securing the end of pipe in place, shall be as proposed by the Engineer and approved by City of Gentry Water and/or Wastewater Department. City of Gentry Water and/or Wastewater Department requires usage of oakum, water stop sleeve, and Strong QSR.

3.12 Water Tightness

All manholes constructed shall be watertight and show no visible evidence in infiltration or leakage. Manholes shall be tested in accordance with this specification and any manhole that is not water tight will not be accepted by City of Gentry Water and/or Wastewater Department.

DIVISION III – SANITARY SEWER TESTING

Gravity sewer lines shall be air tested, manholes shall be vacuum tested, and PVC gravity sewer lines shall be mandrel tested at the completion of initial construction. Prior to the end of the 1-year warranty period sewer mains shall be pressure cleaned and video inspected. The contractor is liable for repair of any discovered defect.

SECTION 1 - PRESSURE TESTING OF GRAVITY SEWER

1.1 General

All gravity sanitary sewer main extensions shall be pressure tested as required by City of Gentry Water and/or Wastewater Department for water tightness by low pressure air loss as described herein.

1.2 Procedure

1. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

2. Pipe air supply to the pipeline to be tested in such a manner that the air supply may be shut off, pressure observed, and air pressure released from the pipe without entering the manhole.

3. Add air slowly to portion of pipe under test until the internal pressure of the line is raised to +/- 4 psig, but less than 5 psig.

4. Shut the air supply off and allow at least two minutes for the air pressure to stabilize.

5. The test is to be started when the pressure has stabilized and is at or above the starting test pressure of 3.5 psig.

6. Determine the time in seconds with a stop watch for the pressure to fall 0.5 psig so that the pressure at the end of the time is at least 3.0 psig.

7. Compare the observed time with the minimum allowable times in the chart for pass/fail determination located in the following Table:

SPECIFICATION TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP

FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015*

(Adapted from UNIBELL Handbook of PVC Pipe, Third Edition)

1	2	3	4								
Pipe Diameter	Minimum Time	Length For Minimum Time	Time For Longer Length	Specified Minimum for Length (L) Shown (min:sec)							
(in.)	(min:sec)	(ft)	(sec)	**100 ft**	**150 ft**	**200 ft**	**250 ft**	**300 ft**	**350 ft**	**400 ft**	**450 ft**
4	01:53	597	0.190L	01:53	01:53	01:53	01:53	01:53	01:53	01:53	01:53
6	02:50	398	0.427L	02:50	02:50	02:50	02:50	02:50	02:50	02:51	03:12
8	03:47	298	0.760L	03:47	03:47	03:47	03:47	03:48	04:26	05:04	05:42
10	04:43	239	1.187L	04:43	04:43	04:43	04:57	05:56	06:55	07:54	08:54
12	05:40	199	1.709L	05:40	05:40	05:42	07:08	08:33	09:58	11:24	12:50
15	07:05	159	2.671L	07:05	07:05	08:54	11:08	13:21	15:35	17:48	20:02
18	08:30	133	3.846L	08:30	09:37	12:49	16:01	19:14	22:26	25:38	28:51
21	09:55	114	5.235L	09:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.296L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23
42	19:74	57	20.942L	34:54	52:21	69:49	87:15	104:42	122:10	139:37	157:04
48	22:67	50	27.352L	45:35	68:23	91:11	113:58	136:46	159:33	182:21	205:09

* Q is the allowable leakage rate in cu. Ft/min/ft^2 of inside surface area of pipe.

Safety Precaution

The low pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is over pressurized or plugs are installed improperly. It is extremely important that the various plugs be installed so as to prevent the sudden expulsion of a poorly inflated plug. As an example of the hazard, a force of 250 pounds is exerted on an 8 inch plug by an internal pressure of 5 psi. Observe the following precautions:

1. No one shall be allowed in the manholes during the test or when a plugged pipe is under pressure.

2. Gauges, air piping manifolds, and valves, shall be located outside of the manhole above ground.

3. Install and brace all plugs securely.

4. Do not over pressurize the lines.

1.3 Observation

All gravity sewer lines must pass the air test before being accepted by City of Gentry Water and/or Wastewater Department. Air test results will not be accepted unless a representative of City of Gentry Water and/or Wastewater Department is present during the test.

1.4 Test Equipment

All necessary equipment to perform the air test in accordance with this specification shall be provided by the Contractor. The test gauge shall preferably have incremental divisions of 0.10 psi and have an accuracy of at least plus or minus 0.04 psi. In no case shall a test gauge be used which has incremental divisions of greater than 0.25psi. The gauge shall be of sufficient size in order to determine this accuracy.

SECTION 2 - PVC PIPE DEFLECTION TESTING

2.1 General

All PVC sewer lines shall be mandrel tested in accordance with these specifications prior to acceptance by City of Gentry Water and/or Wastewater Department.

2.2 Allowable Deflection

The maximum allowable pipe deflection shall not exceed five percent (5%) of the inside diameter.

2.3 Mandrel

The mandrel (go/no-go) device shall be cylindrical in shape and constructed with either 9 or 16

evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The contact length of the mandrel's arms shall equal or exceed the nominal diameter of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance of plus or minus 0.01 inch. The mandrel and all necessary equipment for the mandrel test shall be provided by the Contractor.

2.3.1 Procedure

The mandrel shall be hand-pulled by the contractor through all PVC sewer lines no earlier than 30 days after the trench has been completely backfilled. Any segments of the sewer not passing the mandrel shall be uncovered and the Contractor shall re-bed, re-round, or replace the sewer to the satisfaction of the Engineer and/or City of Gentry Water and/or Wastewater Department. Any repaired segment shall be re-tested.

2.3.2 Mandrel O.D. (Outside Diameter)

The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The tests shall be performed without mechanical pulling devices.

2.4 TV Inspection of Gravity Sewer Mains

City of Gentry Water and/or Wastewater Department may require, at the Developer's expense, to inspect all gravity sewer lines with CCTV inspection unit. These tests shall be performed by City of Gentry Water and/or Wastewater Department personnel. Based on the results found, the Developer shall be required to correct all deficiencies as directed by City of Gentry Water and/or Wastewater Department.

2.5 Adjustment to Final Grade

Manhole tops or any other sewer main appurtenance purposed to remain at the surface shall be adjusted to match final grade.

2.6 Contractor's Warranty

City of Gentry Water and/or Wastewater Department reserves the right to require mandrel test any PVC sewer pipe before acceptance, and also prior to expiration of the first year of operation. If a previously accepted line fails a mandrel test performed during the first year of operation, the defects must be corrected at the Contractor's expense.

SECTION 3 - MANHOLE TESTING

3.1. General

All sanitary sewer manholes shall be tested in accordance with these specifications prior to acceptance by City of Gentry Water and/or Wastewater Department. If a manhole fails the test, the Contractor shall locate the leak and make proper repairs and re-test. City of Gentry Water and/or Wastewater Department reserves the right to refuse leaking manholes, in which case the Contractor will replace the manhole at his expense.

3.2. Manhole Vacuum Testing

The contractor shall demonstrate at his expense the water tightness of all manholes, at the direction of the engineer, by a vacuum test, performed by the Contractor and witnessed by City of Gentry Water and/or Wastewater Department personnel or Engineer's representative. The manhole vacuum test shall be performed with suitable apparatus made for such purpose and shall draw a vacuum of 10 inches of Mercury (Hg). The test shall pass if the vacuum remains at 10" Hg or drops to not less than 9"Hg in one minute.

DIVISION IV - SANITARY SEWER FORCE MAIN

SECTION 1 - SANITARY SEWER FORCE MAINS

1.1 General

All sanitary sewage force mains shall be of equal design, material, and construction as potable water pipe unless stated otherwise herein.

1.2 Minimum Size

Force mains smaller than 4" I.D must be submitted for review on a case by case basis.

1.3 PVC Pipe

4" to 8" diameter force mains shall be C900 PVC, DR 18 or DR 14 as required. Any other type or designation of plastic pipe must be approved in writing by City of Gentry Water and/or Wastewater Department. Plastic pipe used for force main construction must be marked "Sanitary Sewer" and/or "Force Main" or installed with a continuous plastic tape or ribbon with "Sanitary Sewer" and/or "Force Main" printed continuously on one side. The plastic tape or ribbon shall be installed on top of and adjacent to the pipe.

1.4 Ductile Iron Pipe

Force mains larger than 8-inch diameter shall be constructed of class 350 ductile iron pipe with American Polybond lining, 401 Epoxy Ceramic, or approved equal.

1.5 Fittings

All fittings employed in the construction of sanitary sewer force mains shall be mechanical joint ductile iron and lined with American Polybond lining, 401 Epoxy Ceramic, or approved equal. Said fittings shall be installed with locking retainer glands such as Megalug or approved equal.

1.6 Valves

Plug valves shall be used in sanitary sewer force mains. Plug valves shall be non-lubricated, resilient-seated, eccentric valves. Plug valves shall conform to the latest revision of ANSI/AWWA C517-05. All materials shall be new. Plug valve body and cover shall be composed of cast iron in conformance with either ASTM A126 Class B or ASTM A48 Class 40. All buried valves shall have mechanical joint ends conforming to ANSI/AWWA C111/A21.11, and all exposed valves measuring 4 inches in diameter and larger shall have Class 125 flat face flanged ends, at a minimum, conforming to ANSI B16.1 or ANSI/AWWA C110/A21.10. At a minimum, valves measuring 4 inches to 12 inches in diameter shall have 175 psig bodies and valves measuring 14 inches and greater in diameter shall have 150 psig bodies.

1.7 Air Release Valves

Air release valves shall be installed as directed by City of Gentry Water and/or Wastewater Department. Said valves shall be APCO 401Sewage Air/Vacuum valves or approved equal.

1.8 Construction

Sanitary sewer force mains shall be constructed in the same manner as detailed for potable water main construction in these specifications.

1.9 Testing

Sanitary sewer force mains shall be pressure tested in the same manner as potable water mains as detailed in these specifications.

PART 4 - CONSTRUCTION COMMON TO WATER & SEWER

SECTION 1 - PROJECT CLEANUP

1.1 General

Cleanup shall be considered an important part of any project, and adequate equipment and qualified personnel shall be applied to this phase of the work from the very beginning of the project. There are generally four classifications of cleanup to be used on this project, as set out below.

Class I Cleanup - Areas of construction within lawns, gardens, or other well-kept areas including street rights of way that are kept as lawns by adjacent landowners.

Class II Cleanup - Areas of construction within fields, meadows and street rights of way which are mowed or cultivated (garden excepted).

Class III Cleanup - Areas of construction that are heavily brushed or wooded, steep rocky slopes, or other areas where it is not practical for the area to be cultivated.

Special Clean-up - Unless otherwise noted under paragraph 1.4 below, no special cleanup will be required.

1.2 Methods of Cleanup

The method of cleanup for each of the classes defined above shall be as set out below.

1.2.1 Class I Cleanup (Lawns, Gardens, etc.)

The trench shall be backfilled in accordance with the Pipe Specifications. After the topsoil has been spread over the damaged areas, the Contractor shall proceed immediately to hand rake the entire construction area to remove all rock 1 inch or larger in diameter. Debris of every type shall be removed and all damaged tree limbs shall be pruned. After the area has been raked and accepted by the Engineer, the area shall be seeded at the rate of 0.25 pounds per 100 square feet, using the following seed mixture (percent expressed in terms of weight).

Lawn Fescue	50%
Rye Grass (Annual)	40%
White (Common)	5%
Red Clover (Common)	5%

During or after seeding is complete, all areas shall be covered with 10-20-10 fertilizer at the rate of 250 pound per acre, or approximately one-half pound per 100 square feet. No watering will be required. However, after seeding and fertilization, the entire area shall be rolled with a roller of sufficient size and weight to achieve a smooth finished surface prior to mulching.

Straw mulch consisting of good grade clean straw, free of weeds or seed and of a quality approved by the Engineer prior to use, shall be placed over damaged and seeded areas and shall be uniformly spread so as to provide a thickness of approximately 2 inches when first spread.

Straw mulch shall be applied using an asphalt mixing blower. Asphalt shall be added to the straw in sufficient quantity to bind mulch together. Placing straw and top spraying with asphalt will not be permitted.

Where the existing ground cover contains grasses such as Bermuda grass, Zoysia, etc., grasses not included in the prescribed seed mixture, the Contractor shall be responsible for cutting, removing and stockpiling the existing sod on the job site. After constructing the line and backfilling the trench, the sod shall be replaced to a condition equal to or better than that prior to construction. In the event that insufficient sod has been stored, or sod has been lost or destroyed, the Contractor shall be responsible for providing and installing new ground cover of the existing type in accord with technical specifications for "Sodding", included in these specifications, to complete the cleanup.

"Before and after" photographs shall be provided of lawns, gardens, etc. as directed by the Engineer.

1.2.2 Class II Cleanup (Fields, Meadows, etc.)

The trench shall be backfilled in accordance with the pipe specifications. After the backfill is completed and the surface over the trench left slightly rounded, the area shall be machine raked to remove all rock to a condition equal to the existing surface on the better side of the adjacent existing right of way. All excess excavated material shall be removed from the site, including excess material which has accumulated around fence post, trees, mailboxes, etc. All areas which have been disturbed, such as that caused by equipment tracks, shall be carefully backfilled and repaired as through it were a part of the actual trench excavation. Seeding and fertilizing of these areas is required using the seed mixture and application rates set out below (percent expressed in terms of weight).

Field Fescue	50%
Rye Grass (Annual)	40%
White Clover (Common)	3%
Red Clover (Common)	7%

After the area has been accepted by the Engineer, the area shall be seeded at the rate of 0.15 pounds per 100 square feet. During or after seeding is completed, all areas shall be covered with 10-20-10 fertilizer at the rate of 250 pounds per acre, or approximately one-half pound per 100 square feet. No watering will be required. However, after seeding and fertilization, the entire area shall be rolled with a roller

of sufficient size and weight to achieve a smooth finished surface prior to mulching. Where the existing field grass is Bermuda, or other type not specified above, the Contractor shall place such topsoil as required, and shall seed with the existing type grass so that an equivalent ground cover will be provided.

Straw mulch consisting of good grade clean straw, free of weeds or seed and of a quality approved by the Engineer prior to use, shall be placed over damaged and seeded areas and shall be uniformly spread so as to provide a thickness of approximately 2 inches when first spread.

Straw mulch shall be applied using an asphalt mixing blower. Asphalt shall be added to the straw insufficient quantity to bind mulch together. Placing straw and top spraying with asphalt will not be permitted.

1.2.3 Class III Cleanup (Steep, Wooded or Rocky Areas)

The trench shall be backfilled in accordance with the pipe specifications. After the trench backfill is complete, all damage brush of every type shall be cut just below ground surface and all damaged limbs shall be trimmed. All brush and debris shall be disposed of by the Contractor and the entire area shall be machine raked so that the area of construction is in a condition equal to the existing surface on the better side of the existing adjacent right of way.

When directed by the Engineer, the area of the trench line shall then be seeded and fertilized at the rate of 0.15 pounds per 100 square feet using the same seed mixture, fertilizer and application rates as set out under Class II Cleanup, except that tall fescue (Kentucky 31) shall be used in place of field fescue.

Straw mulch consisting of good grade clean straw, free of weeds or seed and of a quality approved by the Engineer prior to use, shall be placed over damaged and seeded areas and shall be uniformly spread so as to provide a thickness of approximately 2 inches when first spread.

Straw mulch shall be applied using an asphalt mixing blower. Asphalt shall be added to the straw in sufficient quantity to bind mulch together. Placing straw and top spraying with asphalt will not be permitted.

1.2.4 Special Cleanup

In cases where lines cross through or near to existing septic tank lateral fields, any damage caused by the Contractor to such field shall be repaired at the Contractor's expense. Where septic tank leaching fields are known to exist, they shall be brought to the Contractor's attention. This does not relieve the Contractor from the responsibility of assuring himself there are no other private utilities in the areas of construction.

1.2.5 All Areas Disturbed by Construction

All work within the construction area shall be cleaned up to the satisfaction of the Owner and the Engineer. In general, all rocks, trash or rubbish of any nature shall be removed from the site of the work.

During construction, the Contractor shall at all times keep work areas in a clean, neat and workmanlike condition. Excess pipe, excavation, brush and materials of construction shall be removed and disposed of as the work progresses. In built-up areas, including lawns, the job site shall be cleaned up immediately behind construction. Streets and driveways blocked by excess materials after basic construction is completed will not be tolerated.

If the trench should settle while the Contractor is still on the job or within one year of the project completion date, the Contractor shall make the required repairs at his cost in accordance with the continuing responsibility provisions of these specifications.

1.2.6 Restoration of Damaged Surfaces and Property

Where any pavement, trees shrubbery, fences, poles, or other property and surface structures have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, state laws, municipal ordinances or the specific direction of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired at the expense of the Contractor.

1.2.7 Access after Construction

Unless otherwise directed by the Engineer, all areas shall be graded after construction so as to be accessible by four wheel drive vehicle.

1.2.8 Erosion Control

The Contractor shall terrace slopes where, in the opinion of the Engineer, potential erosion problems may arise after construction.

1.3 Sodding

The work to be included in this section of the specifications shall consist of providing all materials, labor, equipment, tools, supplies and incidentals necessary for completion of sodding of areas required to replace sod disturbed by construction activities.

The Contractor shall furnish the following specified materials for work under this specification.

1.3.1 Fertilizer

Fertilizer shall be a commercial grade, uniform in composition, free flowing and suitable for application with mechanical equipment, delivered to the site in labeled containers conforming to current Arkansas Fertilizer Laws and bearing the analyses of the available nutrients which shall be 10-20-10 (nitrogen-phosphorous-potash). Fertilizer shall be applied to areas seeded at a rate of 290 pounds per acre or 0.15 pounds per 100 square feet.

1.3.2 Seed

Annual Rye grass seed for over-seeding shall be labeled in accord with current rules and regulations of the Arkansas Plant Board and shall have a minimum of 98 percent pure seed and 85 percent germination by weight and contain no noxious weed seeds.

1.3.3 Water

Water shall be of irrigation quality, free of impurities which would be detrimental to plant growth.

1.3.4 Execution

Sodding shall be installed by the Contractor as required on the plans. The areas to be sodded shall be graded as specified elsewhere in these specifications to the configuration shown by the Plans. The top 3- inches of the finished grade shall be topsoil, also as specified elsewhere in these Specifications.

Immediately prior to the placement of sod, the surface shall be scarified and have applied fertilizer as herein specified. The fertilizer shall be incorporated in the top 1 inch of the topsoil. The surface shall be moist and firm, but in an un-compacted condition at the time the sod is placed.

Sod shall be moist when placed, and shall be laid along contour lines, by hand, commencing at the lower elevation of the area to be sodded and working upward. Transverse joints of sod strips shall be staggered, and the sod strips carefully placed to produce tight joints.

At the edges of the areas to be sodded the sod shall be toed into the surface and backfilled with topsoil to provide a smooth transition from sodded areas to non-sodded areas.

The sod shall be compacted and watered as directed by the Engineer, and re-compacted after it is placed. The compaction shall be accomplished by use of a lawn roller or tamper, with care being taken to avoid damage to the sod strips.

Water shall be applied to sodded areas as directed by the Engineer for a period of three weeks.

1.4 Adjustment to Final Grade

All meter boxes, valve boxes, fire hydrants, manholes or any other water main or sewer main appurtenance shall be adjusted to match final grade as noted on the detailed specifications.

SECTION 2 - ARKANSAS HIGHWAY CROSSINGS

2.1 General

The work to be included under this section of the specifications shall consist of providing all material, labor, equipment, tools, supplies, and incidentals necessary to bore and insert a casing pipe, or to open cut as required, existing Arkansas State and Federal Highway(s).

2.2 Materials

2.2.1 Carrier Pipe

The carrier pipe shall be in conformance to those sections of these specifications governing ductile iron and PVC sewer mains and/or water mains.

2.2.2 Casing Pipe

Unless otherwise shown on the plans, casing pipe shall be constructed by boring and inserting a casing pipe of the type and thickness, diameter and length as specified or shown on the plans.

2.3 Permit Application

All water and sewer utility construction within State or Federal Highway right-of-ways must be permitted by the Arkansas Department of Transportation (ADOT). Water and sewer improvements to be operated and maintained by City of Gentry Water and/or Wastewater Department must be permitted in the name of City of Gentry Water and/or Wastewater Department with the construction covered by City of Gentry Water and/or Wastewater Department standing bond. The application process shall be coordinated through City of Gentry Water and/or Wastewater Department. The Engineer is responsible for the preparation of the permit application with accompanying sketches/plans. The completed application shall be delivered to City of Gentry Water and/or Wastewater Department for review. City of Gentry Water and/or Wastewater Department Manager or designated representative will sign the application and transmit to ADOT. Work within highway right-ways cannot take place until a permit has been received by City of Gentry Water and/or Wastewater Department. A copy of the permit issued by the ADOT shall be kept on the job site at all times.

2.3.1 Bond Posted

City of Gentry Water and/or Wastewater Department maintains a standing bond with the Arkansas Department of Transportation.

2.3.2 Location of Utilities

The Contractor shall be responsible for the location of all utility lines situated within the area of construction.

2.3.3 Traffic Control

It shall be the responsibility of the Contractor to provide sufficient flagmen, signs, barricades, lights and other items required to insure complete safety of the public and the workmen at all times.

Traffic control on state or federal highways shall be conducted and maintained as set forth in the manual on Uniform Traffic Control Devices as published by the U. S. Department of Transportation, Federal Highway Administration.

2.3.4 Borings

The crossing shall be made by boring or tunneling and inserting a casing pipe. The top of the casing pipe shall be a minimum of 4.0-feet below the low points of the roadbed cross-section (including ditches) or 5.0 feet below the top of the pavement at any location along the casing pipe, whichever gives the greater depth. If rock is encountered and all available means of the crossings by boring or tunneling have been exhausted, the Engineer will make application to the Arkansas Department of Transportation to make the installation by the open cut method.

2.3.5 Open Cut

If approval to open cut is received, the Contractor shall proceed with the installation in full accordance with all provisions and special conditions set forth by the Arkansas State Highway and Transportation Department. Any cost of deposits or bonds above and beyond City of Gentry Water and/or Wastewater Department 's standard standing bond for open cutting shall be borne by the Contractor. Since the return of the deposit required by ADOT depends upon returning the roadbed to its original or better condition, The Contractor will be required to complete this item of construction to the satisfaction of the ADOT.

2.3.6 Restoration of Property

Any highway property disturbed by the installation of the facility shall be restored to its original or equivalent condition including establishing sod as required by the ADOT District Engineer.

SECTION 3 - STREET AND COUNTY ROAD CROSSINGS

3.1. General

This item shall consist of obtaining permits and posting bonds and/or deposits which may be required by the City of Gentry, other municipality or Benton County, and providing all labor, equipment, tools, supplies and incidentals necessary for the crossing (bore), maintaining and restoring streets and roads to the satisfaction of the permitting entity. The work shall include every item of work necessary for a complete and acceptable installation.

3.2. County Road Permits

City of Gentry Water and/or Wastewater Department maintains a standing bond with the Benton County Road Department (BCRD). All water and sewer utility construction within Benton County road right-of-ways must be permitted by the Benton County Road Department. All water and sewer construction to be operated and maintained by City of Gentry Water and/or Wastewater Department must be permitted in the name of City of Gentry Water and/or Wastewater Department with the construction covered by City of Gentry Water and/or Wastewater Department 's standing bond. The application process shall be coordinated through City of Gentry Water and/or Wastewater Department. The Engineer is responsible for the preparation of the permit application with accompanying sketches/plans. The completed application shall be delivered to City of Gentry Water and/or Wastewater Department for review. City of Gentry Water and/or Wastewater Department Manager or designated representative will sign the application and transmit to BCRD. Work within county road right-of-ways cannot take place until a permit has been received by City of Gentry Water and/or Wastewater Department. A copy of the permit issued by the BCRD shall be kept on the job site at all times.

3.3. Pavement Repair Determined by Governing Authority

All permanent repairs of streets, roads, alleys, sidewalks, or other public rights-of-way shall meet with the construction requirements of the governing authority or private owner and shall also meet the requirements of all local Ordinances, Regulations, Permits, or Codes governing such repairs. Permanent repairs shall be constructed as soon as practically possible after water and/or sewer construction is completed.

3.4 Pavement Repairs to be Made With Concrete

All pavement repairs shall be made with concrete except when the governing authority or private owner dictates otherwise. The width of the repair shall be equal to the pipe line trench width plus 18-inches on each side of the trench. The repair shall be made with 3000 psi concrete. The repair shall be a minimum of 8-inches thick or match the thickness of the existing pavement if greater than 8-inches. The concrete repair shall include 6x6 W2.9/W2.9 welded wire mesh vertically centered in the concrete.

3.5. Service Crossings

Service Crossings of all existing roads whether private / public or dirt / asphalt / concrete shall be bored and not "cut" to cross the road to the main side of the road.

3.6. Referenced Materials and Construction

The following specifications are hereby referenced and made a part of these specifications. The specifications are contained in the 'Standard Specifications for Highway Construction' latest edition, published by the Arkansas Department of Transportation. These specifications are available on-line, or may be obtained from the Arkansas Department of Transportation.

3.7. Execution

City of Gentry Water and/or Wastewater Department shall obtain permits for work in State and federal highway right-of-ways and county road right-of-ways. The Contractor shall obtain all other permits, and post required and/or deposits with the permitting entity. Street crossings in the City of Gentry shall be performed in accordance with City of Gentry.

The Contractor shall provide and maintain during his construction activities adequate barricades, construction signs, torches, lanterns and guards as required to protect persons from injury and to avoid property damage. All materials pipes, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences and/or barricades and shall be protected by adequate torches and lanterns. Execution of adequate safety precautions set forth in these specifications is the sole responsibility of the Contractor.

The Contractor shall carry on the work in manner which will cause the least interruption to traffic, and may close to through travel not more than two consecutive blocks, including the cross street intersected. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways.

The Contractor shall post suitable signs indicating that a street is closed and necessary detour signs for a proper maintenance of traffic.

All areas excavated for the construction of sewer line, force mains and water lines and appurtenances within city streets and/or county roads shall have bedding, pipe protection cover and backfill placed as specified elsewhere in theses specifications.

All unpaved driving surfaces shall be replaced with Class 8 crushed stone base as specified elsewhere in these specifications and as shown on plans details. Crushed stone base (Class 8) shall be placed and compacted to 95 percent of modified proctor density (ASTM D 1557-78), as shown on the plans detail.

All street and county road right-of-ways disturbed by water construction and /or sewer construction shall be restored to their original or equivalent condition as required by the governing authority.

SECTION 4 - CREEK CROSSINGS

4.1 General

The work to be included under this section of the specifications shall consist of providing all materials, labor, equipment, supplies and incidentals necessary for the construction sewers, force mains and water lines crossing creeks as shown on the plans.

4.2 Permit Application

When open cut wet crossings are proposed applications for a Corps of Engineers Section 404 permit and ADEQ Short Term Activity Authorization permit are required. The Contractor will be responsible for compliance with the terms of the permits as issued. This may include the restriction of construction activity to certain times of the year as well as the quantity of fill which may be placed in the creek during construction.

4.3 Materials

4.3.1 Restrained Joint Pipe

Restrained join pipe shall be as specified by the Engineer.

4.3.2 Concrete

Concrete for pipe encasement shall be as specified elsewhere in these specifications.

4.4. Construction

Creek crossings shall be made at the locations shown on the plans and shall be made in conformance to these plans and specifications.

4.4.1 General

The creek crossings shall generally consist of excavating the trench to a depth of approximately7-feet below the stream bed or to solid rock prior to laying any pipe. From this information, the Engineer will determine cover necessary and using this information, compute grade for the pipe. The depth of bury may vary depending on actual conditions. City of Gentry Water and/or Wastewater Department may require the installation of valves on both sides of the creek crossing and a leak detection meter assembly if the normal sustained water surface width exceeds 15-feet.

4.4.2 Excavation

The pipe shall be laid with 5 feet cover if no rock is encountered in the excavation. However, if rock is encountered in the excavation, the pipe shall be laid with the crown 2 feet below the top of the rock.

4.4.3 Placement of the Pipe

Mechanical joint pipe may be installed by pulling or other method recommended by the pipe manufacturer and approved by the Engineer. In any event, the allowable tensile stresses induced in the pipe shall not exceed limits recommended by the pipe manufacturer. If the pipe is pulled, the pipe manufacturer shall provide closure pieces with cable eyes as required.

SECTION 5 - PAVED SURFACE REPAIR

5.1 General

The work to be included under this section of the specifications shall consist of providing all labor, equipment, tools, supplies, and the incidentals necessary for the repair of driving surfaces, curb and gutter, and sidewalks. This specification is intended for any driving surface, paved or unpaved, including but not limited to streets, roads, driveways, and parking lots.

This specification does not apply to state or interstate highways or driving surfaces within railroad rights of way unless otherwise directed by the Engineer.

5.2 ADOT Specifications Inclusion by Reference

The latest edition of "Standard Specifications for Highway Construction", published by the Arkansas Department of Transportation are hereby referenced and made a part of these specifications.

These specifications are available on-line, or may be obtained from the Arkansas Department of Transportation.

5.3 Temporary Repair

As soon as excavations in paved surfaces are backfilled temporary driving surfaces shall be placed and maintained in good drivable condition until permanent pavement repairs are constructed. Temporary paved driving surface shall consist of compacted asphalt concrete cold plant mix of the same thickness as the proposed permanent repair. Temporary pavement repairs shall be maintained as required to facilitate traffic and not impede drainage. Temporary pavement repairs of any other description and/or construction must be approved by the Engineer and City of Gentry Water and/or Wastewater Department.

5.4 Permanent Repair

All permanent repairs of streets, roads, alleys, sidewalks, driveways or other public rights-of-way shall meet the construction requirements of the governing authority or private owner and shall also meet with the requirements of all local Ordinances, Regulations, Permits, or Codes governing said repairs. See Standard Details for pavement repair in the Appendix.

Permanent repairs shall be constructed as soon as practically possible after water and/or sewer construction is completed. Pavement repairs shall be made with concrete unless dictated otherwise by the governing authority or property owner. The width of the repair shall be equal to the pipe line trench width plus 18-inches on each side of the trench or all sides of the excavation. The repair shall be made with a minimum of 8" thick 3000 psi concrete with six percent entrained air and shall include 6x6 W2.9/W2.9 welded wire mesh centered vertically in the repair. The repair thickness shall match the thickness of the existing pavement if it is thicker than 8-inches.

5.5 Pavement Repair Materials

5.5.1 Concrete

Concrete shall be as specified elsewhere in these specifications.

5.5.2 Prime Coat

Prime coat material shall be Grade MC-30 as stated in the Arkansas Department of Transportation Standard Specifications.

5.5.3 Tack Coat

Tack coat material shall be Grade SS-1, as set forth in the Arkansas Department of Transportation Standard Specifications.

5.5.4 Hot-Mixed, Hot-Laid Asphaltic Concrete

The hot-mix asphalt surface course shall conform in composition and to weights and gradation of Type 2 asphalt as set forth in the Arkansas Department of Transportation Standard Specifications, using asphalt cement viscosity grade AC-30.

5.5.5 Crushed Stone Base

Crushed stone base shall be as specified elsewhere in these specifications. The Contractor shall submit suppliers' certificates stating that the materials provided are in conformance with these specifications.

5.5.6 Curb and Gutter Joint Sealer.

Curb and gutter joint sealer shall be Type 1, Type 2, or Type 3 in accordance with the Arkansas Department of Transportation Standard Specifications.

5.6 Construction

5.6.1 Pavement Removal, Pipe Protection Cover and Backfill

The pavement shall be removed, pipe protection cover placed, and trench backfilled in accordance with the pipe specifications according to the type of pipe being installed.

All pavements which have been removed or damaged shall be repaired in accordance with these specifications.

5.6.2 Asphaltic Pavement Repair

After the trench has been backfilled and compacted, as specified elsewhere in these specifications, permanent repair shall be made as follows. The existing pavement shall be saw-cut and removed to a point 18 inches beyond the trench line limits, or as directed by the Engineer, and brought to grade 6 inches below the top of the existing pavement. This area shall then be resurfaced by applying asphaltic cement prime coat at the rate of 0.25 gallon/square yard, followed by a minimum course of hot-mixed, hot-laid asphaltic concrete of thickness as shown on the plans detail, laid to an elevation matching the existing finished grade. The hot-mixed, hot-laid asphaltic concrete shall be compacted to 92 percent of theoretical density.

One nuclear density meter test per asphaltic patch or repair shall be performed. The cost of determining the compacted density shall be at the expense of the Contractor. Any unacceptable patch or repair shall be re-compacted and re-tested at the Contractor's expense.

5.6.3 Unpaved Driving Surface Repair

After the trench has been backfilled and compacted as specified elsewhere in these specifications, the surface shall be brought to the existing grade with additional compacted Class 8 crushed stone base.

5.6.4 Barricades, Guards and Safety Provisions

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the roadway. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. Execution of all safety precautions previously set forth in these specifications is the sole responsibility of the Contractor.

5.6.5 Maintenance of Traffic and Closing of Streets

The Contractor shall carry on the work in a manner which will cause the least interruption to traffic, and may close to through travel not more than two consecutive blocks, including the cross street intersected. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways.

The Contractor shall post suitable signs indicating that a street is closed and necessary detour signs for a proper maintenance of traffic.

5.6.6 Piling Excavated Material for Reuse

All excavated material which is to be reused shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed.

5.6.7 Removal of Excess Material

All excess excavated material shall be loaded in trucks during the excavating operation, hauled from the job site, and disposed of at the option of the Contractor.

5.6.8 Cleanup

Cleanup of areas behind the curb and gutter and around sidewalks shall be as specified elsewhere in the specifications.

SECTION 6 - DUMPED STONE RIPRAP

6.1 General

The work to be included under this section shall consist of providing all materials, labor equipment, tools and supplies and incidentals necessary to construct riprap bank stabilization where required as shown on the plans.

6.2 Materials

6.2.1 Riprap

Material for dumped stone riprap shall be from a quarry source approved by the Engineer. Material for dumped stone riprap shall be reasonably free from overburden spoil and reasonably well graded between the maximum and minimum

rock piece sizes specified. Based on any one hauling unit shipment or delivery, the maximum piece size shall be not greater than 18 inches in any dimension and at least 50 percent of the material by weight shall consist of pieces weighing 35 pounds or more. Dirt or fines passing a ½ inch sieve accumulated from quarrying or loading operations shall not exceed five percent of the total weight.

6.2.2 Filter Blanket

Filter blanket shall be Class 8 stone base as specified elsewhere in these specifications.

6.3 Execution

6.3.1 Sub-Grade

The pipe backfill shall be constructed as specified elsewhere in these specifications. The toe trenches shall be excavated directed by the Engineer. The sub-grade shall be stripped of vegetation and smoothed to conform to the general shape of the stream bank prior to construction activities.

6.3.2 Filter Blanket

The filter blanket material shall be spread uniformly to the thickness required by the Engineer. Placement of the filter blanket shall be by a method which will prevent damage to the sub-grade and which will prevent segregation of the filter blanket material. Compaction of the filter blanket will not be required. However, it shall be finished to a smooth surface of uniform depth.

6.3.3 Dumped Stone Riprap

This term shall consist of a protective layer of riprap placed in accordance with these specifications and to the thickness, line grade and location shown on the plans or as directed by the Engineer. Dumped stone riprap shall be placed in such a manner as to produce a reasonably well graded, smooth surface mass of rock with the minimum practicable percentage of voids, and shall be constructed to the lines and grades as directed by the Engineer. Material shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing dumped riprap in layers will not be permitted. The larger stones shall be well distributed and the entire mass of stones shall be roughly graded to conform to the gradation specified. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Hand-placing to a limited extent may be required but only to the extent necessary to secure the results specified immediately above. Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. Particular care shall be exercised by the Contractor to restore the area where rock is stockpiled to pre-construction conditions. These areas shall be cleaned up and seeded

as specified elsewhere in these specifications for pipeline cleanup and seeding.

6.3.4 Backfill of Toe Trenches

After the riprap placement is completed, the toe trenches shall be backfilled and cleaned up and seeded as specified elsewhere in these specifications for pipeline cleanup and seeding.

SECTION 7 – FENCE CONSTRUCTION & REPAIR

7.1 General

The work to be included under this section of the specifications shall consist of providing all materials, labor, equipment, tools, supplies and incidentals necessary for the construction or repair of existing fences affected by construction. The work shall include every item of construction necessary for a complete and acceptable installation as shown on the plans and hereinafter specified.

7.2 Yard Fence Materials and Construction

Repair/replacement of yard fencing shall be made with all new materials and construction matching the existing fence as nearly as possible. Differences in materials or construction must be approved by City of Gentry Water and/or Wastewater Department.

7.3 Farm Fence Materials and Construction

Unless otherwise required by these specifications, all farm type fences shall be five strand barbed wire, steel "T" post and treated wood corner and brace posts.

7.3.1 Posts

All corner and brace post assemblies shall be constructed of treated wood, first quality, and of such length that they may be embedded in concrete to a depth not less than 30 inches. All line post shall be metal "T" posts.

7.3.1.1 End, Corner, Brace Assembly and Gate Posts

Posts shall be 6 inches minimum diameter, 7 feet in length, creosoted or pressure treated Grade A southern yellow pine. Cross brace post shall be 4 inches minimum diameter.

7.3.1.2 Line Post

Line posts shall be 1-1/4 inches by 1-1/4 inches by 5 feet 6 inches minimum length painted steel "T" type posts. Minimum weight per foot shall be 1.44 pounds. All "T" posts used at one location shall be the same color and same brand.

7.3.2 Wire

Barbed wire shall be used in all locations unless specific requirements call for other types of wire.

7.3.2.1 Barbed Wire

Barbed wire shall be zinc coated, two strand twisted No. 12-1/2 ASW gauge galvanized steel wire with four point barbs of No. 14 ASW gauge galvanized steel wire. Wire shall conform to Federal Specifications FF-F-221, Type A.

7.3.2.2 Bracing wire

Bracing wire shall be smooth No. 9 gauge galvanized soft wire and shall be zinc coated.

7.3.2.3 Staples

Staples shall be No. 9 galvanized steel wire and shall be 1-1/2 inches long.

7.3.3 Gates

Gates shall be constructed to the height and width as shown on the plans. Perimeter framework shall be 1-1/2 inches in diameter, Schedule 40 black pipe with all joints welded. Interior horizontal members shall 3/4 inch diameter, Schedule 40 black pipe with vertical braces of 3/16 inch x 2 inch steel straps welded to each member as shown on the plans. Gates shall be primed with a rust-inhibiting primer and shall be painted as set out elsewhere in these specifications. Color will be selected by City of Gentry Water and/or Wastewater Department or its representative. Each installation of a farm gate alone shall be furnished with a single 42 inch length of 5/16 inch steel chain with the chain attached to the post by means of 3 inch x 1/4 inch lag screw. All padlocks will be provided by City of Gentry Water and/or Wastewater Department.

7.3.4 Concrete

Where specified or shown on the plans, all concrete shall conform to requirements as set out elsewhere in these specifications.

SECTION 8 - BACKFILL DENSITY TESTS

8.1 Description

This section covers the testing of backfill around newly constructed manholes, water and sewer lines, service lines, and other structures to insure proper fill and compaction.

8.2 Requirements

Backfilling of pipelines shall include the refilling and consolidation (compaction) of the fill in the excavation up to the surrounding ground surface. In unpaved areas pipeline trench backfill shall be placed in layers of appropriate thickness not to exceed 24" and compacted by hand or approved mechanical methods. Trench backfill of unpaved areas shall be compacted to a minimum density of 85% of the Standard Proctor density of the adjacent undisturbed soil as determined in accordance with ASTM D6938.

Unless dictated otherwise by a governing authority or property owner, trenches in existing or proposed roads, streets and other paved areas shall be entirely backfilled with Class 67 crushed stone.

When a governing authority or property owner dictates trench backfill for paved areas with ADOT Class 8 crushed stone, the entire trench up to a point 2-feet below existing or proposed subgrade shall be backfilled and compacted to 90 percent Modified Proctor Density as determined by AASHTO T-180. The remaining 2-feet shall be backfilled with ASOT class 8 placed in 6-inch lifts and compacted to 95% Modified Proctor Density as determined by AASHTO T-180. Density shall be verified in the field by the use of a calibrated nuclear density gauge, with a minimum of three tests per project, or 1 per 100 feet, whichever is greater.

8.3 Method of Testing

8.3.1 Moisture Density Relation

The moisture density relations of material shall be determined in the laboratory in accordance with AASHTO Designation T-99 or Designation T-180, as specified.

8.3.2 Field Density

Field density of backfill shall be determined in accordance with ASTM D6938.

SECTION 9 - CONCRETE AND REINFORCING STEEL

9.1 Description

This section covers the construction methods for concrete and reinforcing steel. All material shall conform to the requirements of this Section - Concrete and Reinforcing Steel.

9.2 Pre-Cast Concrete Structures

Pre-cast concrete structures are not allowed and shall not be installed for any potable water or sanitary sewer construction.

9.3 Ready-Mix Concrete

All concrete for poured-in-place manholes and other structural applications shall be ready-mixed

concrete. Ready-mixed concrete shall conform to ASTM Standard C 94 and to applicable portions of these specifications for on-site mixing. The concrete shall be delivered and placed within one hour after all materials, including mixing water, shall have been placed in the mixing drum. Each batch shall be accompanied by a load ticket and with a copy for the inspector showing the concrete type, mixing proportions, and time mixing began.

9.4 Reinforcing Steel

Steel reinforcing shall be free from rust, scale, and from mortar, dirt, or other objectionable coatings. It shall be placed accurately in accordance with details shown on the plans and properly secured in position.

9.5 Vibration

All structural concrete must be vibrated as it is placed. The use of form vibrators is not acceptable. Internal vibrators shall be capable of transmitting vibration to the concrete at frequencies not less than 4,500 impulses per minute. Duration of vibration shall be limited to the time necessary to provide satisfactory consolidation without causing segregation. The vibrator shall not be inserted into the lower courses previously vibrated. Vibrators shall be applied in a substantially vertical position and at uniformly spaced points not further apart than the visible effectiveness of the vibrator. Vibration shall be supplemented by such spading as the Engineer may require. The slump of concrete shall be the minimum that is practical. When vibration is used to consolidate the concrete, the slump shall not exceed 4".

9.6 Application of Structural Concrete Other Than Manholes

Utilization of reinforced or non-reinforced concrete for structural uses other than poured-in-place manholes shall be subject to individual design and specification of the responsible Engineer to meet the specific needs of the project. Design and specification shall be in keeping with current engineering practice, applicable codes of practice, and subject to the review and approval of City of Gentry Water and/or Wastewater Department.

SECTION 10 - CONCRETE TESTING

10.1 Description

This section covers the testing of concrete used in the construction of sanitary sewer manholes and other concrete structures.

10.2 Testing Requirements

10.2.1 Composite Samples

Composite samples shall be taken in accordance with ASTM C172, (Standard Method of Sampling Fresh Concrete).

10.2.2 Number of Test Cylinders Required

Mold and laboratory cure three test cylinders from each test required in accordance with ANSI/ASTM C31, (Standard Method of Making and Curing Concrete Tests Specimens in the Field).

10.2.3 Tests Required

Test the specimens in accordance with ANSI/ASTM C39, (Standard Test Method for Compressive Strength of Concrete Specimens). One cylinder shall be tested at 7 days and the remaining two cylinders shall be tested at 28 days.

10.2.4 Slump

The slump of the normal-weight concrete sample for each strength test shall be determined in accordance with ANSI/ASTM C143, (Standard Test Method for Slump of Portland Cement concrete).

10.3 Acceptance

Should the test cylinders fail at less than the specified concrete strength, the Contractor shall reconstruct the concrete structure at his cost. The Contractor shall then be responsible for the expenses involved in re-testing the concrete.

10.4 Routine Testing

Testing will be required on all job sites where 50 cubic yards of cement are placed or as directed by the Engineer. The cost of all testing made at the request of City of Gentry Water and/or Wastewater Department will be borne by the Contractor. The Engineer shall furnish City of Gentry Water and/or Wastewater Department copies of any and all concrete testing performed by the Engineer or his representative during the course of the work.

SECTION 11 – ENCASEMENT PIPE

11.1 Steel Encasement Pipe

Steel encasement pipe shall be of the dimensions as shown in the Standard Details. The pipe shall be new smooth wall pipe with beveled ends. Unless otherwise required by City of Gentry Water and/or Wastewater Department the minimum wall thickness of steel encasement pipe shall be 0.25-inches. Greater wall thicknesses may be required dependent on depth of installation, structural loading and installation circumstance.

The encasement pipe steel shall have 35,000-psi minimum yield strength. The pipe shall conform to ASTM A-53 / ASTM A283 / ASTM A-135, Grade B, CW, physical tests only (hydrostatic test not required). A letter of compliance from the manufacturer shall be supplied upon request.

All pipe less than or equal to 24-inch diameter shall be Type E (electric-resistance welded, Grade B) or Type S (seamless, Grade B). All pipe greater than or equal to 26-inch diameter shall be Type E (electric-resistance welded, Grade B) or Type S (seamless, Grade B) or Rolled Plate (straight seam, Grade B material) or Spiral Welded. Rolled plate pipe shall have only one longitudinal seam per section; sections shall be no shorter than 96-inches long except one short piece will be allowed to complete a specified installation length.

11.2 PVC Encasement Pipe

Any use of PVC encasement must be specifically approved by City of Gentry Water and/or Wastewater Department. PVC Encasement pipe may be used for small diameter (4-inch or smaller) pressure main open cut crossings of gravel roads, parking areas and creeks. All PVC encasement pipe shall conform to the polyvinyl chloride pipe specifications contained in these specifications. PVC encasement pipe shall be, SDR 17 Pressure Class 250 or C900 DR 18 with the same diameters as required for steel encasement as shown in the standard details.

11.3 Casing Spacers

Casing Spacers will be required on water pipes two (2) inches and larger, sewer force mains and gravity sewer pipe. The spacers shall be fusion bonded epoxy coated carbon steel or T-304 stainless steel casing spacers Model SI or SSI as manufactured by Advance Products and Systems, Inc., of Lafayette, Louisiana, or approved equal.

11.4 Restrained Joint Pipe

Manufactured restrained joint pipe shall be required for all water main and force main carrier pipe installed within encasement pipe.

PART 5 – SANITARY SEWER PUMP STATIONS

SECTION 1 - GENERAL REQUIREMENTS

1.1 General

Lift stations, when required, shall be uniquely designed and shall have a wet well fluid reservoir and a dry well pump chamber. Lift stations shall have a minimum of two (2) pumps and shall have all required piping, valves, lever controls, instrumentation, electric switch gear, etc.

1.2 Design by Engineer

The sewage pump station shall be designed by a Professional Engineer licensed by the state of Arkansas.

1.3 Minimum Requirements

Pump stations requirements presented herein are general in nature and are the minimum necessary design and operation conditions acceptable to City of Gentry Water and/or Wastewater Department. Any proposed alteration of pump station design, construction and operation from the standards set forth herein must be approved by City of Gentry Water and/or Wastewater Department before construction can begin.

The lift station consists of a tank like structure fabricated of steel fabricated by USEMCO Incorporated, or approved equal, buried underground with a steel access tube and ladder to provide entry. The structure is externally coated with two-compound epoxy coatings and is protected from corrosion by a cathodic system.

The station houses two sewage pumps with electric motor drives, electric motor starting equipment and a level control system to operate the pumps. Accessories include: a sump pump with screen, dehumidifier, ventilation blower, heater and electric distribution equipment, pump lift eye and alarm system.

1.4 Drywell Pumps Required

Each pump station dry well shall be completely separated from the wet well and common walls shall be gas tight. The dry well shall be equipped with at least two pumps. A third pump complete and ready to be installed and run shall be supplied to City of Gentry Water and/or Wastewater Department. Each pump shall be capable of handling normal flow conditions.

1.5 Electrical Voltage Requirement

All Pump Stations shall be designed for and operate at voltage and phase configuration acceptable to City of Gentry Water and/or Wastewater Department. Generally pump stations with 25 horsepower or larger pumps shall be designed and constructed for 480 V, three (3) phase power. No deviation from this requirement shall be permitted without the express prior written approval

of City of Gentry Water and/or Wastewater Department. Costs for electrical extensions or upgrades must be borne by the developer.

1.6 Electric Power Coordination

Pump motors must be specified to operate at voltages available from the electric power company providing service as acceptable to City of Gentry Water and/or Wastewater Department.

1.7 SCADA System Connection

The station shall be equipped to be connected to City of Gentry Water and/or Wastewater Department SCADA system to allow monitoring and control of all pump station functions. The equipment necessary to make the connection to the SCADA system including possible software upgrades shall be purchased and installed by City of Gentry Water and/or Wastewater Department at the developer's or contractor's expense.

1.8 Sole Source Provision of Equipment

All of the mechanical and electrical equipment shall be an integral package provided by one supplier whether the pump manufacturer and/or manufacturer's local vender or other representative so as to provide undivided responsibility. City of Gentry Water and/or Wastewater Department reserves the right to reject any and all proposed pump station equipment as well as the right to require specific equipment brands and pump station construction.

1.9 Submittals

Three (3) sets of shop drawings, detailed specifications, pump warranty, and performance characteristics for all of the equipment and fixtures to be furnished and installed shall be submitted to City of Gentry Water and/or Wastewater Department for review and approval. The Shop Drawings and equipment data shall be submitted with a cover letter, Contractor's stamp of approval, and Engineer's stamp of approval indicating that he has reviewed, checked, and approved the data submitted. City of Gentry Water and/or Wastewater Department will review the submittal and render a decision in writing as to the acceptability of the equipment. Without prior written City of Gentry Water and/or Wastewater Department approval, the item of work may not be accepted.

1.10 Exceptions to Requirements

Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by City of Gentry Water and/or Wastewater Department prior to proceeding with the work.

1.11 Stainless Steel Hardware

All mounting and fastening hardware shall be stainless steel.

1.12 Weather Exposure

All components of the pump station that are exposed to weather shall be constructed of material that is resistant to corrosion and will not require surface protection throughout the expected life of the lift station. In general, these materials are stainless steel, aluminum, fiberglass reinforced polyester (FRP), and ultraviolet stabilized PVC.

1.13 Epoxy Coating

All valves and ductile iron fittings shall be epoxy coated inside and out. All ductile iron piping coming in contact with wastewater or installed in the wet well, dry well or valve pit shall be coated with epoxy inside and out. Acceptable interior epoxy for ductile iron pipe shall be Protecto 401, or approved equal. Acceptable field applied exterior coating of ductile iron pipe shall be Raven 405, or approved equal. All stainless steel hardware and accessories shall be protected from field applied coating of the epoxy.

SECTION 2 - PUMP STATION SITE

2.1 Site Area, Grading and Surface

The pump station site shall have area sufficient to allow City of Gentry Water and/or Wastewater Department to operate and maintain the pump station. The area required shall be determined by City of Gentry Water and/or Wastewater Department depending on the diameter and depth of the wet well and dry well, other equipment, operating conditions and any extenuating circumstances. Maximum slope across the site shall be no greater than 5% in any direction. As a minimum the entire pump station site shall be surfaced with 12-inches of compacted crushed stone. If deemed necessary City of Gentry Water and/or Wastewater Department may require that the entire site be surfaced with asphalt or concrete pavements.

2.2 Access Drive

The pump station shall be provided with a 10-feet wide access drive to the nearest public road and right-of-way. The access drive shall be constructed and surfaced in the same manner as the pump station site.

2.3 Site Ownership

The pump station site shall be deeded to City of Gentry Water and/or Wastewater Department. The deeded property shall include the access to the site from the public right-of-way. The access shall be a minimum of 15-feet wide.

2.4 Site Fencing

The pump station site shall be secured by a minimum 6’ high wooden fence. Posts shall be a minimum of 3” SCH 40 galvanized steel. Gate posts shall be a minimum of 4” SCH 40

galvanized steel. Rails shall be 16-gauge galvanized steel, 2" x 4" nominal dimensions. Pressure treated wood shall be installed in the rails to anchor the pickets. All pickets shall be constructed of cedar or treated pine, and shall be a minimum of 1"x6"x6'. All hardware used to anchor the pickets to the steel rails shall be designated for use with cedar and treated lumber. A 12' wide double gate with lockable hasp shall be provided. A 3' wide man gate with lockable hasp shall be provided.

SECTION 3 - WETWELL SIZING

3.1 Wetwell Diameter

Wetwell diameter shall be sufficient to allow efficient pump operation. Minimum allowable diameter is 6-feet.

3.2 Wetwell Depth

The wetwell depth shall be sufficient to provide a volume above the low water pump cutoff level equal to the combined pumping rate for two pumps running simultaneously for 10-minutes of run time plus 1-foot of additional depth below the lowest pipe invert discharging into the wetwell.

3.3 Structural Dimensions

The thickness of the wetwell bottom, sides and top shall be large enough in conjunction with steel reinforcement to withstand all forces that may come to bear on the wetwell. The weight of the concrete for all parts of the empty wetwell must be large enough to overcome the buoyant force with a safety factor of 1.5.

3.4 Operational Levels

Pump on and off levels and alarm levels shall be calculated by the design Engineer but are subject to change by City of Gentry Water and/or Wastewater Department.

3.5 Level Sensors

The pump station shall be equipped with pressure transducers and backup float switch system for measuring water levels and controlling lift station functions.

SECTION 4 - PUMP STATION WARRANTY

Pump station warranty shall be two (2) years from the date of acceptance per City of Gentry Water and/or Wastewater Department maintenance bond requirements.

SECTION 5 - WETWELL AND ACCESSORIES

5.1 Cast-in-Place Concrete Construction

The basin and valve pit are to be constructed of cast-in-place concrete. Minimum valve vault and wetwell diameter shall be 6'-0'. The basin, valve pit, flat tops, and base slabs shall be constructed of cast-in-place reinforced concrete. All joints between the wetwell bottom, walls and subsequent wall pours shall be constructed with water stops and formed key ways. Pipe penetrations through wetwell walls shall be constructed with pipe water stops. The actual arrangement of the structures is to be as shown in the approved Plans.

5.2 Wetwell Vent

The wetwell basin top shall be provided with a six (6) inch stainless steel vent having a downward pointing inlet with insect screen over the inlet opening. Vents through wetwell walls are not allowed.

5.3 Finish Grade

The elevations of the top slabs for wetwell and valve vault shall be at least 6-inches above surrounding grade.

5.4 Interior Surface Coating

All concrete surfaces within the wet well shall be coated with one of the products listed below. These products shall only be applied by personnel thoroughly familiar with handling of the coating material, and in accordance with the manufacturer's specifications, recommendations and requirements.

5.4.1 Acceptable Coating Products

Raven Ultra High-Build Epoxy Coating, designated as Raven 405, with an average thickness of 100 mils and a minimum thickness of 80 mils.

Warren Environmental Systems, designated as S-301, with an average thickness of 100 mils and a minimum thickness of 80 mils.

5.4.2 Minimum Requirements

All epoxies shall meet the following minimum requirements:

Flexural Strength	ASTM D790	6,000 psi
Compressive Strength	ASTM D695	8,000 psi
Tensile Strength	ASTM D638	4,000 psi
Tensile Elongation	ASTM D638	4%
Adhesion	ASTM D4541	Concrete Substrate Failure

5.5 Wetwell Aluminum Access Hatch

Aluminum access hatch frame and door assembly(ies) with safety grating assembly are to be supplied and installed in the wetwell top. The size, number and installation configuration of the access hatches shall be determined by the size, number and installation configuration of the pumps. The access hatches shall provide at least 6-inches clear opening beyond the pumps on all sides. Said access hatches shall allow installation and removal of the pumps and shall support the guide rails. The doors shall be provided with lifting handle, automatic safety latch to hold door in the open position and a hasp suitable for padlock. The doors shall have a non-skid finish and be designed for light, medium, or heavy duty, depending on the location of the pumping station.

5.6 Ductile Iron Yard Piping

All yard piping within the pump station site shall be centrifugally cast class 350 ductile iron pipe with American Polybond lining, 401 Epoxy Ceramic, or approved equal.

SECTION 6 - ELECTRICAL DESIGN

6.1 Coordination with Electric Utility

The design Engineer must coordinate with the Electric Utility Company providing service in the location where the pump station is to be constructed to ascertain what voltages can be provided to allow correct pump motor and electrical equipment specification. City of Gentry Water and/or Wastewater Department must approve proposed electric voltage and phase conditions before design proceeds.

6.2 Control Panel Circuit Breaker

A single main fusible or breaker disconnect switch of adequate size to provide power for the "control panel" and its related components shall be provided by the Contractor.

6.3 Disconnect Switch Housing

The disconnect switch shall be housed in a NEMA 4X stainless steel enclosure with an external operation handle capable of being locked in the ON position.

6.4 GFI Convenience Outlet

The pump station site shall include a GFI convenience outlet with 20 amp breaker and suitable transformer or power supply to provide 110 volt single phase power to the convenience outlet.

6.5 Electric Conduit

Schedule 40 electrical conduits of sufficient size shall be provided through the drywell and to the control panel for pump power cables, sensor cables and control cables. Sensor and control cables shall not be placed in the same conduit as power cables. There shall be no wiring splices between the control panel and equipment in the drywell. Conduits shall be sealed at entry to the control panel to prevent movement of sewer gases into the control panel.

6.6 Electric Connections

All electrical contacts and connection lugs shall be heavy duty.

6.7 Rigid Conduit

All vertical conduit and transitions from horizontal to vertical runs shall be rigid metallic conduit. Horizontal conduit runs below grade may be either Schedule 40 PVC or rigid metallic conduit. All conduit fittings shall be threaded metal.

SECTION 7 – CONTROL PANEL

7.1 General

Internal control panel shall be provided and installed by manufacturer of drywell pump station. External control panel shall be built in a NEMA 4X stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock. Inside shall be a separate hinged panel to protect all electrical components. H-O-A switches, run lights, circuit breakers, etc. shall be mounted such that only the faces protrude through the inside swing panel and no wiring is connected to the back side of the inside swing panel. The control panel shall be located so as to provide safe access to the panel while drywell hatch doors are opened, and shall be positioned so as not to be between the access drive and the drywell.

7.2 Electrical

A circuit breaker and magnetic starter with three (3) leg overload protection and manual reset shall be provided for each pump. Starters shall have auxiliary contacts to operate both pumps on override condition. A separate circuit breaker shall be supplied for power to the control circuit. The control panel shall include an extra circuit breaker of adequate size to provide 115 volt, single phase power for the remote monitor panel. The control panel shall include a control voltage transformer to reduce supply voltage 115 volt, the float circuit and associated relays which shall be provided with 24 volt control voltage. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. A green run light and H-O-A switch shall be provided for each pump. A terminal strip shall be provided to make field connections of pump power leads, level control, seal sensor leads, heat sensor leads, and remote monitor panel interconnections.

7.3 Time Delay Relay

A time delay relay shall be provided to delay start of second pump should power outage occur.

7.4 Pump Heat Sensor Connection

The control panel shall incorporate connections for heat sensors which are installed in the pumps. The connection shall disconnect the starter upon high temperature signal and will automatically reconnect when condition has been corrected.

7.5 Seal Failure Sensor Connection

The control panel shall incorporate connections for seal failure sensors which are installed in the pumps. The panel will have a seal failure alarm light for each pump. This alarm indicates failure of the lower mechanical seal in the pump. This will be an alarm light only and will not shut down the pump.

7.6 Hour Meter

The control panel shall include an hour meter for each pump to register the elapsed operating time of each pump.

7.7 High Water Alarm

The control panel shall have a high water alarm built into the main enclosure. The high water alarm shall consist of a flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted on top of the enclosure such that it is visible from all directions. An alarm horn shall be mounted on the side of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure.

7.8 Condensate Heater

The control panel shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control panel.

7.9 Lightning Protection

The control panel shall include lightning protection and a phase monitor relay to shut down the control circuit and protect the equipment due to loss of phase or phase reversal. The three (3) phase sequence voltage relay shall be of the 8-pin connector type.

7.10 Alternator Selector Switch

The control panel shall incorporate an alternator selector switch to allow selection of automatic alternation or manual selection of the lead pump.

7.11 Domestic Manufacture and Local Availability

All component of the control panel shall be American made and available from local sources. In particular, items such as circuit breakers, overload protection, relays, etc. shall be available and in stock by local sources.

7.12 Compatibility of Equipment

In order to maintain unit responsibility and warranty on the pumping equipment and control panel, the control panel must be accepted in writing by the pump manufacturer as suitable for operation with the pumping equipment.

7.13 Operation and Maintenance Manuals

Three (3) operation and maintenance manuals shall be submitted to City of Gentry Water and/or Wastewater Department. Manuals shall include, at a minimum:

1. Operation instructions;
2. Maintenance instructions;
3. Recommended spare parts list;
4. Lubrication schedules;
5. Structural diagrams;
6. As-built wiring diagrams; and
7. Bill of materials.
8. Copy of design engineer's pump operating point calculations, population assumptions, average daily flow, and peaking factor

SECTION 8 - GENERATOR SET

8.1 General

The pump station shall include an on-site backup power generator. The generator and lift station combination must include switching and control gear such that the backup power source is activated automatically without human action. The generator shall be powered by diesel fuel

and supplied with double wall steel belly tank sized to run all pumps at full load for 48 hours. The generator must be capable of operating the lift station at full capacity, i.e., with the largest pumps, impellers, and motors, and the greatest number of pumps, that the lift station can physically contain, with all of the above operating at full speed simultaneously.

8.2 Generator Set

8.2.1 Generator Size/Rating

The generator set shall be minimally rated at the kW rating as indicated on the drawings when operating at voltage required by pump motors with 0.8 lagging power factor. The generator set shall be capable of this rating while operating in an ambient temperature condition of 122°F (50°C).

8.2.2 Starting Loads

The generator set shall be capable of starting motor loads as indicated on the drawings along with a minimum station load of 5 kW and a maximum voltage dip of 25%.

8.2.3 Engine Speed

The engine shall deliver power at a governed speed of 1800 rpm.

8.2.4 Fuel Tank

All fuel tanks shall be of double wall construction. Further fuel spill protection measures such as containment vessels, earthen berms, etc. will be required if deemed necessary by City of Gentry Water and/or Wastewater Department.

8.3 Sound Attenuated Protective Weather Enclosure

8.3.1 Manufacturer Experience

Manufacturer shall have a minimum five years of experience in the design and construction of weather-protected generator-set enclosures.

8.3.2 Modular Construction

The enclosure panels shall be assembled with modular, bolt- together construction.

8.3.3 Required Features

Enclosure shall include the following features:

1. Foam insulation on all interior surfaces

2. Sound level not to exceed 68 dba within 7 meters of enclosure surface in any direction

3. All exterior and interior surfaces finished with baked-on powder-coat

4. Bottom flange with multiple mounting holes

5. Stainless steel door hardware and lift-off hinges

6. Lockable doors

7. Gasketed access doors

8.4 Automatic Transfer Switch (ATS)

8.4.1 Transfer Switch Manufacture

It is the intent of this specification to secure automatic transfer switches that have been prototype tested, factory built, production tested, and site tested, together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein. Automatic transfer switches with number of poles, voltage and current ratings as shown on the plans shall be provided. Each ATS shall consist of an inherently double-throw power transfer switch unit and a control module interconnected to provide complete automatic operation. All equipment shall be new and of current production by a domestic firm that manufactures the generator, controls, and transfer switch. The company selected will assemble the standby generator set and system as a matched unit so that there is one-source responsibility for warranty, parts and service through a local representative with factory-trained personnel.

8.4.2 Transfer Switch Sizing/Rating

ATS shall be sized as indicated on the drawings to match the generator and power requirements of pump motors including starting loads.

8.5 Sizing Calculations

Submit motor starting calculations and generator sizing calculations for approval.

8.6 Scada Signals

The generator set shall provide the following status signals to the SCADA package:

1. Generator status
2. Generator general alarm

SECTION 9 - PUMP OPERATION

9.1 Pump Operation

9.1.1 Lead Pump Start

On wet well level rise, the lead pump shall start at the lead pump ON elevation. With the lead pump operating, the wet well level shall lower to all pumps OFF and turn off the pump. The alternating relay in the control panel shall index on stopping of the pump so that the lag pump will start on the next operation.

9.1.2 Lag Pump Start

If the wet well level continues to rise when lead pump is operating, the override switch shall energize and start the lag pump. Both lead and lag pumps shall operate together until low level switch turns off both pumps. If level continues to rise when both pumps are operating, alarm level switch shall energize and signal the alarm.

9.1.3 Pump Start Failure Override

If one pump should fail for any reason, the second pump shall operate on the override switch.

9.1.4 Low Level Alarm

If the pumps fail to turn off for any reason after receiving the signal for all pumps OFF, a low level alarm shall signal.

9.1.5 Control Level Adjustment

All level controls shall be adjustable for level setting from the surface.

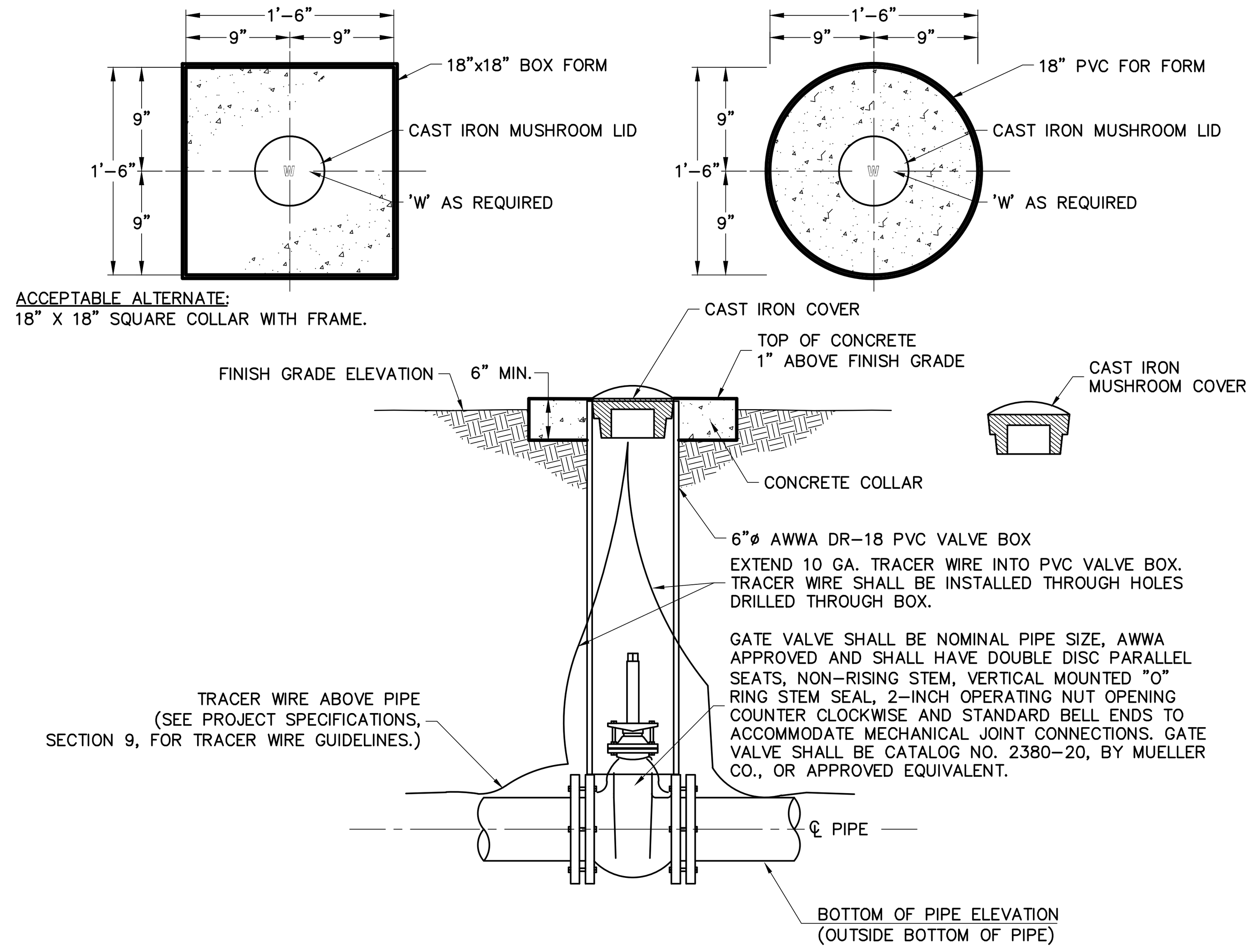
SECTION 10 – PUMP STATION TESTING

10.1 Pump Testing

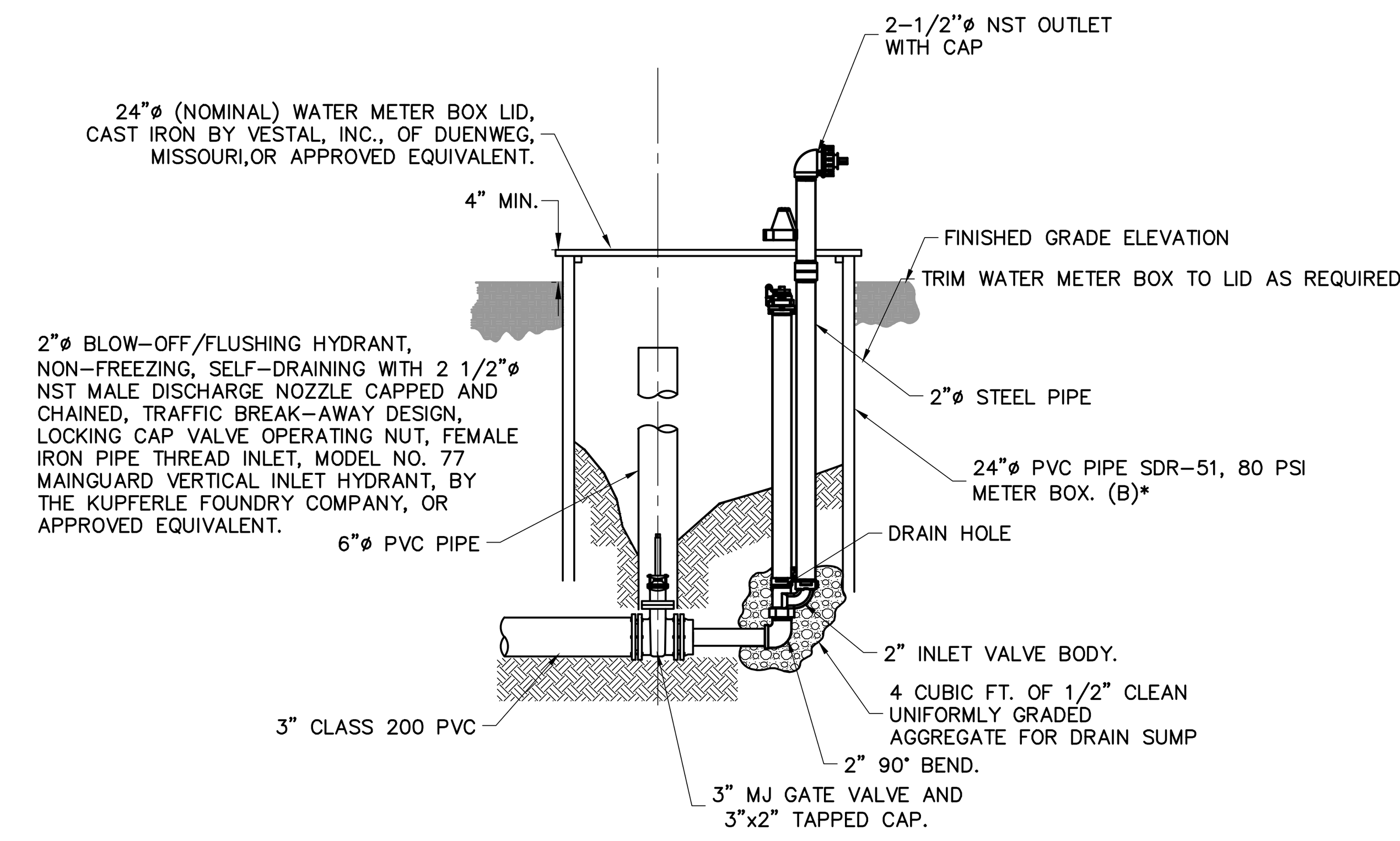
All pumps shall be flow tested to ascertain pumping rate. Actual pumping rates must meet or exceed the design specified maximum flow rate for the pump station.

10.2 Electrical components

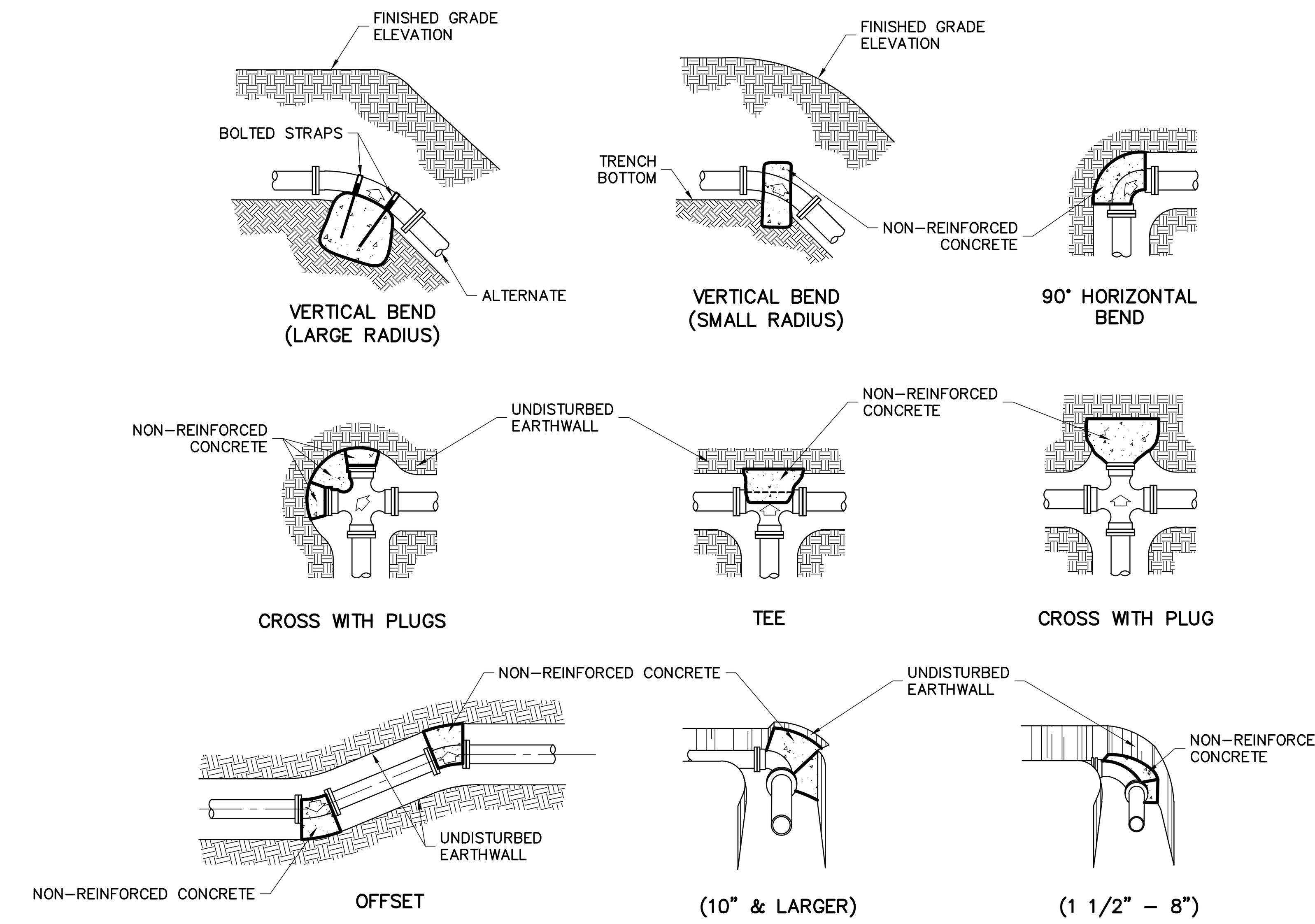
All electrical components including emergency generator and transfer switch must be tested and proved to operate as designed and approved.



TYPICAL GATE VALVE AND VALVE BOX DETAIL
N.T.S.



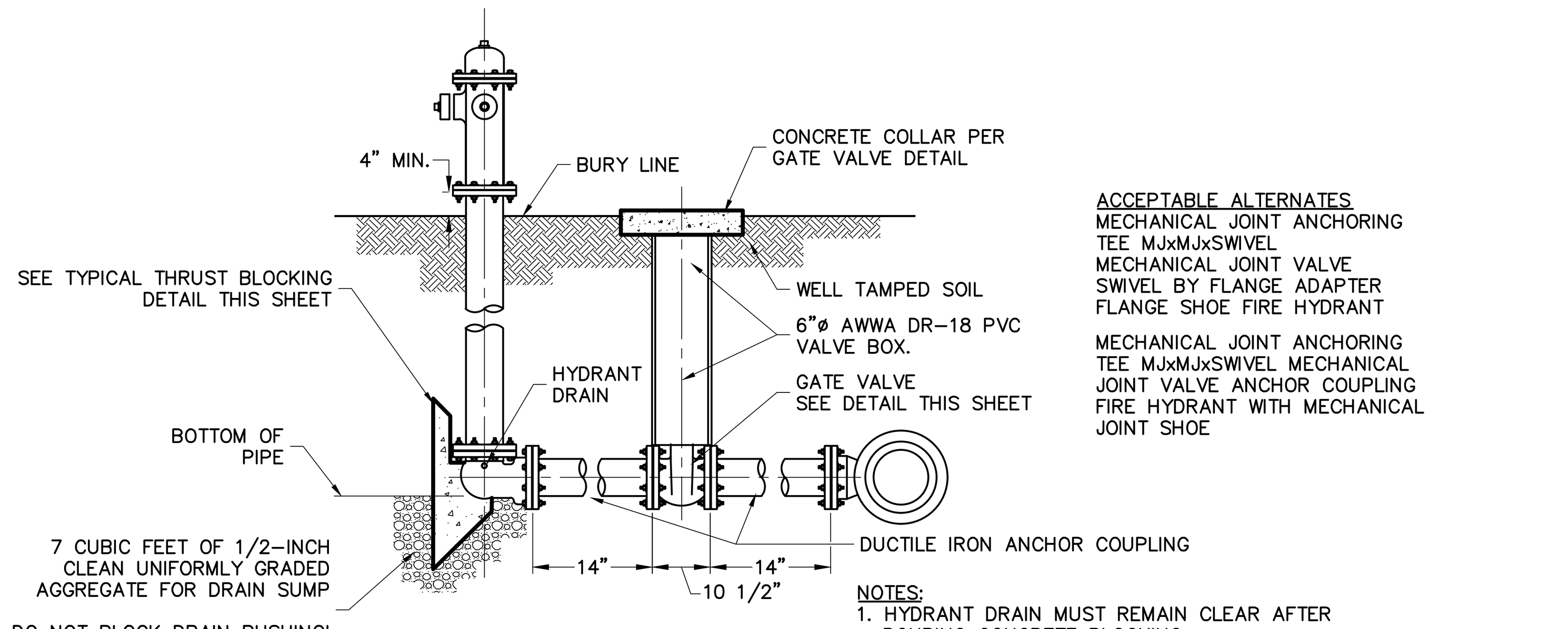
TYPICAL BLOW-OFF/LINE FLUSH VALVE DETAIL
N.T.S.



NOTE:
THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED EARTH OR SELECTED HOMOGENEOUS FILL MATERIAL, FREE OF ORGANICS, NATIVE TO THE PROPERTY, PLACED IN A MAXIMUM OF 6-INCH THICK (COMPACTED THICKNESS) BUILT UP LAYERS AND COMPACTED TO 95 PERCENT OF THE MAXIMUM LABORATORY DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR TEST (ASTM D698).

ACCEPTABLE ALTERNATE
FOR PVC PIPE AND/OR DUCTILE IRON PIPE USE MECHANICAL JOINT RESTRAINT, MJR JOINT GLAND (BY TYLER PIPE OR APPROVED EQUIVALENT) AT BELLS OF MECHANICAL JOINT FITTINGS SUBJECT TO THRUST.

TYPICAL THRUST BLOCK CONDITIONS DETAIL
N.T.S.



ACCEPTABLE ALTERNATES
MECHANICAL JOINT ANCHORING TEE MJxMJxSWIVEL MECHANICAL JOINT VALVE SWIVEL BY FLANGE ADAPTER FLANGE SHOE FIRE HYDRANT

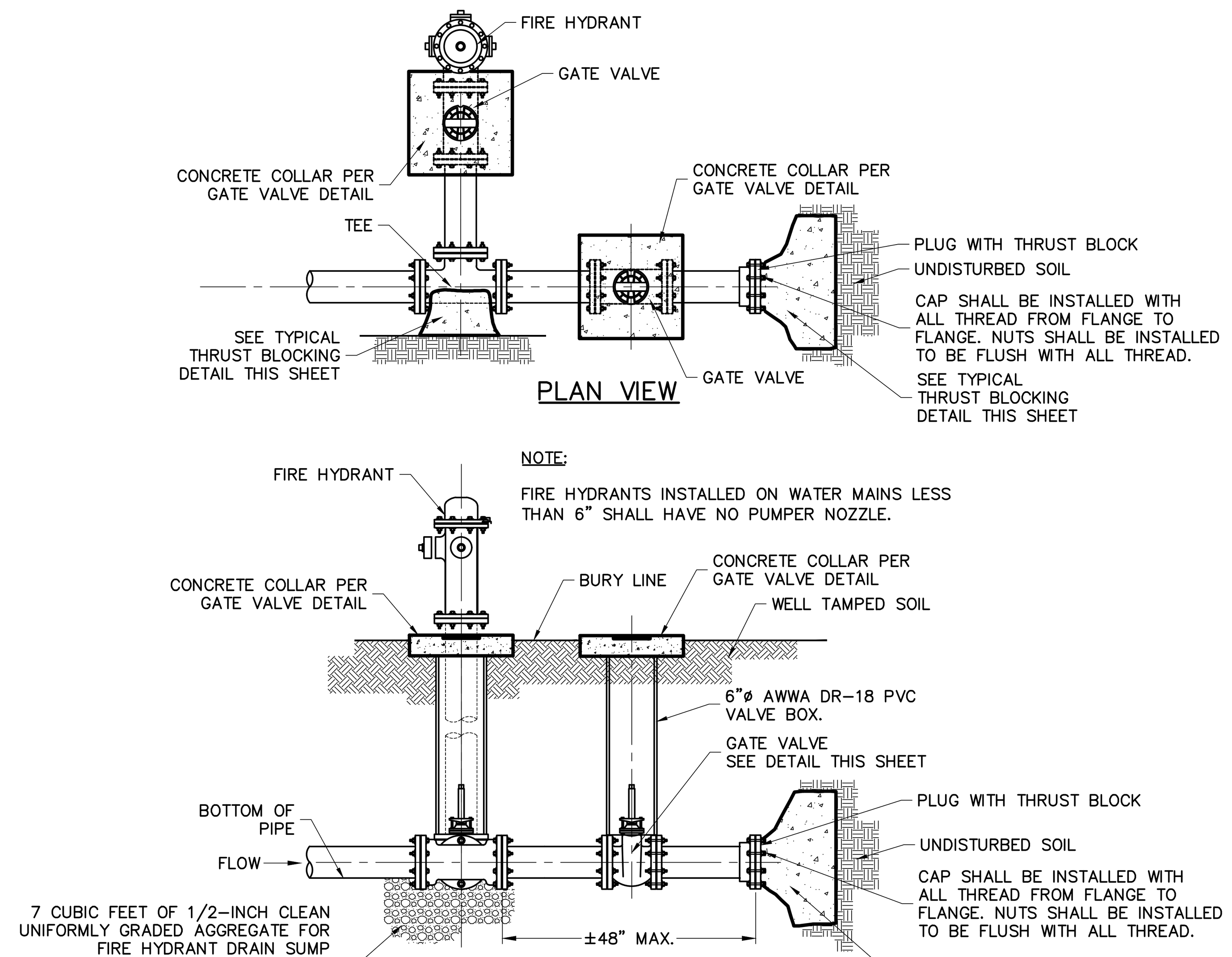
MECHANICAL JOINT ANCHORING TEE MJxMJxSWIVEL MECHANICAL JOINT VALVE ANCHOR COUPLING FIRE HYDRANT WITH MECHANICAL JOINT SHOE

NOTE: DO NOT BLOCK DRAIN BUSHING! MAKE PATH FOR WATER TO DRAIN TO AGGREGATE.

TYPICAL FIRE HYDRANT INSTALLATION DETAIL
N.T.S.

NOTES:
1. HYDRANT DRAIN MUST REMAIN CLEAR AFTER POURING CONCRETE BLOCKING.
2. UNLESS OTHERWISE SPECIFIED, ALL HYDRANTS WILL BE LOCATED INSIDE OF R/W FENCES OR PUBLIC R/W. UNLESS SEPARATE QUANTITIES ARE SHOWN, THE CONTRACTOR WILL INCLUDE THE COST OF ALL PIPE AND FITTINGS FOR THE HYDRANT FROM THE LINE TEE TO THE HYDRANT.
3. WHEN HYDRANT TEE IS LOCATED AT THE DEAD END OF A WATER MAIN BRANCH LINE, THEN LINE SIDE OF TEE MAY BE RESTRAINED WITH MECHANICAL JOINT RESTRAINT, MJR JOINT GLAND PACK (BY TYLER PIPE OR APPROVED EQUIVALENT) OR MEGA LOCK RETAINER GLAND (BY TYLER PIPE OR APPROVED EQUIVALENT).
4. CONTRACTOR TO CONFIRM WITH OWNER THE NUMBER, SIZE & THREAD TYPES OF ALL HYDRANT CONNECTIONS.
5. FIRE HYDRANTS INSTALLED ON MAINS LESS THAN 6" SHALL HAVE NO PUMPER NOZZLE.
6. IN LIEU OF DOPE & WRAP,"POLYWRAP TUBING" OR "POLYETHYLENE FILM" WITHA FULL THICKNESS OF 8 MILS. MAY BE USED.

FIRE HYDRANT NOTE:
FIRE HYDRANT SHALL BE DRY TOP DESIGN, BREAK-AWAY/TRAFFIC TYPE AWWA APPROVED FIRE HYDRANT AND SHALL BE 150 PSI WORKING PRESSURE, WITH A 6-INCH STANDARD MECHANICAL JOINT BELL INLET CONNECTION, TWO 2 1/2-INCH HOSE CONNECTIONS, ONE 4 1/2-INCH PUMPER CONNECTION. ALL THREE DISCHARGE CONNECTIONS SHALL BE CAPPED AND CHAINED AND SHALL BE NATIONAL STANDARD FIRE HOSE THREAD. HYDRANT SHALL BE OPEN COUNTER-CLOCKWISE BY A PENTAGON SHAPED OPERATION NUT 1 1/2-INCH FROM POINT TO OPPOSITE FLAT SIDE. THE MAIN VALVE SHALL BE COMPRESSION TYPE 5 1/4-INCH DIAMETER. FIRE HYDRANT SHALL BE MUELLER CENTURION FIRE HYDRANT A-423 BY MUELLER CO., OR APPROVED EQUIVALENT.



NOTE:
FIRE HYDRANTS INSTALLED ON WATER MAINS LESS THAN 6" SHALL HAVE NO PUMPER NOZZLE.

NOTE:
DO NOT BLOCK DRAIN BUSHING! MAKE PATH FOR WATER TO DRAIN TO AGGREGATE.

IN LIEU OF DOPE & WRAP, "POLYWRAP TUBING" OR "POLYETHYLENE FILM" WITH A FULL THICKNESS OF 8 MLS. MAY BE USED.

END OF LINE w/FUTURE-USE VALVE INSTALLATION DETAIL
N.T.S.

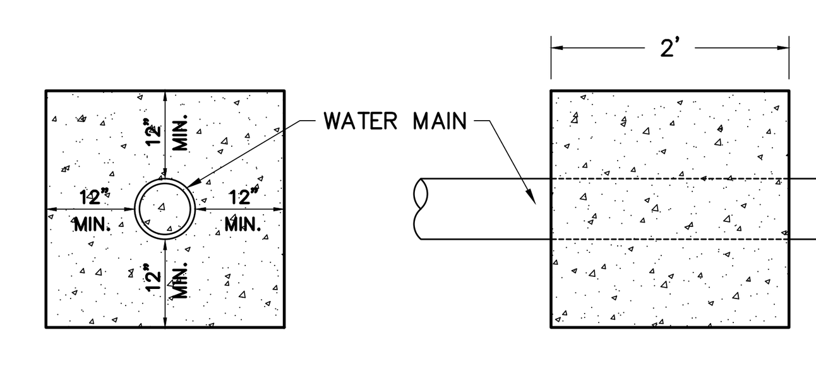
THRUST BLOCK NOTES:
1. USE 2000 PSI CONCRETE ON ALL BLOCKING.
2. ALL BEARING AREAS SHALL BE ON UNDISTURBED EARTH.
3. BLOCKING SHALL BE PLACED SO THAT PIPE AND FILLING WILL BE ACCESSIBLE FOR REPAIR.
4. USE THRUST BLOCKS FOR CHANGES IN DIRECTION OF 22 1/2° OR GREATER (I.E. TEES, BENDS, AND CROSSES), CHANGES IN SIZE (I.E. REDUCERS), STOPS (I.E. DEAD ENDS), AND VALVES WHERE THRUST DEVELOPS WHEN CLOSED.

THRUST BEARING AREAS & CONCRETE VOLUMES

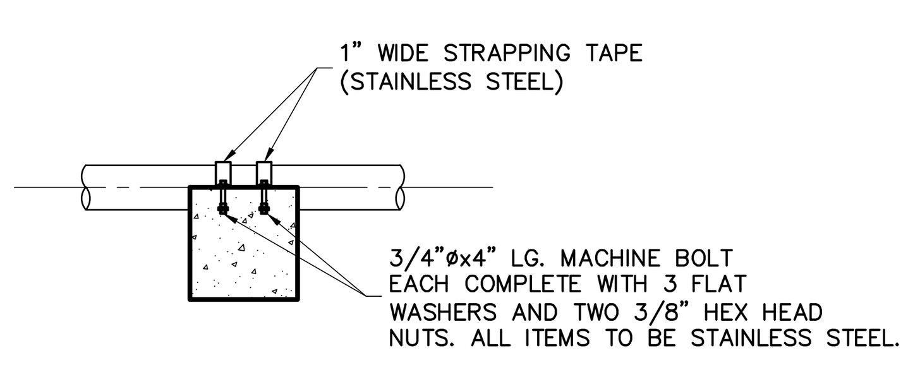
PIPE SIZE	90° BEND SF	90° BEND CF	45° BEND SF	45° BEND CF	22.5° BEND SF	22.5° BEND CF	PLUG/TEE SF	PLUG/TEE CF
1.5	0.26	0.50	0.14	0.50	0.07	0.50	0.37	0.50
2.0	0.47	0.50	0.25	0.50	0.13	0.50	0.66	0.50
3.0	1.05	0.50	0.57	0.50	0.29	0.50	1.48	0.54
4.0	1.87	0.99	1.01	0.54	0.51	0.50	2.64	1.40
5.0	2.95	1.47	1.58	0.79	0.80	0.50	4.12	2.08
6.0	4.20	1.98	2.27	1.07	1.16	0.55	5.94	2.80
8.0	7.46	4.48	4.04	2.43	2.06	1.24	10.56	6.34
10.0	11.65	8.49	6.31	4.59	3.22	2.34	16.49	12.00
12.0	16.79	10.91	9.09	5.90	4.63	3.01	23.75	15.43
16.0	25.86	20.59	16.16	11.14	8.24	5.68	42.22	29.11
20.0	46.65	33.81	25.25	18.30	12.87	9.33	65.97	47.82
24.0	67.18	35.75	36.36	19.35	18.53	9.86	95.00	50.56
30.0	104.96	72.44	56.81	39.21	28.96	19.99	148.44	102.45
36.0	151.15	93.24	81.80	50.46	41.70	25.72	213.75	131.86
42.0	205.73	111.04	111.34	60.09	56.76	30.64	290.94	157.03
48.0	268.71	123.62	145.42	66.90	74.14	34.11	380.01	174.82
54.0	340.08	128.73	184.05	69.67	93.83	35.52	480.95	182.25
60.0	419.85	124.13	227.22	67.18	115.84	34.25	593.76	175.55

TABLE IS BASED ON 210 PSI INTERNAL PRESSURE AND 1000 PSF ALLOWABLE SOIL BEARING PRESSURE. VALUES ARE APPROXIMATE AND ARE THE MINIMUMS ALLOWED. THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED SOIL.

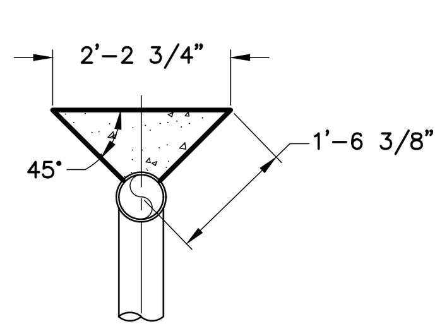
THRUST BLOCKING REQUIREMENTS



CONCRETE ANCHOR DETAIL
N.T.S.



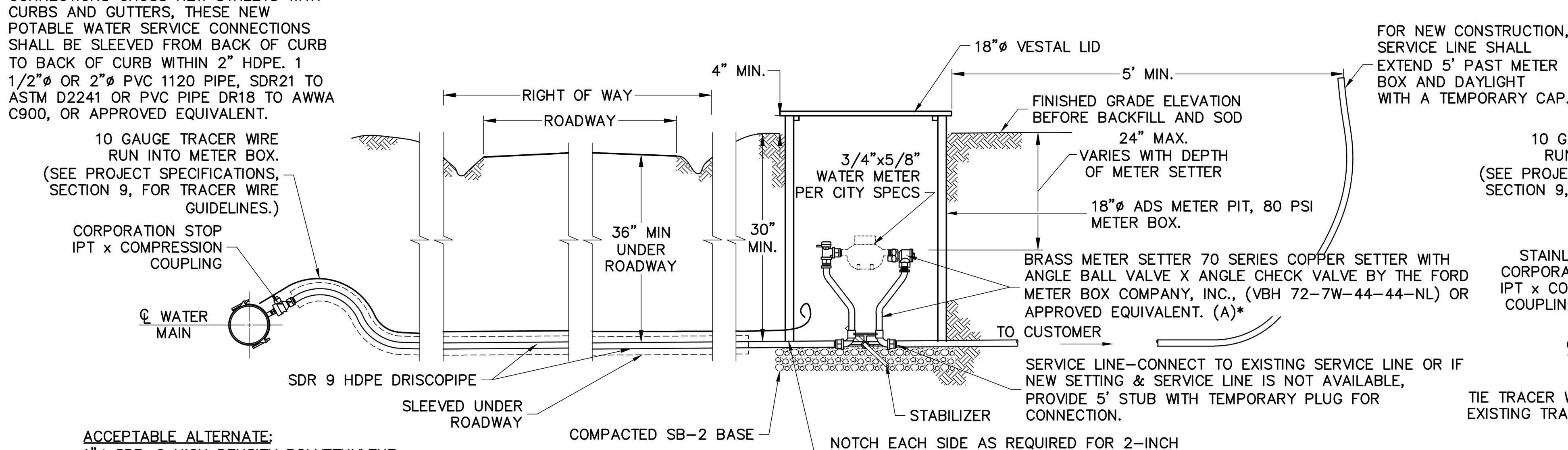
TYPICAL THRUST BLOCK WITH TIE DOWN STRAPPING DETAIL
N.T.S.



PLAN VIEW

TYPICAL FIRE HYDRANT THRUST BLOCK DETAIL
N.T.S.

NOTE:
WHERE NEW POTABLE WATER SERVICE CONNECTIONS CROSS NEW STREETS WITH CURBS AND GUTTERS, THESE NEW POTABLE WATER SERVICE CONNECTIONS SHALL BE SLEEVED FROM BACK OF CURB TO BACK OF CURB WITHIN 2" HDPE. 1 1/2"ø OR 2"ø PVC 1120 PIPE, SDR21 TO ASTM D2241 OR PVC PIPE DR18 TO AWWA C900, OR APPROVED EQUIVALENT.

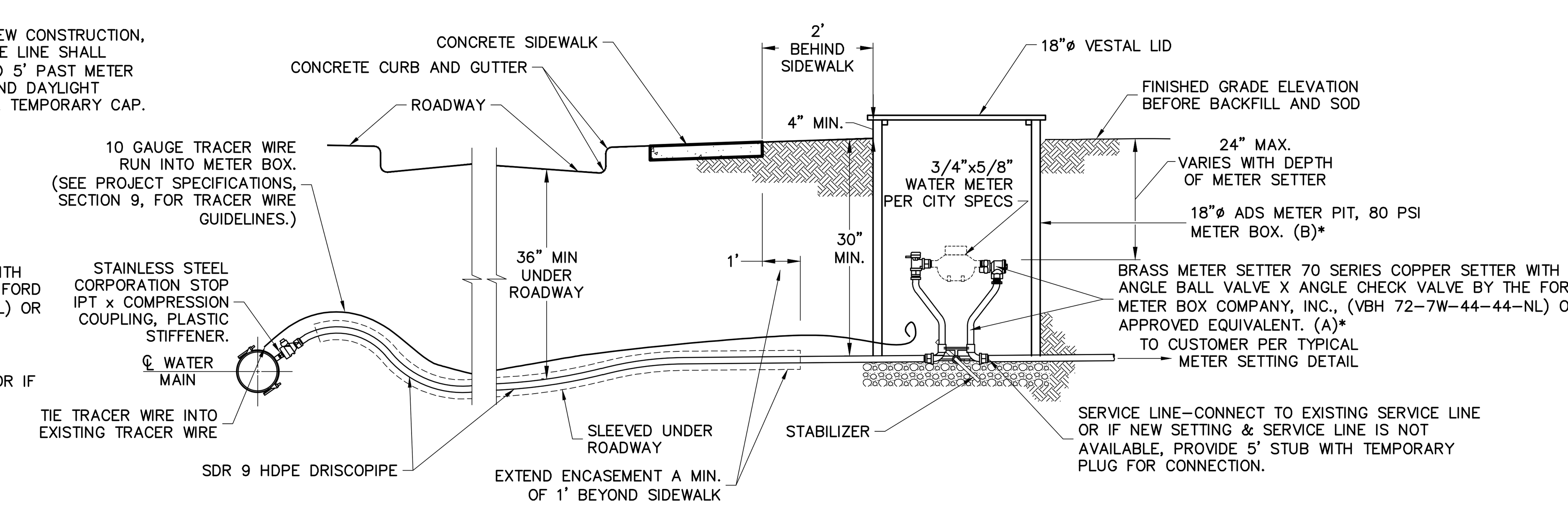


ACCEPTABLE ALTERNATE:
1"ø SDR-9 HIGH DENSITY POLYETHYLENE TUBING, SERIES 5100 ULTRA-LINE, BY DRISCOPIPE, OR APPROVED EQUIVALENT.

NOTES:
(A)* PRESSURE REDUCING VALVE SHALL BE INSTALLED IN SEPARATE METER BOX.

SERVICE CLAMP TO BE DOUBLE-STRAPPED, COATED SMITH-BLAIR OR APPROVED EQUIVALENT.

TYPICAL 3/4" x 5/8 METER CONNECTION DETAIL (WITHOUT CURB OR SIDEWALK)
N.T.S.



NOTE:
WHERE NEW POTABLE WATER SERVICE CONNECTIONS CROSS NEW STREETS WITH CURBS AND GUTTERS, THESE NEW POTABLE WATER SERVICE CONNECTIONS SHALL BE SLEEVED FROM BACK OF CURB TO BACK OF CURB WITHIN 2" HDPE. 1 1/2"ø OR 2"ø PVC 1120 PIPE, SDR21 TO ASTM D2241 OR PVC PIPE DR18 TO AWWA C900, OR APPROVED EQUIVALENT.

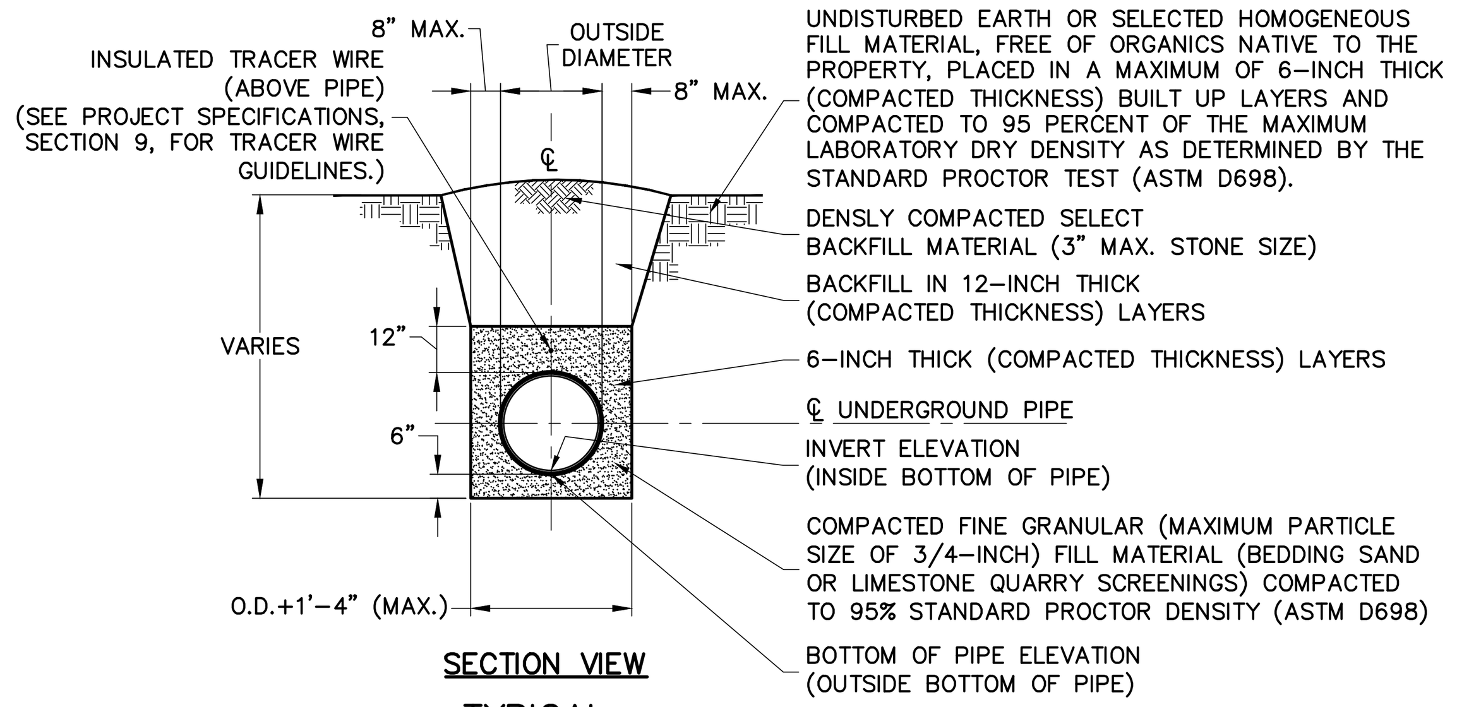
TYPICAL 3/4" x 5/8 METER CONNECTION DETAIL (WITH CURB AND SIDEWALK)
N.T.S.

ENGINEERING SERVICES INC.
1207 SOUTH OLD MISSOURI RD.
SPRINGDALE, ARKANSAS 72764

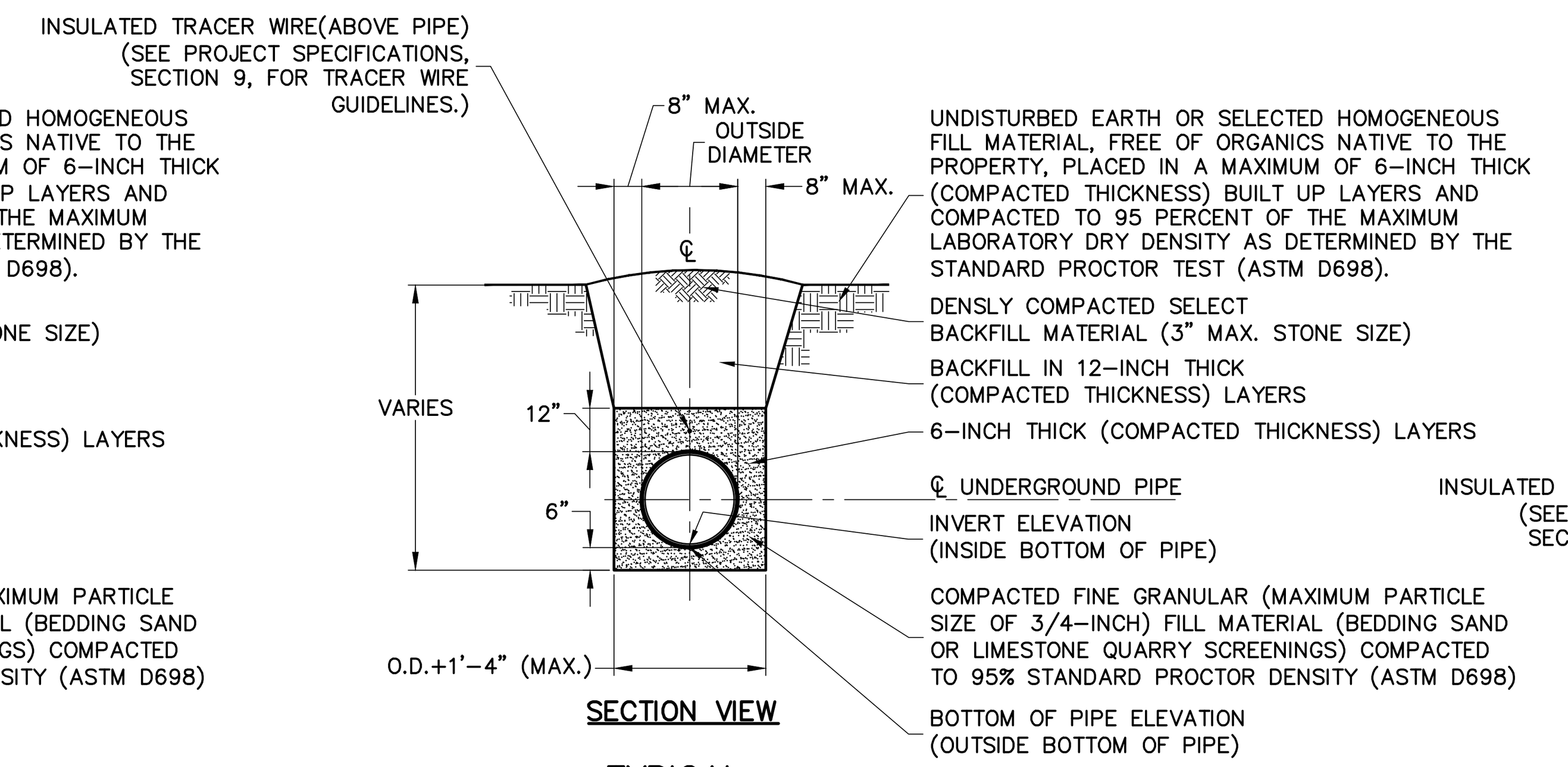
TYPICAL WATER DETAILS
CITY OF GENTRY WATER DEPARTMENT
GENTRY, BENTON COUNTY, ARKANSAS

REVISION	DATE	DESCRIPTION

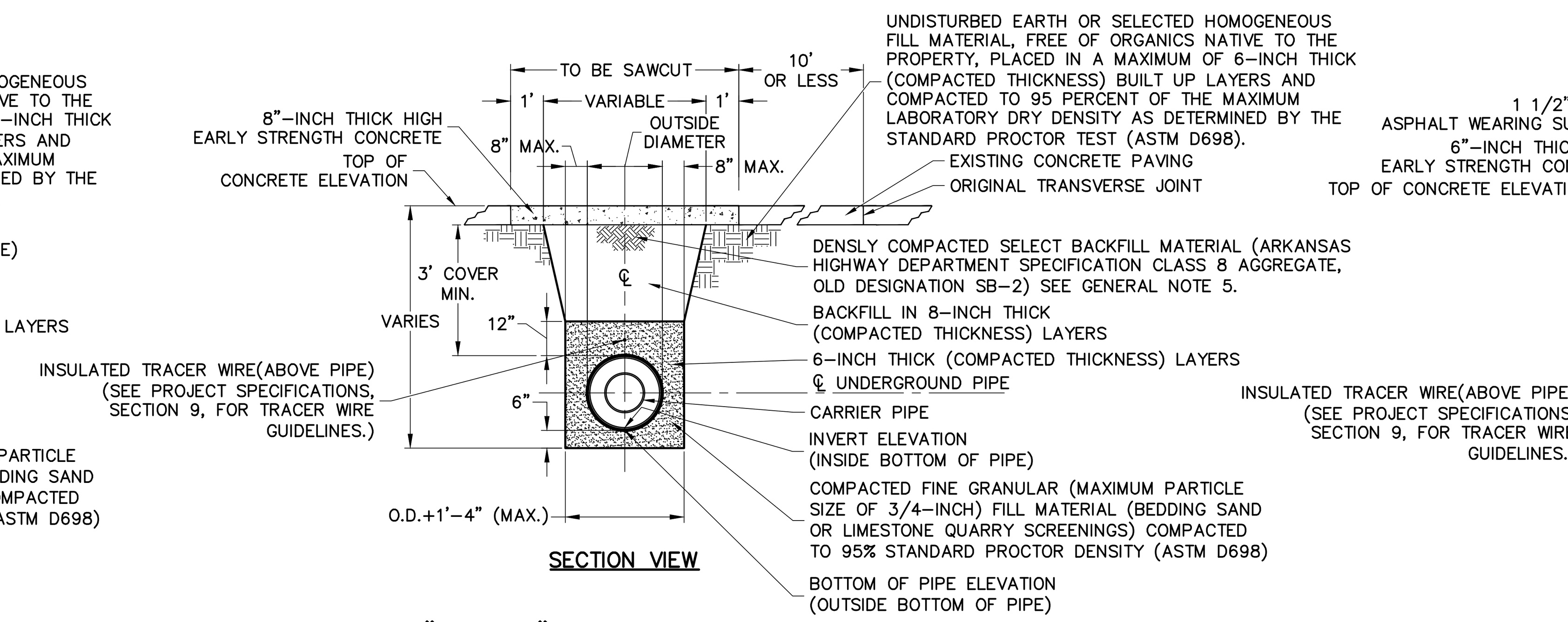
SCALE: NTS
DATE: March, 2022
ENGINEER: TJM
DRAWN BY: JAL
W.O. #: 20819



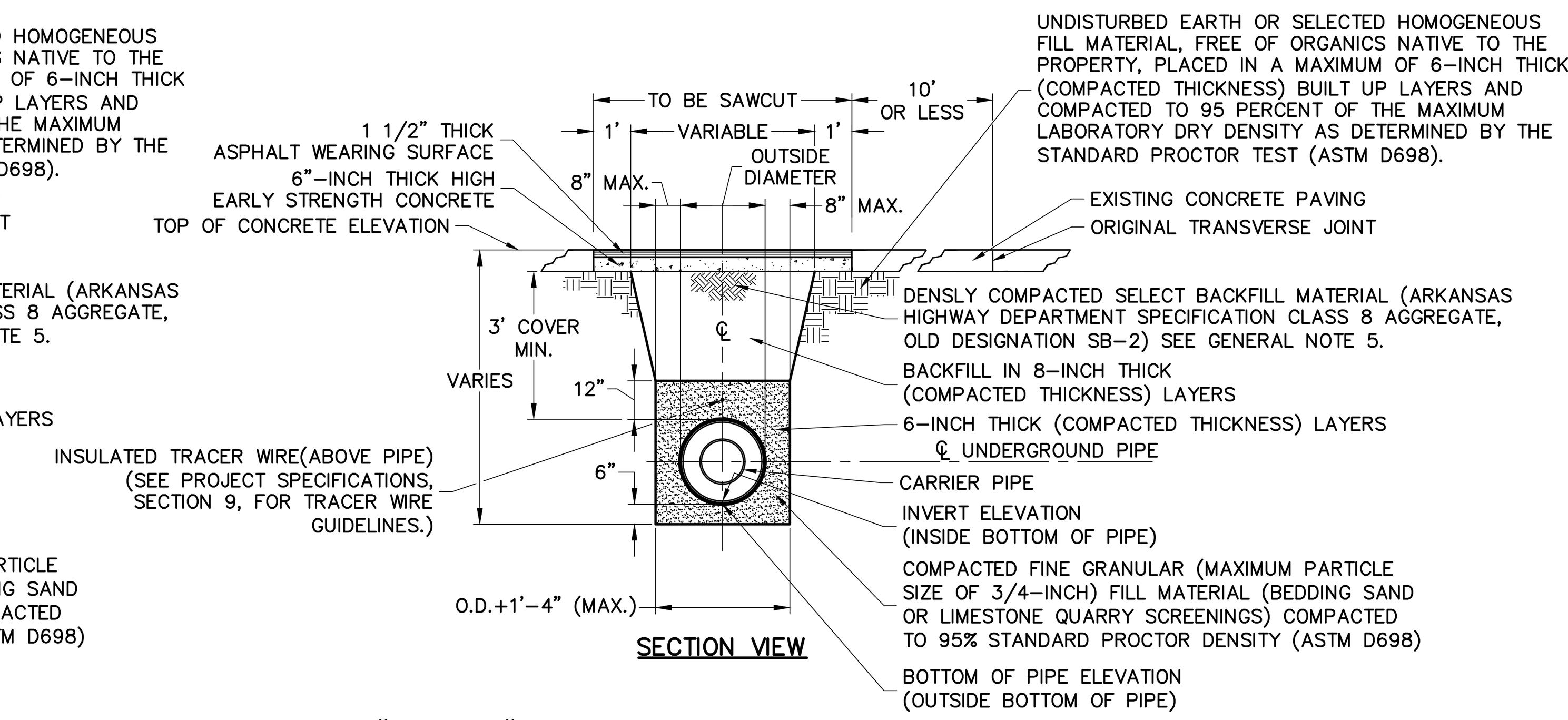
TYPICAL
TRENCHING, BEDDING & BACKFILLING
(NEAR OR BELOW GROUND WATER TABLE
DETAIL
N.T.S.



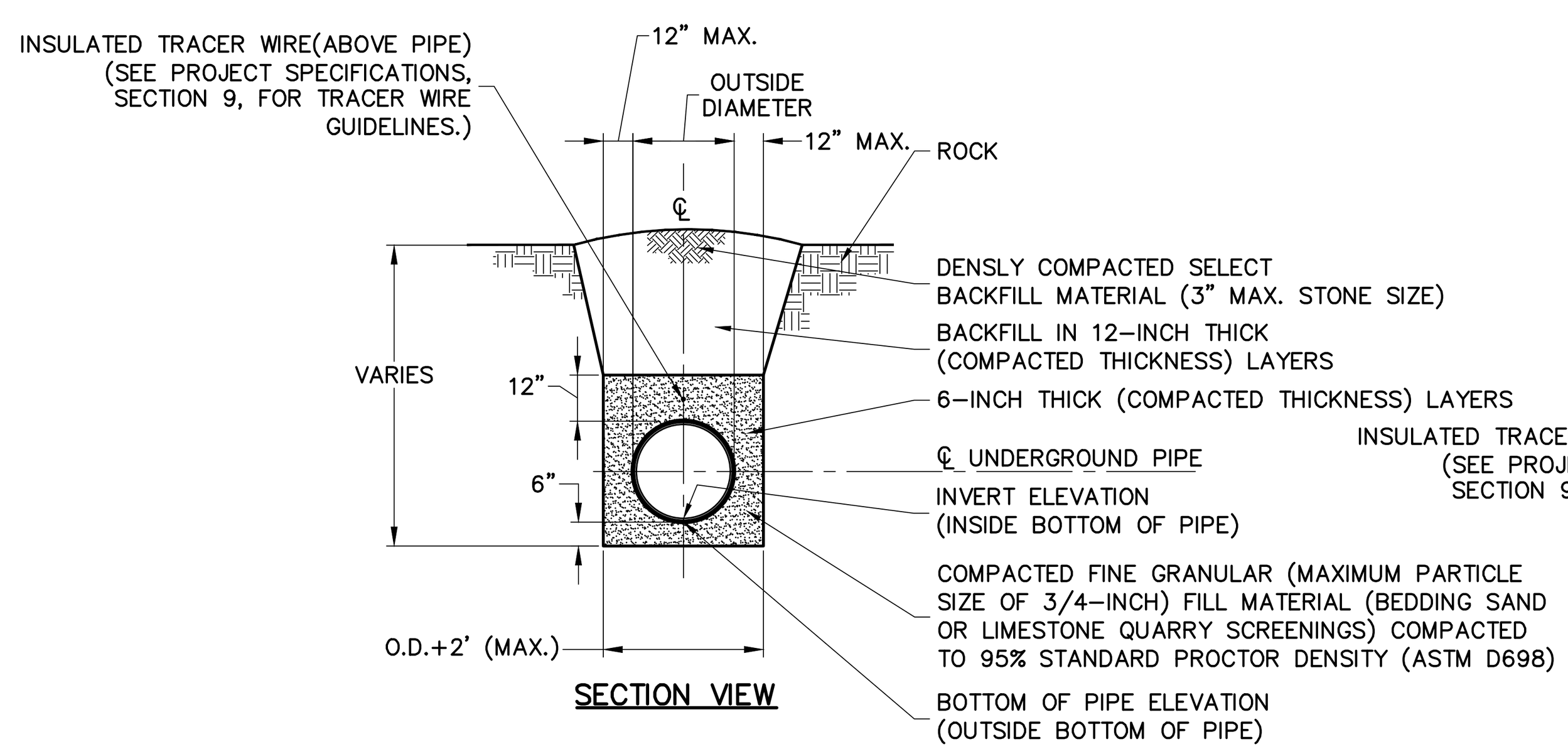
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



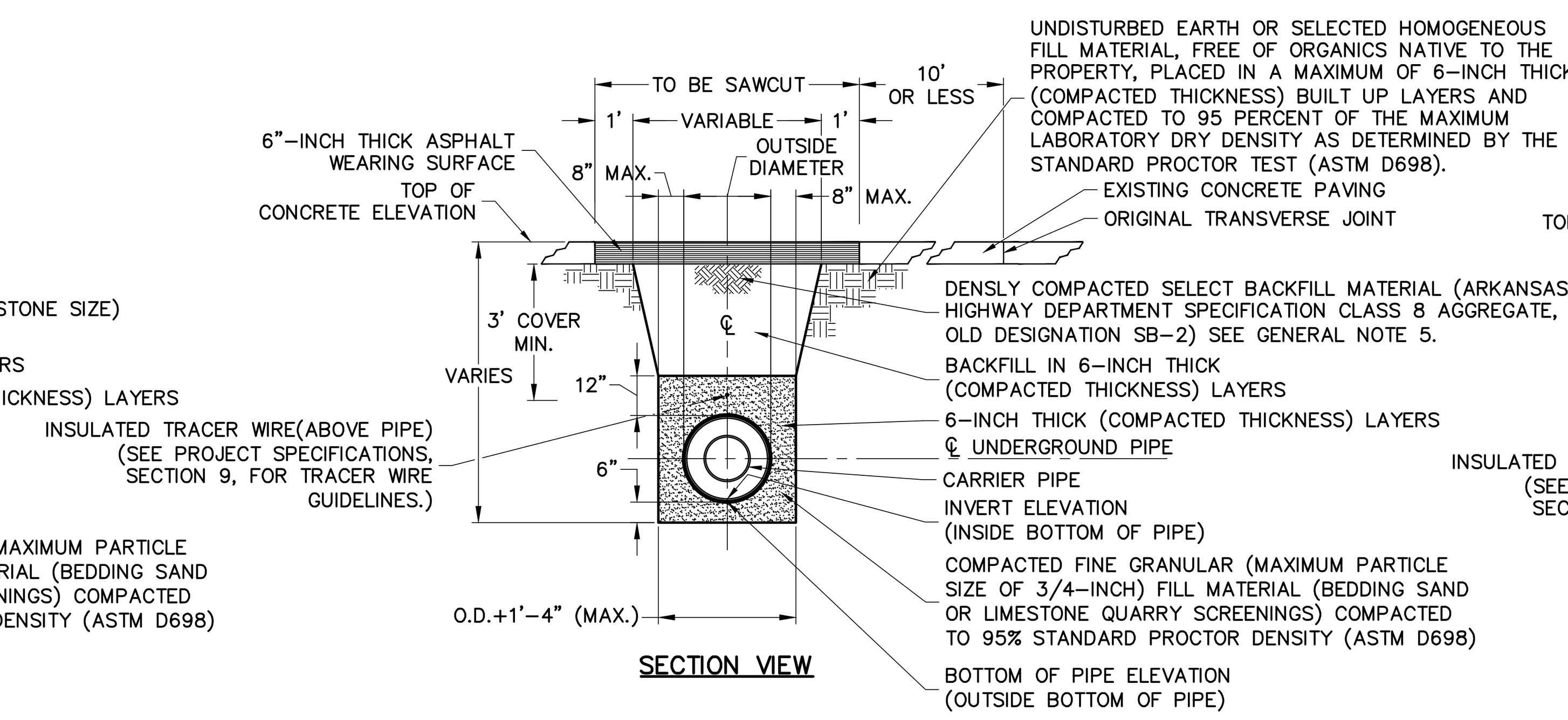
"TYPE A"-CONCRETE PAVING
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



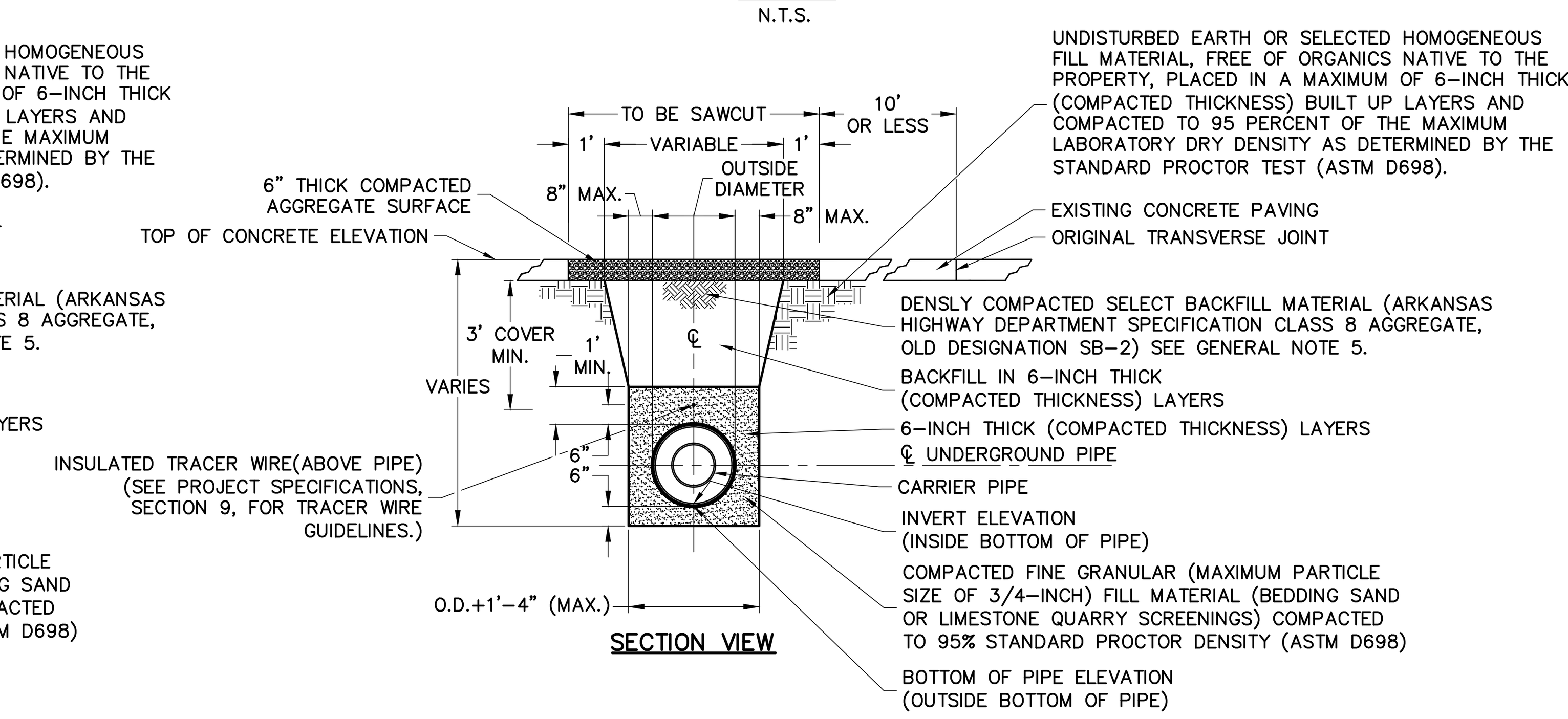
"TYPE B"-CONCRETE WITH ASPHALT OVERLAY
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



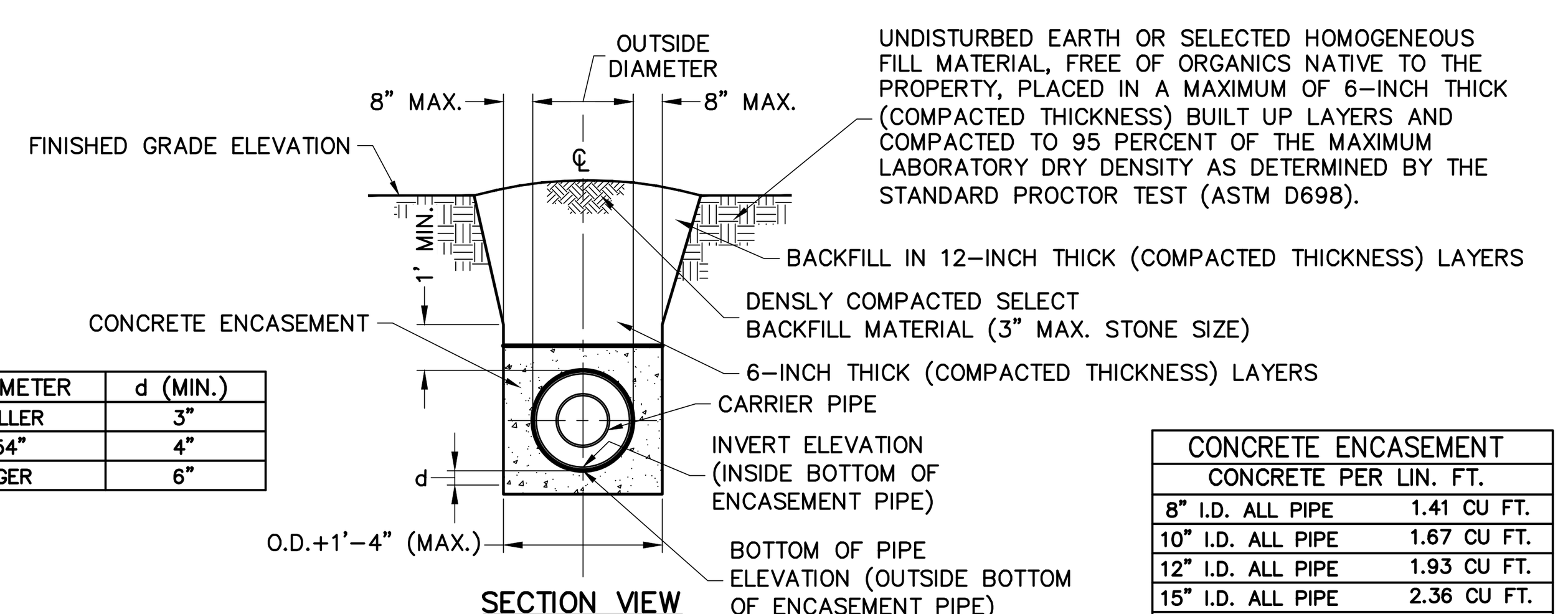
"ROCK EXCAVATION"
TYPICAL TRENCHING, BEDDING & BACKFILLING DETAIL
N.T.S.



"TYPE C"-ASPHALT/OIL MAT PAVING
TYPICAL TRENCHING, BEDDING & BACKFILLING DETAIL
N.T.S.



"TYPE D"-COMPACTED AGGREGATE SURFACE
TYPICAL TRENCHING, BEDDING & BACKFILLING DETAIL
N.T.S.



INSIDE DIAMETER	d (MIN.)
24" & SMALLER	3"
27" THRU 54"	4"
60" & LARGER	6"

TYPICAL
TRENCHING, CONCRETE ENCASEMENT
& BACKFILLING DETAIL
N.T.S.

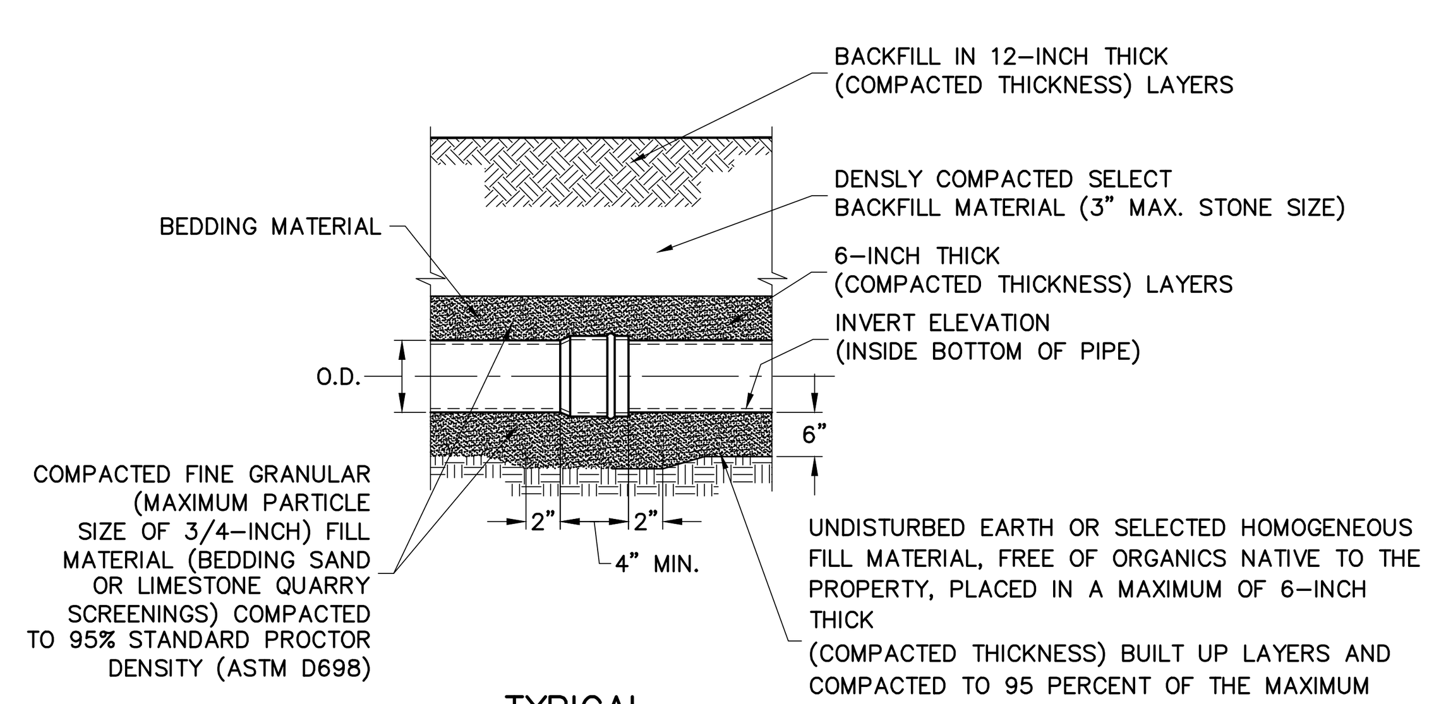
CONCRETE ENCASEMENT	
CONCRETE PER LIN. FT.	
8" I.D. ALL PIPE	1.41 CU FT.
10" I.D. ALL PIPE	1.67 CU FT.
12" I.D. ALL PIPE	1.93 CU FT.
15" I.D. ALL PIPE	2.36 CU FT.
18" I.D. ALL PIPE	2.81 CU FT.
21" I.D. ALL PIPE	3.27 CU FT.
24" I.D. ALL PIPE	3.76 CU FT.
27" I.D. ALL PIPE	4.26 CU FT.
30" I.D. EXCEPT RCP	4.78 CU FT.
30" I.D. RCP	5.09 CU FT.
36" I.D. EXCEPT RCP	5.80 CU FT.
36" I.D. RCP	6.20 CU FT.

CLASS 8 BASE AGGREGATE (OLD DESIGNATION SB-2)	
SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
1 1/2"	-
1"	100
3/4"	65-100
NO. 4	25-55
NO. 40	10-30
NO. 200	3-10

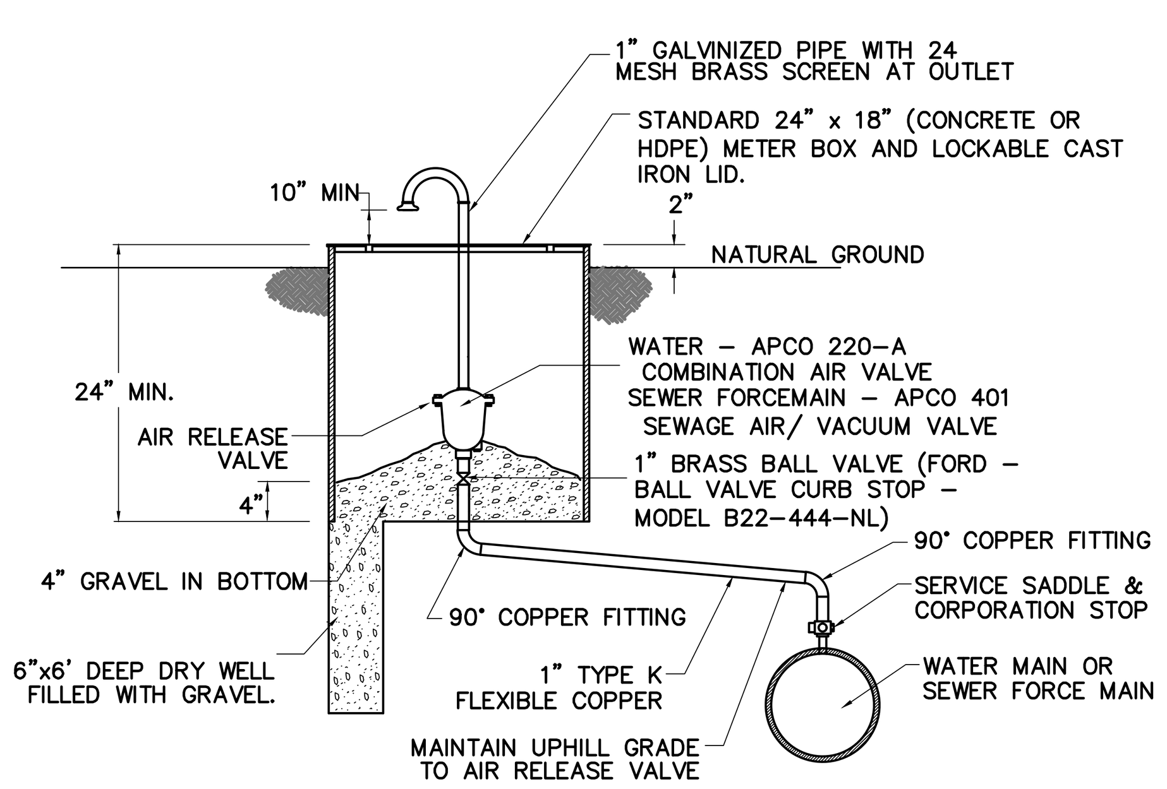
ARKANSAS HIGHWAY DEPARTMENT
SPECIFICATION CLASS 8 AGGREGATE
(OLD DESIGNATION SB-2)

GENERAL NOTES:

1. ALL ELEVATIONS ON THIS CONSTRUCTION DRAWING ARE IN FEET AND DECIMALS AND ARE RELATIVE TO THE EXISTING BRASS CAP ELEVATION BENCH MARK IN GENTRY, ARKANSAS ON ARKANSAS HIGHWAY 59B LOCATED ON THE NORTH EAST CORNER OF MAIN AND COLLINS. ELEVATION ABOVE SEA LEVEL: 1237'
2. FOR LOCATION, ORIENTATION, AND ELEVATIONS, SEE CONSTRUCTION DRAWING PLAN SHEETS AND/OR PLAN AND PROFILE SHEETS.
3. PRIOR TO EXCAVATION AND/OR TRENCHING FOR THE NEW UNDERGROUND POTABLE WATER MAINS AND SANITARY SEWER LINES, THE CONTRACTOR SHALL LOCATE ALL EXISTING UNDERGROUND UTILITIES AND TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THESE EXISTING UTILITIES.
4. ALL CONSTRUCTION SHALL CONFORM TO THE ARKANSAS STATE DEPARTMENT OF HEALTH CRITERIA.
5. BACKFILL MATERIAL, WHERE SECTION IS LOCATED IN STREET RIGHT-OF-WAYS, SHALL BE ARKANSAS HIGHWAY DEPARTMENT SPECIFICATION CLASS 8 BASE AGGREGATE (OLD DESIGNATION SB-2) COMPACTED TO 95% STANDARD PROCTOR DENSITY (ASTM D698).
6. WATER TRENCH DETAILS SHOWN ON THIS SHEET SHALL ALSO BE TYPICAL FOR SANITARY SEWER FORCE MAINS.

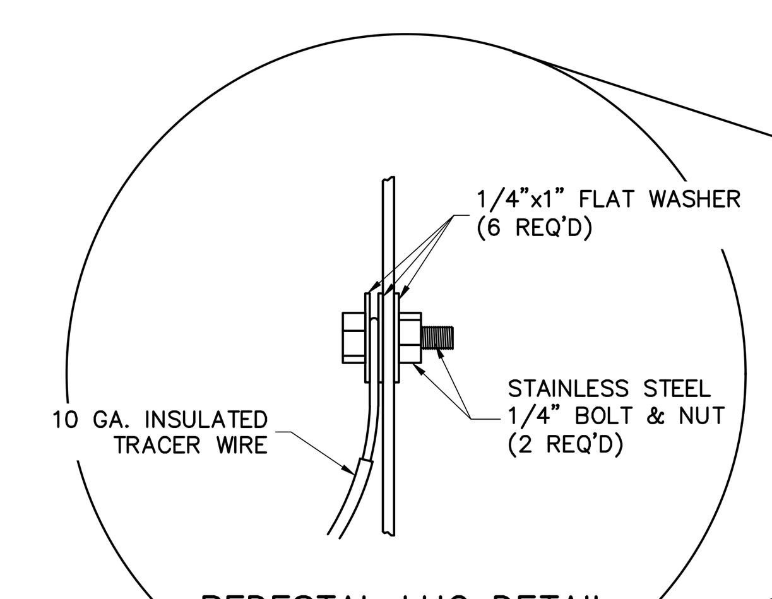


TYPICAL
LONGITUDINAL SECTION
DETAIL
N.T.S.



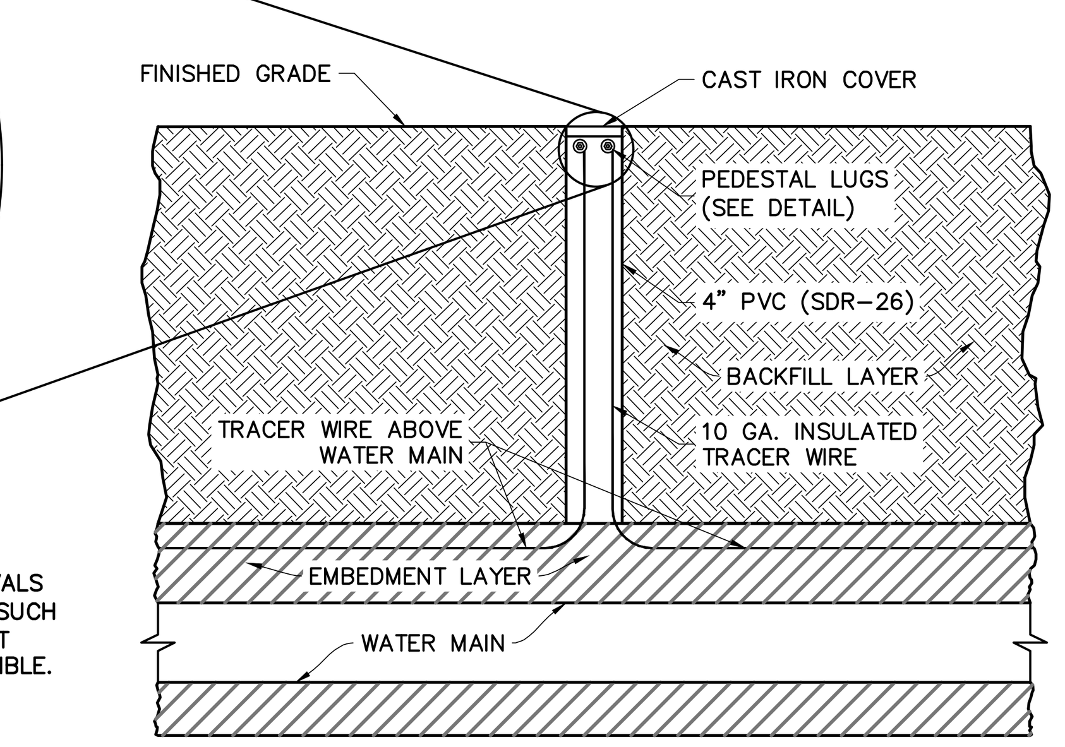
AIR RELEASE VALVE DETAIL

PLACE AIR RELEASE VALVES AT HIGH POINT NEAREST FENCES AND OUT OF YARDS AND OPEN FIELDS.



PEDESTAL LUG DETAIL

NOTE:
TRACER WIRE ACCESS BETWEEN 1200 FT. INTERVALS WHEN THERE IS NO OTHER MEANS OF ACCESS (SUCH AS A METER SERVICE OR A VALVE), INSTALL AT PROPERTY LINES AND FENCE LINES WHERE POSSIBLE.



TRACER WIRE ACCESS
N.T.S.

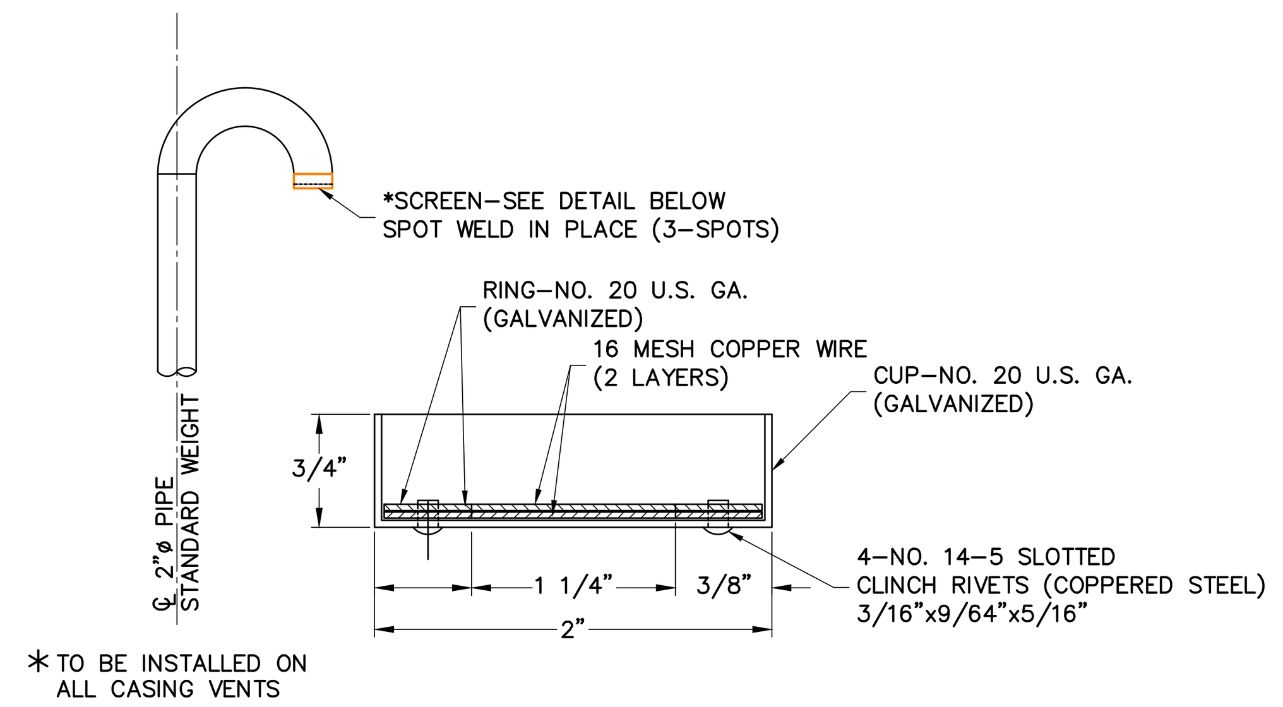
ENGINEERING SERVICES INC.
1207 SOUTH OLD MISSOURI RD.
SPRINGDALE, ARKANSAS 72764

TYPICAL WATER DETAILS
CITY OF GENTRY WATER DEPARTMENT
GENTRY, BENTON COUNTY, ARKANSAS

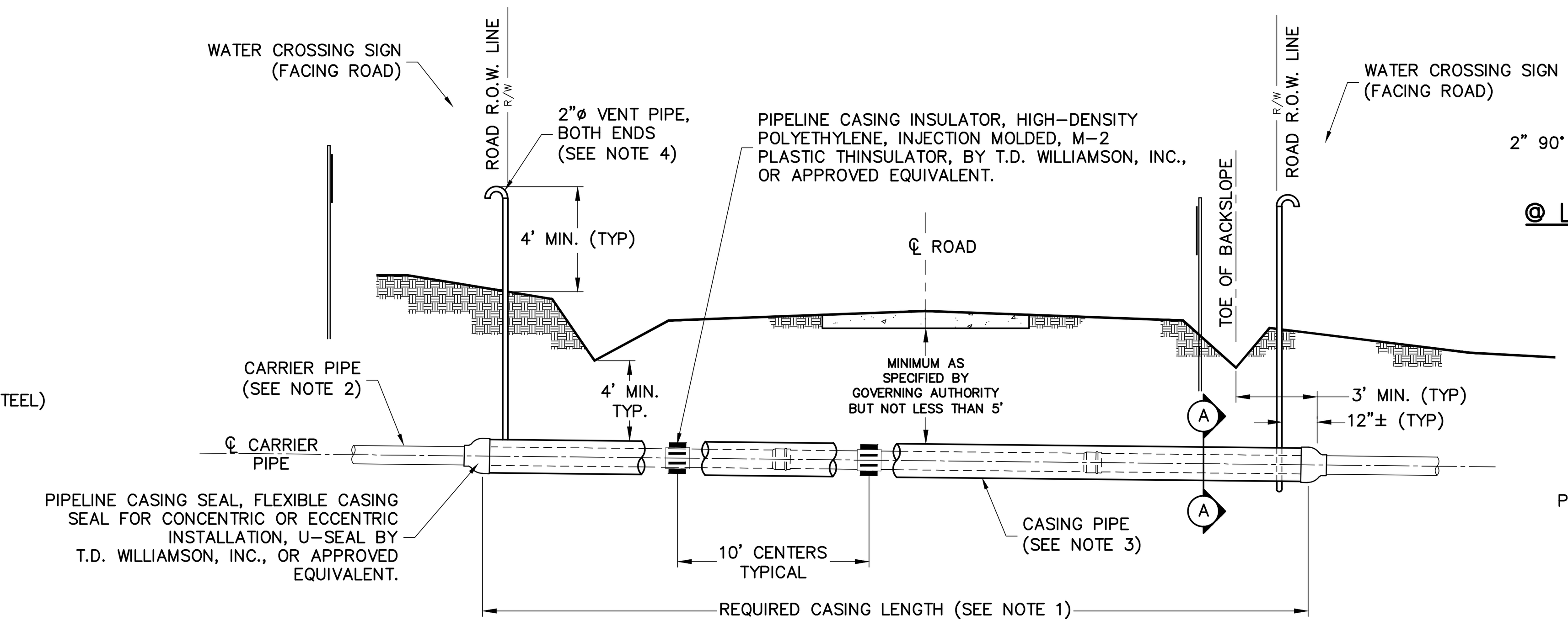
REVISION	DATE	DESCRIPTION

Z:\WATER\Gentry\GENTRY STANDARD SPECIFICATIONS\20819-GENTRY STANDARD DETAILS (PER ADH COMMENTS).dwg

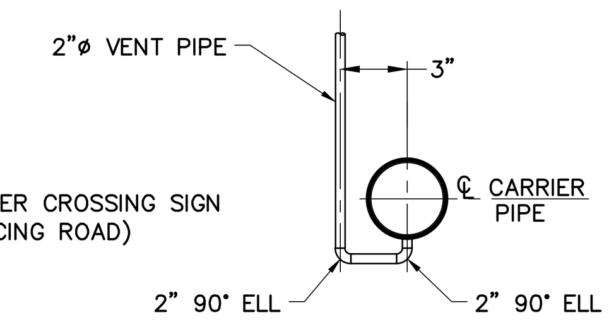
SCALE: NTS
DATE: March, 2022
ENGINEER: TJM
DRAWN BY: JAL
W.O. #: 20819



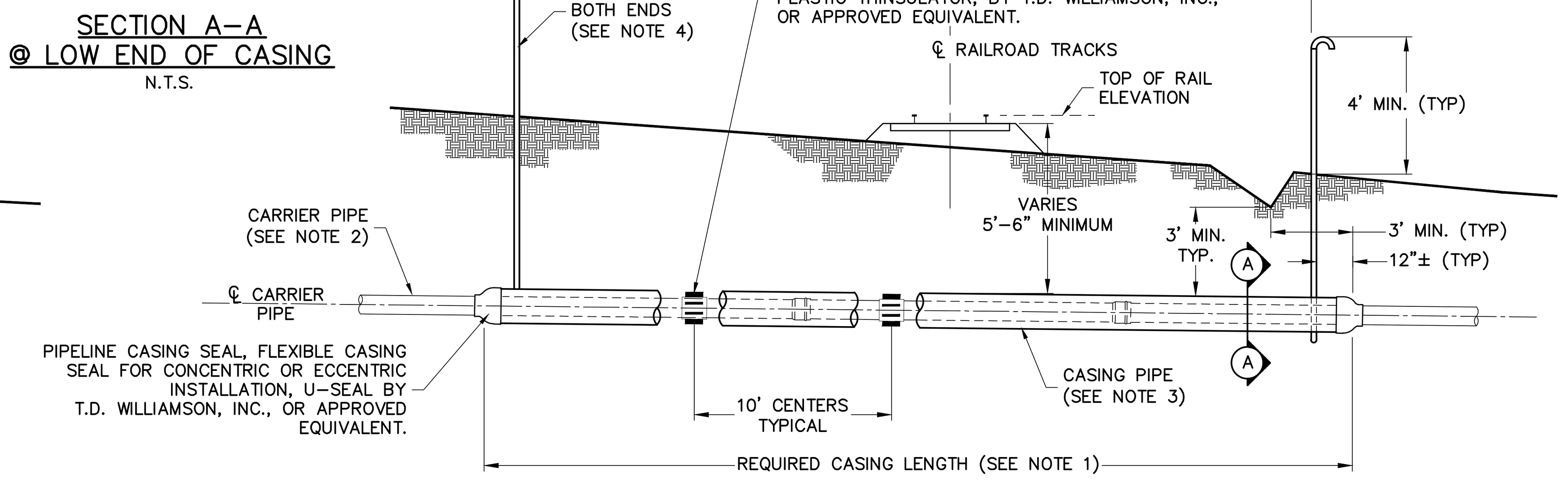
TYPICAL
CASING VENT AND SCREEN
DETAIL
N.T.S.



TYPICAL
HIGHWAY CROSSING
DETAIL
N.T.S.



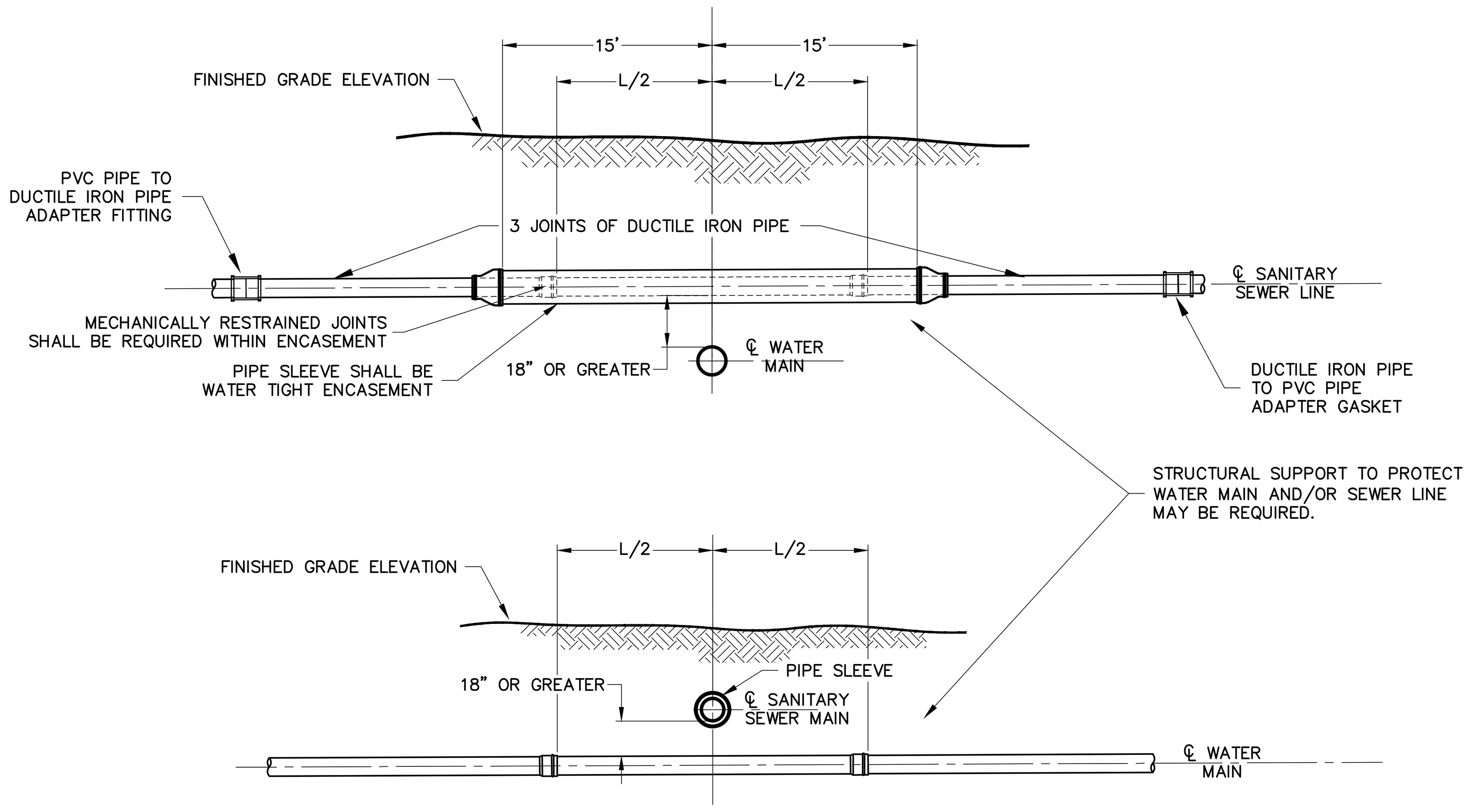
SECTION A–A
@ LOW END OF CASING
N.T.S.



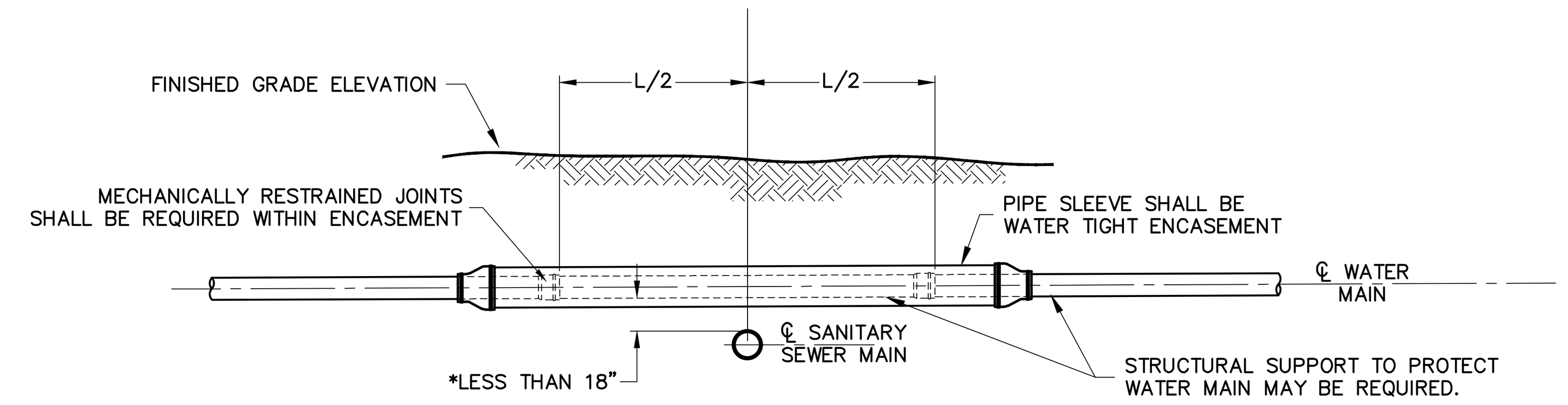
TYPICAL
RAILROAD CROSSING
DETAIL
N.T.S.

TYPICAL CROSSING DETAIL NOTES:
1. FOR LOCATION, ORIENTATION, ELEVATION, AND LENGTH OF CASED CROSSINGS SEE CONSTRUCTION DRAWING PLAN SHEETS AND/OR PLAN AND PROFILE SHEETS.
2. CARRIER PIPE WITHIN CASING PIPE SHALL BE AS SHOWN ON CONSTRUCTION DRAWING PLAN SHEETS AND/OR PLAN AND PROFILE SHEETS.
3. CASING PIPE TO BE INSTALLED PRIMED, BUT UNCOATED UNLESS OTHERWISE STIPULATED BY APPLICABLE PERMIT.
4. CUT VENT HOLE AND WELD VENT PIPE TO CASING PIPE PRIOR TO INSERTING CARRIER PIPE. INSTALL 180° RETURN WITH SCREEN ON CASING VENT. VENT PIPE BELOW GROUND SHALL BE COVERED WITH ONE COAT OF ROSKOTE MASTIC 612 XM (MEDIUM) OR APPROVED EQUIVALENT. VENT PIPE ABOVE GROUND SHALL BE PAINTED WHITE.
5. BORING SHALL BE DONE BY AN APPROVED METHOD AND THE CASING SHALL BE ADVANCED AT A RATE APPROXIMATELY EQUAL TO THE RATE OF BORING. WHERE BORING IS NOT PRACTICAL, DUE TO ROCK STRATA OR OTHER OBSTRUCTIONS,THE CHIEF ENGINEER OF THE DEPARTMENT OF HIGHWAYS OR THE CHIEF ENGINEER OF THE RAILROAD COMPANY SHALL FIRST APPROVE ALL PLANS FOR CONSTRUCTION BY "OPEN CUT", "TUNNELING" OR OTHER METHODS.
6. IN REFILLING THE TRENCH EXCAVATED FOR THE PIPELINE, ADJACENT TO RAILROADS, HARD SURFACED ROADS, OR ROADS WHERE TRENCHING IS PERMITTED, THE TRENCH SHALL BE PROMPTLY BACKFILLED IN A PROPER AND WORKMANLIKE MANNER SO AS TO LEAVE NO HOLES OR OBSTRUCTIONS THEREIN AND SO AS TO PROVIDE PROPER DRAINAGE.
7. CROSSING INSTALLATION SHALL BE IN ACCORDANCE WITH APPLICABLE PERMIT WHICH MAY REQUIRE THE INSTALLATION TO BE SOMEWHAT DIFFERENT THAN SHOWN ON THIS DETAIL CONSTRUCTION DRAWING.

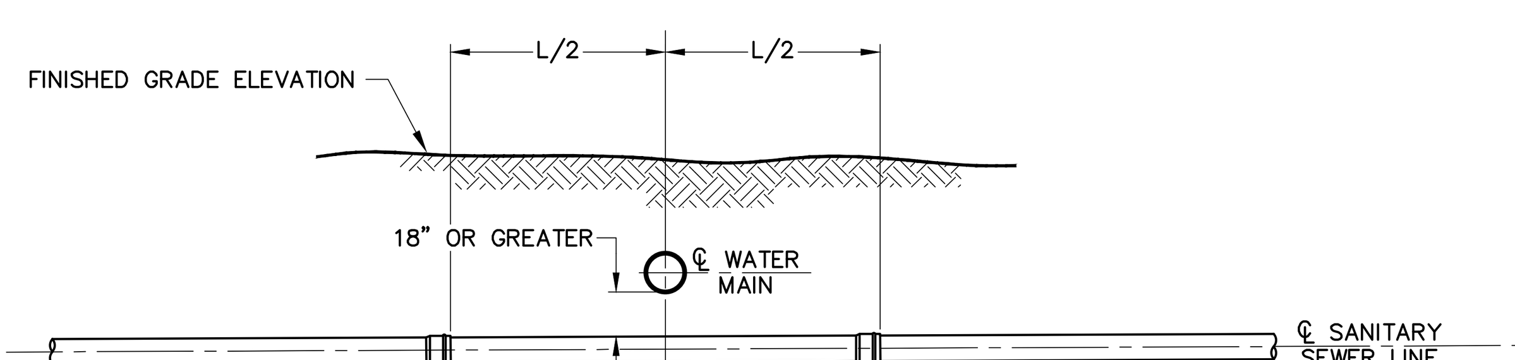
GENERAL NOTES:
1. ALL ELEVATIONS ON THIS CONSTRUCTION DRAWING ARE IN FEET AND DECIMALS AND ARE RELATIVE TO THE EXISTING BRASS CAP ELEVATION BENCH MARK IN GENTRY, ARKANSAS ON ARKANSAS HIGHWAY 59B LOCATED ON THE NORTH EAST CORNER OF MAIN AND COLLINS. ELEVATION ABOVE SEA LEVEL: 1237'
2. FOR LOCATION, ORIENTATION, AND ELEVATIONS, SEE CONSTRUCTION DRAWING PLAN SHEETS AND/OR PLAN AND PROFILE SHEETS.
3. PRIOR TO EXCAVATION AND/OR TRENCHING FOR THE NEW UNDERGROUND POTABLE WATER MAINS AND SANITARY SEWER LINES, THE CONTRACTOR SHALL LOCATE ALL EXISTING UNDERGROUND UTILITIES AND TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THESE EXISTING UTILITIES.
4. ALL CONSTRUCTION SHALL CONFORM TO THE ARKANSAS STATE DEPARTMENT OF HEALTH CRITERIA.
5. BACKFILL MATERIAL, WHERE SECTION IS LOCATED IN STREET RIGHT–OF–WAYS, SHALL BE ARKANSAS HIGHWAY DEPARTMENT SPECIFICATION CLASS 7 BASE AGGREGATE (OLD DESIGNATION SB–2) COMPACTED TO 95% STANDARD PROCTOR DENSITY (ASTM D698).



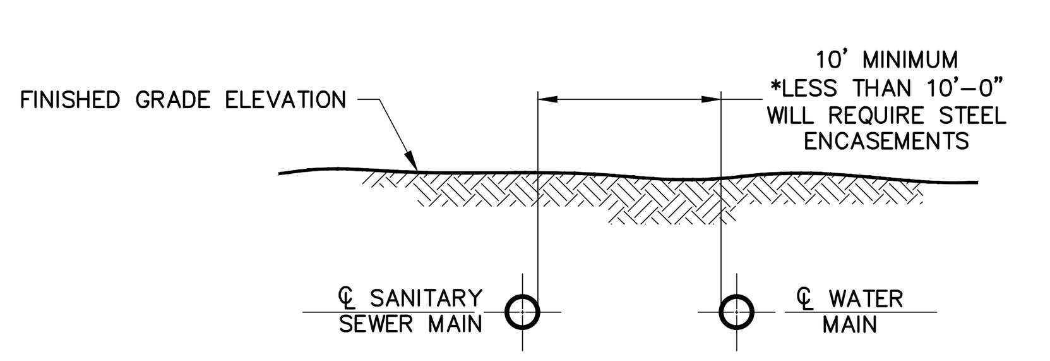
ENCASED SANITARY SEWER ABOVE WATER MAIN



* SPECIAL SPECIFIC CONDITIONS REQUIRE APPROVAL IN WRITING BY THE DIVISION OF ENGINEERING, ARKANSAS DEPARTMENT OF HEALTH.



VERTICAL CLEARANCE



* IF HORIZONTAL CLEARANCE IS LESS THAN 10 FT., ENCASEMENTS WILL BE REQUIRED.

* PRESSURE PIPE FOR SANITARY SEWER LINES SHALL BE EQUAL TO WATER PIPE.

HORIZONTAL CLEARANCE

TYPICAL WATER MAIN &
SANITARY SEWER MAIN SEPARATION DETAILS
N.T.S.

ENCASEMENT/ CARRIER PIPE SIZING DETAIL

WATER MAIN

SDR 21 (CLASS 200) / STEEL ENCASEMENT

ND.	O.D.	BELL O.D.	ND.	ID.	O.D.
2	2.375	3.224	6	6.249	6.625
3	3.500	4.655	8	8.250	8.625
4	4.500	5.820	8	8.250	8.625
6	6.625	8.185	12	12.250	12.750
8	8.625	10.335	14	13.438	14.00
10	10.750	12.782	16	15.438	16.00
12	12.750	15.014	20	19.312	20.00

DUCTILE IRON / STEEL ENCASEMENT

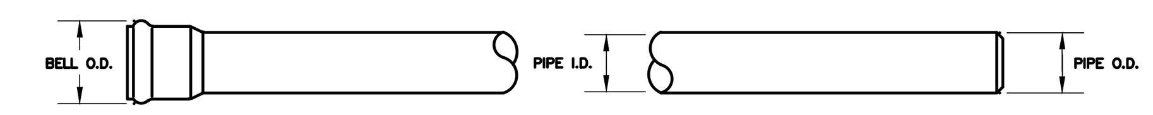
ND.	O.D.	BELL O.D.	ND.	I.D.	O.D.
4"	4.80	7.00	10	10.374	10.75
6	6.90	9.13	12	12.250	12.75
8	9.05	11.50	16	15.438	16.00
10	11.10	13.63	18	17.376	18.00
12	13.20	15.75	20	19.312	20.00
14	15.30	18.63	24	23.188	24.00
16	17.40	20.75	26	25.124	26.00
18	19.50	23.00	28	27.062	28.00
20	21.60	25.25	30	29.062	30.00
24	25.80	29.63	34	32.876	34.00

SDR 17 (CLASS 250) / STEEL ENCASEMENT

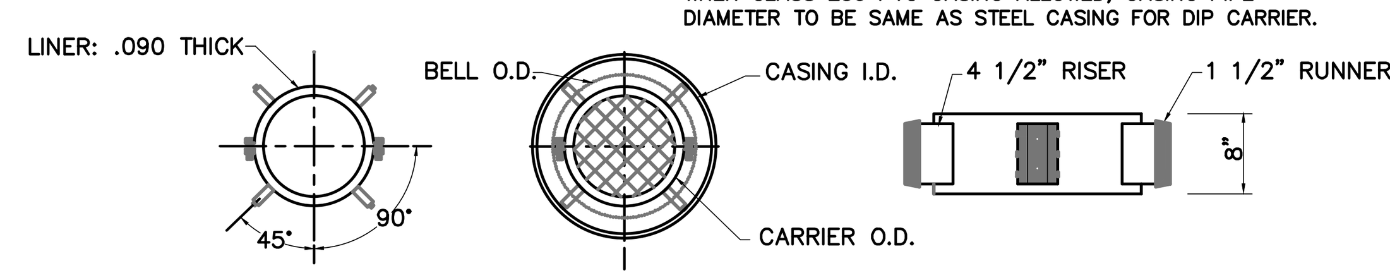
ND.	O.D.	BELL O.D.	ND.	I.D.	O.D.
2	2.375	3.278	6	6.249	6.625
3	3.500	4.733	8	8.250	8.625
4	4.500	5.922	10	10.374	10.750
6	6.625	8.291	12	12.250	12.750
8	8.625	10.479	14	13.438	14.00

C900 DR 14 (CLASS 305) / STEEL ENCASEMENT

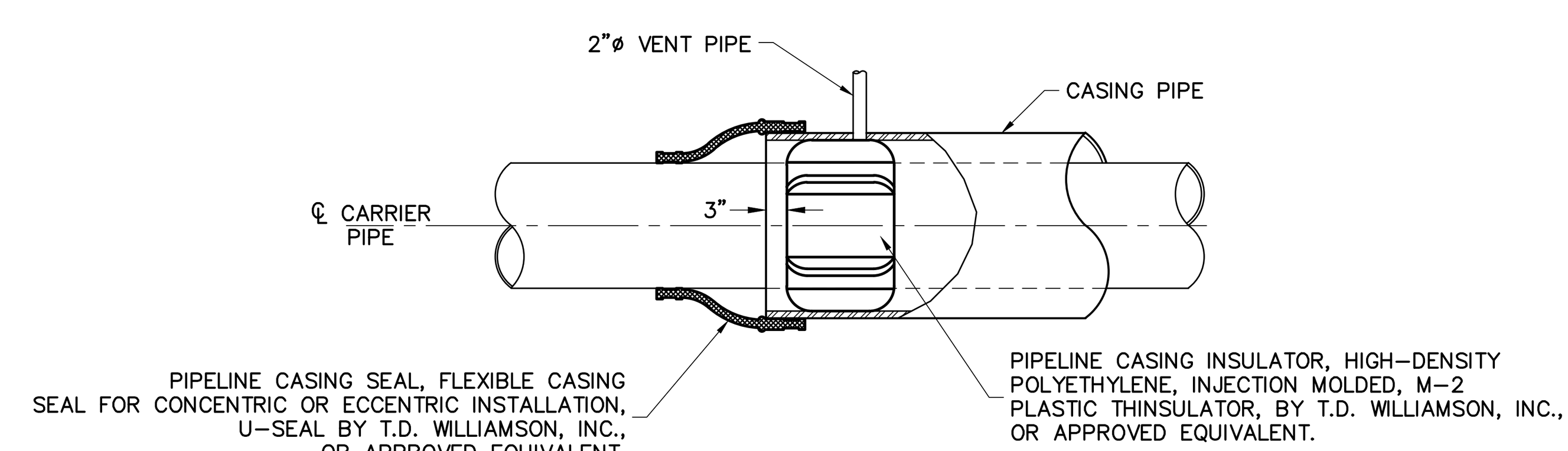
ID.	O.D.	BELL O.D.	ID.	O.D	WALL
4	4.80	6.46	10.374	10.750	.188
6	6.90	9.02	12.250	12.750	.250
8	9.05	11.54	15.438	16.00	.281
10	11.10	14.18	17.376	18.00	.312
12	13.20	16.61	19.312	20.00	.344



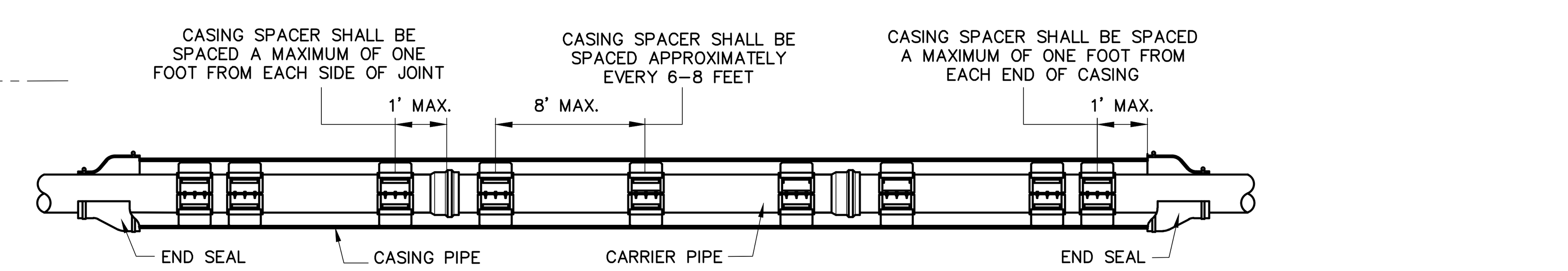
NOTE:
WHEN CLASS 250 PVC CASING ALLOWED, CASING PIPE DIAMETER TO BE SAME AS STEEL CASING FOR DIP CARRIER.



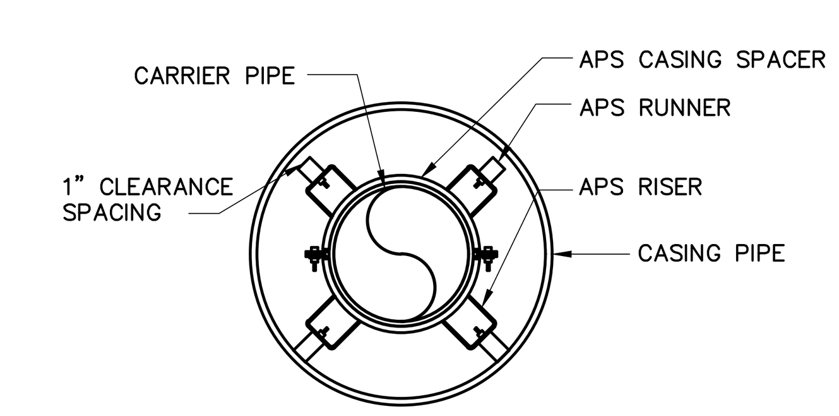
TOP VIEW　ASSEMBLED VIEW　CASING SPACER



TYPICAL
CASING SEALS AND INSULATOR
DETAIL
N.T.S.



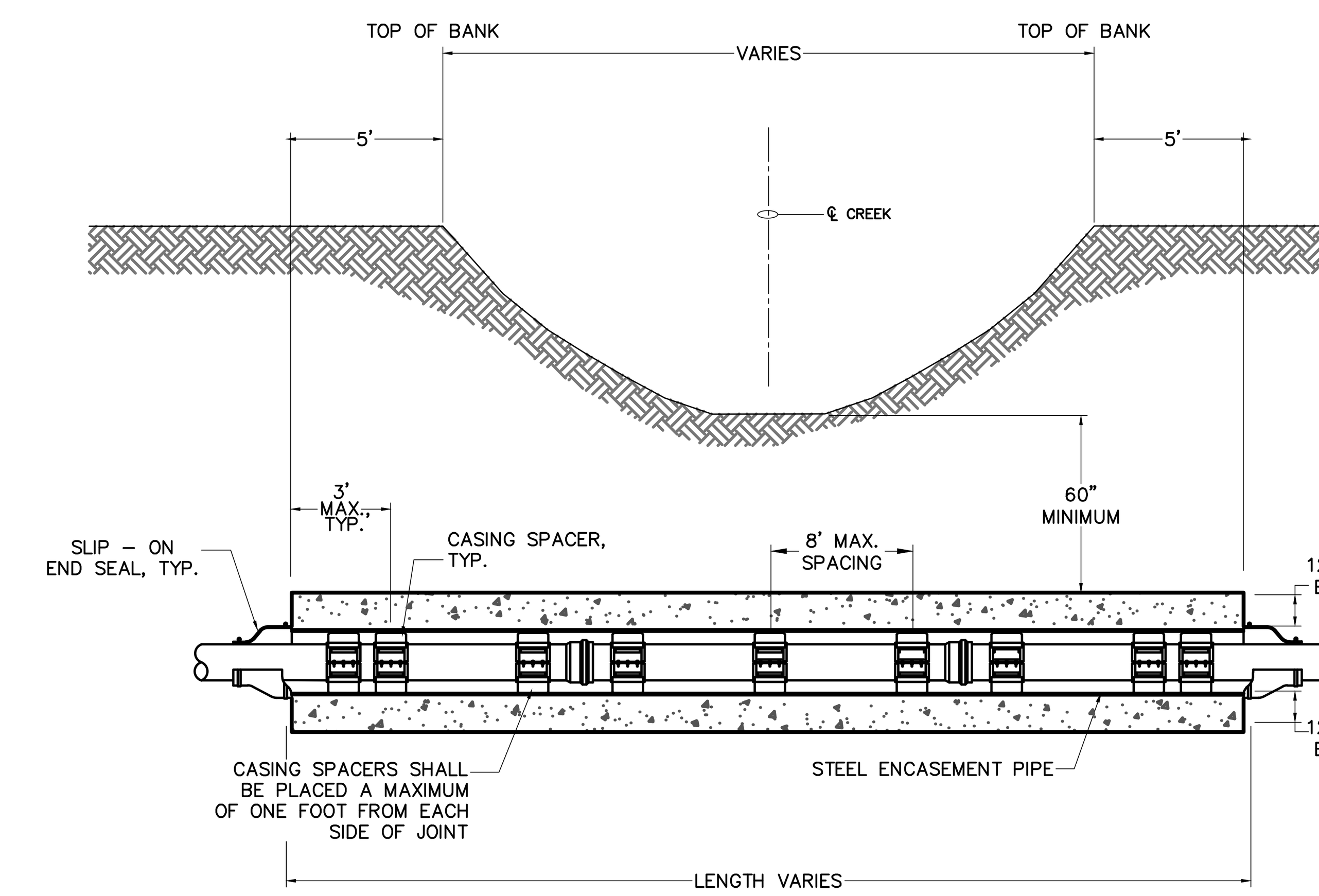
TYPICAL WATER LINE CASING SPACER CONFIGURATION



TYPICAL WATER LINE END VIEW

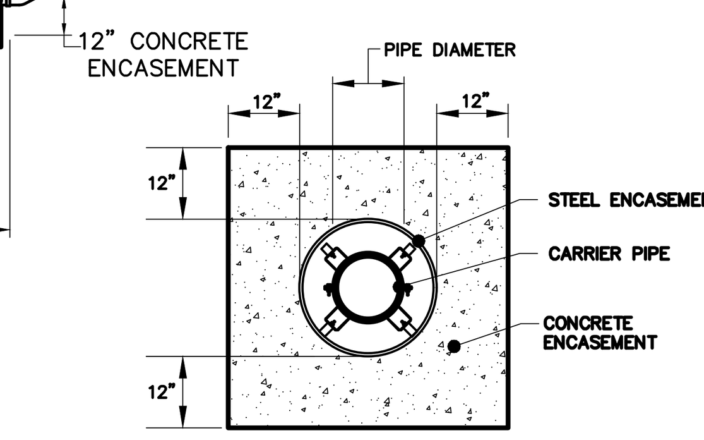
NOTES:
1. QUANTITY OF RUNNERS SHALL BE IN ACCORDANCE WITH CARRIER PIPE SIZE AS FOLLOWS: TO 14" DIAMETER – 4 RUNNERS 16" TO 36" DIAMETER – 6 RUNNERS
38" TO 48" DIAMETER – 8 RUNNERS
2. DIMENSIONS BETWEEN SPACERS SHALL BE AS FOLLOW:
STAINLESS STEEL – 6 TO 8 FEET.
3. WIDTH OF SPACERS SHALL BE IN ACCORDANCE WITH CARRIER PIPE SIZE AS FOLLOWS: TO 14" DIAMETER – 8" WIDTH
16" AND LARGER DIAMETER – 12" WIDTH
4. A MINIMUM OF THREE SPACERS PER FULL JOINT OF PIPE.
5. WATER LINES SHALL BE "CENTERED" IN CASING.
6. ALL D.I. CARRIER PIPE MUST HAVE RESTRAINED JOINTS INSTALLED WITHIN THE CASING PIPE.

ENCASEMENT DETAILS
N.T.S.



CROSS SECTION

NOTE: WHEN CLASS 250 PVC CASING ALLOWED, CASING PIPE DIAMETER TO BE SAME AS STEEL CASING FOR DIP CARRIER.

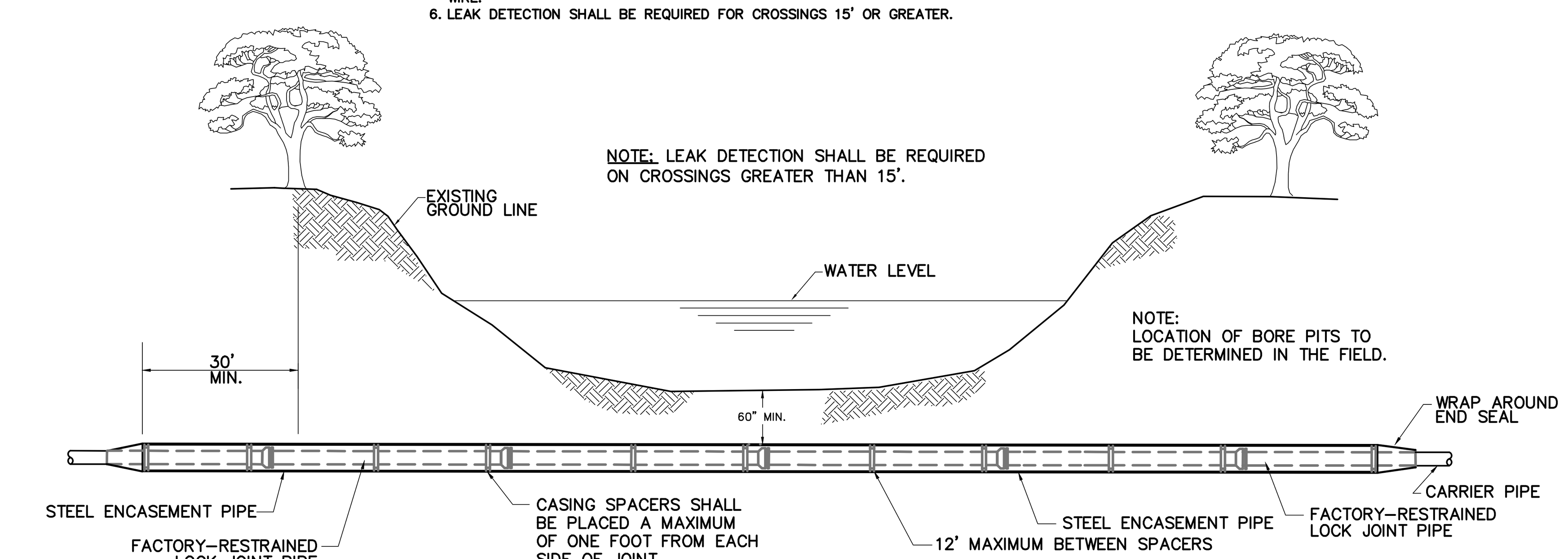


END VIEW

STANDARD CONCRETE ENCASEMENT FOR STREAM CROSSING

NOTES:
1. CONCRETE SHALL BE CLASS B PER SPECIFICATIONS.
2. CASING PIPE SHALL BE SEALED AT THE ENDS WITH A WRAP AROUND END SEAL (ADVANCED PRODUCT SYSTEM OR APPROVED EQUAL.)
3. CASING SPACERS AS SPECIFIED (MINIMUM OF 3 CASING SPACERS PER JOINT OF PIPE)
4. RESTRAINED JOINT PIPE REQUIRED INSIDE OF CASING PIPE FOR WATER MAINS AND SEWAGE FORCE MAINS.
5. ALL NON–METALLIC PRESSURE PIPE SHALL BE INSTALLED WITH 10–GAUGE TRACE WIRE.
6. LEAK DETECTION SHALL BE REQUIRED FOR CROSSINGS 15' OR GREATER.

NOTE: LEAK DETECTION SHALL BE REQUIRED ON CROSSINGS GREATER THAN 15'.



NOTE:
LOCATION OF BORE PITS TO BE DETERMINED IN THE FIELD.

SECTION VIEW
ENCASED CREEK BORE

ENGINEERING SERVICES INC.
1207 SOUTH OLD MISSOURI RD.
SPRINGDALE, ARKANSAS 72764

TYPICAL WATER DETAILS
CITY OF GENTRY WATER DEPARTMENT
GENTRY, BENTON COUNTY, ARKANSAS

REVISION	DATE	DESCRIPTION

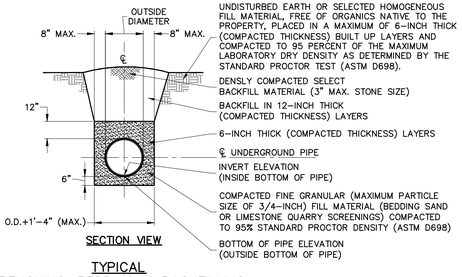
Z:\WATER\Gentry\GENTRY STANDARD SPECIFICATIONS\20819-GEN...

SCALE: NTS

DATE: March, 2022

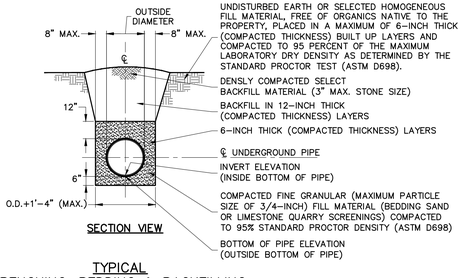
ENGINEER: TJM
DRAWN BY: JAL

W.O. #: 20819



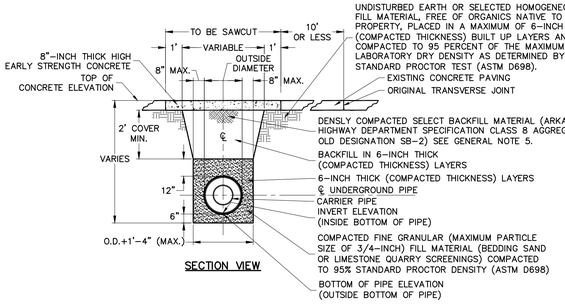
SECTION VIEW

TYPICAL
TRENCHING, BEDDING & BACKFILLING
(NEAR OR BELOW GROUND WATER TABLE
DETAIL
N.T.S.



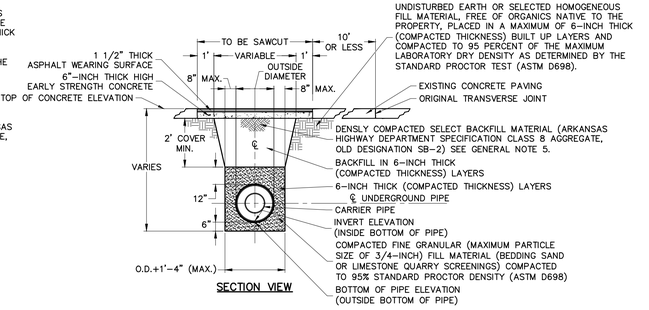
SECTION VIEW

TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



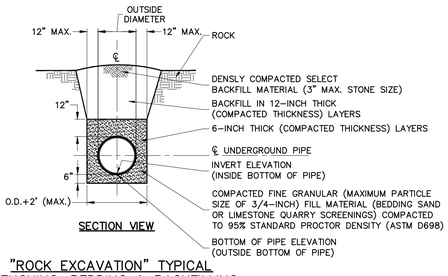
SECTION VIEW

"TYPE A"-CONCRETE PAVING
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



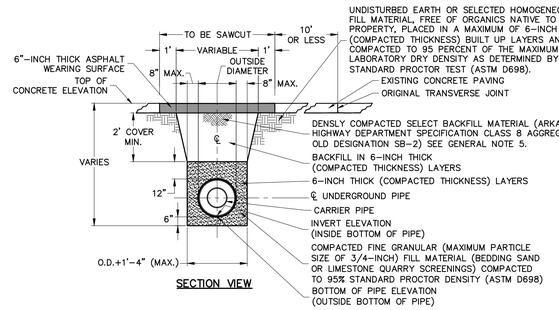
SECTION VIEW

"TYPE B"-CONCRETE WITH ASPHALT OVERLAY
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



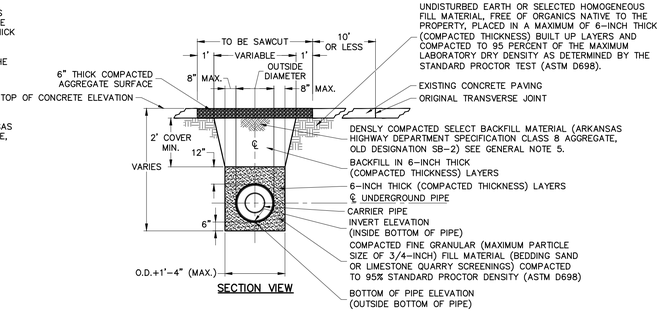
SECTION VIEW

"ROCK EXCAVATION" TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



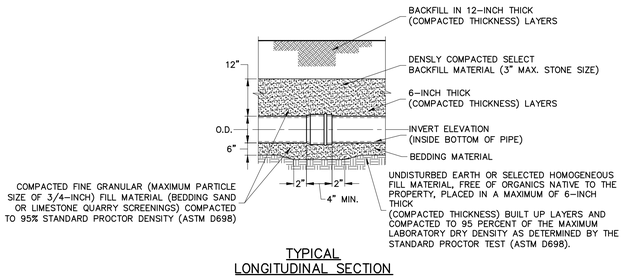
SECTION VIEW

"TYPE C"-ASPHALT/OIL MAT PAVING
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



SECTION VIEW

"TYPE D"-COMPACTED AGGREGATE SURFACE
TYPICAL
TRENCHING, BEDDING & BACKFILLING
DETAIL
N.T.S.



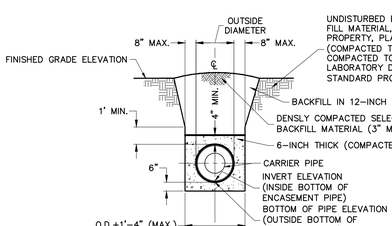
TYPICAL
LONGITUDINAL SECTION
DETAIL
N.T.S.

GENERAL NOTES:

1. ALL ELEVATIONS ON THIS CONSTRUCTION DRAWING ARE IN FEET AND DECIMALS AND ARE RELATIVE TO THE EXISTING BRASS CAP ELEVATION BENCH MARK IN GENTRY, ARKANSAS ON ARKANSAS HIGHWAY 59B LOCATED ON THE NORTH EAST CORNER OF MAIN AND COLLINS. ELEVATION ABOVE SEA LEVEL: 1237'
2. FOR LOCATION, ORIENTATION, AND ELEVATIONS, SEE CONSTRUCTION DRAWING PLAN SHEETS AND/OR PLAN AND PROFILE SHEETS.
3. PRIOR TO EXCAVATION AND/OR TRENCHING FOR THE NEW UNDERGROUND POTABLE WATER MAINS AND SANITARY SEWER LINES, THE CONTRACTOR SHALL LOCATE ALL EXISTING UNDERGROUND UTILITIES AND TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THESE EXISTING UTILITIES.
4. ALL CONSTRUCTION SHALL CONFORM TO THE ARKANSAS STATE DEPARTMENT OF HEALTH CRITERIA.
5. BACKFILL MATERIAL, WHERE SECTION IS LOCATED IN STREET RIGHT-OF-WAYS, SHALL BE ARKANSAS HIGHWAY DEPARTMENT SPECIFICATION CLASS 8 BASE AGGREGATE (OLD DESIGNATION SB-2) COMPACTED TO 95% STANDARD PROCTOR DENSITY (ASTM D698).
6. WATER TRENCH DETAILS SHOWN ON THIS SHEET SHALL ALSO BE TYPICAL FOR SANITARY SEWER FORCE MAINS.

CLASS 8 BASE AGGREGATE (OLD DESIGNATION SB-2)	
SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
1 1/2"	—
1"	100
3/4"	65-100
NO. 4	25-55
NO. 40	10-30
NO. 200	3-10

ARKANSAS HIGHWAY DEPARTMENT
SPECIFICATION CLASS 8 AGGREGATE
(OLD DESIGNATION SB-2)



SECTION VIEW

TYPICAL
TRENCHING, CONCRETE ENCASEMENT
& BACKFILLING DETAIL
N.T.S.

CONCRETE ENCASEMENT	
CONCRETE PER LIN. FT.	
8" I.D. ALL PIPE	1.41 CU FT.
10" I.D. ALL PIPE	1.67 CU FT.
12" I.D. ALL PIPE	1.93 CU FT.
15" I.D. ALL PIPE	2.36 CU FT.
18" I.D. ALL PIPE	2.81 CU FT.
21" I.D. ALL PIPE	3.27 CU FT.
24" I.D. ALL PIPE	3.76 CU FT.
27" I.D. ALL PIPE	4.26 CU FT.
30" I.D. EXCEPT RCP	4.78 CU FT.
30" I.D. RCP	5.09 CU FT.
36" I.D. EXCEPT RCP	5.80 CU FT.
36" I.D. RCP	6.20 CU FT.

ENGINEERING SERVICES INC.
1207 SOUTH OLD MISSOURI RD.
SPRINGDALE, ARKANSAS 72764

TYPICAL SEWER DETAILS
CITY OF GENTRY WATER DEPARTMENT
GENTRY, BENTON COUNTY, ARKANSAS

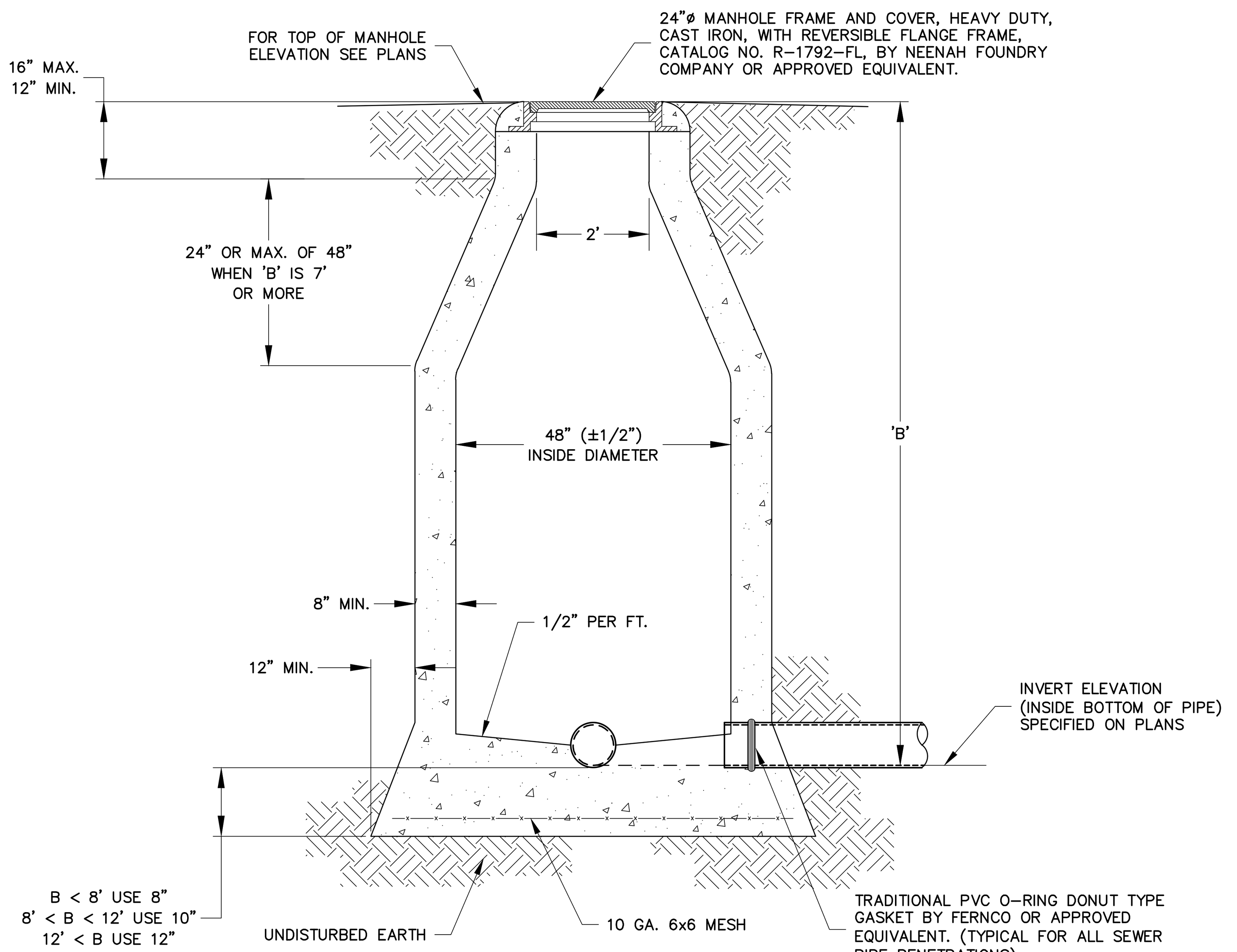
REVISION	DATE	DESCRIPTION

SCALE: NTS

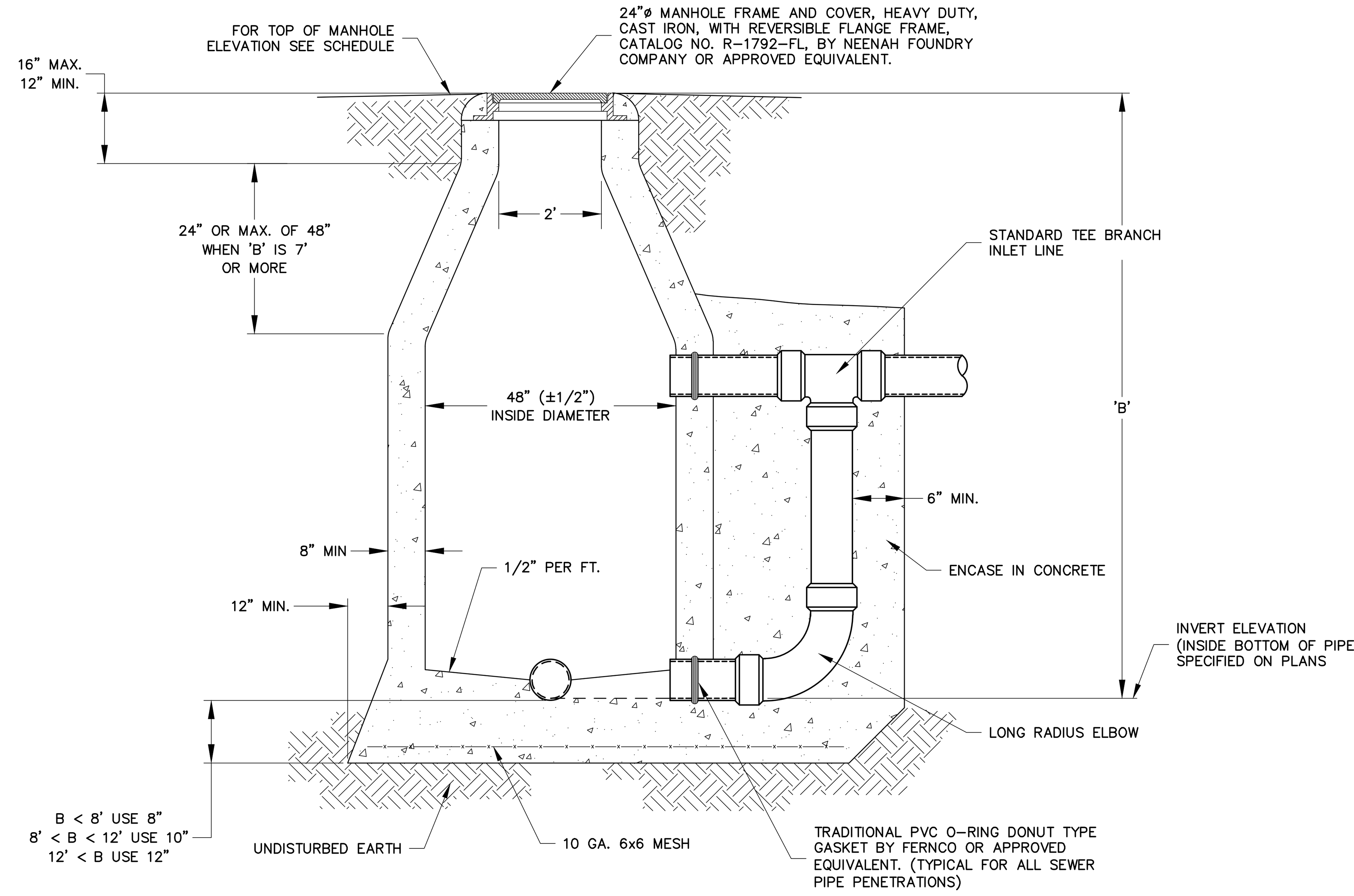
DATE: March, 2022

ENGINEER: TJM
DRAWN BY: JAL

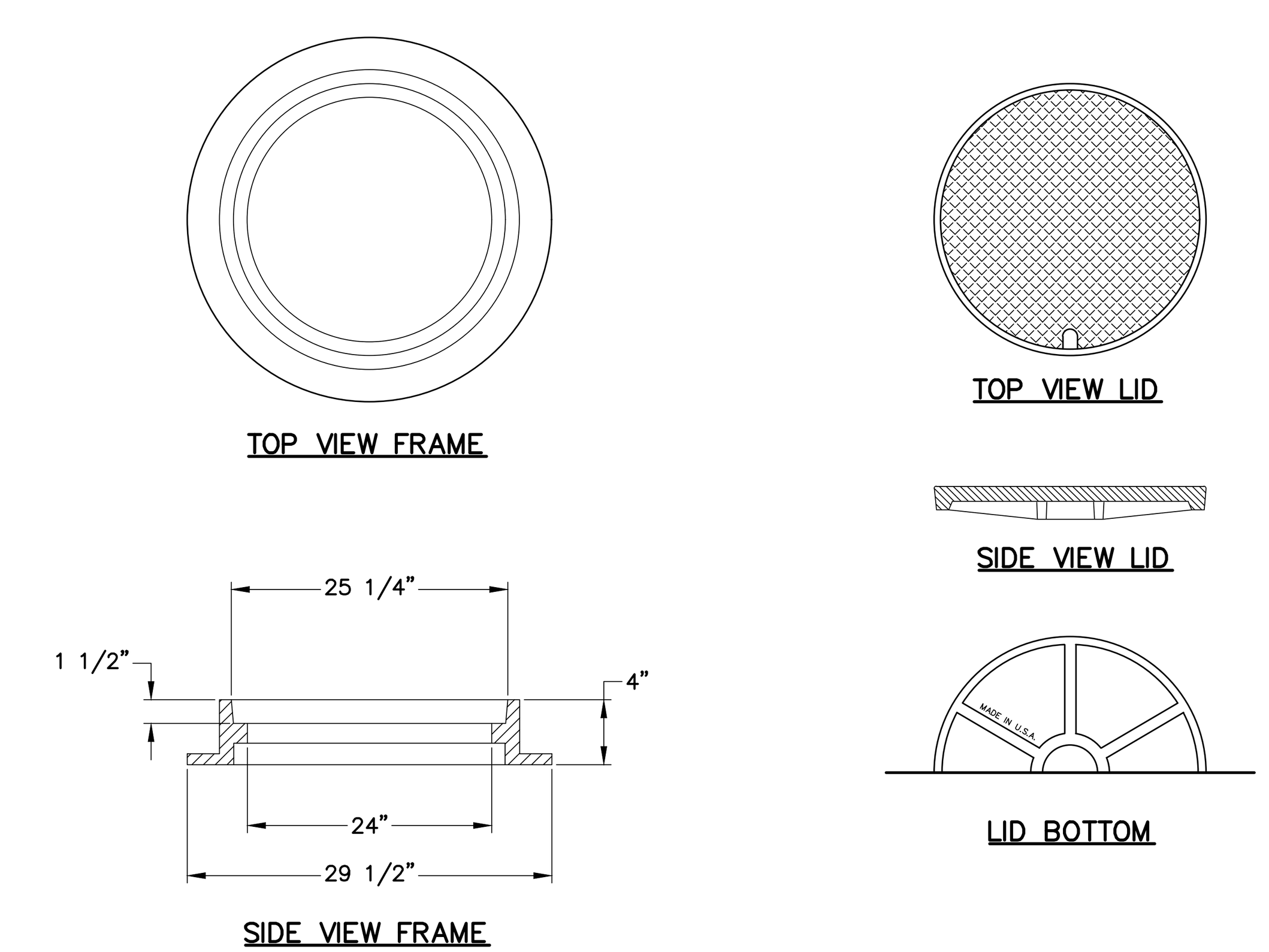
W.O. #: 20819



TYPICAL
CAST-IN-PLACE MANHOLE
(MONOLITHIC CONSTRUCTION)
DETAIL
N.T.S.

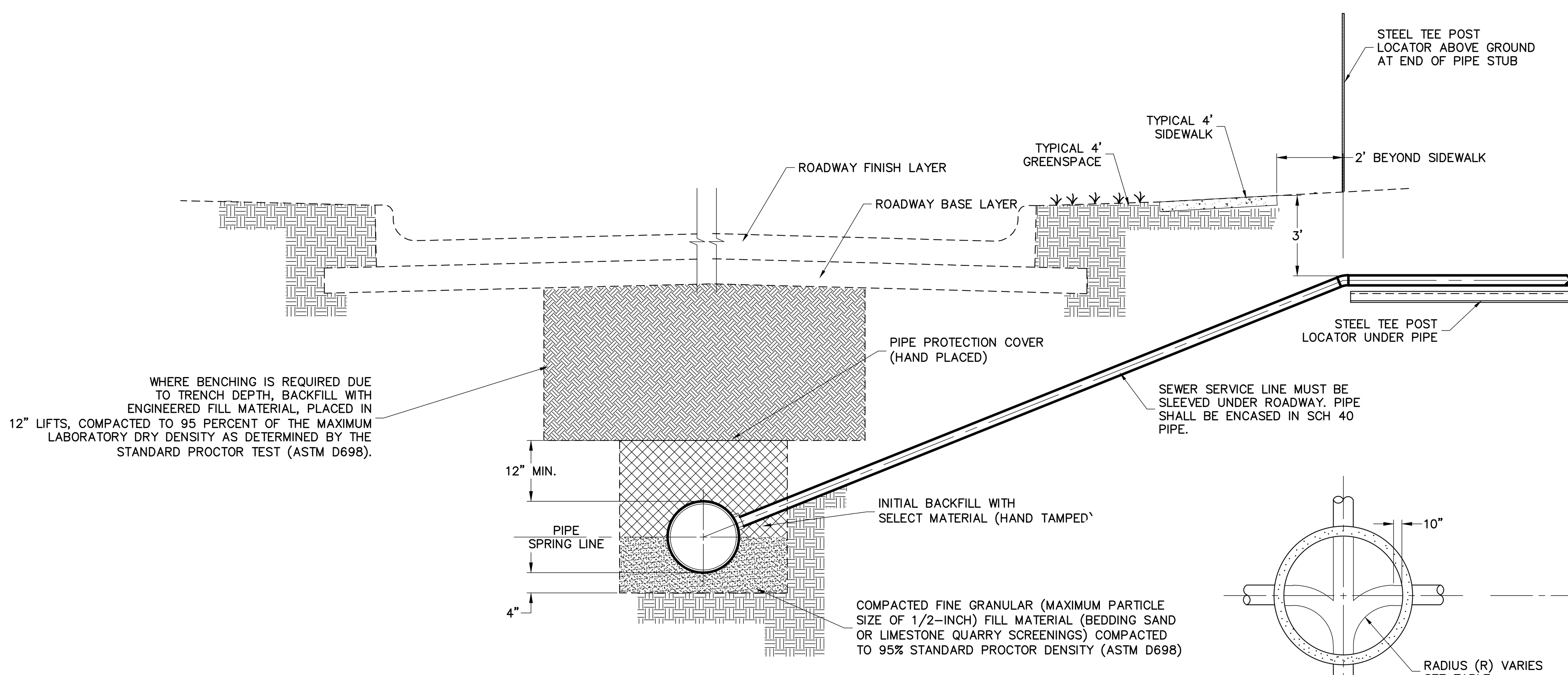


TYPICAL
CAST-IN-PLACE DROP MANHOLE
(MONOLITHIC CONSTRUCTION)
DETAIL
N.T.S.

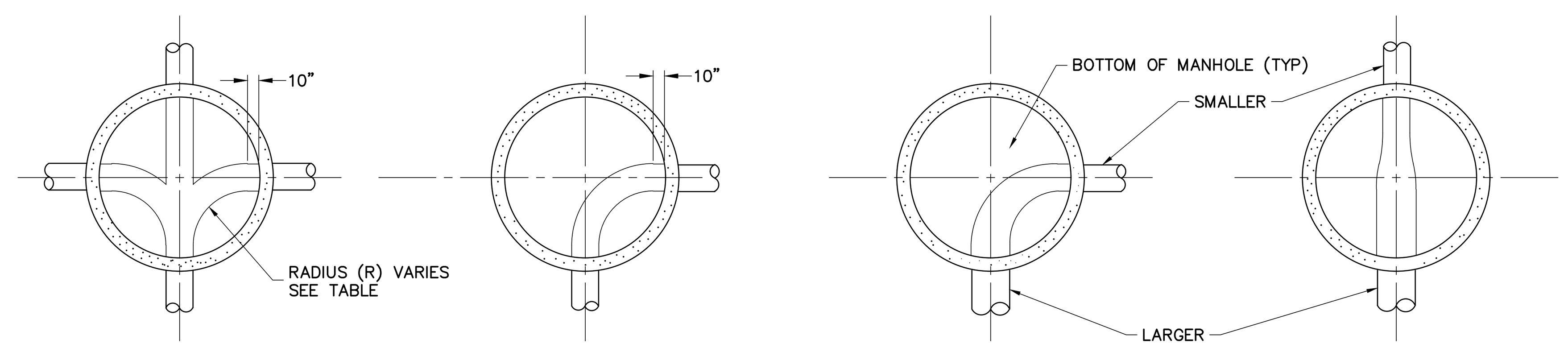


TYPICAL
FRAME AND COVER FOR MANHOLE
DETAIL
N.T.S.

MINIMUM WEIGHTS:
COVER: 110 LBS.
FRAME: 146 LBS.
MINIMUM COMBINED WEIGHT: 270 LBS.
(SEE SPECS FOR ADDITIONAL REQUIREMENTS)

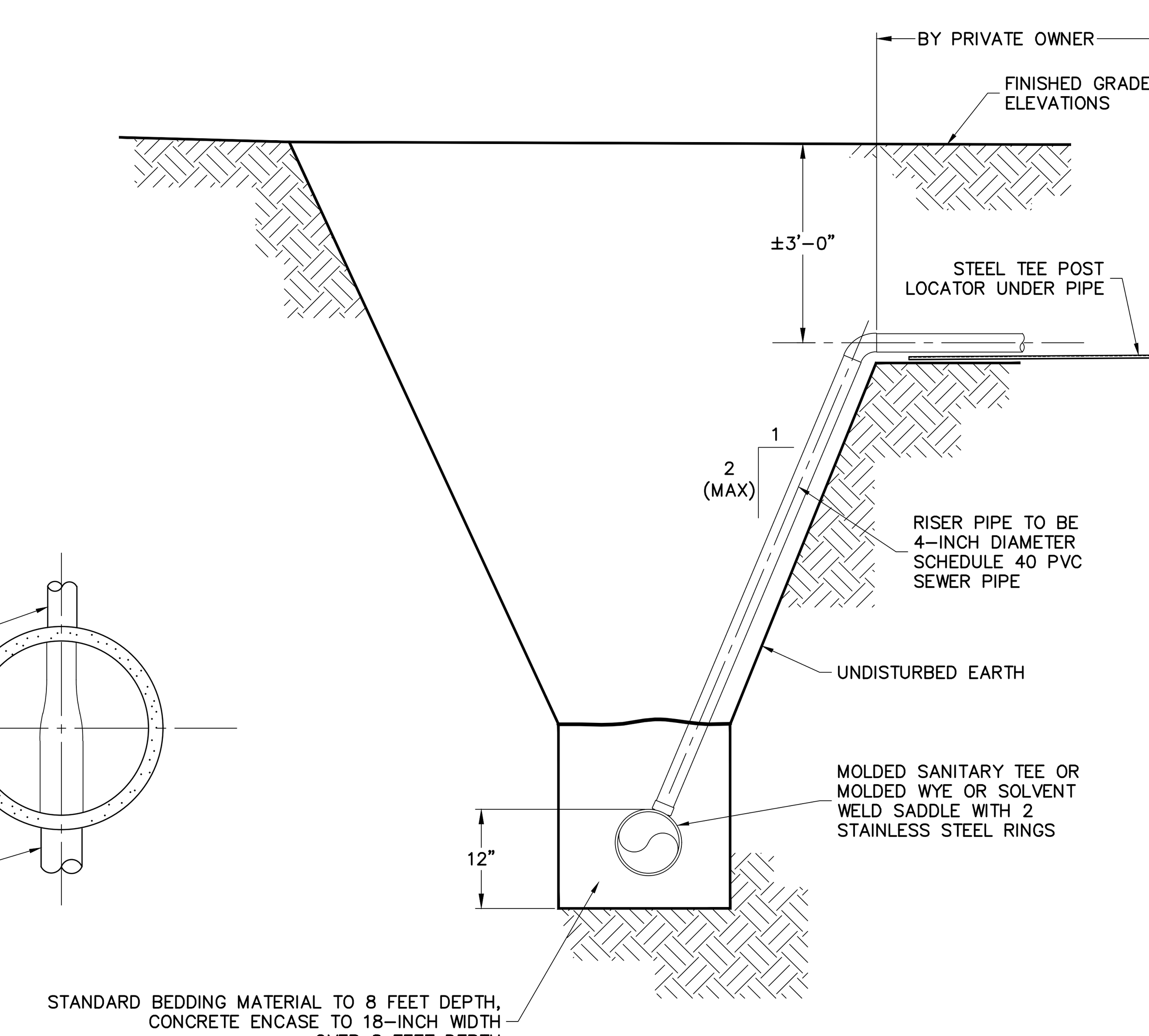


TYPICAL
TRENCHING, BEDDING & BACKFILLING FOR
DEEP SEWER MAINS UNDER ROADWAYS
IN SUBDIVISION DETAIL
N.T.S.



PIPE SIZE	RADIUS (R)
6"	12"
8"	10"
10"	9"
12"	8"

TYPICAL
MANHOLE INVERT
DETAILS
N.T.S.



TYPICAL
SERVICE CONNECTION
DETAIL
N.T.S.

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ENGINEERING SERVICES INC.
1207 SOUTH OLD MISSOURI RD.
SPRINGDALE, ARKANSAS 72764

TYPICAL SEWER DETAILS
CITY OF GENTRY WATER DEPARTMENT
GENTRY, BENTON COUNTY, ARKANSAS

REVISION	DATE	DESCRIPTION

Z:\WATER\Gentry\GENTRY STANDARD SPECIFICATIONS\20819-GENTRY STANDARD DETAILS

SCALE: NTS
DATE: March, 2022
ENGINEER: TJM
DRAWN BY: JAL
W.O. #: 20819