STANDARD SPECIFICATIONS

FOR CONSTRUCTION OF PUBLIC WATER AND SEWER IMPROVIEMENTS IN THE CITY OF ROGERS AND AREAS UNDER THE JURISDICTION OF THE ROGERS WATERWORKS AND SEWER COMMISSION

REVISED APRIL 16, 1997

ROGERS WATER UTILITIES

601 s. 2nd St..
PO Box 338
Rogers, AR 72756

NOTE TO USER
Sections of the specifications highlighted in the Table of Contents are not current, and have been superseded by later revisions which have been published online:
www.rwu.org/engineering.htm

Table of Contents

PART I - GENERAL REQUIREMENTS

SECTION 1 - GENERAL REQUIREMENTS

1.1 Description:

This part of the specifications 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 Rogers Water Utilities. Any deviations from the requirements set forth herein these specifications will be approved only by written authorization from Rogers Water Utilities. Special conditions may arise on any project that are not covered in these specifications or that may require special handling. In case of such special conditions, complete detail as to materials, method of construction, or other procedures shall be submitted to Rogers Water Utilities 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.

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 Rogers Water Utilities. 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.

Rogers Water Utilities 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 Rogers Water Utilities be responsible for any actions resulting from direction of the project by the Engineer.

Rogers Water Utilities 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 Rogers Water Utilities of any product, material, or workmanship. Rogers Water

Utilities shall not be responsible nor shall it bear any liability for the failure of any material or method of construction.

1.3 Definitions:

Rogers Water Utilities - The department of the City of Rogers under the jurisdiction of the Rogers Waterworks and Sewer Commission, hereinafter referred to as "the Utility", having full and complete authority to manage, operate, improve, extend and maintain the Utility's water works and distribution system and the sanitary sewage treatment plant and collection system.

Manager - The executive superintendent of Rogers Water Utilities.

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 Rogers Water and Sewer 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 Utility and provide service to individual private connections. The minimum diameter of all new main line construction is eight inches.

The term "as specified" shall mean as specified by the Rogers Water Utilities 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. Rogers Water Utilities shall make final approval of such items or materials judged to be "equal".

The term "these specifications" shall refer to the "Specification Requirements for the Construction of Water and Sewer Facilities", latest revision.

Abbreviations used throughout these specifications have meanings as follows:

ASTM	American Society for Testing and Materials
AASHTO	American Association of State Highway and

	Transportation Officials
AHTD	Arkansas Highway and Transportation Department
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
psi	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 Utility.

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:

All extensions of public water mains

All extensions of sanitary sewer mains

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

Backflow prevention systems

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

Private sanitary sewer systems

Private sanitary sewer pretreatment systems

These specifications govern all areas now served or to be served by the Utility. These areas include the City Limits of Rogers, 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 of the City must be submitted for approval to the Waterworks and Sewer Commission, Rogers Planning Commission and the City Council.

All plans for private commercial plumbing (commercial & industrial building plumbing, process plumbing, fire protection, irrigation, etc.) must be submitted to the Utility for determination of the adequacy of proposed backflow prevention. Plumbing permits will not be issued by the Rogers Building Inspection Department until the Utility 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 the Utility 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 may be required to meet with the Utility Engineer or other Utility personnel as designated to discuss proposed utility extensions before detailed plans are prepared. Those representing the development are encouraged to bring site location maps, layout drawings, sketches, preliminary plans or any other document that will provide adequate understanding of what is proposed. The Utility will provide input as to what is required from the development for water or sewer extensions and/or service connections.

3.3 Preliminary Report:

When requested by the Utility, 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 Pollution Control and Ecology and shall contain data and facts as may be required by the Manager.

The size, scope, and contemplated land use of the proposed development will determine the need for a preliminary report.

3.4 Construction Plans and Specifications:

No water or sewer main extension may be approved for connection to the Department's system which was constructed prior to approval of construction plans by the Utility or which was not constructed in accordance with approved plans. Construction plans shall conform to the requirements herein. Specifications shall be in accordance with Parts "I" and "II" of these 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" = 5' or 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 the 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 the Utility 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:

Sanitary Sewer Mains:

1. No gravity sewer main conveying raw sewage shall be less than eight inches in diameter unless written permission is obtained from the Manager or other authorized Utility personnel

2. Where the difference in invert elevation between any two pipes entering a manhole is 2.0 feet or

more, an outside drop connection shall be utilized as shown on the standard detail sheets. Drop connections are permitted on a case by case basic, only.

3. The minimum earth cover for sanitary sewer mains shall not be less than 24 inches, unless exception granted in writing by Rogers Water Utility.

4. Where the earth cover over the pipe bells cannot be maintained at least 2.5 feet (30 inches) the pipe material shall be ductile iron pipe as specified in Section 11.2 of these specifications. Sewers buried to depths of 14 feet or greater shall be ductile iron pipe only.

5. Sewer pipe material shall be of the types listed in Section II of these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless approved in writing otherwise.

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

7. All sewer main extensions without regard to length shall terminate in a standard manhole.

Water Distribution Mains:

1. The minimum inside diameter (I.D.) for public water mains shall be eight (8) inches unless hydraulic analysis determines that adequate fire flow may be obtained through a six inch line. Generally, six inch diameter mains must be constructed in closed loop configurations.

2. Fire hydrants shall be installed every 800 feet along proposed water main extensions. In planned additions or developments, fire hydrants shall be configured to provide adequate fire protection to all planned structures.

3. All main extensions without regard to length shall terminate in a fire hydrant unless otherwise

approved by the Manager or other authorized Utility personnel.

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

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 the Utility, it is necessary for review and approval of the plans.

6. Sufficient valves shall be provided on water mains to minimize inconvenience, facilitate expansion and minimize sanitary hazards during repairs, as determined by the Utility. Valves should be located at not more than 500 foot intervals in commercial districts or 1000 foot intervals in other districts. Also, if possible, valves shall be provided so that no more than 20 residential water services shall be affected by main line shut downs.

7. All taps on existing mains for main extension shall be performed by Rogers Water Utility at the Contractor's expense.

8. Water pipe materials shall be of types listed in Part II of these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless approved in writing by the Utility.

3.7 Approval:

Four (4) sets of complete construction plans shall be furnished to the Department. 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 the Utility. 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 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 I. 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. No service shall be established without the submission and acceptance of the required as built plans.

3.9.1 Sanitary Sewer System:

All service wyes and manhole stub outs must be shown on the "as-builts". 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 clearly marked on the "as-builts".

3.9.2 Water Distribution System:

All meter boxes with an indication of whether it is a single or split service, valves, and blow-offs must be shown on the "as-builts". 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.

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 the Utility 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 the Utility.

Any defects, deficiencies or irregularities in the work found by the Engineer or reported by the resident inspector shall be reported to the Utility. Such action, as deemed appropriate, and as approved by the Utility, 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 the Utility. The frequency of visits and the number of hours required for Utility 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, full time 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 the Utility prior to start of construction. It shall be the responsibility of the resident inspector to safeguard the Utility'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 the Utility 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 24 inches for sewer mains after completion of all dirt work.

4.6 Preconstruction Conference

The Utility 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 the Utility may deem necessary. It is the engineer's responsibility to contact the Utility 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". A typical contract is included in the appendix.

4.8 New Connection Fees

The Rogers Waterworks and Sewer Commission 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

The Rogers Waterworks and Sewer Commission 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 AND 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 not be limited to the obtaining of approval from the Arkansas Department of Health and the Arkansas Department of Pollution Control and Ecology. Responsibility for submission to, and approval by, the Arkansas Department of Health and the Arkansas Department of Pollution Control and Ecology 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 individuals laying or installing water and/or sewer lines, except when being laid by Utility personnel, shall have a contractors license, specific water and/or sewer utility construction experience and shall post a performance and payment bond, in a form acceptable to the Utility 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. Typical bond forms may be found in the Appendix.

SECTION 6 - EXISTING UTILITIES

6.1 Description:

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

6.2 Proximity:

All plans shall be drawn in such 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 of 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. Exceptions shall be only as authorized by the Arkansas Department of Health, Division of Engineering.

6.3 Crossings of Water and Sewer Lines:

Where water and sanitary sewer lines cross, a minimum vertical distance of 18" shall be provided between the outside of the water line and the outside of the sewer line. This shall be the case where the water line is either above or below the sewer line. When it is impossible to obtain proper vertical separation, the lines shall be constructed as follows:

1. The proposed line shall be constructed of ductile iron pipe.

2. All joints shall be located equidistant and as far as possible from the point of crossing.

3. Special structural support for the water and sewer lines may be required by the Utility.

4. The Arkansas Department of Health must approve all such crossings on an individual basis

Water and sewer mains shall not cross with anything less than six inches vertical separation. Water and sewer services must also be constructed to maintain minimum separations. All such crossings must be shown on the plans.

SECTION 7 - EASEMENTS

7.1 Description:

This section covers the requirements of easements for the purpose of maintaining water and/or sanitary sewer lines where the proposed lines will be on private property or where the lines would not be within public rights-of-way.

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 easement shall have a minimum width of 15' or two times the maximum depth to pipe flowline, whichever is greater. Common utility easements will be accepted provided that the easement is wide enough to accommodate the above requirements. 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 of Easements:

An example of a typical easement is provided in the Appendix. Easements shall be prepared in the same manner as the typical and submitted to the Utility for approval before being filed for record. Any proposed easement not approved by the Utility 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 the Utility before construction will be accepted. All easements shall be in favor of the City of Rogers. Easements as shown on a 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 in Part IV-Testing, of these standard specifications. All tests shall be conducted in the presence of the Engineer, the Contractor, and a representative of the Utility. The Engineer shall schedule said tests with the Utility 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 the Utility.

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 Utility 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 the Utility or his representative for an amount equal to 50% of the construction cost shall be submitted to the Utility (see appendix for sample form). The bond shall be for a period of 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 the Utility, 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 the utility until a letter of acceptance is issued. The acceptance letter will not be issued until the following requirements are met:

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

2. Satisfactory correction of all defects noted in final inspection.

3. Receipt of maintenance bond if applicable.

4. Receipt of all required easements.

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

6. Receipt of an affidavit from the owner or developer that all materials, supplies and labor bills have been paid.

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

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

9. Payment of all applicable fees.

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 the Utility 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, the Utility will issue full acceptance of the project for maintenance.

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 of 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 the Utility.

SECTION 9 - SERVICE CONNECTIONS

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 shall be installed on the sewer main to facilitate connection of anticipated services to the sewer. All service stubs shall terminate in suitable manner for insertion of a watertight plug or watertight cap. Unless anticipated service requires a larger line, all service stubs shall be 4" nominal diameter. Service stubs shall terminate at least 2 feet inside the property line but in no case shall the service stub terminate at a distance less than 8 feet from the sanitary sewer main.

The exact location of all sanitary sewer stubs shall be accurately identified in the field at the property line in order that the exact location can be easily found by a metal detector when the connection is made. This shall be done by burying a 6 Ft. steel tee post over the end of the service stub and buried to the finish grade of the lot.

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 service requires a larger line, all service lines shall be 1" nominal diameter. The meter box shall be field adjusted to final grade. 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.

SECTION 10-FACILITY EXTENSION

10.1 General

10.1.2 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, as determined by the Utility (see Section 11-"participation")

10.1.3 Changeability

The information furnished herein is subject to change, may not apply under certain circumstances and is not binding upon the Utility. THE UTILITY IS NOT BOUND EXCEPT BY WRITTEN CONTRACT.

10.1.4 Construction Permission

No facilities may be constructed prior to applicant entering into a written contract with the Utility. See Appendix A for a typical contract form.

10.2 Requirements

10.2.1 Mains twelve inches or Smaller

A water or sewer main, twelve (12) inches in diameter or smaller, must lie in an easement immediately adjacent to the property to be served, so that the service line to the property to be served shall not cross a platted lot line. Private service lines must intersect the easement at a right angle. Otherwise, a main line extension is required.

10.2.1.1 Adjacency of Service

Should a water or sewer main be adjacent to property which requires service but main is not available or adequate in size, in the judgment of the Rogers Water Utility to provide the service required 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, it is considered that no main exists and a 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 the Utility.

10.4 Approvals

10.4.1 Subject to Approval of the City

All plans for installation of water or sewer utilities are subject to the approval of the City (Arkansas Law - Act 186 of 1957 annotated). Until approval is given by the Rogers Water Utilities, no water or sewer main extensions, either inside or outside the city, will be allowed.

10.4.1.1 Plans affecting major streets and drainage

Plans which affect major streets and drainage must be approved by Rogers Street Department.

10.4.1.2 Fire Hydrant Spacing

Fire hydrant spacing, within the city limits, requires approval from the Rogers Fire Department.

10.4.2 County

Work within County or within road right-of-way requires County Planning approval.

10.4.2.1 Cut Permits

Cut permits are required for work within county right-of-way

10.4.3 Arkansas State Health Department

All plans for the installation of water facilities are subject to prior approval (Act 96, Arkansas State).

10.4.4 Arkansas State Highway and Transportation Department

All plans for the installation of water facilities within state right-of-way are subject to prior approval and p

10.4.5 Right-of-way Requirements

If not installed in public right-of-way, the APPLICANT must furnish an easement acceptable to the Department.

SECTION 11 - PARTICIPATION

11.1 General

Under certain circumstances, the Utility may determine that it is in the public interest that distribution/col

A. The Utility may pay a portion of the additional installation cost; or,

B. The APPLICANT may pay the additional installation cost; or,

C. The APPLICANT and Utility may share in the additional installation cost.

11.1.1 Cost Participation

All cost participation is subject to approval by the Commission and commitments to participate shall not be made prior to such approval and prior to execution of main extension contract (see the Appendix for an example form).

11.1.2 Limiting Participation

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

11.1.3 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:

A. Minimum criteria for water facilities established by the Department;

B. Type development proposed or anticipated within the general service area;

C. Anticipated rate of development;

D. Projected total demand (both fire and domestic);

E. Hydraulic gradient and characteristics of system;

F. Department's Master Plan for distribution/transmission facilities and collection and treatment facilities;

G. 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, the utility desires to have larger mains installed, the Utility 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 The Department may pay the cost for:

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 mains 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 Rogers Water Utility.

11.2.4 The amount of participation will be determined by the Rogers Water Utility 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 facilities of a similar nature.

11.3 Utility Master Plan

In some cases there maybe a need for a water or sewer main as a part of the Utility Master Plan. If this pipe line exceeds a reasonable cost to the APPLICANT, as determined by the Commission, and if funds are available, the Utility may, on Commission approval, move up the

construction date if the APPLICANT makes an acceptable "contribution in aid of construction". An extension made under these conditions will require a contract.

SECTION 12 - TAP FEES AND CONNECTIONS

12.1 Tap Fees in General

Tap Fees are required to be paid to the Utility before the taps are made. Applicant shall complete a "request for service" application. Upon approval of the application and receipt of required fees, the work will be scheduled by utility crews.

12.1.1 Tap Fees

Taps fees refer to latest fees established by the Rogers Waterworks and Sewer Commission. Fees are charged only when it is necessary to complete a water service or tap an existing water or sewer main.

Water

Fee schedules may be obtained from Rogers Water Utilities. Some services may cost more than the published rate, due to local conditions. All services 1 1/2" and larger will be charged on a "cost plus" basis, as determined by Rogers Water Utilities.

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

Sewer

Sewer connection fees schedules may be obtained from the Rogers Water Utilities office. Some services may cost more than the published rates due to local condition, as determined by Rogers Water Utilities.
This cost does not include excavation. Builder or owner responsible for excavation of sewer line.

12.1.2 Tap fees do not include the building service lines.

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 Rogers Water Utilities.

12.2 Connection Fees.

Connection fees help defray costs of water and sewer system improvements. Connection fees are collected by the Utility 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. Connection fees may be included in the "contract for extension of water and /or sewer facilities", if the connection to the existing facilities includes such extensions. If water or sewer service only is required, the connection fee will be collected at the time the "application for service" is submitted to the utility. Connection fees are separate and in addition to tap fees. Connection fees may be waived in the "contract for extension of Utilities", if Commission participation (see Part 11) is approved.

12.2.1 Water connection fees.

The current rate schedule may be obtained at the Rogers Water Utilities business office.

12.2.2 Sewer Connection fees.

A current Sewer connection fee rate schedule is available at the Rogers Water Utilities business office.

12.2.3 Multiple unit housing will be assessed on a per unit basis.

12.2.4. Water and sewer connection fees are subject to change without notice.

The Rogers Water Utilities is not bound except by written contract. Failure to collect connection fees at the time service is made does not constitute a waiver of such fees.

PART II-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 and/or sewer mains and appurtenances. Projects that would necessarily involve materials other than those included in this specification shall be subject to the approval of the Rogers Water Utilities.

1.2 Domestic Manufacture:

All materials must be of DOMESTIC manufacture and approved by the utility.

1.3 References:

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

SECTION 2 - POTABLE WATER PIPE

2.1 General:

All pipe furnished shall be designed for the distribution of potable water. Lubricant furnished for lubricant 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 Cast Iron and Ductile Iron Pipe

The pipe shall have a 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 a cement mortar lining and seal coat conforming to ANSI A21.4 / AWWA C104. Joints shall conform to ANSI A21.11 / AWWA C111 and may be mechanical joint or push-on joint unless otherwise specified.

2.4 Copper Pipe

Copper pipe shall be Type "K", soft tempered, seamless, for underground installation, in accordance with ASTM B88 and Federal Specifications WW-T-799.

SECTION 3 - WATER PIPE FITTINGS

3.1 Iron Fittings:

Iron fittings shall be designed for working pressure of at least 250 psi, may be ductile iron or gray iron and shall conform to ANSI A21.10 /AWWA C110. Joints shall be mechanical joints which conform to ANSI A21.11 /AWWA C111, latest revision. All fittings shall be furnished with gaskets and mechanical joint fittings shall be furnished with bolts, nuts and iron glands. All fittings except sleeves and plugs/caps shall be cement mortar lined in accordance with ANSI A21.4 /AWWA C 104.

3.1.1 Mechanical Joint Retainer Glands

Shall be made from ductile iron and shall be designed for a working pressure of at least 200 psi. The set screws shall be extended through the outer part of the gland. Glands shall be designed to meet standard mechanical joint fittings specifications (AWWA C110). The minimum number and minimum size set screws shall be as follows:

Size Gland	Size Set Screw	Number Set Screws
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

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 a least 200 psi. A test plug shall be furnished through the body for hydrostatic pressure testing on sleeves 4-inch and larger. Cast iron mechanical type sleeves are required for taps unless approved in writing by the Rogers Water Utilities.

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. The bolts and coating shall conform to paragraph 3.1 above.

3.2 Ductile Iron Compact Fittings:

Compact or lightweight fittings shall be ductile iron fittings and shall conform to the requirements of ANSI A21.53 / AWWA C 153, latest revision, for "Ductile Iron Compact Fittings, 3 inch through 12 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 A 21.4 / AWWA C 104.

Joints shall be mechanical joints which conform to ANSI A21.11/ AWWA C111, latest revision. All fittings shall be furnished with gaskets and mechanical joint fittings shall be furnished with bolts, nuts, and iron glands.

SECTION 4 - WATER SERVICE FITTINGS

4.1 Tapping Saddles:

All 1" service saddles shall be made from ductile or malleable iron provided with a shop coat and designed for a working pressure of 200 psi. A rubber gasket shall be provided between the casting and pipe surface. Saddle straps and bolts shall be high strength corrosive resistant alloy steel. All 6" and larger saddles shall be provided with double straps. The outlet threads shall be compatible with AWWA CC type 1" corporation stops.

4.2 Corporation Stops:

Corporation stops shall conform to AWWA C800-84 without a positive stop. The inlet shall be AWWA CC tapered threads and the outlet with a compression coupling. The coupled compression outlet shall be a Buna-N beveled gasket to provide a water-tight connection and with a split clamp locking device. The split clamp shall be grooved and provided with a stainless steel screw to draw down the clamp for the prevention of mechanical pullout. The corporations shall be AWWA red brass with precision machined castings and compatible with conventional tapping machines. (Ford 44F1000-3, 1", or equal)

4.3 Service Tubing - See section 2.4 (Copper Tubing).

4.4 Service Taps-

All service taps must be made on the main during construction.
Service lines must terminate at the location shown on the plans, in either a Ford angle valve AV94313 (for a single service), or a Ford U4843 and two Ford AV91313 angle valves. All connections must be made secure and the brass assembly must be placed inside a meter box with a cast iron lid. See Appendix for detail.

SECTION 5 - WATER VALVES

All valves in excess of 12" nominal I.D. shall conform to butterfly valve specs below:

5.1 Gate Valves, 6" and Larger, Double Disc:

5.1.1 Gate Valves, 6" through 12"

Shall be designed for a working pressure of 200 psi. Valves shall conform to AWWA C500 with iron bonnet (bronze mounted), non-rising stem double-disc (parallel seat type), O-ring stem seals and 2" x 2" square operating nut. Valves shall open when the operating nut is turned to the left (counter clockwise). Valve ends shall be mechanical joint complete with accessories or as specified. Tapping valves shall conform to above specifications except that the connections shall be ANSI B16.1, Class 125 flange on one side (inlet) and mechanical joint on the other (outlet), or as specified.

5.1.2 Valve Manufacturers

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

1. Mueller Company, Decatur, Illinois
2. Kennedy Valve Manufacturing Company, Elmira, New York
3. Clow Corporation, Cochocton, Ohio

5.2 Gate Valves, 6" through 12" with Resilient Seat:

5.2.1 Resilient seat gate valves 6" through 12"

Resilient seat gate valves 6" through 12" shall be designed for a working pressure of 200 psi. Valves shall conform to AWWA C509 with non-rising stem, O-ring stem seals, 2" square operating nut. Valves shall open when the operating nut is turned to the left (counter clockwise). Valve ends shall be as specified. The resilient seat may be bonded or mechanically attached to the gate. All interior metal surfaces shall be coated with a two-part thermosetting epoxy.

5.2.2 Valve Conformation Specifications

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

1. Mueller Company, Decatur, Illinois
2. Clow Corporation, Oskaloosa, Iowa
3. American Valve & Hydrant Co., Birmingham, Alabama
4. Kennedy Valve, Elmira, New York
5. Waterous, St. Paul, Minnesota

5.3 Butterfly Valves

Butterfly valves furnished and installed shall be Class 150B in conformance with the requirements of AWWA C504, latest revision, for "Rubber Seated Butterfly Valves." All butterfly valves shall be furnished by Henry Pratt Company, groundhog type, or approved equal.

5.3.1 Body

The valve body shall be constructed of cast iron ASTM-126, Class B, and shall have integrally cast mechanical joint ends unless otherwise specified. If flange ends are specified, they shall conform to Class 125, ANSI B16.1. Body thickness shall be in strict accordance with AWWA C504, latest revision, Class 150B.

5.3.2 Valve Seats

All butterfly valves shall be of the tight closing, synthetic rubber seat type, as follows:

1. Valves 20 inches (nominal diameter) and smaller shall have bonded seats which are simultaneously molded in, vulcanized and bonded to the body. Seat bond must withstand 75 pounds pull under test procedure ASTM D429, Method B.

2. On valves 24 inches and larger, all seats shall be of a synthetic rubber compound. Seats shall be retained in the valve body by mechanical means without retaining rings, segments, screws, or hardware of any kind in the flow stream.

Seats shall be a full 360 degrees without interruption and have a plurality of grooves mating with a spherical disc edge seating surface. Valve seats shall be field adjustable around the full 360 degree circumference and replaceable without dismantling operator, disc, or shaft and without removing the valve from the line. Manufacturer shall certify that rubber seat is field replaceable.

5.3.3 Valve Discs

Valve discs shall be as follows:

1. Valves 12 inches through 20 inches nominal diameter shall have valve discs constructed of alloy cast iron ASTM A-436, Type 1.

2. Valves 24 inches nominal diameter shall have valve discs constructed of cast iron with a stainless steel seating edge.

3. Valves 30 inches through 48 inches nominal diameter shall have valve discs constructed of ductile iron with a stainless steel seating edge.

5.3.4 Valve Shaft and Bearings

The valve shaft shall be constructed of stainless steel and the bearings shall be corrosion resistant and self lubricating.

5.3.5 Operator

The valves shall be equipped with a totally enclosed type operator, fully gasketed and grease packed, suitable for direct burial. The operator shall be designed for operation with a nominal 2 inch X 2 inch operating nut for use with a standard T wrench. Operators shall be designed to open with a counterclockwise rotation of the operator nut.

5.3.6 Painting

All valves shall be painted in accordance with AWWA C504, latest revision.

5.3.7 Testing

The valve shall be hydrostatically tested at 150 psi for leakage in accordance with AWWA C504, latest revision.

5.3.8 Affidavit of Compliance

The manufacturer shall furnish to the Engineer prior to delivery an affidavit stating that the valve and all materials used in its construction conform to the requirements of AWWA C504 and that all tests specified therein have been performed and that all test requirements have been met.

5.3.9 Outside Coating

All butterfly valves shall have either a bituminous exterior coating or shall be delivered to the site factory cleaned and primed as set out below:

1. Factory Primed Valves - Unless otherwise specified, all exposed valves within the limits of structure walls or any valves exposed above ground shall be delivered to the site factory blasted, cleaned, and primed with one coat of Koppers Pug Primer, or approved equal.

2. Bituminous Coating - All valves indicated for buried service shall have a bituminous coating in accordance with AWWA Standards.

5.3.10 Inside Coating

All valves furnished and installed shall have the interior ports and discs coated with a minimum of 10 mils thickness of Keysite No. 750 epoxy enamel or approved equal which has passed FDA extraction tests required for use in contact with potable water.

5.3.11 Butterfly Valve Boxes

All buried valves shall be furnished with a suitable valve box. The manufacturer shall submit three sets of drawings prior to delivery for review by the Engineer and the Utility, showing the principal dimensions, construction details, and materials used in the construction of the valve box.

5.4 Air Release Valves

Air-Release Valves - shall be APCO No. 200-A, or equal, or as specified. See Appendix - for detail.

SECTION 6 - VALVE BOXES

6.1 Valve Boxes (standard depth)

Valve Boxes (standard depth) shall be three-piece, screw type, 5 1/4" shaft, 6860 series, with drop cover marked "WATER", and shall have a combined weight of at least 80 lbs., manufactured by Tyler Pipe, or approved equal. The normal base shall contour to the size valve.

6.2 Valve Boxes (extra depth)

Valve Boxes (extra depth) shall be two-piece, screw-type, 5 1/4" shaft, with extension length appropriate for depth of bury, drop cover marked "WATER", and shall be 6850 Series, manufactured by Tyler Pipe, or approved equal. 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.

SECTION 7 - FIRE HYDRANTS

7.1 General

Fire Hydrants shall be Traffic Model fire hydrants conforming to AWWA C 502-80 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 plane

Nozzle Thread	National Standard
Nozzle Cap Chains	Each cap
Nozzle Cap Washers	Rubber
Operating Threads	Oil W/O-Ring Seals
Seat Rings	Bronze to Bronze
Direction to Turn to Open	Left (Counterclockwise)
Shape & Size of Operating & Nozzle Cap Nut	5-sided, 1½" from flat to point
Operating Nut	Bronze

7.2 Manufacturers

Fire hydrants shall conform to Mueller Centurion Fire Hydrant, Catalog Number A-423, traffic model.

7.3 Design Specifications:

7.3.1 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 bushed to reduce corrosion. A weather cap shall be provided.

7.3.2 The hydrant shall be of the breakable or traffic type.

The union between the upper and lower barrel shall consist of breakable bolts and/or nuts or two part breakable flanges. The union between the upper and lower stem shall consist of a torque diverting breakable coupling made of coated steel, cast iron, or bronze.

7.3.3 Retainer Ring

The main valve seat ring shall be made of bronze and threaded into a bronze retainer ring or it may be threaded into a heavy bronze bushing in the shoe.

7.3.4 Seat

Seat must be removable, using a short, light-weight wrench which will fit all depths of bury.

7.3.5 Shoe

The shoe of the hydrant shall be internally coated with one coat of two part thermoset epoxy coating (4 mil.)

SECTION 8 - POLYETHYLENE MATERIAL FOR PIPE ENCASEMENT

8.1 Polyethylene Materials

Polyethylene material for the encasement of cast iron pipe (gray or ductile) shall conform to ANSI A21.5 /AWWA C 105.

8.2 Tape Materials

Tape material for field application shall be Polyken #900, or Scotchrap # 50, or equal, at least 2-inches wide.

SECTION 9 - TRACE WIRE FOR NON-METALLIC PIPE

9.1 Trace wire

Trace wire shall be 12-gauge, insulated copper wire.

SECTION 10 - SANITARY SEWER PIPE

10.1 Description

All gravity sewer pipe 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 Manager of the Rogers Water Utilities.

10.2 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 21.51-81 or latest revision. It shall be lined with a poly bond lining and seal coat in accordance with the latest revision of ANSI/ AWWA C104/A21.4. 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 joint unless otherwise specified. The minimum thickness class shall be Class 50 unless specified.

10.3 Polyvinyl Chloride (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 have 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 D 2412.

10.4 Cell Classification

The 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 D2412, D2152, and D2444.

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

Users of PVC pipe are to take particular notice of the bedding and backfilling requirements for PVC gravity sewer pipe listed in Part III Section 3.3 and the testing requirements listed in Part IV Section 6. All PVC gravity sewer pipe is required to pass a mandrel test for deflection of no more than 5% during the final inspection.

10.5 Sanitary Sewer Service Lines

10.5.1 General

Service lines are defined as that portion of the sanitary drainage system which extends from the city sewer main to the stubout 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.

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 the Rogers Water Utilities.

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

10.5.2 Cast Iron Soil Pipe, 4"-12"

Cast iron soil pipe shall meet the requirements of ASTM Designation A74-69. Cast iron soil pipe shall not be used for sewer lines other than service lines. All cast iron soil pipe shall be made with bell and spigot joints with rubber gaskets.

10.5.3 Ductile Iron Pipe, 4" - 36"

Ductile iron pipe shall meet the requirements of Section 10.2.

10.5.4 Polyvinyl Chloride (PVC) Pipe, 4"-15"

PVC pipe shall meet the requirements of Section 10.3.

10.6 Pipe Joints

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

10.6.1 Ductile Iron Pipe

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

10.6.2 Polyvinyl Chloride (PVC) Pipe

The use of solvent or chemically welded joints is prohibited in a street right of way.
Joints shall be push-on, elastometric gasket type conforming to ASTM D3212 and ASTM F-477.

10.6.3 Cast Iron Soil Pipe

Joints for cast iron soil pipe shall be rubber gasket type commonly used on bell and spigot pipe conforming to ASTM A74-69.

10.7 Sewer Pipe Fittings

10.7.1 Standard Fittings

All bends, tees, plugs, adapters, wyes, 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 wyes, tee-wyes, bends, or other fittings shall be one piece molded construction with:

1. elastometric gaskets conforming to ASTM 3212
2. self cleansing sanitary flow
3. design meeting ASTM 3034 standards

10.7.2 Special Fittings

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

SECTION 11 - MANHOLES

11.1 Description

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

11.2 Concrete

Concrete used in the construction of manholes shall conform to the requirements of Section 12 - Concrete and Reinforcing Steel.

11.3 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 requirements of Section 12 Concrete and Reinforcing Steel. Masonry cement shall be strictly prohibited for use in any part of manhole construction.

11.4 Brick Manholes

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

11.5 Precast Manholes

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

11.6 Cast-in-Place Manholes

Cast-in-place manholes shall be made of 3000 psi, 28 day concrete conforming to the requirements of Section 12 - Concrete and Reinforcing Steel.

11.7 Drop Type Manholes

Materials used in the construction of drop manholes shall conform to the requirements of Sections 10.7 above and/or other applicable parts of this specification.

11.8 Manhole Rings and Covers

All castings for manhole rings and covers 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 the metal.

Manhole rings and lids shall have a combined weight of not less than 250 lbs. and shall have a minimum access diameter of 22 inches. The manhole lids shall be of solid construction without any openings of 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" or "CITY OF ROGERS - SANITARY SEWER" cast on the lids.

11.8.1 Traffic model manhole rings and lids

Castings shall be as specified above except the minimum weight shall be 400 lbs. 540 lbs. ring and lids may be required by Rogers Water Utilities.

11.9 Watertight Manhole Rings and Covers

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

11.10 Manhole Steps

Manhole steps are not required in sanitary sewer manholes except under extenuating circumstances and only as approved by the Utility.

11.11 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 PVC gravity sewer pipes entering manhole walls or bases.

SECTION 12 - CONCRETE AND REINFORCING STEEL

12.1 Description

This section covers materials for concrete and reinforcing steel used in the construction of potable water lines, sanitary sewer lines, and sanitary sewer manholes.

12.2 Cement

Cement shall be Portland Cement conforming to the requirements of ASTM C 150-80, " Standard Specification for Portland Cement," Type I or IA. Type III or IIIA portland cement, high early strength, may be used if approved by the Rogers Water Utilities.

12.3 Water

Water used in mixing concrete and mortar shall be free from injurious amounts of acids, alkalis, oils, sewage, and organic matter. It shall be fit for drinking.

12.4 Reinforcing Steel

Reinforcing steel where required on the plans shall conform to the latest edition of ASTM A615-72 and/or ASTM A185-70 (Specifications for steel bars for concrete reinforcement).

12.5 Composition and strength

Concrete shall be composed of Portland cement, fine and coarse aggregates, and water all proportioned to provide 3000 psi compressive strength at 28 days. Air entraining agents, if used, shall comply to ASTM C260. The total air content (entrained and entrapped shall be 6% $\pm$ 1%. Proportioning of concrete components shall be by weight. Water may be measured by volume.

Portland cement weighs 94 pounds per bag. Water weighs 8.34 pounds per gallon.

Proportioning of concrete shall be by weight except that water may be measured by volume. A one cubic foot sack of Portland Cement will be considered as weighing 94 pounds.

Coarse aggregates shall be no larger than 3/4 inches. The designated range of coarse aggregate shall be 3/4 inch to No. 4. Fine aggregates shall consist of clean, sound, properly graded sand conforming to ASTM C-33.
If made with high early strength cement, those strengths shall be attained at the end of 7 days.

12.6 Testing

The Rogers Water Utilities reserves the right to require the Contractor to provide test specimens in accordance with Part IV Section 8 - CONCRETE TESTING of these specifications.

SECTION 13 - SEWER PIPE EMBEDMENT MATERIALS

13.1 Description

This section covers materials used for embedment of sanitary sewer mains. Unless otherwise specified herein or shown on the plans, embedment materials shall be restricted to Class I or Class II materials as defined in ASTM D 2487 (Standard Classification of Soils for Engineering Purposes) or ASTM D 2321-80 (Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe) and as described below. Class III, IV, and V bedding materials are unacceptable.

13.2 Class I Embedment Material:

Class I material consists of manufactured angular, granular material, 1/4 to 1 1/2 inches (6 to 40 mm) in size.

13.3 Class II Embedment Material

Class II material consists of coarse sands and gravel with maximum particle size of 1 1/2 inches (40 mm), including variously graded sands and gravel containing small percentage of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.

GW - Well-graded gravel and gravel-sand mixtures, little or no fines. 50% or more retained on a No. 4 sieve. More than 95% retained on a No. 200 sieve.

GP - Poorly graded gravel and gravel-sand mixtures, little or no fines. 50% or more retained on a No. 4 sieve. More than 95% retained on a No. 200 sieve.

SW - Well-graded sands and gravelly sands, little or no fines. More than 50% passes a No. 4 sieve. More than 95% retained on a No. 200 sieve.

SP - Poorly graded sands and gravely sands, little or no fines. More than 50% passes a No. 4 sieve. More than 95% retained on a No. 200 sieve.

(Class I or Class II materials shall include, but not be limited to, Arkansas Highway and Transportation Department (AHTD) designation Class 7).

SECTION 14 - SANITARY SEWAGE FORCE MAINS

14.1 Description

All sanitary sewage force mains shall be of equal design, material, and construction as potable water pipe. Force mains less than 4" I.D. shall be SDR 21, PVC pipe. From 4" to 8", force main shall be C900 PVC, SDR 18. Over 8" I.D., force main shall be constructed of DIP, Class 350, American Polybond lining, 401 Epoxy ceramic or approved equal.

PART III - CONSTRUCTION PROCEDURES

SECTION 1 - DESCRIPTION

1.1 General

This part of the specifications shall set forth minimum acceptable construction procedures for the installation of water and sanitary sewerage facilities under the jurisdiction of the Rogers Water Utility. 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.

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.

2.1.1 Trench Depth

The trench for all sanitary sewers shall be excavated to at least 4 inches below the grade required to provide proper pipe embedment and a minimum earth cover of 24 inches. The trench for all water lines shall be excavated to the established pipe grade (unless structural or foundation requirements indicate otherwise) so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. The minimum pipe cover for water or force mains shall be 36 in.

All over 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 bottom of the trench under each bell shall be excavated 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 width as 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 as necessary to prevent crushing of the pipe due to excessive earth loads.

2.1.4 Trench Length

The Utility 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.

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 on each side of all pipe, valves, and fittings for pipes 24 inches in diameter or less, and 9 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.

2.1.6 Excavation in Poor Soil and Refilling to Grade.

Where the bottom of the trench is found to be unstable Class IV or V 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 the Utility Engineer should be removed, the Contractor, at his own expense, shall excavate and remove such unsuitable material to the width and depth ordered by the Utility Engineer.

Before the pipe is laid, the subgrade shall be made by backfilling with clean crushed rock or gravel (ASTM D2487, Class I material), or crushed stone (AHTD Class 7) in 6 - 8 inch uncompacted 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 clean crushed rock or gravel (ASTM D2487, Class I material), or (AHTD Class 7). 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.

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 2.1.7.

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 the Rogers Water Utility, 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, 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's, 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 the Rogers Water Utility will reduce the Contractor's responsibility. Contract documents 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, water lines, 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 the Rogers Water Utility 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 Excavation for Manholes

Excavation for manholes shall be as specified in Section 7 -Manholes.

2.1.13 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.

SECTION 3 - PIPE EMBEDMENT BACKFILLING PROCEDURES

3.1 General

This section covers the minimum requirements for the embedment and backfilling of potable water lines, sanitary sewer lines, and sanitary sewage force mains.

All pipelines shall be installed using either Class I or II embedment materials as defined in part II section 14 of these specifications and ASTM D2487 (classification of soils for engineering purposes).

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 24"; 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 that of the adjacent undisturbed soil as determined in accordance with ASTM D2922.

Where trenches are under existing or proposed paved area, the entire trench up to a point (2) feet below existing or proposed subgrade shall be backfilled with AHTD Class 7 and compacted to 90 percent Modified Proctor Density as determined by AASHTO T-180. The remaining 2 feet shall be backfilled with AHTD Class 7 placed in 6 in. lifts and compacted to 95% Standard Proctor Density as determined by AASHTO T-99. 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.

Where trenches are under existing or proposed public streets of the City of Rogers, the entire trench shall be backfilled up to the subgrade with AHTD Class 7 material placed in 4-6 inch lifts and compacted by approved mechanical methods to 95% Standard Proctor Density as determined by AASHTO T-99. Design shall be field verified as above.

3.1.1 Pipe Protection Cover

Pipe protection cover shall be defined as backfill from the top of the pipe to a point 6 inches above the top of the pipe and shall consist of Class 7 crushed stone. The trench may then be backfilled in accordance with Section 3.7 of these specifications.

3.2 Ductile Iron Water and Sewer Pipe Embedment

The trench bottom shall be shaped and graded so as to provide a continuous bearing support for the pipe at every point along the pipe barrel. Bell holes shall be excavated to accommodate the pipe bells so that no weight of the pipe is supported by any bell.

Class 7 crushed stone shall be hand placed and consolidated (hand tamped) to the centerline of the pipe. The intent is to cradle the pipe so that the full length of each joint is uniformly supported on firm bedding and the weight of the pipe and fill is borne uniformly by the pipe barrel.

3.3 Polyvinyl Chloride (PVC) Sewer Pipe Embedment:

Polyvinyl Chloride (PVC) Sewer Pipe shall be bedded in accordance with ASTM D 2321-80, "Standard Recommended Practice for Underground Installation of Thermoplastic Sewer Pipe."

The pipe shall be bedded in Class 7 crushed stone embedment materials for the full width of the excavated trench from a point 4 inches below the bottom of the pipe barrel up to the springline of the pipe. All pipe embedment material shall be tamped by hand or approved mechanical methods so as to provide a uniform and continuous bearing support for the pipe at every point along the pipe barrel.

Class 7 crushed stone shall then be hand placed and consolidated (by hand or approved mechanical methods) to a depth of 6" over the top of the pipe.

3.4 Ductile Iron Force Main Embedment

Embedment procedures for ductile iron force mains shall be identical to those for ductile iron water mains as defined above in Section 3.2.

3.5 Service Lines

The bedding of service lines in the street right-of-way and/or easement shall meet the requirements set forth above.

3.6 Manholes

Backfilling of manholes is detailed in Section 7 - Manhole Construction.

3.7 Backfilling

This section specifies the procedures for backfilling areas excavated during the construction of sewer lines, manholes, force mains, water lines, valves, fittings, fire hydrants and other appurtenances.

3.7.1 Backfill Material:

All backfill material shall be free from cinders, ashes, refuse, vegetable, or organic material, boulders, rocks, or stones, frozen soil, or other material that in the opinion of the Engineer or the Rogers Water Utility is unsuitable.

3.7.2 Pipe Protection Cover

After embedment and crushed stone has been placed to the required depth and compaction as required above, the Pipe Protection Cover (as defined in 3.1.2) shall be placed to a depth of 6 inches above the pipe. All pipelines, regardless of material, shall have at least 6 inches of pipe protection cover.

3.7.3 Backfilling of Ductile Iron Pipe

After the pipe protection cover has been placed, the trench, excavated areas around manholes, valves, fittings, fire hydrants, and other appurtenances shall be backfilled with excavated material free from rock larger than 8 inches.

3.7.4 Backfilling of Polyvinyl Chloride (PVC) Pipe

After the pipe protection cover has been placed, the trench, excavated areas around manholes, fittings, and other appurtenances shall be backfilled with excavated material free from rock larger than three inches; however, place no rock or stones having a dimension larger than 6 inches within (3) feet of the top of the pipe.

3.7.5 Backfilling of Sanitary Sewer Service Lines

The backfilling of sanitary sewer service lines in the street right of way and/or easement shall meet the requirements set forth above for the pipe material.

3.7.6 Backfilling of Potable Water Service Lines

Initial backfill of Copper Tubing shall consist of a minimum of 6 inches of Class 7 material over the top of the pipeline. The remainder of the trench shall be backfilled with materials as defined in Section 3.7.1, Backfill Material.

Where the water service line trench is under existing or proposed paved areas or public streets of the City of Rogers, the trench shall be backfilled according to Section 3.1.

SECTION 4 - PIPE LAYING

4.1 Description

This section covers the laying of pipe for potable water lines, sanitary sewer lines, and sanitary sewage force mains. All material 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, spigots centered in bells, and all valve and hydrant stems plumb.

4.2.2 Installing Ductile Iron Pipe

Ductile iron pipe and ductile iron pipe fittings shall be installed in accordance with AWWA C 600-82, or latest revision, (Installation of Ductile Iron Water Mains and Their Appurtenances.)

4.3 Water Pipe and Force Main Laying

All pipe and fittings shall be installed to the line and grade as detailed on the plans. Subject to the approval of the Utility, 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 laying, care shall be taken to keep dirt out of the jointing space. At the end of each days 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 reasons, the degree of deflection at 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.

4.4 Gravity Sewer Lines

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 pipe 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 beam grade light. Care shall be taken that each spigot is centered properly in the bell or the proceeding pipe and properly seated, and that 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 that 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 sections 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.

4.5 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:

(a) Not over 36 feet center to center on grades 20 percent and up to 35 percent;
(b) Not over 24 feet center to center on grades 35 percent and up to 50 percent;

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

4.6 Connections to Existing Lines:

No connection to existing sewer lines will be made until the newly constructed facilities meet with all required standards on construction, pass all required tests, and are approved by the Department for connection.

4.7 Potable Water Service Lines:

Copper Tubing shall be installed with a minimum earth cover of 30 inches over the top of the pipeline.

SECTION 5 - PIPE JOINTS

5.1 Description

This section covers the installation of pipe joints. Joint materials shall be as specified in PART II.

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 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 as are 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.

5.4 Installation of Mechanical Joints

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 gland shall also 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.

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 therefrom 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 follows:

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 sanitary sewer lines.

6.2 Pipe Fittings Installation

All pipe fittings shall be installed in strict accordance with the manufacturers 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 SECTION II-Materials.

6.3 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.

6.3.1 Examination of Material

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

6.3.2 Placement

All hydrants shall stand plumb and shall have their nozzles parallel with, or at right angles to, the street with the pumper nozzle facing the curb. Hydrants shall be set to established grade with the pumper nozzle centerline at least 18 inches above the final grade, unless otherwise directed by the Rogers Water Utilities.

6.3.3 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 the 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.

6.3.4 Connection to Mains

Each hydrant shall be connected to the main with a 6 inch ductile iron pipe branch and independent (6) inch gate valve as shown on the Standard Detail of these specifications.

6.3.5 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.

6.3.6 Thrust Blocking for Hydrants

The bowl of each hydrant shall be braced against unexcavated earth at the end of the trench with 3000 psi concrete as shown on the Standard Detail sheet. The pipe, hydrants, and fittings shall be wrapped in visqueen to prevent permanent bonding to the concrete.

6.4 Thrust Blocking for 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 on the Standard Detail Sheet. Retainer glands may be required, as determined by the Rogers Water Utilities. See Appendix for detailed drawing.

6.5 Retainer Glands

Retainer glands or other necessary means of thrust restraint shall be installed at designated locations where, in the opinion of the Rogers Water Utilities, they are needed.

6.6 Location of Valves

Valves in water mains shall be located as shown on the plans and valve boxes shall be set to finished grade.

6.7 Valve Boxes

A 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 other level as may be directed. Valve boxes shall be installed as shown on the detail sheets of these specifications.

6.8 Valve Box Collar

All valve box lids outside of paved areas shall have a 2 foot square concrete collar placed around them. After the valve box lid has been adjusted to final 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 the surrounding ground. Valve box collars shall not be constructed until every item of cleanup has been completed and the soil has 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 assembly's are not allowed as a means of flushing at the end of dead end lines unless approved by the Manger. Fire hydrants meeting the requirements of Part II Section 7 will be required in all cases unless otherwise approved by the Manager.

6.10 Sewer Wye Connections

Wye connections placed in sanitary sewer lines for services shall be installed in accordance with the manufacturer's recommendations and as approved by the Utility. Installation of wye branches shall be as indicated on the Standard Detail Sheet.

SECTION 7 - MANHOLES

7.1 Description:

This section covers the construction methods for manholes, drop manholes, and watertight manholes.

7.2 Excavation and Backfill

7.2.1 Excavation

Excavation for manholes shall be of such dimension and depth as to allow the construction of the manhole as shown on the Standard Detail Sheet. 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.

7.2.2 Base:

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

7.2.3 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 the Utility. Manholes must be vacuum tested prior to backfilling.

7.3 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 1/2 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 flowline 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 (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 T/V-grout seal equipment.

Additional smoothing of manhole inverts may be necessary. 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.

7.4 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 midspringline with concrete. A water stop sleeve or collar shall be used on all pipes entering manhole walls.

7.5 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 (4) feet plus or minus (1/2) inch. Other than shallow manholes, (i.e., manholes less than 4 feet in depth), the top section or cone shall be concentric.

7.6 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 barrel for the installation of pipes which are to enter the manhole at points other than adjacent to 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 the Rogers Water Utilities.

7.7 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 keyway shall be formed in the top of the manhole outside of where the manhole ring will rest.

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 and covers shall be level except in public rights of way where the top shall be set flush with pavement, sidewalks, or other surface area.

7.8 Drop Manholes:

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 on the Standard Detail Sheet.

7.9 S**ealed 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 cover as shown on the Standard Detail Sheet.

7.10 Manhole Details:

All manholes shall be constructed in accordance with the standard manhole details in the Appendix.

7.11 Connection to Existing Manholes:

7.11.1 Connection cannot be made before sewer lines have been completed, cleaned, tested, inspected, and approved.

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 the Rogers Water Utilities unless approved by the Utility.

7.11.2 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.

7.11.3 Connection to the existing manhole shall be made using a circular diamond tip cutter.

Connection to the existing manhole shall be made using a circular diamond tip cutter. 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 the Utility.

7.12 Watertightness:

All manholes constructed shall be watertight and show no visible evidence of infiltration or leakage. Manholes shall be tested in accordance with this specification and any manhole that is not watertight will not be accepted by the Rogers Water Utilities.

SECTION 8 - CONCRETE AND REINFORCING STEEL

8.1 Description:

This section covers the construction methods for concrete an reinforcing steel. All material shall conform to the requirements of Part II Section 12 - Concrete and Reinforcing Steel.

8.2 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 D 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 with a copy for the inspector showing the concrete type, mixing proportions, and time mixing began.

8.3 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.

8.4 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 the concrete shall be the minimum that is practical. When vibration is used to consolidate the concrete, the slump shall not exceed 4".

8.5 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 the Rogers Water Utilities.

SECTION 9 - PAVEMENT REPAIRS

9.1 Description:

This section covers the construction methods to be used in the repair of roads, streets, or other public rights-of-way.

9.2 Permanent Repair:

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. See Standard Detail in the Appendix.

9.3 Temporary Surfacing:

Methods of temporary surfacing shall meet with the requirements of Paragraph 9.2 or as otherwise approved to adequately maintain traffic and proper drainage, as directed by the Engineer and approved by the Rogers Water Utilities.

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 Horizontal Separation:

Sewers, manholes, wet wells, etc, shall be laid at least 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 the Rogers Water Utilities.

10.3 Crossings

Sewers crossing water mains 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. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses a sewer, adequate structural support shall be provided for the sewer and/or water line, or both, as determined by Rogers Water Utilities to prevent damage to the water main.

PART IV - TESTING

SECTION 1 - DESCRIPTION

1.1 General:

This part of the specifications outlines test requirements for materials, construction methods, and leakage tests for newly constructed water and/or sewer mains and their appurtenances. Testing for materials and construction methods shall be at the Developer's expense. The Rogers Water Utilities has the authority to require any test outlined in these specifications if in the opinion of the Utilities they are needed to demonstrate that the quality of materials and construction procedures meet the requirements of these specifications.

In all cases, pressure lines shall be tested hydrostatically, gravity sewer lines shall be air tested, manholes shall be tested, and PVC gravity sewer lines shall be mandrel tested. All tests shall be made in the presence of the Engineer and a representative of the Rogers Water Utilities. All required tests must be successfully passed before new utilities are accepted by the Department.

If, for any reason, the quality of workmanship becomes questionable in the construction of sewer lines, the Utility may at the Developer's expense, inspect all questionable lines with a TV inspection unit. Based on the results found, the Developer shall be required to correct all deficiencies as directed by the Rogers Water Utilities.

SECTION 2- BACKFILL DENSITY TESTS

2.1 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.

2.2 Requirements:

Backfill density requirements are specified in PART III - CONSTRUCTION PROCEDURES of these specifications.

2.3 Methods of Testing:

2.3.1 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.

2.3.2 Field Density:

Field density of backfill shall be determined in accordance with ASTM Designation D 2922 - 78.

SECTION 3 - WATER MAIN AND FORCE MAIN TESTING

3.1 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 watertightness. All pressure pipeline shall be tested in accordance with Section 4 of AWWA C600-82 and as specified herein.

3.2 Hydrostatic Testing:

3.2.1 Pressure Test:

After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing and not less than 150 p.s.i. The minimum duration of the pressure test will be two hours.

3.2.2 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 section 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 section over a period of time.

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

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).

3.3 Visible Leakage:

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

3.4 Acceptance of Installation:

If any test of pipe laid discloses leakage greater than that specified in 3.2, the Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance.

SECTION 4 - DISINFECTION OF POTABLE WATER LINES

4.1 General:

All newly installed water mains shall be disinfected in accordance with ANSI/AWWA C601-81, Section 5.2 (Continuous Feed Method), and as specified herein.

4.2 Methods:

All pipes are to be disinfected after laying 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.

4.2.1 Discharge highly chlorinated water

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

4.3 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 1 ppm.

4.4 Sampling:

Bacteriological samples shall then be collected from each respective section of the new main on two consecutive days and shall be submitted to the Arkansas Department of Health for analysis. The samples shall be collected by the contractor and the results shall be copied to the Utilities.

The lines shall not be placed in service until the results of two consecutive daily samples showing negative reports for coliform bacterial (safe) are received by the Engineer or Contractor and are submitted to the Rogers Water Utilities.

SECTION 5 - AIR TESTING OF GRAVITY SEWERS

5.1 General:

All gravity sanitary sewer main extensions shall be air tested as required by the Rogers Water Utilities for watertightness by low pressure air loss as described herein.

5.2 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. When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi, start the test.

6. Determine the time in seconds with a stopwatch 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 Appendix.

5.3 Safety Precautions:

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 safety 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 at the top of the ground.

(3) Install and brace all plugs securely.

(4) Do not over pressurize the lines.

5.4 Observation:

All gravity sewer lines must pass the air test before being accepted by the Rogers Water Utilities. No air test results will be accepted unless a representative of the Utility is present during the test.

5.5 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 0.25 psi. The gauge shall be of sufficient size in order to determine this accuracy.

SECTION 6 - PVC PIPE DEFLECTION TESTING

6.1 General:

All PVC sewer lines shall be mandrel tested in accordance with these specifications prior to acceptance by the Rogers Water Utilities.

6.2 Allowable Deflection:

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

6.3 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 less 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.

6.4 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 sections 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 the Rogers Water Utilities. Any repaired section shall be re-tested.

6.5 Mandrel O.D. (outside diameter):

The outside diameter of the mandrel shall be set according to the following table:

6.6 Contractor's Warranty:

The Rogers Water Utilities reserves the right to 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 7 - MANHOLE TESTING

7.1 General:

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

7.2 Manhole Vacuum Testing:

The contractor shall demonstrate at his expense the watertightness of all manholes, at the direction of the engineer, by a vacuum test, performed by the contractor and witnessed by Rogers Water Utilities personnel. 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.

SECTION 8 - CONCRETE TESTING

8.1 Description:

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

8.2 General:

If in the opinion of Rogers Water Utilities the concrete furnished in the field warrants concrete testing to demonstrate its quality and strength, the cost of all testing to demonstrate such shall be borne by the Contractor. The testing laboratory shall be one recommended by the Contractor and approved by the Engineer. Testing will be performed generally as outlined below in Section 8.3:

8.3 Testing:

1.) Composite samples shall be saved in accordance with ASTM C172-71 (Re-approved 1977), (Standard Method of Sampling Fresh Concrete).

2.) Mold and laboratory cure three specimens from each test required in accordance with ANSI/ASTM C31-69 (Re-approved 1975), (Standard Method of Making and Curing Concrete Test Specimens in the Field).

3.) Test the specimens in accordance with ANSI/ASTM C39-72 (Re-approved 1979), (Standard Test Method for Compressive Strength of Concrete Specimens). Two specimens shall be tested at 28 days for acceptance and one specimen shall be tested at 7 days for information.

4.) The slump of the normal-weight concrete sample for each strength test shall be determined in accordance with ANSI/ASTM C143-78, (Standard Test Method for Slump of Portland Cement Concrete).

8.4 Acceptance:

Should the test cylinders fail, 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.

8.5 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 Rogers Water Utilities will be borne by the Contractor. The Engineer shall furnish the Rogers Water Utilities copies of any and all concrete testing performed by the Engineer or his representative during the course of the work.

PART V - 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 (gardens 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 Cleanup - Unless otherwise noted under paragraph 1.4 below, no special cleanup will be required.

1.2 Method 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 l 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 0.15 pounds per 100 square feet, using the following seed mixture (percent expressed in terms of weight).

Lawn Fescue	50%
Rye Grass (annual)	40%
White Clover (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 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.

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.

Photographs "before and after" as specified elsewhere in these Specifications 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 posts, trees, mailboxes, etc. All areas which have been disturbed, such as that caused by equipment tracks, shall be carefully backfilled and repaired as though 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 complete, all areas shall be covered with 10-20-10 fertilizer at the rate of 250 pounds per acte, 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 in sufficient 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 damaged 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 not other private utilities in the areas of construction.

1.2.5. All Areas.

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

Materials. 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 surface removal.

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

1.3.1. Sod.

Sod shall consist of a densely rooted growth of Bermuda grass, Zoysia, etc. substantially free from noxious weeds and undesirable grasses. The sod shall be cut in uniform strips with a minimum of 2 inches of root depth approximately 12 inches in width and not less than 12 inches in length but not longer than can be conveniently handled and transported.

1.3.2. 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-phosphorus-potash). Fertilizer shall be applied to areas seeded at a rate of 290 pounds per acre or 0.15 pounds per 100 square feet.

1.3.3 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.

1.3.4. Water.

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

1.3.5. Execution.

Sodding shall be installed by the Contractor as required on the plans.
The area 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 uncompacted 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 laid 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 recompacted 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.

PART VI - CROSSINGS AND MISCELLANEOUS

SECTION 1 - ARKANSAS STATE HIGHWAY CROSSINGS

1.1 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 Highway(s).

1.2. Material

1.2.1. Carrier Pipe. The carrier pipe shall be in conformance to that section of the Specifications governing ductile iron sewer lines and/or ductile iron force mains.

1.2.2. Casing Pipe. Unless otherwise shown on the Plans, casing pipe shall be welded or seamless steel pipe having a wall thickness as shown on the Plans and a minimum yield strength of 35,000 pounds per square inch.

1.3 Construction

The Plans show the location of highway crossings to be made. The crossings shall be accomplished by boring and inserting a casing pipe of the type and thickness, diameter and length as specified or shown on the Plans.

1.3.1. Permit Application.

The Engineer is responsible to prepare any application by the City of Rogers with the Arkansas State Highway and Transportation Department for permits which includes all crossings and construction on ASHTD right of way as shown on the Plans. A copy of the permit issued by the ASHTD will be furnished by the Contractor to the Owner. A copy of the license or permit issued by the ASHTD shall be kept on the job site at all times.

1.3.2. Bond Posted.

The Rogers Water Utilities maintains an acceptable bond with the Arkansas State Highway and Transportation Department.

1.3.3. Location of Utilities.

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

1.3.4. 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.

1.3.5. 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 2.5 feet below the low points of the roadbed cross section (including ditches) or 4.0 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 making the crossings by boring or tunneling have been exhausted, the Engineer will make application to the Arkansas State Highway and Transportation Department to make the installation by the open cut method.

1.3.6. 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 additional cost of deposits or bonds for open cutting shall be borne by the Contractor. Since the return of the deposit required by the ASHTD 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 Highway Department.

1.3.7. Restoration of Property.

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

SECTION 2 - STREET AND COUNTY ROAD CROSSINGS

2.1 GENERAL

This item shall consist of obtaining permits and posting bonds and/or deposits which may be required by the City of Rogers and Benton County, and providing all labor, equipment, tools, supplies and incidentals necessary for the crossing, 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.

2.2 MATERIALS

2.2.1. Pipe Bedding Material.

Pipe bedding material shall be as specified elsewhere in these Specifications.

2.2.2. Crushed Stone Backfill.

Backfill under streets and county roads shall be crushed stone (AHTD Class 7).

2.2.3. Prime Coat.

Prime coat material shall be Grade MC-30 as set forth in Section 403.03, Table II, on page 230 of the 1996 Edition of the Arkansas State Highway and Transportation Commission Standard Specifications.

2.2.4. Asphaltic Concrete Hot-Mixed Surface Course.

The asphaltic concrete hot-mixed surface course shall be Type II as set forth in Section 407, page 249, of the 1996 Edition of the Arkansas State Highway and Transportation Commission Standard Specifications.

2.3. Referenced Materials and Construction

The following specifications are hereby referenced and made a part of these Specifications. These specifications are contained in the "Standard Specifications for Highway Construction," Edition of 1996, published by the Arkansas State Highway and Transportation Commission. The page numbers given below refer to pages in these "Standard Specifications for Highway Construction".

These specifications are available for inspection in the Engineer's office, or may be obtained from the Arkansas State Highway and Transportation Department, Little Rock, Arkansas, and are set out below:

Bituminous Pavement
Prime and Tack Coats, Section 401 217-221

Materials and Equipment for Bituminous
Surface Courses, Section 403 227-234

Asphaltic Concrete Hot-Mix Surface
Course, Section 407 248-251

Materials and Equipment for Hot-Mix Bituminous Binder and Surface Courses,
Section 408..... 251-256

Construction Methods for Hot-Mix Bituminous Binder and Surface Courses,
Section 410..... 269-284

2.4. Execution

The Contractor shall obtain required permits, and post required bonds and/or deposits with the permitting entity. Street crossings in the City of Rogers shall be performed in accord with City of Rogers Code of Ordinances.

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 piles, 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 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.

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

Crushed stone base (Class 7) shall be placed and compacted to 95 percent of modified Proctor density (ASTM D1557-78), as shown on the Plans detail.

All asphaltic surfaces shall be replaced with asphaltic concrete hot-mixed surface course. Asphaltic concrete hot-mixed surface course, Type II, shall be constructed as specified herein.

All Portland cement surfaces shall be replaced with Portland cement concrete. Portland cement concrete surfacing shall be constructed as specified elsewhere in these Specifications.

All unpaved driving surfaces shall be replaced with crushed stone base SB-2 as specified elsewhere in these Specifications, as shown on the Plans detail.

All street and county road rights-of-way disturbed by construction of these wastewater and water facilities shall be restored to its original or equivalent condition as required by the permitting entity.

SECTION 3 - CREEK CROSSINGS

3.1 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 of sewers, force mains and water lines crossing creeks as shown on the Plans.

3.2 Permit Application

Applications for a Corps of Engineers Section 404 permit may be 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.

3.3 Materials

3.3.1. Restrained Joint Pipe. Restrained joint pipe shall be as specified by the Engineer.

3.3.2 Concrete.

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

3.4. Construction

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

3.4.1 General.

The creek crossings shall generally consist of excavating the trench to a depth of 7 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.

3.4.2. Excavation.

The pipe shall be laid with 5 feet of 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.

3.4.3. Placement of the Pipe.

Mechanical Potential 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.

3.4.4. Backfilling the Trench.

After the pipe is placed, the pipe, except for 2 feet either side of joints, shall be encased in concrete as shown on the Plans detail. Concrete encasement may be placed under water. The backfill shall be as specified elsewhere in these Specifications.

SECTION 4 - MISCELLANEOUS PAVED SURFACE REPAIR

4.1 General

The work to be include 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.

4.2 Materials

4.2.1. Prime Coat.

Prime coat material shall be Grade MC-30 as set forth in Section 403, on page 229 of the 1996 Edition of the Arkansas State Highway Department Standard Specifications.

4.2.2. Tack Coat.

Tack coat material shall be Grade SS-1, as set forth in Section 401.02, Table III, on page 217 of the 1996 Edition of the Arkansas State Highway Department Standard Specifications.

4.2.3. 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 under Section 408, page 253, of the 1996 Edition of the Arkansas State Highway Department Standard Specifications, using asphalt cement viscosity grade AC-30.

4.2.4. Concrete.

Concrete shall be as specified elsewhere in these Specifications.

4.2.5. 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.

4.2.6. Curb and Gutter Joint Sealer.

Curb and gutter joint sealer shall be either Type 1, Type 2, or Type 3 in accordance with Section 501 of the 1996 Edition of the Arkansas State Highway Department Standard Specifications.

4.3 Materials and Construction

The following specifications are hereby referenced and made a part of these Specifications. These specifications are contained in the "Standard Specifications for Highway Construction", Edition of 1996, published by the Arkansas State Highway and Transportation Commission. The page numbers given below refer to pages in these "Standard Specifications for Highway Construction".

These Specifications are available for inspection in the Engineer's office, or may be obtained from the Arkansas State Highway Department, Little Rock, Arkansas, and are set out below.

Bituminous Pavement Pages

Prime and Tack Coats, Section 401 217-221

Materials and Equipment for Bituminous
Surface Courses, Section 403 227-234

Asphaltic Concrete Hot-Mix Surface
Course, Section 407 248-251
Materials and Equipment for Hot-Mix Bituminous Binder and Surface Courses,
Section 408..... 251-256

Construction Methods for Hot-Mix Bituminous Binder and Surface Courses,
Section 410..... 269-284

4.4 Construction

4.4.1. 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.

4.4.2. Asphaltic Pavement Repair.
After the trench has been backfilled and compacted, as specified elsewhere in these Specification, 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 gallons/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 recompacted and re-tested at the Contractor's expense.

4.4.3. 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 Class 7 crushed stone base.

4.4.4. 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.

4.4.5. 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.

4.4.6. 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.

4.4.7. 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.

4.4.8 Cleanup.

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

SECTION 5 - DUMPED STONE RIPRAP

5.1 General

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

5.2. Materials

5.2.1. 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 1/2 inch sieve accumulated from quarrying or loading operations shall not exceed five percent of the total weight.

5.2.2. Filter Blanket.

Filter blanket shall be class 7 crush stone base as specified elsewhere in these Specifications.

5.3. Execution

5.3.1. Subgrade.

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

5.3.2. 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 subgrade

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.

5.3.3. Dumped Stone Riprap.

This item 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 surfaced 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 rip-rap 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. The area shall be cleaned up and seeded as specified elsewhere in these Specifications for pipeline cleanup and seeding.

5.3.4. 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 6 - FARM TYPE FENCE

6.1 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 of farm type fence. The work shall include every item of construction necessary for a complete and acceptable installation as shown on the Plans and hereinafter specified.

6.2 Materials and Construction

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

6.2.1. Posts.

All corner and brace post assemblies shall be 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 posts shall be metal "T" posts.

a. End, Corner, Brace Assembly and Gate Posts. Posts shall be 6 inches minimum diameter, 7 feet in length, creosoted or penta treated Grade A southern yellow pine. Cross brace post shall be 4 inches minimum diameter.

b. Line Posts. 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 by the same manufacturer.

6.2.2. Wire.

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

a. 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 RR-F-221, Type A.

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

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

6.2.3. 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 be 3/4 inch diameter, Schedule 40 black pipe with vertical braces of 3/15 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 as selected by the Rogers Water Utilities or his 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 the Rogers Water Utilities.

6.2.4. Concrete.

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