113 West Mountain Street
Fayetteville, AR 72701
(479) 575-8323

Ordinance: 6148

File Number: 2018-0777

AMEND THE STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES:

AN ORDINANCE TO AMEND THE *STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2017 EDITION* AS ORIGINALLY ADOPTED IN § 173.12 **STANDARD SPECIFICATIONS FOR WATER AND SEWER LINES** IN CHAPTER 173 **BUILDING REGULATIONS** OF THE UNIFIED DEVELOPMENT CODE AND TO MOVE THE AMENDED REGULATIONS TO CHAPTER 51 **WATER AND SEWERS**

WHEREAS, pursuant to Ark. Code Ann. § 14-55-207, the City may adopt by ordinance technical codes, regulations, or standards without including the full text of the regulations in the City Code; and

WHEREAS, on October 17, 2017, by Ordinance 6003, the Fayetteville City Council adopted the *Standard Specifications for Design and Construction of Water Lines and Sewer Lines, 2017 Edition* which updated a previous version to incorporate changes to the City's regulations recommended by City staff and the Arkansas Department of Health and contained the engineering seal of the City Utilities Engineer, Jim Beavers; and

WHEREAS, upon Mr. Beavers's retirement, which is scheduled for January 31, 2019, his engineering seal will be void and City staff recommends modifying the standard specifications to remove his seal, which will require engineers on future utilities projects to independently review and seal the standard specifications for each new project submitted to the City for review; and

WHEREAS, City Staff also recommends moving the regulations from Chapter 173 **Building Regulations** in the Fayetteville Unified Development Code to Chapter 51 **Water and Sewers** because the regulations pertain more to public works than private development.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FAYETTEVILLE, ARKANSAS:

Section 1: That the City Council of the City of Fayetteville, Arkansas hereby removes the *Standard Specifications for Water and Sewer Lines* from § 173.12 of the Unified Development Code and

recodifies them in Chapter 51, **Water and Sewers** at Article VI - Standard Specifications, § 51.170 **Standard Specifications for Water and Sewer Lines**.

Section 2: That the City Council of the City of Fayetteville, Arkansas hereby amends the *Standard Specifications for Design and Construction of Water Lines and Sewer Lines, 2017 Edition*, as recommended by the Utilities Director and attached to the agenda packet included with this enacting ordinance, by removing the seal of Fayetteville Utilities Engineer Jim Beavers and modifying the language in subsections 1.02 *Requirements* and 2.01 *Engineering Seal and Certification* of Section 0001 **Certification and Statement**, and the language in subsection 1.01 *General* of Section 1000 **General Requirements** to remove all references to the sealing of the standard specifications by any City of Fayetteville engineer.

PASSED and APPROVED on 2/5/2019

Approved:

Lioneld Jordan, Mayor

Attest:

Lisa Branson, Deputy City Clerk

CITY CLERK / TREASURER CITY OF FAYETTEVILLE ARKANSAS WASHINGTON COUNTY

STANDARD SPECIFICATIONS
FOR DESIGN AND CONSTRUCTION
OF WATER LINES AND SEWER LINES

CITY OF
FAYETTEVILLE
ARKANSAS

2017 EDITION

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STANDARD SPECIFICATIONS
FOR DESIGN AND CONSTRUCTION
OF WATER LINES AND SEWER LINES

2017 EDITION

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2017 EDITION

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SECTION 0001 CERTIFICATION AND STATEMENT

1.01 INTENT

A. The intent of this publication is to simplify and expedite the process of water and sewer design and construction within the jurisdiction of the City of Fayetteville.

B. As requested by the Utilities Director, additional provisions are added including:

Increased flexibility in minimum water line sizing,
Increased acknowledgement of cost-share opportunities,
Unless specified otherwise, all materials will be 100% USA Domestic.

1.02 REQUIREMENTS

All rules, regulations and requirements of the Arkansas Department of Health (ADH) are the minimum standard of all plan requirements and construction and development practices to be approved by the City of Fayetteville. In such case as the Standard Specifications herein set forth exceeds the Arkansas Department of Health requirements, then this Standard Specification as approved by the City Council Fayetteville, Arkansas govern.

The Utilities Director and/or the City Engineer are responsible to the extent possible as a function of their supervisory position within the City to require compliance with the Arkansas State Board of Health, Department of Health Center for Local Public Health Environmental Health Branch, Engineering Section, Rules and Regulations Pertaining to Public Water Systems, latest edition, aka "Rules and Regulations Pertaining to Public Water Systems".

All rules, regulations and requirements of the Arkansas Board of Licensure For Professional Engineers and Professional Surveyors shall be the minimum standard for professional surveying and for professional engineering.

Standard construction details prepared by the City of Fayetteville Engineering Division are available from the City Engineer. In the case of a conflict between the Standard construction details prepared by the City of Fayetteville Engineering Division and the text of these Standard Specifications, then the text of these Standard Specifications govern unless an exception or variance is otherwise granted.

Nothing within this Standard Specification is intended to, or can, replace any latest edition minimum requirement by City Ordinance or Arkansas State Rules, Law or Regulations or any Federal Law or Regulation.

The Engineer of Record is responsible for their design and compliance with City of Fayetteville Specifications, ADH minimum standards and State of Arkansas Rules, Regulations and Laws and any Federal Law, Rule or Regulation.

These Specifications do not replace the Engineer of Record's specifications and contract documents, however these specifications set forth the minimum requirements for design and construction of all

water and sanitary sewer within the jurisdiction of the City of Fayetteville.

These Specifications shall not be copied, reproduced or physically included within any private or public project documents without the prior written consent of the City of Fayetteville.

The City of Fayetteville, and the City of Fayetteville Utilities Engineer, accept no liability arising from any use or reuse of these specifications.

1.03 CITY STANDARDS

The basis for the STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2017 Edition is as follows:

A. Previous editions of City of Fayetteville water and/or sewer standards.

   The following previous editions of Water and Sanitary Sewer minimum standards were found in the files and utilized in the current edition.

   1. City of Fayetteville 1994 Minimum Requirements for Water, Sewer, Streets, Drainage and Inspection by Donald Bunn, P.E., City Engineer.

   2. City of Fayetteville Water and Sewer standards 1995 by Donald Bunn, P.E., City Engineer.

   3. City of Fayetteville 1996 Standard Water Line Specifications 1996 Donald Bunn, P.E., City Engineer, as further approved by the City's Water and Sewer Committee and the City Council by Resolution 46-96 on April 2, 1996.

   4. STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2012 Edition

   As prepared by the Utilities Division and approved by the City of Fayetteville Water and Sewer Committee on December 12, 2012 and as approved by the Arkansas Department of Health on November 29, 2012.

B. Other published City Standard Specifications utilized in our region, with specific acknowledgement to the City of Bentonville.

C. Meetings and review with City of Fayetteville Engineering Division staff, the Utilities Director, the Utitlies Operation Manager, and the Utilities Field Supervisors.

D. Public review available at the City of Fayetteville website, at the City of Fayetteville Water and Sewer Committee meetings, and at the City of Fayetteville City Council meeting.

E. Review and Approval by the Arkansas Department of Health.

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END OF SECTION 0001

SECTION 1000 GENERAL REQUIREMENTS

1.01 GENERAL

A. The intent of this publication is to simplify and expedite the process of water and sewer design and construction with the jurisdiction of the City of Fayetteville.

All rules, regulations and requirements of the Arkansas Department of Health (ADH) are the minimum standard of all plan requirements and construction and development practices to be approved by the City of Fayetteville. In such case as the Standard Specifications herein set forth exceeds the Arkansas Department of Health requirements, then this Standard Specification as approved by the City Council Fayetteville, Arkansas govern.

Additionally, this Standard Specification includes the requirement that the minimum standards of design and construction specified herein, that directly affects health and safety, must further comply with the recommendations of both (1) the 10 States Standards (GLUMRB) and (2) the American Water Works Association (AWWA). Any conflict that directly affects health and safety between these Standard Specifications and the recommendations from the 10 States Standards, or the recommendations from AWWA, must be resolved to provide the greatest protection of health and safety.

Incorporation by reference: The Arkansas State Board of Health, Department of Health Center for Local Public Health Environmental Health Branch, Engineering Section, Rules and Regulations Pertaining to Public Water Systems, lasted edition, aka "Rules and Regulations Pertaining to Public Water Systems"; and the National Primary Drinking water Regulations found in 40 CFR Parts 141, 142 and 143 are incorporated by reference into this Standard Specification.

All rules, regulations and requirements of the Arkansas Board of Licensure For Professional Engineers and Professional Surveyors shall be the minimum standard for professional surveying and for professional engineering.

Special conditions may arise on projects that are not covered in these Specifications. Such special conditions must be submitted to the City Engineer or Utilities Division for review and approval.

Standard construction details prepared by the City of Fayetteville Engineering Division are available from the City Engineer. In the case of a conflict between the Standard construction details prepared by the City of Fayetteville Engineering Division and the text of these Standard Specifications, then the text of these Standard Specifications govern unless an exception or variance is granted.

B. This Standard Specification applies to all water and sewer design and construction within the jurisdiction of the City of Fayetteville and as follows:

This publication specifically applies, but is not limited to "Subdivision", "Large Scale Development" and other development as defined by City ordinances.

This publication provides the minimum standards to be utilized by the Engineer of Record in producing project specific specifications for a Capital Project (a.k.a. Capital Improvement Program/Project or CIP). The Engineer of Record for a Capital Project shall not copy these Standard Specifications. The Engineer of Record for a Capital Project shall prepare and provide project specific technical specifications.

Maintenance performed by City forces "in-house" shall utilize these specifications under the direction of the Utilities Director.

The Utilities Director and/or the City Engineer are responsible to the extent possible as a function of their supervisory position within the City to require compliance with the Arkansas State Board of Health, Department of Health Center for Local Public Health Environmental Health Branch, Engineering Section, Rules and Regulations Pertaining to Public Water Systems, lasted edition, aka "Rules and Regulations Pertaining to Public Water Systems".

Nothing within this Specifications is intended to, or can, replace any minimum requirement by City Ordinance or State Law.

C. The Engineer of Record is responsible for their design and compliance with latest edition City of Fayetteville Ordinances and Specifications, ADH minimum Standards and State of Arkansas Rules, Regulations and Laws, or any Federal Law, Rule or Regulation.

These Specifications do not replace the Engineer of Record's specifications and contract documents, however these specifications set forth the minimum requirements for design and construction of all water and sanitary sewer within the jurisdiction of the City of Fayetteville. These specifications may be included by reference only in the Engineer of Record's documents.

D. The Engineer of Record for public, private and City-forces "in-house" projects designed and constructed under the requirements of these Specifications, shall provide to the Utilities engineer and copy to the City Engineer a sealed (PE) letter report stating that the design and construction of the water and/or sewer improvements met the minimum requirements of these Specifications. This sealed letter report will also contain documentation of any special conditions or additions to these Specifications for the specific project.

E. These specifications shall not be copied, reproduced or physically included within any private or public project documents without the prior written consent of the City of Fayetteville.

The City, and the Utilities Engineer (aka Utilities Technical & Design Team Leader), accept no liability arising from any use or reuse of these specifications.

F. Comprehensive construction observation services shall be provided by, or under the direction of, the Engineer of Record.

G. The City Engineer's office is responsible for the issuance of construction permits for the installation of water and sewer facilities constructed in the City of Fayetteville as required by the City of Fayetteville Unified Development Code. The City's Utilities Engineer is responsible to assist the City Engineer's office as directed by the Utilities Director.

The City's Utilities Engineer is responsible for review and recommendations, or assisting the City Engineer with review and recommendations, of the City's Capital Improvement Projects requiring City Council approval.

All water and/or sewer capital project design, including water and/or sewer included in other capital projects such as roadway improvements, designed by consultant or by City engineers, will be reviewed and approved by the Utilities Director or the Utilities Engineer as appropriate.

H. The City of Fayetteville is not responsible, nor bears any liability for the Contractor's means, methods, techniques, sequences procedures of construction or the safety precautions and programs incident thereto in performing or furnishing any of the work.

I. Maintenance Bond: Once the City accepts the project for ownership, the Owner shall be responsible for the provision to the City of a two (2) year maintenance bond for 25 percent of the construction cost of water lines and sewer lines, which shall cover defects in materials and workmanship. A walk-through shall be performed at the end of the two year period and all deficiencies corrected prior to release of the bond. City maintenance shall begin after release of the Two (2) year Maintenance Bond.

J. Change's or addendums to this ~~sealed~~ document shall require formal approvals and ~~sealed~~ addendums in compliance with professional standards of practice and Arkansas Professional Engineering rules and regulations.

K. Administration, Appeals, Variances and Exceptions:

Administration, Appeals and Variances are defined in Chapters 152, 155 and 156 of the City of Fayetteville Unified Development Code and as follows:

When the Utilities Director and/or the City Engineer determines that application of the standards within this Standard Specification would cause undue hardship, or unnecessary practical problems for a specific project, then an exception or variance to this Standard Specification may be reviewed on a case by case basis and may be granted by the Utilities Director and/or City Engineer. An exception or variance that is granted may be conditioned by requiring other standards to safeguard the purposes of this Standard Specification.

No exception or variance can violate minimum Arkansas Health Department requirements, or the Arkansas Board of Licensure for Professional Engineers and Professional Surveyors Board Laws and Rules, City Ordinances or State or Federal Law.

Requests that are Professional Engineering shall be submitted by and reviewed by a licensed Professional Engineer.

Such exception or variance request will be approved or denied by written communication by the Utilities Director and/or City Engineer as appropriate to existing regulations.

If an exception or variance is granted then a copy of the exception or variance must be provided by the Engineer of Record to the Arkansas Department of Health.

L. Questions and comments concerning theses Specifications should be directed to the Utilities Director, 113 W. Mountain St., Fayetteville, Arkansas, 72701 (479) 575-8386.

1.02 DEFINITIONS

A. City – The City of Fayetteville. Throughout this document, the name City of Fayetteville applies for all entities in the City of Fayetteville water and/or sewer service and jurisdiction areas.

B. City of Fayetteville Utilities Department –The Utilities Department is comprised of 4 major divisions with a common goal of providing vital city services to the citizens of Fayetteville:

Utilities Management and Capital Projects
Wastewater Treatment
Water and Sewer Operations Division
Water & Sewer Service Set Up & Billing

C. City of Fayetteville Engineering Division - The Engineering Division:

Provides design and project management for city infrastructure projects.
Reviews development proposals for compliance with city criteria such as water, sewer, streets, drainage, grading and other technical requirements.
Manages the planning, design, and permitting of trails projects and oversees construction of trails by the Transportation Division or private contractors.
Assists in the acquisition and sale of city property, right of way, easements, etc.
Manages miscellaneous stormwater and water quality initiatives.
Is responsible for ensuring compliance with
- The City's NPDES Stormwater Permit issued through the Arkansas Department of Environmental Quality.
- The City's floodplain regulations.

D. Engineer, and/or Engineer of Record – A qualified Professional Engineer licensed in the State of Arkansas, for the Owner, City or Governmental agency.

E. STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2017 Edition – also referred to as "standards" or "minimum standards" or "specifications" or "Standard Specification(s)" within this document.

F. Design – Includes, but is not limited to, all requirements of:

1. Arkansas State Law Title 22 - Public Property Chapter 9 – Public Works Subchapter 1 – General Provisions 22-9-101 -Observation by registered professionals required.

2. Arkansas Board of Licensure for Professional Engineers and Professional Surveyors, Board Laws and Rules Handbook.

3. Arkansas Department of Health requirements, including but not limited to, "Rules and Regulations Pertaining to Public Water Systems" XXI. Submission of Plans and Specifications.

G. Comprehensive construction observation services -

1. Observation and inspection services must comply with Arkansas State Law Title 22 - Public Property Chapter 9 – Public Works Subchapter 1 – General Provisions 22-9-101 - Observation by registered professionals required.

2. As required by the City of Fayetteville. Observation and inspection includes, but is not limited to, periodic visits to construction site to observe the progress and quality of the executed work to determine compliance with approved plans and specifications and the standards or requirements as set forth in the project approval or permit.

If deemed necessary by the City of Fayetteville, the Engineer of Record shall provide qualified full time Resident Inspection during part or all of the executed work for the project.

3. As required by the Arkansas Department of Health.

4. As further defined in this Standard Specification.

H. Owner – Any Individual, partnership, firm, corporation or other entity who, as property owner, is initiating the work.

I. Provide – Furnish and install, complete in place, operating, tested and approved.

J. Products – The materials, systems, and equipment provided by the Contractor.

K. 10 States Standards – The recommended standards and polices prepared by Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMB). Standards include: Recommended Standards for Waterworks and Recommended Standards for Wastewater Facilities, latest editions.

1.03 LAWS, REGULATIONS AND ORDINANCES

A. All Federal, State, County and Municipal Laws, Regulations, or Ordinances shall be complied with on all projects. Where the requirements of another jurisdictional authority having influence on work outside the purview of the City of Fayetteville are greater than that provided by these Specifications, the work shall conform to the greater requirement of that respective jurisdictional authority.

1.04 PERMITS AND LICENSES

A. City of Fayetteville construction permits for Development projects shall be obtained from the City Engineer's Office for the installation of all water and/or sewer facilities in accordance with the City Ordinances, City Engineering standards and these Specifications.

B. All other permits required to accomplish the work shall be the responsibility of the owner or engineer. Such permits may include but are not limited to permits for work within Highway Department R/W, railroad crossing permits, "Notice of Intent" for Erosion Control (Arkansas Department of Environmental Quality). Work shall not be started without the appropriate permit(s) in place.

1.05 DOMESTIC USA MANUFACTURE

A. Domestic United States of America (USA) manufacture.

1. In so much as possible, all material, pipe, fittings, castings, products, concrete, reinforcement and appurtenances must be 100% Domestic United States of America (USA). If a material or product is available as 100% Domestic USA, then that (USA) material or product shall be provided.

2. If a material or product is not available as 100% Domestic USA then the products shall comply with the following:

a. Based upon the experience and history of the City of Fayetteville, certain named product exceptions to the Domestic USA requirement are included within these specifications. These named product exemptions are limited to the specific product(s) or manufacturers named or listed within these Specifications.

i. Where a specific named exception for manufacturer, product, or products are listed within the Specifications without the statement “or approved equal” then that (listed) product, or products, shall be the only product(s) furnished for the specified application.

3. “Approved equal” within the Standard Specifications including the Qualified Products List shall require written approval from the Utilities Director.

B. American Iron and Steel (AIS) requirements.

a. The American Iron and Steel (AIS) requirements of the Consolidated Appropriations Act of 2014 Public Law 113-76 and further requirements including, but not limited to P.L. 113-121, 114-113 and 608 of Title 33 of the United States Code and latest codes/laws as may be provided, are a separate and additional consideration to these Specifications based upon Clean Water and Safe Water SRF Federal and State funding sources.

1.06 PLANS AND SPECIFICATIONS - SUBMITTAL AND APPROVAL

A. Detailed plans and specifications shall be required for all water and/or sewer extensions, facilities or modifications and shall be prepared by a qualified professional engineer registered to do business in the State of Arkansas. These detailed plans and specifications shall be submitted to the City for review and approval.

B. The plans and specifications shall be first approved in writing by the City Engineer or Utilities Engineer as applicable for the project and then shall be forwarded to the Arkansas Department of Health by the Engineer of Record for their (ADH) approval. In no case shall any water or sewer construction be allowed before the City has written approval from the Arkansas Department of Health.

C. The City of Fayetteville must approve all material prior to installation.

D. The Owners of the project are responsible for acquiring and recording all easements and giving all notices necessary and incidental to the work.

E. Private water lines constructed for fire prevention purposes which have no metering device or backflow prevention device at the point of tie-in to the City main shall be treated as a public line and be subject to these Standard Specifications as far as engineering, construction techniques, materials, testing, and inspections are concerned. After a final inspection and acceptance of the work, the line shall be owned and maintained by the owner of the property it serves.

F. For projects which require formal erosion control plans by ordinance or standards, the construction may not begin without an approved erosion control plan on file with the City. Minimum erosion control measures are required for all projects. It is the responsibility of the owner and contractor to comply with the Arkansas Department of Environmental Quality (ADEQ) requirements.

G. A pre-construction conference involving the Engineer of Record, Contractor, and the City is required prior to beginning construction. One full set of construction drawings will be provided to the Water and Sewer Department prior to the pre-construction meeting.

H. Provide legible, professional documents meeting the requirements of Ten States Standards and as follows to City Engineering and/or the Utilities for review and approval.

Design drawings will be 22-inch by 34-inch, or as approved by the City Engineer.

Plans should be drawn to a scale suitable for adequately showing the facilities proposed as stipulated herein. Plans and profiles are requested to be drawn to scale with the profile vertical scale at 1”=5’ and the plan horizontal scale 1”=30” or larger.

All proposed water mains, sewer mains, water meters, water services, sewer services, valves, hydrants, sewer manholes, lift stations and other appurtenances are to be clearly represented on the plans.

Water lines 8 inches in diameter, and all other water lines when requested by the City, shall include plan and profile. All sewer lines shall include plan and profile.

I. Engineering work, including plan and profile sheets, shall be sealed and dated by a Professional Engineer licensed in the State of Arkansas and in compliance with the requirements of the Arkansas Board of Licensure for Professional Engineers.

1.07 EASEMENTS

A. The Owners of the project are responsible for acquiring and recording all easements and giving all notices necessary and incidental to the work.

1.08 UTILITY COORDINATION

A. The plans shall show the location of existing overhead and underground utility lines, existing water and sewer lines and the proposed water and/or sewer improvements according to the best information presented and available.

B. It is the responsibility of the Owner or his authorized representative to coordinate with and get approval from the various UTILITIES, including other Departments of the City. Further, it is the responsibility of the Owner to get authorization to encroach upon any other utilities' easement(s) and secure such recorded encroachment as a requirement for dedication of the water and/or sewer lines and system.

C. It is the responsibility of the owner or his authorized representative to comply with the “Arkansas Underground Facilities Damage Prevention Act”.

1.09 PUBLIC TRAVEL

A. When requested by the City, and project specific, the Engineer will provide a maintenance of traffic plan for City review and approval.

B. The contractor will plan and execute the work to assure minimal interference with normal flow of traffic and pedestrians.

C. The contractor will be reasonable for making provisions for the safe and free passage of persons and vehicles over or around the construction site, both during and after working hours. Such provisions will be satisfactory to the City, County or State authority having jurisdiction within the work area.

D. The contractor will notify and obtain applicable approvals and permits from City, County or State authorities before closing or obstructing any public highway, street, road, trail or sidewalk.

E. The contractor will provide and maintain necessary barricades, signs, lights, roadway trench covering, fencing, personal safety equipment and markers around or at the construction area to avoid any property damage or personal injury. The contractor will provide qualified flagmen to direct traffic while working upon or in a highway, street or road over which traffic must pass.

F. Excavated area within traffic lanes of highways, streets, roads, trails and walks will be backfilled with compacted class 7 aggregate base course immediately following pipe installation and the area opened to traffic. Where indicated or when requested by the City an additional course of asphalt concrete hot or cold mix will be provided as the travel surface. Excavated areas shall be brought to the adjacent/contiguous paved surface elevations and constantly maintained by the contractor.

1.10 MATERIALS SUBMITTALS

A. Submittals for the City's review shall be in PDF format.

B. The Engineer of Record will review and approve the materials submittal(s) prior to submitting to the City of Fayetteville. Legible scanned copies will be provided for review. The City of Fayetteville reserves the right to make corrections as necessary to ensure compliance with these specifications. The Engineer of Record will provide the subsequent City approved material submittal(s) to the contractor.

C. Submit the manufacturer's certificate that the products/materials meets the Specification requirements including material testing requirements.

D. Construction procedures other than those outlined in these specifications shall be submitted for review and approval by the City of Fayetteville.

E. Allow up to of two (2) weeks for material submittal review.

1.11 CONSTRUCTION LAYOUT

A. The layout and staking of the construction work shall be by trained and qualified survey personnel under the supervision of the Engineer. Construction layout shall consist of staking (physical monuments) necessary to determine alignment and elevations to properly construct the proposed facilities. The use of a pipe laser is required for gravity sewer

construction.

1.12 INSPECTION, OBSERVATION AND TESTING

A. Comprehensive construction observation services shall be provided by the Engineer of Record.

B. Only authorized personnel from the City of Fayetteville Water & Sewer Department are permitted to operate valves on the existing water system. Under no circumstance shall the Contractor operate any valve on the existing water system.

C. All field tests required for a project shall be witnessed by the City in the presence of the Engineer of Record or his authorized representative and the Contractor. Water Testing is further defined in Section 5300. The tests required for sewer lines, manholes and service lines are further specified in Section 5200. The tests for pump stations will be determined for each project based upon the final design and Section 3500.

D. The City representative will be determined at, or prior to, the pre-construction meeting.

E. The City requires a 24 hour working day notice on all tests. Calls to the City for the purpose of setting test times shall be made by no later than 10:00 AM for test on the following work day.

F. Tests delayed by weather or other factors will be rescheduled on the same basis. If a test cannot be reasonably scheduled so that a representative of the City can be present, the Engineer of Record will witness the test and certify to the City the results.

G. In no case shall a test be made without the presence of the Engineer of Record's representative and the Contractor. It is the responsibility of the Engineer of Record and/or the Contractor to coordinate the scheduling of tests with the City and with the other parties involved.

H. All equipment, materials, and labor required for testing shall be furnished by the Contractor at his expense.

I. Generally, no Contractor or Engineer of Record involvement is required in the taking of samples for the Bac-T test except that the Contractor is responsible for the proper flushing of the line prior to samples being taken by the City. However, the City may require the presence of the Contractor or Engineer of Record when questions have been raised as to the methodology or techniques used in the sampling process.

J. Bac-T samples are sent to the Arkansas Department of Health for testing. Results are available on-line at the ADH website. Results obtained by the City may be forwarded to the Engineer of Record either by email, fax, or mail upon request of the contractor.

K. Lines failing the Bac-T tests shall be re-sampled as soon as practicable. If a line fails two (2) consecutive Bac-T tests, the line must be re-chlorinated before Bac-T samples can be

taken again. The City shall not be responsible for rescheduling Bac-T tests.

L. The fire hydrant test shall consist of checking the operation of the fire hydrant valve and flowing the fire hydrant. This test will be performed jointly by Contractor and City forces. This test will be done after the pressure test has been completed. The fire hydrant valve shall be left in the open position during the test and after the test is completed.

1.13 "AS-BUILT" or "RECORD DRAWINGS"

Upon completion of the project, the Engineer shall provide to City Engineering for record purposes "as-built" or "record drawings". The minimum requirements include:

A. DATUM REQUIREMENTS

1. Horizontal Datum: NAD83 (1986) Arkansas State Plane, North Zone, US foot (Grid System).
2. Vertical Datum: NAVD88 (feet)

B. TOLERANCES

1. Horizontal: +/- 0.5 feet
2. Vertical: +/- 0.05 feet

C. Water drawings submitted as record ("as-built") drawings shall indicate the location where the water line was installed and have the following items surveyed during/after construction and shown on the drawings:

1. Fire hydrant, location and top operating nut elevation
2. Water valves, location
3. Water fittings, location
4. Water service saddle, location
5. Water service saddles used for testing, location
6. Water meters, location
7. Tapping sleeves, location
8. Any other pipe penetrations, location
9. Steel encasements, location
10. Details shall be provided for all vertical offset water lines, profile drawing

D. Manufacturing data shall be collected for pipe, valves, and hydrants as follows:

1. Pipe
   a. Manufacturer
   b. Material: DI, PVC or other – specify.
   c. Diameter
   d. Production run code or lot code
   e. DR or Thickness class
   f. Pressure class
2. Valves

a. Manufacturer
b. Model number
c. Year manufactured
d. Type (gate, butterfly, ball, etc.)
e. Diameter

3. Hydrants
   a. Manufacturer
   b. Model number
   c. Year manufactured
   d. Depth of bury, including extensions

E. Sanitary sewer drawings submitted as record ("as-built") drawings shall indicate the location where the sewer line was installed and have the following items surveyed during/after construction and shown on the drawings:

1. Manholes, location and rim elevation
2. Pipe material, diameter, and invert elevations
3. Sewer main percent slope (calculated and setting from pipe laser)
4. Lateral connections. Lateral measurements shall be indicated by their distance from the downstream manhole in the form of stationing. Lateral stationing shall begin at 0+00 at each downstream manhole.
5. Location of capped service lines
6. Cleanouts (if installed during construction)
7. Location of fittings, valves, and valve boxes on force mains
8. Location of steel encasements
9. TV video (DVD format) and logs shall be delivered to the City of Fayetteville. Video shall play in a standard DVD player without the need of viewing software.

F. All sheets shall have the phrase "as-built" or "record drawing" boldly printed on them with the as constructed date, and shall be stamped and signed by a professional engineer registered in the State of Arkansas. Record drawings shall be submitted in hard copy, .dwg electronic format, and .pdf electronic format.

1.14 FINAL ACCEPTANCE BY THE CITY

A. The City will be deemed to have accepted water and sewer lines and appurtenances for ownership upon completion of the following.

1. Acceptable physical site Final Inspection by the following:
   a. A representative of the City Engineer's Office
   b. A representative of the Fayetteville Water and Sewer Department
   c. The Engineer of Record
   d. The Contractor

2. Acceptable walk-through by the Meter Foreman for location, grade, and condition of water meter settings
3. Acceptable walk-through by the City representative for all other items of water or sewer

construction.
4. Construction Cost is received by the City and subsequently approved in writing.
5. Record Drawings are received by the City
6. Engineer of Record Certification is received by the City.
7. Contractor furnished statement of estimated water quantity used during construction, testing, flushing and final acceptance, total gallons.
8. The Engineer of Record shall provide to the Utilities engineer and copy to the City engineer a sealed (PE) letter report stating that the design and construction of the water and/or sewer improvements met the minimum requirements of these Specifications including certification that the project was constructed in accordance with the engineering plans and specifications as approved by the Arkansas Department of Health. This sealed letter report will also contain documentation of any special conditions or additions to these Specifications for the specific project.
9. Letter of Final Acceptance is provided by the City to the Engineer.

B. No water meter shall be set until all final acceptance requirements are met and the line is accepted by the City.

C. No sewer shall be utilized until all final acceptance requirements are met and the line is accepted by the City.

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END OF SECTION 1000

SECTION 2001 DESIGN STANDARDS - WATER

PART 1 – GENERAL

1.01 WATER LINE (MAIN) MATERIALS

A. Unless specified or detailed otherwise, materials for water line mains up to and including 12 inch diameter shall be PVC as further specified within these Standard Specifications. Ten (10) inch diameter pipe is not permitted for water mains.

B. Materials for 12 inch water mains will be PVC , except that ductile iron pipe may be required on 12 inch diameter water mains on each side of certain fittings and appurtenances including, but not limited to, 12-inch Butterfly Valves (BFV). This (BFV and pipe) detail shall be provided by the Engineer of Record.

C. Ductile iron pipe (DIP) shall be used for all private fire lines, for 12 inch water mains at certain fittings and vales, for all pipe greater than 12-inches in diameter and as further specified within these Standard Specifications.

D. Unless requested otherwise by the City's designated engineer, all fire hydrant leads shall be of the same pipe material as the attached water main as recommended in AWWA M17 latest edition.

E. All buried iron pipe, valves, and fittings shall be double poly wrapped in accordance with these Standard Specifications.

F. Polyethylene (PE) pressure pipe is not permitted as publically (City) maintained water main or water service lines.

G. Pipe and fittings for nominal pipe diameters/sizes greater than 18-inch are not a Standard Specification. Projects including pipe and fittings for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

H. Any and all work for, on, or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) is not permitted as a Standard Specification. Work for, on or connecting to the City's PCCP will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

I. Generators (backup power) for water pump stations will be designed and evaluated on a case by case basis and are not a Standard Specification.

1.02 REQUIREMENTS TO EXTEND WATER SERVICE

A. Unless approved otherwise by City Council, new developments and/or water extensions to serve existing lots, are required to extend water service to that development at the owner's

expense in accordance with City Ordinance Chapter 51: Water and Sewers. Water lines shall be extended to each property to be served by City of Fayetteville water. Water service shall include providing adequate domestic water flows as well as fire protection with hydrants spaced in accordance with the local and state fire codes.

City Council approved cost share projects, including defined infill projects, may be further considered in accordance with City Council guidance or policy and paragraph 1.05.

B. Water service lines shall extend perpendicular to the water main and extended to the property being served where an appropriately sized water meter will be installed.

C. On subdivision or large scale development water systems, water lines shall be extended through all the development to the property line so that future development(s) can tie on without disrupting the service to or property of any existing customers or owners. Dead end lines shall be avoided whenever possible.

D. All water lines with dead ends shall be installed with an upstream valve, one full joint of ductile iron pipe with a MJ restraining gland, concrete anchor collar, a MJ cap with restraint, and a blow off assembly. The seat of the MJ restraining gland on the ductile iron pipe shall face the valve.

E. Subdivision developments greater than lot splits as defined in UDC Chapter 166: Development will:

a. Connect into the existing water system at a minimum of two locations.

b. Provide water line extensions off of the development property to loop with the existing water distribution system.

The extension and second connection to the water system is required to better maintain water quality and to maintain water service in the event of a water line break in the immediately vicinity. An inline valve shall be installed on the existing water line between the two points of connection if one is not currently installed.

Construction of off-site extensions will be at the expense of the developer, subject to “rough proportionality” as further noted in Chapter 155 of the City of Fayetteville Unified Development Code.

Other developments, including Large Scale Developments, may be required by Planning Commission or City Council to tie to the existing water system at a minimum of two locations and provide off-site water extensions to maintain water quality and maintain water service in the event of a water line break in the immediately vicinity.

F. At other locations easements may be required to facilitate future extension of lines to adjacent properties.

G. The requirements to extend water service and provide lines adequate for both domestic and

fire demands shall apply to all subdivisions regardless of whether they are inside the City Limits or not. Where subdivisions are outside the City Limits, the placement of fire hydrants shall be optional and in no case shall hydrants be installed outside the City unless a) a fire flow of at least 500 gallons per minute can be obtained at the hydrant, and b) the residents being served by the hydrant have a contract for fire protection with the City of Fayetteville and/or with a Washington County Rural Fire Department having a mutual aid agreement with the Fayetteville Fire Department.

1.03 MINIMUM SIZE OF WATER LINES

A. The minimum sized water line that may be installed in the water system as a "Water System Improvement" shall be eight (8) inch diameter as defined in Chapter 151 of the City of Fayetteville Unified Development Code. Unless documented and approved otherwise by the City, the minimum size water main installed by development shall be eight (8) inch diameter.

Minimum water line sizes less than eight (8) inch diameter will receive special consideration in situations such as existing areas of six (6) inch water lines. Such special consideration will be based upon engineering calculations for domestic and fire flow demands, existing infrastructure, water modeling, water age and water quality and as follows.

Four (4) inch diameter lines shall be the minimum water line size that may be approved for special conditions such as "short" cul-de-sacs as determined by the City or rural water extensions, provided such lines could not be reasonably extended in the future to provide service to adjacent property and where a larger line is not needed to provide either fire protection or adequate domestic flows.

Two (2) inch domestic water service extensions may be granted by the Utilities Director.

All water lines less than eight (8) inches in diameter require approval from the Utilities Director and subsequently the ADH.

B. The minimum line size requirement for the provision of fire protection shall be based upon fire flow calculations including the flow for the private fire line/sprinklers in addition to the flow required at fire hydrants, water modeling calculations and as follows. The minimum line size requirement for the provision of fire protection shall a looped six (6) inch line or, in the event of a dead end line, an eight (8) inch. This minimum requirement shall apply regardless of the theoretical flow capacities existing in the system. Lines larger than six (6) inch looped and eight (8) inch dead end may be required if larger lines are needed to provide domestic and/or fire flow demands based upon engineering calculations and/or water modeling.

C. The latest Water System Study has recommended a twelve (12) inch water line grid not to exceed a spacing of 1/2 of a mile in both the north-south and east-west direction. In the event that the maximum size water line for a development is less than twelve (12) inches, the City may participate in "cost sharing" for the installation of twelve (12) inch water lines as recommended by the latest Water System Study. The extent of the "cost share" will be for pre-approved and verified installation cost differences. Refer to Paragraph 1.05 – City Participation in Water Line Costs.

1.04 WATER SYSTEM STUDY/MASTER PLAN

A. The City's latest Water System Study (or Master Plan) and current water model will be the primary basis for decisions made in regard to required line sizes, water line locations, location of water pump stations, water tank sizes and location, and any other matter relating to the water distribution system.

1. The latest Water System Study is a published document on file at the City Engineer's Office and at the Utility.

2. The current water model is located at the City's Utility (Water/Sewer).

   It is the intent of these Standards that the City Utility, subject to other City and Utility priorities, will provide the modeling of proposed water mains using the City's current software and model. However, there may be specific projects that due to the size or complexity, the Utility's current priorities, or the requirements of a Professional Engineering sealed report, that such projects will require water modeling by the Engineer of Record and review by the City.

B. The Utilities Director and City Engineer have the discretion to alter the published Water System Study (Master Plan) priorities and recommendations based upon current City requirements.

1.05 CITY PARTICIPATION IN WATER LINE COSTS

A. In cases where the City desires to have a larger sized water line in place than is required under Paragraph 1.02 of these Standard Specifications, or in cases where the City desires to extend a water line under Paragraphs 1.02 and 1.03 of these Standard Specifications, in accordance with City Ordinance Chapter 51: Water and Sewers, the City may enter into an agreement with the developer to provide for the construction of the larger sized line, or the extension of the designed water line. City participation in water line costs will be based upon current City Council guidance.

B. Upon City Council or Mayoral approval, the City will be responsible for the pre-approved and verified installation cost difference between the water line required for the development and the water line desired by the City.

C. The cost involved in up-sizing, or extending the water line shall be determined by the developer's engineer by the taking of bids, and shall be approved by the City Engineer or Utilities Director, and then approved by the City Council prior to construction.

1.06 WATER SERVICE LINES

A. Water service connections shall be made on 12-inch and smaller water lines.

B. Service lines serving single meters sets and double meter sets shall be 1- inch coated copper pipe in accordance with these Standard Specifications.

C. In areas where it is determined by the City Engineer that installation of irrigation systems is likely, service lines that cross roads and serve double meter sets shall be 2" services ending in a 2" x 1" x 1" x 1" splitter. The middle leg of the splitter shall feed the double meter set, with the other two legs containing a ball valve, and being intended to serve future irrigation meters. The meter box shall be no greater than two feet from the splitter.

D. Service lines serving 1-1/2 and 2 inch meter sets shall be 2-inch coated copper pipe, or 2-inch restrained joint PVC (main) in accordance with these Standard Specifications.

E. Water services lines installed across city streets shall be encased back of curb to back of curb, or state highway right-of-way to right-of-way. 1-inch lines shall be encased in minimum 1-1/2 inch HDPE SDR9 tubing. 2-inch lines shall be encased in minimum 3-inch HDPE SDR9 tubing. Larger diameter encasement tubing will be provided by the contractor as required.

F. Service lines serving 3-inch and large meter sets shall be PVC in accordance with these Standard Specifications.

1.07 WATER METER SIZE

A. Water meters serving flows up to 10 gpm continuous (15 gpm intermittent) shall be 5/8” water meter.

B. Facilities that use flush valve style (tankless) toilets shall use a minimum 1” water meter.

C. Water meters serving flows up to 25 gpm continuous (40 gpm intermittent) shall be 1” water meter.

D. Water meters serving flows greater than 25 gpm continuous shall be approved by the City of Fayetteville Meter Department during the plan review process.

1. For reference only, meter flow ranges may be as follows:

a.	1-1/2” meter	up to 65 gpm continuous (100 gpm intermittent)
b.	2” meter	up to 150 gpm continuous (200 gpm intermittent)
c.	3” meter	up to 350 gpm continuous (500 gpm intermittent)
d.	4” meter	up to 800 gpm continuous (1000 gpm intermittent)

1.08 BACKFLOW PREVENTION

A. The City of Fayetteville water distribution system shall be protected from the possibility of backflow by the use of a reduced-pressure principal backflow prevention assembly (RP), a double check valve assembly (DC), or an air gap in accordance with the City Ordinance 51.146 Backflow Prevention and the Arkansas State Plumbing Code (ASPC), latest edition.

B. The City of Fayetteville Utilities shall review and sign off on all proposed backflow prevention

installations.

1.09 EASEMENTS

A. For water lines that are up to 10 feet deep, easements shall be at least 20 feet in width with the water line in the center of the easement. For water lines that are greater than 10 feet deep, easements shall be 1 foot per foot of depth to the bottom of the pipe on each side of the water line. The easement may be designated specifically for water line purposes or it may be a general utility easement.

B. Lines sized 12-inches through 18-inches shall not be placed in easements of less than 25 feet. Lines larger than 18-inches shall be placed in an easement of no less than 30 feet. Wider easements may be required, depending on the specific circumstances involved.

C. New developments that contain existing water lines must modify the existing easements as necessary to meet the above requirements for widths in relation to pipe location and size, including increasing the size of the easement if proposed fill will cause the depth of bury to exceed ten feet.

D. Easements of a lesser width will be considered when adjacent to another easement or under other special circumstances.

1.10 LOCATION OF WATER LINES

A. Water lines shall be placed on public streets either in the right of way or in an easement adjacent to the street right of way except that lines can go between lots when there is no other reasonable way to access a line or provide for future service. In no case shall lines intended for individual services be placed in the rear of lots or along back property lines.

B. Water lines shall be located a minimum of 36-inches from any other parallel utilities or structures.

1.11 LOCATION OF WATER METERS

A. Water meters shall be located in non-paved areas and readily accessible to the Meter Department without going through fences or gates.

B. Water meters shall be free of obstructions for a minimum of a 3-foot radius from the center of the water meter box.

C. Water meters shall be located on the Owner's side of the property line (edge of easement or right-of-way).

D. Double meter sets shall be located on the common property line between the two properties being served.

1.12 VALVE MARKERS

A. In all rural settings and where requested by the City, except those in cleaned yards, when valve boxes, bends, air release valves, blow-offs, meter boxes and other similar hardware are installed in an easement location, water system marker signs shall be installed so that the items may be more easily found.

1.13 WATER LINE DEPTH

A. Minimum depth to the top of pipe for all water main lines less than 12- inches diameter shall be 3.0 feet.

B. Minimum depth to the top of pipe for water lines 12 - inch diameter and greater shall be 4.0 feet.

C Maximum water line cover shall be 5.0 feet under normal conditions. Cover greater than 5.0 feet shall be allowed for short distances where required by field conditions and approved by the City.

D. Minimum depth of all water service lines from the main to the water meter shall be 30-inches.

1.14 WATER PRESSURE

A. The water distribution system shall be designed to maintain a minimum working water pressure of 45 psi at the water meter.

B. Design of new construction that results in less than 45 psi working pressure at the water meter shall be approved by the Utilities Director on a case by case basis.

C. Under no circumstances shall the working pressure of the water distribution system be below 20 psi.

1.15 VELOCITIES

A. Velocities in the water distribution system shall be designed such that velocities will be no greater than five (5) feet per second during normal operation conditions.

B. Velocities in the water distribution system during fire flow conditions shall be designed not to exceed ten (10) feet per second.

1.16 VALVES

A. Valves for 4-inch through 8-inch water distribution shall be resilient seat gate valves. Ten (10) inch diameter pipe is not permitted for water mains.

B. Valves 12-inch and larger shall be butterfly valves.

C. Valve spacing in the water distribution system shall not exceed 500 feet in commercial districts and not more than one block or 800 feet intervals in other districts.

D. Valves at “tees” shall be provided to isolate water mains for maintenance or repairs and to limit outages. Valves may be required on multiple legs of tees as designed by the Engineer of Record and approved by the designated City engineer.

E. Valves shall also be located on each side of stream crossing as determined by the designated City engineer.

1.17 90 DEGREE BENDS

A. Ninety degree (90°) bends shall only be used on a by-exception basis, and must each be specifically approved by the City. Forty-five degree (45°) bends separated by a twenty-four (24) inch swivel adapter shall be used in locations where 90° bends would otherwise be considered.

1.18 FIRE FLOW DESIGN

A. Fire flow design for single family dwellings and duplexes shall be 1,500 gpm for a duration of two (2) hours or as determined and documented by the City’s Fire Chief.

B. Fire flow design for apartment complexes, commercial structures, and industrial structures shall be as required by the International Fire Code latest edition, or as determined and documented by the City’s Fire Chief.

1.19 FIRE HYDRANT SPACING AND PLACEMENT

A. Fire hydrants for single family dwellings and duplexes shall be installed so that (1) the distance between two consecutive fire hydrants does not exceed 500 feet, and (2) no lot is more than 250 feet from a fire hydrant. The Fire Chief shall have the authority to require additional fire hydrants upon a determination that such additional fire hydrants are necessary to provide adequate fire protection as outlined in the International Fire Code, latest edition.

B. Fire hydrants in areas for apartment complexes, commercial structures, and industrial structures shall be installed so that the distance between two consecutive fire hydrants does not exceed 400 feet. The Fire Chief shall have the authority to require additional fire hydrants upon a determination that such additional fire hydrants are necessary to provide adequate fire protection as outlined in the International Fire Code, latest edition.

C. Fire hydrants shall be free of obstructions for a minimum of a 3-foot radius from the center of the fire hydrant. Fire hydrants shall be placed outside of any fence.

1.20 FIRE LINES

A. Fire lines, backflow prevention, and FDC shall be installed and inspected the same as water lines.

B. Fire lines shall be constructed of ductile iron pipe and shall be double poly wrapped.

C. All valves on fire lines shall have the word “FIRE” on the valve box lid, this includes the valve on the water main.

D. Post Indicator Valves, or underground valves in a roadway box, as determined by the Fire Chief or the City Engineer in compliance with NFPA 24 and City ordinances, shall be installed on all fire lines to demarcate ownership. Post indicator valves shall match the valve manufacturer.

1.21 AIR RELEASE VALVES

A. Air release valves shall be required on uphill, dead-end lines or on other specific applications to protect the water distribution system at the discretion of the City Engineer or Water/Sewer Maintenance Superintendent.

1.22 STEEL ENCASEMENTS

A. Water lines under culverts, creeks, concrete channels, retaining walls, or other difficult and/or dangerous to maintain areas shall be encased in a smooth steel encasement pipe. The steel encasement shall extend 5 feet either side of the area.

B. Water lines through steel encasement shall be installed with three spacers per joint such that the spacers are equally spaced along the length of the pipe.

C. Self-restraining gaskets (DIP only) or bell restraints shall be used for all joints inside the encasement pipe and for the first joint in each direction outside the encasement pipe.

D. End Seals shall be used on all encasement pipes.

E. Restrained and blocked ductile iron water pipe or restrained and blocked C900 PVC will be used in situations where fittings are required on either side of the steel encasement to change direction or overcome varying field conditions. Additional joint restraints and the use of anchor collars shall be designed by the Engineer of Record and submitted to the City for review.

1.23 PLANNED WATER OUTAGES

A. Under no circumstances shall water be shut off to any active service in the course of new construction without written permission from the City of Fayetteville Water & Sewer Department. If water pressure needs to be reduced to facilitate construction, a preconstruction meeting shall be held. The work shall be performed as described in Section 4200 – Water Line Pressure Reduction Procedures.

1.24 PROTECTION OF WATER SUPPLIES

A. Only authorized personnel from the City of Fayetteville Water & Sewer Department are

permitted to operate valves on the existing water system.

B. There shall be no physical connections between a public or private water supply system and a sanitary sewer or appurtenances thereto which would permit the passage of any polluted water into the potable supply. Sanitary sewers shall be laid at least ten (10) feet horizontally from any existing or proposed water line. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten (10) foot separation, the appropriate reviewing agency may allow an exception on a case-by-case basis if supported by data from the design engineer. Such exception may allow installation of the sewer closer to a water main provided that the design and construction meets the more stringent requirements of the ADH, Ten States Standards and City of Fayetteville requirements which may include full encasement of the water main, and special trench, fill and drainage requirements.

C. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.

D. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.

E. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in twenty (20) feet of watertight encasement pipe, centered over the point of crossing. Crossings that are not perpendicular will require more than twenty (20) feet of encasement. The encasement shall extend a minimum of ten (10) feet perpendicular from the outside edges of the line that is not being encased. The ends of the encasement pipe shall be sealed watertight. Refer to Section 3400 – Steel Encasement Pipe.

END OF SECTION 2001

SECTION 2002 DESIGN STANDARDS – SEWER

1.01 REQUIREMENTS TO EXTEND SEWER SERVICE

A. Unless approved otherwise by City Council, new developments and/or sewer extensions to serve existing lots, are required to extend sewer services to that development at the owner's expense in accordance with City Ordinance Chapter 51: Water and Sewers.

Sewer lines shall be extended to each property to be served by City of Fayetteville sewer. Sewer service lines shall extend perpendicular to the sewer main and extended to the property being served. Sewer service lines will not cross property lines.

City Council approved cost share projects, including defined infill projects, and/or oversizing of mains, may be further considered in accordance with City Council guidance or policy and similar to Section 1100 paragraph 1.05 in accordance with City Ordinance Chapter 51: Water and Sewers, or as requested by the City Council.

Construction of off-site extensions will be at the expense of the developer, subject to "rough proportionality" as further noted in Chapter 155 of the City of Fayetteville Unified Development Code.

B. Connection to a public sewer system shall be as required, or permitted, by City of Fayetteville Ordinances and ADH regulations.

1.02 DESIGN CRITERIA

A. <u>GENERAL</u>

All sanitary sewers shall be designed to carry the estimated flow from the area ultimately contributing to the respective reach of the sanitary sewer. The required capacity shall either be established by the City or at the City's option by means of a basin study developed by the Owner or his authorized engineer/designer. In no instance shall a gravity sewer, other than a building sewer, be less than eight (8) inches in diameter.

The following design standards for gravity sewers within or contributing to the City of Fayetteville Sanitary Sewer System have been established:

1. <u>Population Density</u>

Population density shall be in accordance with the Comprehensive Plan for Fayetteville projected by the Division of Planning for the City of Fayetteville or actual count or character of proposed development, whichever is greatest.

2. Average Family

For the purposes of design the average family unit is considered to be 3.0 persons per single family home.

3. Design Flow

The design of all sanitary sewer facilities shall be based on future area population growth and land development characteristics and figures provided by the Department of Planning including the servicing of existing contiguous developed areas not currently served by sanitary sewers. The values of Average and Peak Flow and Design Population hereby shall be the values which include the future flows and population. The City reserves the right to review and determine the appropriateness and/or applicability of the estimated flow volumes provided.

The following shall be used as a guide:

a. Average Design Flows:

1) Single Family Residential: The average design flow for single family dwellings shall be one hundred (100) gallons per person per day.

2) Multifamily/Commercial/Industrial/Institutional: Based upon Table 1 Section 2002-1.10 within these specifications unless modified by technical information either submitted by the Owner and approved by the City, or developed by the City. These flow volume guidelines may be modified at the City's discretion as project location specific.

b. Peak Design Flow

1) Single Family and Multifamily Residential: The peak design flow for a single family development shall be calculated as follows:

$$Peak\ Flow = (Avg.Flow)\left[\frac{18+\sqrt{P}}{4+\sqrt{P}}\right]$$

Where P is equal to the total Design Population in thousands.

2) Commercial/Industrial/Institutional: The peak design flow from commercial, industrial or institutional developments shall be the average daily flow determined multiplied by 2.5. The peak design flow shall not be less than 90% of the peak water demand or exceed the flow limits of the water meter supplying the facility.

c. Inflow and Infiltration

1) When requested by the City, the design engineer will also utilize current City Masterplan(s) and/or SSES Studies.

4. Design Capacities: Collector and trunk sewers shall be designed on the following basis:

a. Collector Sewers Twelve (12) Inches and Smaller

Peak design flow capacities shall be based on sewers flowing two-thirds (2/3) full.

b. Trunk Sewers Fifteen (15) Inches and Larger

Peak design flow capacities for trunk or interceptor sewers shall be based on sewers flowing 90% full, without head, using the design population density and appropriate land use determined by the Division of Planning; and shall include an allowance for infiltration which will be reviewed on a case-by-case basis and is subject to the approval of the City.

B. SEWER COMPREHENSIVE STUDY REQUIREMENTS

A study/engineering report of the applicable sewerage drainage basin(s) is required. This study may include in addition to the proposed project or development, the upstream and downstream basins and existing or proposed lift/pump stations. The size and location of the project will determine the information required in the study/engineering report for the proposed project.

If requested by the designated City Engineer, the Engineer of Record (EOR) shall provide a detailed analysis and PE sealed report including:

The proposed design

The effects of the proposed project, and coordination with any required improvements, to existing sewer facilities including pipe lines and existing or proposed lift/pump stations.

The designated City engineer shall coordinate between the EOR and the City's waste water operations contractor.

Other as determined by the designated City engineer.

1.03 MINIMUM PIPE SIZES AND STANDARDS

A. PIPE DIAMETER

1. The required diameter of gravity sewers shall be determined by Manning's formula using a roughness coefficient, "n" of 0.013 or the pipe manufacturer's recommendation, whichever is greater. The minimum pipe diameter for gravity sewers lines shall be eight (8) inches.

B. MINIMUM SLOPES AND VELOCITIES

1. All sanitary collector and trunk sewers shall be designed and constructed to provide a minimum velocity when flowing full of two (2) feet per second. The slope of the sewer pipe shall be such that these minimum velocity requirements are attained. The minimum acceptable slopes for the design and construction of sanitary sewers are as follows:

2. THESE ARE MINIMUM SLOPES REQUIRED OF THE DESIGN. AS CONSTRUCTED SANITARY SEWERS FOUND TO HAVE LESS THAN THIS MINIMUM SLOPE SHALL NOT BE ACCEPTED.

Pipe Size* (inches)	Minimum Slope** (Feet per 100 Feet, %)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12

*4" and 6" lines are allowed for building sewers only (services).
** Minimum pipe slopes for diameters 8 inch through 18 inch are based upon the Ten States Standards 2014 Edition of the Recommended Standards for Wastewater Facilities.

** Slopes for pipe diameters greater than 18 inch require specific City approvals.

C. MINIMUM DEPTH

1. For the protection of the sanitary sewer lines from damage caused by utilities installed after the sanitary sewer has been constructed, the minimum depth to crown of all gravity sanitary sewers shall be 3.0 feet, and the minimum depth to crown of all force main sanitary sewers shall be 3.0 feet.

D. BUILDING SEWERS

1. Building sewers shall conform to the latest edition of the Uniform Plumbing Code, the requirements of the City's Building Safety Division and to these Standards.

2. The building sewer shall connect to the public sewer at a mainline fitting. Sewer service connections shall be made on 12-inch and smaller sewer lines. Connections to manholes shall only be allowed at upstream terminating manholes or by approval of the City. Inside drop connections to manholes are not allowed.

3. Building sewers requiring a 6-inch or larger sewer connection shall be connected at a manhole. If an existing manhole is not available, a new manhole must be constructed.

4. Homes or buildings where the lowest elevation to have gravity sewer service is less than 1 foot above the cover of either the first upstream or downstream manhole on the sewer main shall have a cleanout with a pop-up type, non-locking cover at an elevation no less than 6-inches below the lowest sanitary facility in the structure.

5. Homes or buildings with a slope from the lowest sanitary facility to the public sewer main less than 1 percent shall be served with a pump system. The system shall be purchased, installed, and maintained by the owner.

6. Building sewers within the right-of-way or easement shall be a minimum of four (4) inches in diameter. Building sewers shall have a wye cleanout located within three (3) feet of the building's exterior wall and extended to 3-inches above grade and shall have a watertight, removable cap.

7. Cleanouts installed under concrete or asphalt paving shall be made accessible by a short bodied cast iron valve box.

8. Building sewers installed for future connections shall be terminated at the right-of-way or easement and plugged to ensure 100 percent water tightness. Mark wyes for future connections using marking tape, tracer wire, yellow nylon rope, and 1/2" x 4' rebar or fence tee-post.

1.04 SEWER LINE MATERIALS

A. Materials for sewer line mains shall be PVC unless approved otherwise by the City of Fayetteville or otherwise indicated in these specifications.

1.05 LOCATION OF SEWER LINES

A. Sewer lines shall be placed on public streets either in the right of way or in an easement adjacent to the street right of way except that lines can go between lots when there is no other reasonable way to access a line or provide for future service. Sewer lines located in easements behind houses without a dedicated, paved alley shall have the manholes located adjacent to the

nearest street right-of-way.

B. Sewer lines shall be located a minimum of 36-inches from any other parallel utilities or structures.

1.06 SEWER STRUCTURES

A. MANHOLES

1. General

a. Manholes shall be installed at the end of each line; at all changes in grade, size, materials or alignment; at all sewer intersections and at the following intervals:

Pipe Diameter (inches)	Maximum Interval Between Manholes (feet)
8 to 18	400

b. Manholes shall be located such that they are readily accessible to sewer cleaning equipment. Access drives will be provided as required by the City of Fayetteville. Access drives will be a minimum 10' wide all weather drive surface designed for maintenance truck traffic. 10' wide double gates shall be provided for all fences where manhole access is required. Sewer mains located in easements behind houses without a dedicated, paved alley shall have the manholes located adjacent to the nearest street right-of-way.

c. The minimum inside diameter of manholes shall be as stated in Section 3300-Manholes.

d. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineer's Standard Details.

e. At changes in sewer alignment and/or sizes, the energy gradient elevation shall not increase. This shall be accomplished by keeping the crown elevation continuous where possible for changes in sewer sizes.

f. Connections to manholes on trunk sewer lines shall be installed at such elevations that will not cause a backup in the collector sewer. Trunk sewers are designed to flow completely full during peak operation. Therefore, connections should not be made below the crown of the trunk sewer line pipe.

g. Minimum drop across the manhole from inlet invert to outlet invert for size on size pipes shall be 0.10' for 0 up to 45 degree change in direction, and 0.20' for 45 to 90 degree change in direction.

h. Manholes proposed to be installed in unpaved areas shall be designed and constructed such that the top of the casting is a minimum of three (3) inches and a maximum of five (5) inches above the finished grade to prevent ponding of water over the casting. Positive drainage away from the manhole shall be provided.

i. Manholes constructed within a 100-yr floodplain shall be constructed such that the rim elevation is a minimum of 2-feet above the flood elevation or be constructed with hinged and gasketed covers. Manholes that are within the 100-yr floodplain and also within the ROW shall have hinged and gasketed covers.

j. Manholes located on 15-inch and larger sewer lines or manholes on sewer lines within 100 feet of a 15-inch and larger sewer line shall be epoxy coated on the interior. Capital Improvement Projects shall be a separate pay item for epoxy coating or lining as further defined in the subsequent measurement and payment specifications prepared by the Engineer of Record.

2. Outside Drop Connections

a. Outside drop pipe connections shall be provided for all sanitary sewers entering a manhole at an elevation greater than twenty-four (24) inches above the invert of the manhole.

b. In areas where future residential, commercial, and/or industrial growth can occur, all new manholes 15 feet deep or deeper shall be equipped with up to two (2) outside drop connections of a size and at an elevation to be determined by the City at the time of design to allow for future connections at these points. The drops shall extend from the base to within 10 feet of the final graded surface elevation.

NOTE: THIS SHOULD NOT IMPLY THAT EVERY MANHOLE <u>SHALL</u> BE PROVIDED WITH 2 OUTSIDE DROP CONNECTIONS.

B. <u>SEWER PUMP STATIONS</u>

1. A construction permit shall not be issued for a sanitary sewer pump station until an economic analysis proves to the satisfaction of the City that the pump station exhibits a lower 20-year life cycle cost than extending a gravity sewer to the development.

2. The analysis shall be per latest standard practice for least cost (life cycle) as developed by ASTM C1131 and evaluate labor costs, maintenance costs (including parts replacements), operation costs and rehabilitation costs. The analysis shall take into consideration both interest and inflation rates.

3. The following minimum assumptions shall be made when calculating life cycle costs.

a. Pump Station Construction Costs = Actual cost
b. SCADA System = $7,500 in 2017 and is subject to annual revision by the Utilities Director
c. Pump Station Routine O&M labor = 50 hrs/year @ $40/hr
d. Effective Energy Costs = $0.25/kW·hr
e. Interest Rate = 5%
f. Inflation Rate = 3%
g. Replace pumps in year 11

4. In the event that a pump station is more cost effective than gravity sewer, the operation and maintenance expenses for the pump station must be paid in addition to the monthly sewer service charges paid by the benefiting customers. The estimated service life shall be 20 years.

5. If a pump station is more cost effective, the City of Fayetteville reserves the right to cost share with the developer to pay for a gravity sewer extension in lieu of a pump station.

1.07 EASEMENTS

A. GENERAL

1. Whenever possible, sanitary sewers shall be constructed within the public right-of-way. Should the construction be outside the limits of the public right-of-way, recorded sewer easements shall be acquired, dedicated and recorded solely for the benefit of the City. Easement boundaries shall be so shown on the plans and specifications as "Water and Sewer Easement" in lieu of "Utility Easement". Sanitary sewers may be constructed within "platted" utility easements if the work is performed in conjunction with a development approved by the City.

2. The minimum permanent easement widths to be dedicated to the City are as follows:

Depth of Sewer from Finished Grade	Easement (ft)
up to 10 feet	20
> 10 feet to 20 feet	25
greater than 20 feet	30

3. All sanitary sewers shall be centered in the easement. For those sanitary sewers constructed in the public right-of-way, the easement shall extend the distance outside the right-of-way necessary to provide the required easement width. Sewers not centered in the easements shall have an easement width equal to 1/2 that designated above on each side of the easement.

4. A minimum 50 foot by 50 foot deeded property shall be provided for all submersible lift stations with wet wells up to 20 feet deep. Deeds for lift stations with wet wells

greater than 20 foot deep and/or wet well/dry pit lift stations shall be handled on a case by case basis.

5. The sewer easements shall be exclusively under the discretion and control of the City. Ingress and egress shall be available to the City's crews at all times. No utility companies are allowed to use the sewer easements for installation of their utility lines without the expressed written permission of the City. All plan sheets shall clearly identify the sanitary sewer easement and the location of all other proposed utilities. The horizontal and vertical plans shall identify all utilities proposed to cross the sanitary sewer easement.

1.08 PROTECTION OF WATER SUPPLIES

A. Comply with Section 2001 1.24.

1.09 STEEL ENCASEMENTS

A. For maintenance purposes, sanitary sewers will be encased in steel encasement pipe wherever the sanitary sewer crosses significant utilities, significant drainage way(s), or other significant obstacles as determined by the design provided by the Engineer of Record or as requested by the designated City engineer.

B. Sewer lines through steel encasement shall be installed with three spacers per joint such that the spacers are equally spaced along the length of the pipe.

C. Self-restraining gaskets (DIP only) or bell restraints shall be used for all joints inside the encasement pipe and for the first joint in each direction outside the encasement pipe.

D. End Seals shall be used on all encasement pipes. Refer to Section 3400 – Steel Encasement Pipe.

E. Force mains shall also include joint restraints, blocking and the use of anchor collars as designed by the Engineer of Record and submitted to the City for review.

1.10 TABLE 1 MINIMUM DESIGN FLOWS

Multifamily/Commercial/Industrial/Institutional:

	Type of Establishment*	Gallons Per Person of Wastewater Per Day Unless Otherwise Noted
1.	Institutions other than hospitals	180 – 120
2.	Schools (without gym and showers)	15
3.	Schools (with gyms and showers)	25
4.	Organization camps only	
	a. With showers and handwashing facilities	20 +
	b. With toilets, showers and handwashing facilities	40 +
	+ Cooking or central food service included.	
5.	Campgrounds	
	a. With individual sewer connections (per site)	100
	b. With community building only (per site)	50
6.	Mobile home parks (per mobile home park space)	200
7.	Motels and hotels (per room)	100
8.	Restaurants along an interstate or major highway; 24-hour operation (per seat)	70
9.	Restaurants; 24-hour operation (per seat)	50
10.	Restaurants; less than 24-hour operation (per seat)	35
11.	Bars and cocktail lounges (per seat)	35
12.	Bowling alleys (per alley)	100
13.	Places of employment (does not include industrial waste, per employee per shift)	15-35
14.	Day workers at offices	15
15.	Picnic parks and areas	5
16.	Drive-in theaters (per ramp parking space)	7
17.	Service stations (per vehicle served)	10
18.	Swimming pool bathhouse (per person)	10

	Type of Establishment*	Gallons Per Person of Wastewater Per Day Unless Otherwise Noted
19.	Private dwelling (per dwelling)	300
20.	Apartments	
	a. One bedroom (per apartment)	200
	b. Two bedroom or more (per bedroom)	150
21.	Shopping center (where stores are not known) per square foot building area	0.45
22.	Churches	
	a. Without kitchen (per sanctuary seat)	3
	b. With kitchen (per sanctuary seat)	5
23.	Beauty salon	35
24.	Day care center	20

* The flows listed indicate a reasonable approach for the type of establishment referenced. Additional considerations, including the ADH Rules and Regulations pertaining to Onsite Wastewater Systems Appendix B or other applicable technical data will be necessary in some cases.

Source: Section 1200 of the "Standard Specifications for Design and Construction of Water Lines and Sewer Lines, 2012 Edition"

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END OF SECTION 2002

SECTION 2003 TRENCH SAFETY/PROTECTIVE SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1926 Safety and Health Regulations for Construction Subpart P, Excavations, Standard 1926.650, of the Code of Federal Regulations and as follows.

B. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications.

C. If the Contractor is working for any Arkansas public body (state agency, county, municipality, school district, or other local tax unit or improvement district), and has entered into a contact under the provisions of Arkansas Code Title 22. Public Property §§ 22-9-202-204, then the engineer and the contractor shall comply with Arkansas Code Title 22. Public Property § 22-9-212 Public improvements generally - Trench or excavation safety systems.

The requirements include, but are not necessarily not be limited to:

> 22-9-212. Public improvements generally -- Trench or excavation safety systems.
>
> (a) Whenever any agency of this state or of any county, municipality, or school district, or other local taxing unit or improvement district, enters into a contract covered by the provisions of 22-9-202 -- 22-9-204 for the making of repairs or alterations or the erection of buildings or for the making of any other improvements, or for the construction or improvement of highways, roads, streets, sidewalks, curbs, gutters, drainage or sewer projects, or for any other construction project in which the public work or public improvement construction project involves any trench or excavation which equals or exceeds five feet (5') in depth, the agency, county, municipality, school district, local taxing unit, or improvement district shall require:
>
> (1) That the current edition of Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P, be specifically incorporated into the specifications for the project; and
>
> (2) That the contract bid form include a separate pay item for trench or excavation safety systems to be included in the base bid.
>
> (b) In the event a contractor fails to complete a separate pay item in accordance with the applicable provisions of subsection (a) of this section, the agency, county,

municipality, school district, local taxing unit, or improvement district shall declare that the bid fails to comply fully with the provisions of the specifications and bid documents and will be considered invalid as a nonresponsive bid. The owners of the above-stated project shall notify the Safety Division of the Department of Labor of the award of a contract covered by this section.

The engineer and the contractor are responsible for compliance with the latest version of this Code (Arkansas Code Title 22. Public Property § 22-9-212 Public improvements generally - Trench or excavation safety systems).

D. Protective Systems - The Contractor shall design or provide an engineered design, and shall install, and maintain Protective Systems in strict compliance with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1926 – Construction, of the Code of Federal Regulations and all other applicable Federal, State, and local requirements.

1.02 29 CFR 1926, SUBPART P, INCORPORATED

A. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P, is incorporated by reference into these Standard specifications.

B. Additional information may be found at:

United states Department of Labor, Occupational Safety and Health Administration, Regulations (Standards – 29 CFR) Construction Standard Number 1926 – Safety and Health Regulations for Construction.

https://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=1926

Trenching and Excavation Safety OSHA 2226-10R 2015 Booklet at:

https://www.osha.gov/Publications/osha2226.pdf

END OF SECTION 2003

SECTION 2004 CONFINED SPACES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1910 Occupational Safety and Health Standards including Subpart J, General Environmental Controls Excavations, Standard 1910, including but not limited to 29 CFR 1910.146, Permit-required Confined Spaces of the Code of Federal Regulations and as follows.

B. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications. The Contractor is responsible to notify OSHA of the commencement of all water or sewer construction.

C. The Contractor is responsible to notify the City Engineer or Utilities Director, and the Engineer, when personnel are to work in, or near, a Permit-Required Confined Space and contractor shall coordinate such work with the City Engineer or Utilities Director, and the Engineer.

D. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of type of Permit-Required Confined Space documentation, permit and program used by the contractor.

E. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of any hazards confronted or created in a Permit-Required Confined Space.

F. The Contractor is responsible to notify the City Engineer or Utilities Director, and the Engineer, when personnel are to work in, or near, a Non-Permit-Required Confined Space and contractor shall coordinate such work with the City Engineer or Utilities Director, and the Engineer.

G. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of type of Non-Permit-Required Confined Space documentation and program used by the contractor.

H. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of any hazards confronted or created in a Non-Permit-Required Confined Space.

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END OF SECTION 2004

SECTION 2005 PUBLIC EMPLOYEES RIGHT TO KNOW ACT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1910 Occupational Safety and Health Standards including Subpart H, Hazardous Materials, Standard 1910.120, of the Code of Federal Regulations and as follows.

B. Comply with State of Arkansas Act 556 of 1991, Arkansas Code Ann. Sec 8-7-1101 et. Seq.: Public Employees Chemical Right to Know Act, and as follows.

C. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications.

D. The Contractor shall provide to the City Engineer or Utilities Director, and the Engineer, a list of all hazardous chemicals and a copy of the appropriate Safety Date Sheets (SDS) (previously aka Material Safety Data Sheets) brought onto the property. This information is required prior to any work being started.

E. The City will provide to the contractor a list of hazardous chemicals at any City facility where work is being performed. The locations and SDS information will be provided prior to any work starting. The contractor is responsible for disseminating this information to its employees.

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END OF SECTION 2005

SECTION 2006 ASBESTOS PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. If asbestos pipe is indicated on the plans for removal, tapping, connection to or other work, or if asbestos pipe is discovered on the project site, then the Owner shall have prepared an asbestos pipe work plan or an asbestos pipe mediation plan. The Owner will submit the asbestos pipe work plan or an asbestos pipe mediation plan to the City for review and approval prior to work beginning that includes asbestos pipe.

B. Comply with U.S. Environmental Protection Agency (EPA) 40 Code of Federal Regulations (CFR) Part 61, Subpart M, National Emission Standards for Asbestos.

C. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1926 Safety and Health Regulations for Construction Subpart Z, Toxic and Hazardous Substances, Standard 1926.1101-Asbestos, of the Code of Federal Regulations and as follows.

D. Comply with Arkansas Department of Environmental Quality (ADEQ) regulations including Regulation 21, The Arkansas Asbestos Abatement Regulation.

When required by ADEQ Regulations, provide the Notice of Intent to remove asbestos to ADEQ and copy to the City, Owner and Contractor or Engineer of Record.

E. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications.

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END OF SECTION 2006

SECTION 2100 EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

A. All projects shall include erosion and sediment control features.

B. Comply with the published City Engineering regulations and standards and as follows.

1.01 WORK INCLUDED

A. For Capital Improvement Projects, and other projects where required by Ordinance or standards, the Engineer shall submit an erosion control plan for the Work to the City for review and approval.

The Contractor shall accomplish temporary and permanent erosion protection in accordance with approved plans and project specific specifications, City Ordinances, manuals and standards, and State and Federal regulations.

City requirements include, but are not limited to:

ITILE XV Unified Development Code (UDC)
- Chapter 167: Tree Preservation and Protection
- Chapter 169: Physical Alteration of Land
- Chapter 170: Stormwater management, drainage and erosion Control,
- Chapter 168: Flood Damage Prevention- section 168.12 Streamside Protection Code

Streamside Protection Best Management Practices (BMP) Manual

Drainage Criteria Manual dated July 1, 2014

City of Fayetteville City Engineer's office Standard Specifications, Manuals and Standard Details, City of Fayetteville, are found at:

http://www.fayetteville-ar.gov/445/Engineering-Specs-Details

B. The Contractor is responsible for implementing and maintaining Best Management Practices (BMPs) during construction activities, including, but not limited to, sediment and erosion control structures and achievement of final stabilization upon completion of construction activities.

C. The Contractor shall be responsible for implementing all applicable requirements of the ADEQ General Stormwater Permit for Construction Activity, the Spill Prevention Control and Countermeasures Plan (SPCCP), as required by USEPA, local Municipal Separate

Storm Sewer requirements, and all other environmental regulatory requirements that are associated with the construction activities that they are contracted to perform. The Contractor is responsible for managing all materials, equipment, and activities at the work site in a manner that is in compliance with local, State, and Federal environmental regulations.

PART 2 – PRODUCTS

2.01 PRODUCTS/MATERIALS

A. Refer to City of Fayetteville City Engineer's office Standard Specifications, Manuals and Standard Details, City of Fayetteville.

PART 3 – EXECUTION

3.01 TEMPORARY EROSION CONTROL

A. Comply with Section 8.2 Erosion, Runoff and Sediment Controls for Construction Sites, of the City of Fayetteville Drainage Criteria Manual (2014 edition), the City Engineer's office Standard Erosion Control Details and as follows:

B. Water removed from open pits and/or trenches shall have silt removed prior to leaving the immediate site of construction. Silt shall be removed by natural vegetation, a straw bale trench dewatering inlet device, settling pond, filter bag, a rock/geotextile fabric sediment trap/basin, or other appropriate sediment control measure. Water filtered through a basin shall not violate any water quality standard and shall have efficient sediment/silt removal prior to discharging to a waterbody.

C. Contractor shall be responsible for providing adequate number of pumps for prompt and efficient dewatering. Ends of discharge hoses shall be provided with flow dispersion and filtration devices to prevent scouring of surface soils, discharge of turbid water, and/or washout of stream banks. Discharges from dewatering activities shall not be conveyed into or upon any roadside ditch, curb and gutter, street or publicly used thoroughfare.

D. The direct discharge of silty/muddy water to a stream, offsite, or across areas of equipment access points and/or construction haul roads is strictly prohibited.

3.02 OTHER CONTROLS

A. A dedicated concrete truck wash out area shall be maintained to include adequate containment to prevent runoff of concrete truck wash water. Concrete truck drivers shall be notified to use wash out area.

B. Contractor shall follow the appropriate waste storage and disposal practices, as per applicable environmental regulatory requirements. Solid waste dumpsters/roll-offs, or

other appropriate waste receptacles will be maintained and used at the site. Good housekeeping practices will preclude trash, construction wastes, and debris to be dumped or scattered on the construction site. There shall be no open burning of any waste material. No solid materials, including building materials, shall be discharged to waters of the State.

C. No liquid waste chemicals, fuels, and/or oils are to be leaked or spilled on ground surfaces. Bulk storage of liquid chemical wastes will be provided with secondary containment with a capacity sufficient to contain the volume of the largest container within the secondary containment. All waste materials shall be stored in a manner to prevent releases and should be disposed of by a qualified waste disposal firm at an acceptable waste disposal facility. Records of the disposal of all solid, hazardous, non-hazardous, and liquid wastes are to be maintained by the Contractor. Contractor shall notify the Engineer of any spills or leaks that occur in spite of the preventive measures taken. Contractor will prepare a report of any spills or leaks in accordance with the reporting and recordkeeping measures described in the BMPs. No contaminants from fuel storage areas, hazardous waste storage and truck wash areas shall be discharged to waters of the State. These areas should not be located near a water body.

D. Contractor shall maintain compliance with applicable State and/or local sanitary sewer, septic system, and waste disposal regulations.

E. Off-site vehicle tracking of sediments and the generation of dust must be minimized. Measures such as stone at construction access points, parking areas, and unpaved roads, providing entrance wash racks or stations for trucks, and/or street sweeping shall be implemented where appropriate. Application of water to construction haul roads should be done, as appropriate, to control dust generation. Application of excessive levels of water that create mud should be avoided.

F. The Contractor shall be responsible for maintaining the site and adjoining paved surfaces in a dust free condition. Fugitive dust control is the sole responsibility of the Contractor.

3.03 PERMANENT EROSION CONTROL

A. The Contractor shall incorporate permanent erosion control features into the project at the earliest practicable time as the construction progresses all in accordance with the approved plans and project specifications, City Ordinances, City manuals and standards.

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END OF SECTION 2100

SECTION 2200 SITE PREPARATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation, grading, cutting and removal of trees, shrubs and underbrush, and the removal of any debris existing above natural ground surface and within the cleared area necessary for the construction of the improvements.

PART 2 - PRODUCTS

A. Not used

PART 3 - EXECUTION

3.01 GENERAL

A. For Development Projects, the Owner and his contractor are responsible for all costs incurred by reason of the requirements of this section. For Capital Improvement Projects, it shall be the responsibility of each bidder to examine the site carefully and make his own calculations as to costs to be incurred by reason of the requirements of this section.

B. The Contractor shall not remove or disturb any vegetation except that required for the execution of the work.

C. Trees, shrubs, underbrush and debris removed will be disposed of by the Contractor in a manner approved by the City.

D. If access roads are required and not indicated on the plans, then the Contractor will be required to submit a plan for construction of access roads for review and approval by the Engineer.

3.02 SITE PREPARATION

A. Clear areas as indicated or only as necessary for performance of the work. Confine operations to that area provided through easements, documented agreements and rights-of-way.

For Capital Improvement Projects, entrance upon any lands outside of that area provided by easements or public rights-of-way, shall require documented written approvals with copies provided by the Contractor to the City.

B. For Capital Improvement Projects, do not occupy any portion of the project site prior to the date established in the Notice to Proceed without prior approval of the Owner.

C. The engineer will notify the contractor of requirements by individual property owners as stipulated in easement documents pertaining to the project.

D. Remove, relocate, reconstruct or work around natural obstructions, existing facilities and improvements encountered during site preparation as herein specified. Take care while performing site preparation work adjacent to facilities intended to remain in place. Promptly repair damage to existing facilities. Dispose of waste materials in a satisfactory manner off the work site.

E. Protect, move, or brace public and private utilities as required by the affected utility.

F. Maintain mailboxes in the manner that the Postal Service requires to prevent interruption of mail delivery.

G. Site preparation includes the removal of trees, shrubs, brush, crops, and other vegetation within the limits of the easements (right-of-way), or as may be provided for in licenses, permits and agreements. For Capital Improvement Projects, all efforts shall be made to retain existing landscaping. For development projects these requirements will follow the Owner's agreements and City Ordinances and City regulations. In the event that trees, shrubbery, and hedges cannot be saved, then prior approval of the property owner and the City's Representative must be obtained before the existing landscaping is removed.

1. Trees
   a. Comply with Chapter 167: Tree Preservation and Protection of the City's UDC. All trees shall be saved unless removal is approved by the Engineer and the City. Trim trees in accordance with the City's regulations including the City of Fayetteville Tree Preservation, Protection, and Landscape Manual.

2. Shrubbery
   a. Shrubbery shall be saved unless removal is approved by the Engineer and the City. Make reasonable efforts to save all shrubbery by trimming, in accordance with acceptable pruning practices, and treating wound surfaces with a commercial pruning compound.

3. Small Plants and Flowers
   a. At least two weeks prior to the start of construction, notify property owners of the proposed starting date so that the property owners can remove any small plants or flowers.

4. Protection of Existing Facilities

   a. The Contractor shall notify all property owners in the immediate vicinity of the construction area that may be affected by the construction activities a minimum of 24-hours before starting work in that area. The notification

shall include a description of the work, work hours, and a 24-hour contact name and number for the contractor.

b. Fences interfering with construction, and located within public rights-of-way or as may be allowed for in permits or agreements, may be removed only if the opening is provided with a temporary gate which will be maintained in a closed position except to permit passage of equipment and vehicles, unless otherwise herein specified. Fences within temporary construction easements may be removed provided that temporary fencing is installed in such a manner as to serve the purpose of the fencing removed.

c. Fencing removed shall be restored or replaced to the condition existing prior to construction unless otherwise specified. Temporary fencing meeting the requirements of the land owner will be provided when requested by the land owner, Engineer or Owner. The Contractor is solely liable for the straying of any animals protected or corralled, or other damage caused by any fence so removed.

d. Driveways and driveway approaches removed or damaged during construction shall be restored to the original or better condition.

e. Make every reasonable effort to protect private sewer facilities. Private sewer facilities may not be shown on the Plans.

f. Preserve property corners, pins and markers. In the event any property corners, pins, or markers are removed by the Contractor, such property points shall be replaced at the Contractor's expense and shall be re-set by competent surveyors properly licensed to do such work. In the event such points are section corners or Federal land corners, they shall be referenced and filed with the appropriate authority.

g. Where existing utilities and service lines are encountered, notify the owner thereof at least 48 hours (not including weekends and/or holidays) in advance of performing any work in the vicinity.

h. Excavate, install pipeline and backfill in the vicinity of such utilities in the manner required by the respective owner and, if requested, under his direct supervision. The Contractor shall be responsible for damages to a public or private utility that may occur as the result of the construction.

i. Protect, move, or brace public and private utilities as required by the affected utility.

j. Make a reasonable effort to ascertain the existence of obstructions and locate obstructions by digging in advance of machine excavation where definite information is not available as to their exact location. Where such

facilities are unexpectedly encountered and damaged, notify responsible officials and other affected parties and arrange for the prompt repair and restoration of service.

END OF SECTION 2200

SECTION 2300 EXCAVATION, BACKFILLING AND COMPACTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation, backfilling, and compaction for water lines, sewer lines, appurtenances, and incidental construction.

1.02 GENERAL

A. Comply with the recommendations of AWWA C600 and AWWAC605 latest editions, except as modified or limited within these specifications.

1.03 QUALITY ASSURANCE

A. When requested by the City's designated engineer, the Engineer of Record will provide:

1. One moisture/density relationship test (AASHTO T-99, or AASHTO T-180) taken at the beginning of the project, and one additional moisture/density relationship test taken for every 5,000 cubic yards of imported material.

2. The field density of adjacent undisturbed soil in accordance with ASTM D2922 (Standard Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods, Shallow Depth) locations as determined by the City.

3. A minimum of one density test per street crossing and/or one density test per 500 lineal feet of pipe or portion thereof when the pipe is located in the street, under pavement, under the curb and gutter, under sidewalks or trails or other as locations as determined by the City.

4. Other project specific tests as required by supplemental specifications provided by the Engineer of Record.

B. Provide submittals as specified or as requested by the City's designated engineer.

1.04 UTILITIES PROTECTION

A. The Work included in this Project may require excavation and related activities in close proximity to existing buried and aerial utility lines and facilities, such as water lines, sewer lines, storm drains, natural gas lines, electrical power lines, telephone cables, and TV cables. Where their presence is known, the approximate location of such utilities is shown on the Drawings, but all such utilities and individual service lines are not shown. The Contractor shall be aware of the potential for such utility lines to conflict with intended construction efforts, and the Contractor shall use appropriate precautionary measures to

locate and protect such utility lines and services so as to avoid damage and interruptions to service.

B. The Contractor shall contact the owners of the various existing utilities lines and services as may be affected by the construction and solicit their assistance in identifying, locating, marking, and protecting these facilities prior to the beginning of any excavation or other work which might endanger the existing utilities. If such utilities are damaged or impaired because of the Contractor's actions or omissions, the Contractor shall be responsible for the cost of repairs or replacements of the affected or damaged utility or service line.

C. The Contractor shall comply with the "Arkansas Underground Facilities Damage Prevention Act" including latest amendments, the Arkansas One-Call System, and shall alert potentially conflicting utility systems accordingly.

D. The Contractor is responsible for protecting public and private property. The Contractor is responsible for the Contractor's safety plan and implementation.

1.05 SEDIMENT CONTROL

A. The Contractor shall be responsible for all sediment control in accordance with Section 2100 – Erosion and Sediment Control.

B. The Contractor shall be responsible for maintaining the site and adjoining properties and adjoining paved surfaces in a dust free condition.

PART 2 – PRODUCTS

2.01 FOUNDATION MATERIALS

A. Foundation materials for trench over excavation shall be Class 7 Aggregate Base Course (ABC), "B" stone with class 7 aggregate cap, or concrete as designed by the Engineer of Record.

2.02 EMBEDMENT MATERIALS

A. Embedment materials are restricted to materials specified below. The Engineer of Record shall provide as a submittal the gradation sieve analysis of the embedment materials proposed for each specific project.

B. Without regard to the pipe material, all embedment materials include: bedding, pipe zone (including haunching), and initial backfill from six (6) inches below the bottom of the pipe to six (6) inches above the top of the pipe the full trench width with a minimum of six (6) inches of embedment materials all around the exterior of the pipe.

C. Special design considerations, including supplemental trench drains, geotechnical fabric, and/or specific aggregate, and/or filter gradations as recommended in AWWA C605 and ASTM D2321 may be required to prevent migration of embedment particles. The Engineer of Record is responsible to design the embedment system as needed for the specific project.

D. Embedment materials for water lines. The maximum aggregate size shall be 3/4 inch. The Engineer of Record will design the installation using embedment materials as ASTM C33 gradation #7 or ASTM C33 gradation 67 as modified and described below:

1. Crushed aggregate conforming to ASTM C 33, gradation 7 as follows:

ASTM gradation Size 7 (<u>not</u> class 7)

Crushed aggregate sized from nominal 1/2 inch to No. 8 sieves:

100 percent passing the 3/4 inch sieve
90 to 100 percent passing the 1/2 inch sieve
40 to 70 percent passing the 3/8 inch sieve
0 to 15 percent passing the No. 4 sieve
0 to 5 percent passing the No 8 sieve

2. Crushed aggregate conforming to the ASTM C 33, gradation 67 and as follows:

Crushed aggregate sized from maximum 3/4 inch to No. 8 sieves:

100 percent passing the 3/4 inch sieve (maximum aggregate size 3/4 inch)
20 to 55 percent passing the 3/8 inch sieve
0 to 10 percent passing the No. 4 sieve
0 to 5 percent passing the No 8 sieve

The required modification of the ASTM C 33, gradation 67 is the clarification and potential additional requirement of 100 percent passing the 3/4 inch sieve. Some aggregate suppliers for Fayetteville projects are currently meeting this requirement (maximum, not nominal, aggregate size 3/4 inch) as required in the 2012 Standard Specifications.

D. Embedment materials for sewer lines shall be a Class I crushed aggregate material in accordance with ASTM D2321 meeting the gradation requirements of ASTM C 33, gradation 7 as specified above for water lines, or the same crushed aggregate material conforming to a modification of the ASTM C 33, gradation 67 as specified above for water lines, or ASTM Class 67 stone. The Engineer of Reocrd is responsible to design the embedment and to verify the proper use of embedment materials for water and sewer installation.

2.03 BACKFILL MATERIALS

A. AGGREGATE MATERIAL

Aggregate material for select backfill across streets, roads, driveways, and for placement of "gravel" or aggregate surfaced areas, shall be Class 7 Aggregate Base Course (ABC) material conforming to the Standard Specifications of the Arkansas Highway & Transportation Department, latest edition.

B. SELECT NATIVE BACKFILL MATERIAL

Select native material shall be suitable on-site materials or imported good earth, sand, or gravel that is free from large rocks or hard lumpy materials. Never use materials of perishable, frozen, spongy or otherwise unsuitable nature as select material.

Initial backfill when consisting of select native materials, shall be free of rocks, stones or particles greater than 3 inches in diameter.

C. FLOWABLE SELECT MATERIAL

Flowable select materials, aka flowable fill or controlled low strength materials, for select backfill where indicated on plans across streets, roads, and driveways shall be Flowable Select Material conforming to the Standard Specifications of the Arkansas Highway & Transportation Department, latest edition.

D. CHERTY RED CLAY aka “HILLSIDE”

Locally available red clay chert material with a minimum of 55 percent retained on the #4 sieve prior to compaction, CBR of eight or greater and classified as GM or GC. The Engineer of Record shall provide as a submittal the geotechnical analysis of the proposed “Hillside” cherty red clay material for each specific project.

E. RIPRAP

1. Riprap material is not permitted as a Standard Specification.

2. Riprap material will be considered on specific case by case basis and in accordance with Sections 1000 General Conditions.

3. Riprap material, if approved, shall be designed in accordance with the City of Fayetteville Drainage Criteria Manual dated July 1, 2014.

PART 3 – EXECUTION

3.01 PROTECTIVE SYSTEMS - EXCAVATIONS AND TRENCHES

A. Comply with all Federal, State and Local requirements.

B. Comply with the requirements as specified elsewhere with these Specifications.

C. The Contractor is responsible for the Contractor's safety plan and implementation.

3.02 EXCAVATION - GENERAL

A. Excavation shall be carried accurately to the line and grade indicated on the drawings and as established by the Engineer.

B. When the bottom of the excavation is at subgrade and found to be unstable or includes ashes, refuse or other organic materials, or large pieces of inorganic material, that in the judgement of the engineer should be removed, the contractor will remove all such material (over-excavate) to the extent required by the engineer.

Over-excavation will be backfilled with foundations materials per 2.01 B and as directed by the engineer.

C. Dewater all excavations as required and as follows:

1. Comply with Section 2100 EROSION AND SEDIMENT CONTROL.
2. Prevent groundwater contamination.
3. Dewater to the extent that water or sewer pipe can be placed on a dry and firm trench bottom. Never place pipe in a wet or unstable trench.
4. When requested by the City, the Contractor, or the Engineer of Record, will provide a dewatering plan based upon the Engineer of Record's dewatering engineered design.

3.03 DISPOSAL OF EXCAVATED MATERIALS

A. The Contractor shall be responsible for disposal of excess material, or disposal of excavated material unsuitable for backfilling.

B. Disposal of excess material on private property shall only be allowed with written permission of the owner of the property. A copy of the written permission must be forwarded to the Engineer along with any permits as may be required by the governing authority, city or county. Grading permits are required for any disposal within the City of Fayetteville city limits.

3.04 EXPLOSIVES

A. The use of explosives/blasting materials is not permitted as a Standard Specification.

B. The use of explosives will be considered only on specific case by case basis in accordance with Section 1000 General Conditions. Approval will be project specific and requires approval from both the Utilities Director, Fire Chief and the designated City engineer.

3.05 EXCAVATION –TRENCHES

A. Trench For Water or Sewer Line - During excavation, all pipe to be replaced shall be properly removed and properly disposed of offsite at a suitable landfill. Trench excavation for water or sewer lines shall be kept within the maximum width limits specified below. The specified maximum trench width from the bottom of the trench to 24-inches above the outside top of the pipe shall not be exceeded unless s authorized by the Engineer.

Refer also to SECTION 2006 ASBESTOS PIPE.

B. Trench For Water or Sewer Line in Paved Area additional requirements – Prior to excavation in paved areas, the Contractor shall saw-cut (or other acceptable method approved by the Engineer) the existing pavement to minimize the destruction of the existing pavement outside the limits of the trench. The maximum trench width for the installation of water or sewer lines, up to 12-inches in diameter, in paved areas shall not exceed 36-inches without written approval from Engineer. The pavement shall be repaired in accordance with Section 6000 – Pavement Repair. Contractor is responsible for damage to paved areas by construction equipment outside the limits of trench excavation.

C. The bottom of the trench shall be prepared to provide a uniform and continuous bearing and support for the pipe on solid or compacted soil. Further, shallow depressions shall be made in the trench bottom to accommodate bellends. It is a requirement for bell or coupling holes to be excavated where no part of the load is supported bells couplings or fittings.

D. Standard Trench Widths:

Refer to the Standard details prepared by the City of Fayetteville Engineering Division.

Minimum	Maximum
Outside pipe diameter + 12 inches	Outside pipe diameter + 24 inches

Notes:

(1) Pipe diameters larger than 24 inches may require specific project trench design
(2) Site specific soil conditions may require specific project trench design
(3) Trench widths may vary per specific project trench design to comply with Section 2003 TRENCH SAFETY/PROTECTIVE SYSTEMS

E. Unless approved otherwise by the designated City engineer, limit trench excavation to one hundred (100) feet ahead of the completed pipe work and backfill. The City, or the Engineer of Record, may lower this limit in traffic or congested areas.

3.06 EMBEDMENT AND BACKFILLING - GENERAL

A. Install all water and sewer pipe using approved embedment materials only.

B. Structure foundation subbase or structure concrete sub-foundations require project specific design.

C. Backfilling includes refilling and compacting the fill in the excavation to the elevations indicated. Backfilling includes initial back fill, final backfill and surface materials.

D. All backfill shall be placed in layers of appropriate thickness and compacted using a mechanical, hydraulically-powered vibratory trench compactor or other equivalent equipment.

E. Unless designed otherwise by the Engineer of Record, use select native materials for backfilling in unpaved areas (only).

F. Where trenches are to be located beneath existing or proposed streets, drives, and parking areas, all backfilling procedures shall be in accordance with the Standard details prepared by the City of Fayetteville Engineering Division.

G. Compaction testing will be provided by the contractor utilizing an independent testing agency approved by the City.

3.07 EMBEDMENT AND BACKFILLING PIPE ADDITIONAL REQIREMENTS

A. A continuous and uniform embedment shall be provided in the trench for buried pipe. Embedment materials shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe.

B. Install embedment materials in no greater than eight (8) inch compacted lifts. Install embedment materials from six (6) inches below the bottom of the pipe to six (6) inches above the top of the pipe. Shovel slice bedding beneath the pipe haunches.

C. Unless approved otherwise by the designated City engineer, compact all embedment material to a minimum density of 90% standard proctor as outlined in AASHTO T-99.

D. Unless designed otherwise by the Engineer of Record for deep bury/installation the tracer wire will be installed on top of the pipe to a maximum of six (6) inches above the top of pipe.

E. Pipe marking tape shall be provided in all trenches for water or sewer line construction. Installation shall be per manufacturer's recommendations and shall be as close as practical to finished grade while maintaining a required minimum of 18 inches between the marking tape and the top of any pipe line.

F. Provide a minimum cover of thirty-six (36) inches over the top of sewer pipe.

G. Provide the following cover for water pipe:

1. Minimum depth to the top of pipe for all water main lines less than 12- inches diameter shall be 3.0 feet.

2. Minimum depth to the top of pipe for water lines 12 –inches diameter and greater shall be 4.0 feet.

3. Maximum water line cover shall be 5.0 feet under normal conditions. Cover greater than 5.0 feet shall be allowed for short distances where required by field conditions and approved by the City.

4. Minimum depth of all water service lines from the main to the water meter shall be 30-inches.

H. The maximum depth of bury for PVC pipe as a standard specification is sixteen (16) feet. Any depths of bury greater than sixteen (16) feet require project specific design by the Engineer of Record or the use of ductile iron pipe.

I. Install pipe in accordance with Section 3100 and Section 4100.

J. Backfill and compact the excavation.

K. Maintain all temporary surfaces in good condition until permanent repairs are complete.

3.08 MISCELLANEOUS STRUCTURES

A. Excavate a sufficient distance from walls and footings to allow for forms, protective systems and observation.

B. Backfill as indicated on Standard details prepared by the City of Fayetteville Engineering Division or project specific drawings.

3.09 BORES/PIPE BORING

A. Bores, pipe boring, pipe jacking and similar installations of encasement and carrier pipes are indicated in SECTION 3400 BORES AND STEEL ENCASEMENT PIPE.

END OF SECTION 2300

SECTION 2400 GENERAL INSTALLATION INFORMATION AND PROCEDURE

1.01 GENERAL

A. Before installation of pipe and appurtenances, the trench bottom shall be graded so uniform support of the pipe and appurtenances are provided per Section 2300 Excavation, Backfilling and Compaction.

B. Comply with the recommendations of AWWA C600 and AWWAC605 latest editions, except as modified, limited and/or further specified within these specifications.

C. Additional sewer specific and water specific requirements are found in Sections 3100 and 4100 respectfully.

1.02 HANDLING PIPE MATERIALS

A. The Contractor shall handle the material with the utmost care and in a manner to prevent damage to the materials, material coating and lining during loading, hauling, unloading, and installation operations. Hooks, chains, or cables shall not come into contact with the exterior/interior of pipeline materials. It is recommended to use approved nylon straps or approved clamps to handle pipeline material. Material damaged shall be replaced at the contractor's expense.

B. Hooks shall not be in contact with the pipe interior and to the extent possible the interior of the pipeline materials shall be kept free from dirt and foreign matter.

C. Pipeline materials, including valves, hydrants and fittings shall be drained and stored in a manner to protect them from damage by freezing. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

D. Proper implements, tool and facilities shall be provided and used by the Contractor for the safe execution of the work.

E. All foreign matter or dirt shall be removed from the inside of the pipe and appurtenances before lowering into the trench and the pipe interior shall be kept clean during and after laying. A swab shall be kept in the water line as long as the pipe is being laid. Care shall be taken to prevent dirt from entering the joint space. When pipe laying is not in progress, the open ends of the pipe shall be closed by installing a plug or cap of sufficient design to prevent trench water, foreign matter and dirt from entering the pipe.

F. Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workman like manner without damage to the pipe or pipe lining. Torch cutting is not permitted. All pipe shall be cut at 90 degrees to the pipe centerline. Cutting at other angles to provide greater deflections at joints shall not be permitted. Field welding or welding except by the pipe manufacture shall not be permitted.

G. Cut ends shall be beveled according to the manufacturer's recommendation to prevent damage to the bell gasket.

1.03 PIPE INSTALLATION - GENERAL

A. Install PVC pipe and DIP as recommended by the manufacturer and as follows.

B. Inspect each joint of pipe carefully internally and externally before it is placed in the trench. Plainly mark and separate from the remaining pipe any joint found to be cracked, warped, or otherwise damaged. Remove these damaged joints from the project site as soon as possible.

C. Unless otherwise designed by the Engineer of Record and approved by the City, all pipe shall be laid with bell ends facing the direction of; and for lines on appreciable slopes, bells shall face upgrade.

D. No pipe shall be laid in water, or when the trench condition or the weather is unsuitable for such work.

E. The pipe, fittings, valves, fire hydrants, meter boxes, manholes and other appurtenances shall be constructed to conform to the location, line size and material and grades specified or indicated on the approved plans.

F. When necessary to deflect PVC pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, the pipe may be deflected in the joint the least of the manufacturer's recommendations, or a maximum of one degree (1°) (equal to 4 inches per 20 feet).

G. When necessary to deflect DIP pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, the pipe may be deflected in the joint the least of the manufacturer's recommendations, or a maximum of three degree (3°) (equal to 12 inches per 20 feet).

H. Pipe barrel bending shall not be allowed.

I. All buried iron pipes, valves, and fittings shall be double poly wrapped.

J. Valves and fire hydrants shall be set with operating stem and nut plumb.

1.04 JOINTING PVC AND DUCTILE IRON PIPE AND FITTINGS

A. Make all pipe joints in strict accordance with the manufacturer's recommendation and as follows for the particular type of connection. Make all joints watertight in accordance with the latest ASTM Standards.

B. Prior to jointing the pipe, and/or fittings, the plain ends of the pipe and the bells of the pipe and fittings shall be thoroughly cleaned using a soapy water and cloth or brush, removing

all foreign materials from the bells, especially the gasket seats. Any burrs or imperfections in that part of the plain end or bell, which will be in contact with the gasket, shall be removed.

C. The clean rubber gasket shall be inserted in the bell and a thin film of lubricant shall be applied per the manufacturer's recommendations. Pipe lubricants specified by the pipe manufacturer shall be used. For water lines the contractor shall lubricate the gaskets and/or spigots with the manufacturer's recommended and NSF-61 approved lubricant.

D. The cleaned plain end shall initially be entered into the bell straight. The plain end shall be pushed inside the gasket and bell until it strikes the end of the interior if the bell, after which the end of the pipe will be moved sideways or as specified by the manufacturer's requirements to move the pipe slightly away from the home position to allow for expansion and to provide flexibility for the complete pipeline.

E. When connecting the pipe or fittings according to manufacturer's requirements, care shall be taken to avoid damage to where the pushing device or machine contacts the pipe. A wood block or suitable pad shall be placed between the pipe and that part of the pushing device which contacts the pipe or fitting.

F. All plain ends that enter a push-on bell shall be beveled as specified by manufacturer requirements. All cut pieces or ends of pipe of other classifications shall be so beveled.

G. All buried iron pipes, valves, and fittings shall be double poly wrapped.

1.05 JOINTING FLANGED PIPE AND FITTINGS

A. The faces of all flanges shall be thoroughly cleaned and all burrs or imperfections removed with a steel brush.

B. Surface coating or lining touch up shall be provided to match original coating or lining.

C. Gaskets shall be AWWA approved of 1/16 inch minimum thickness.

D. All bolts and nuts shall be cleaned and lubricated prior to tightening. Bolts on opposite sides shall be tightened alternatively to the torque recommended by the manufacturer.

1.06 JOINTING MECHANICAL JOINT PIPE AND FITTINGS

A. Comply with AWWA C600 Table I latest edition and the manufacturer's recommendations.

The range of torque for pipe size and bolt size varies per application. The Engineer of Record shall furnished to the City as a submittal the project specific materials used and the range of torque required for the assembly and materials.

The AWWA C600-10 Table I Mechanical-joint bolt torque includes:

Joint Size In.	Bolt Size In.	Range of Torque ft-lbs
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1 1/4	120-150

B. The spigot end of the pipe, the bell of the connecting pipe, and the rubber gasket shall be thoroughly cleaned using soapy water and cloth, removing all foreign materials from the bells, especially the gasket seats as specified for push-on joints. Clean the gland in a similar manner. An approved pipe lubricant shall be applied to the spigot end of the pipe and the gasket.

C. 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, insert the spigot end in the fitting bell to the point of firm contact with the bell shoulder. Then advance the rubber gasket into the bell and seat in the gasket seat. Hammering the gasket into the seat is not permitted. Exercise care to center the spigot end within the bell. Bring the gland into contact with the gasket, enter all bolts, and make all nuts hand tight. Exercise continued care to keep the spigot centered in the bell.

D. Make the joints tight by turning the nuts with a torque wrench: First partially tighten a nut, then partially tighten the nut 180 degrees away from it. Work around the pipe with uniformly applied tension until the required torque is applied to all nuts.

E. The Contractor shall provide a torque wrench suitable for measuring tension on bolts.

F. Proper actuation of the gripping wedges for restraining glands shall be ensured with torque limiting twist off nuts. Tightening sequence shall be as follows. First partially tighten a nut, then partially tighten the nut 180 degrees away from it. Work around the pipe with uniformly applied tension until the required torque is applied to all nuts. Failure to follow proper the proper tightening sequence will result in the disassembly of the joint, removal of the current restraining gland, and installation of a new restraining gland. Any damage to PVC pipe shall be removed as well.

G. All buried iron pipes, valves, and fittings shall be double poly wrapped.

H. The rubber gasket and joint bolts of mechanical joint retainer glands shall be installed in accordance with the above section. Set screws shall be tightened evenly to approximately 75 ft-lbs or as recommended by the manufacturer.

1.07 TRACER WIRE

A. Comply with Arkansas Law Section § 14-271-111 (a)(2) which includes: “In addition to the foregoing, all underground facilities installed after January 1, 1996, shall be permanently marked with tracing wires of appropriate durability or in other manner

which will enable the operator to trace the specific course of the underground facility.", and as follows:

B. Tracer wire shall be installed on all buried pipelines including water mains, water leads and water service lines without regard to pipe material. Tracer wire shall be installed on all buried sewer gravity mains, sewer force mains and gravity or pressure sewer services/sewer laterals without regard to pipe material.

C. Unless designed otherwise by the Engineer of Record for deep bury/installation the tracer wire shall be installed directly on, to 6-inches above, the top of the pipe.

D. As designed by the Engineer of Record and approved by the designated City engineer or Utilities Director, the tracer wire will terminate and/or connect at:

1. An approved site specific application tracer wire box as manufactured by Copperhead Industries, LLC. or approved equal or,
2. CAD welded to the cast iron manhole frame or,
3. Terminate in a valve box as designed by the Engineer of Record and approved by the designated City engineer or Utilities Director.

The termination or installation of tracer wire interior to a manhole is prohibited.

E. Unless approved otherwise by the Engineer of Record and the City's designated engineer, all tracer wire installation will include a grounding anode at the termination and/or connection locations.

1.08 MARKING TAPE

A. Marking tape shall be installed on all buried water or sewer pipelines without regard to pipe material. This includes gravity sewer mains, sewer force mains, gravity sewer laterals, water mains and water services.

1. Marking tape shall be installed 18-inches above the top of pipe.

1.09 CONCRETE MITIGATION DAM

A. Water and sanitary sewer designs shall include the effects of the trench functioning as drainage or groundwater conveyance.

Where indicated on the approved plans, or determined by the Engineer in the field, concrete dams or concrete dams with slotted drainage pipe will be constructed at each connection location of new sewer pipe to the existing sewer system. Concrete dams with, or without slotted drainage pipe will be provided to help control the migration of groundwater from the new sewer trench to the exiting sewer system or adjacent property.

Concrete dams shall be constructed in the sewer trench, outside the limits of excavation for manholes. Slotted drainage pipe where used will terminate in an approved drainage conveyance.

B. Hand excavate around the sewer pipe into undisturbed earth a minimum of six inches into bottom of the trench and the trench wall perpendicular to the pipe. The hand excavated void around the pipe shall be filled with concrete and a form shall be used to hold the concrete in place. The form may be left in place after backfilling and restoration. The concrete dam shall be 8-inches thick, non-reinforced and extend to the elevation indicated on the approved plans.

C. Slotted drainage pipe ("trench drains) shall also be provided at concrete dams or low points from the bedding to defined drainage when required by the City.

1.10 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

A. Comply with the recommendations of AWWA C105 latest edition and as follows.

B. Two layers ("double wrapped") of polyethylene material minimum 8 mils thickness, either in tubing form or in the form of flat sheet or rolls shall be placed around all buried mechanical joints of pipe and fittings, valves, fire hydrants, and all saddles, sleeves, and couplings, tapping saddles, and any other appurtenance with exposed bolts. Any and all iron or steel components installed below ground shall be wrapped with the polyethylene material.

Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal

C. Ductile iron and steel pipe and appurtenances shall be completely encased in polyethylene tubing material. It is not the intent that the material form an enclosure that is absolutely air or water tight, but to prevent pipe to soil contact.

D. All tongs, cables, or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.

E. Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open, wrapped around the pipe and secured in place.

F. Polyethylene material shall be stored on the job site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed forty-eight (48) hours.

G. Backfill material shall be the same as specified for pipe without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, and/or other material that could damage polyethylene.

END OF SECTION 2400

SECTION 3000 SEWER PIPE, FITTINGS AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers pipe, pipe joints, and fittings and other materials for sanitary sewer pipelines and sewer service lines.

B. Use only pipe, fittings, adapters and appurtenances approved by the City of Fayetteville.

C. Use bends, tees, plugs, wyes, or other approved fittings constructed from the same material as the pipe in which they are installed. Use only standard, approved fittings.

D. The Standard Specification include pipe and fitting in diameters up to and including 18-inch diameter. Pipe and fittings for nominal pipe diameters/sizes greater than 18-inch are not a Standard Specification. Projects including pipe and fittings for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 SUBMITTALS

A. Use of materials other than those specifically listed below is prohibited.

B. Submit the manufacturer's certificate that the materials meet with these Specification requirements including material testing requirements.

PART 2 – PRODUCTS/MATERIALS

2.01 PROHIBITED PIPE MATERIALS

A. The following materials are specifically forbidden for use either in city sewers or service lines:
1. Asphalt impregnated fiber tube pipe.
2. Clay pipe.
3. Concrete pipe.
4. Open profile PVC pipe as defined in ASTM F794.
5. “No Hub” cast iron soil pipe or other non bell and spigot pipe.

2.02 SERVICE LINES AND FITTINGS

A. Service lines shall typically be four (4) inches in diameter PVC pipe and PVC fittings. Six (6) inch PVC services may be approved when constructed to the same standards as sewer main lines.

B. Four (4) inch PVC pipe and PVC fittings for service lines shall be SCH 40, glue joints, and shall be completely bedded as required for larger diameter PVC pipe.

2.03 CLEANOUTS

A. Cleanouts shall be two-way opposing, SCH 40 PVC "Memphis Code" style. The riser pipe shall be topped off with a screw type plug.

B. Cleanouts shall not be installed in areas of surface depressions or features that pond water.

C. All cleanouts installed in asphalt or concrete shall be protected by a cast iron short bodied valve box, Model 70 as manufactured by East Jordan Iron Works or approved equal.

All cleanouts installed in areas other than asphalt or concrete including but not limited to lawn areas, will have the cleanout and cap protected from damage by a cast iron short bodied valve box, meter box or other method approved by Utilities Director.

2.04 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE (Solid Wall)

A. PVC pipe for gravity sewer mains or force mains shall be green in color and imprinted with "SEWER".

B. Pipe fifteen (15) inches in diameter and less: conform to ASTM D 3034. Maximum standard dimension ratio (SDR) shall be twenty six (SDR 26).

C. Pipe greater than (15) inches in diameter: conform to the requirements of ASTM F 679 with pipe stiffness designed for the specific site and project. Sanitary sewer larger than 15 inch diameter require specific review and approval from the City.

D. Joint connections for internal or external pressure less than 25-ft head: push on, flexible watertight elastomeric gaskets conforming to ASTM D 3212. Joint connections for internal or external pressure equal to or greater than 25-ft head require specific project design and City approval.

E. Marking In addition to "SEWER" provide: The date of manufacture, class of pipe, specification designation, size of pipe, name or trademark of manufacturer, and identification of plant/location shall be legibly marked on the outside of each pipe section in accordance with the ASTM D-3034.

2.05 DUCTILE IRON PIPE FOR GRAVITY MAINS

A. Gravity Sanitary Sewer ASTM A 746: Ductile Iron Pipe Gravity Sewer Pipe

B. Minimum Pressure Class shall be as follows:

1.	18-inch and smaller	350 psi
2.	24-inch	250 psi

3. 30-inch and greater 200 psi

C. Joint connections, pipe and fittings:

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals, and cast or stamped on the outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.

E. Corrosion Control:

1. Interior:

All Ductile Iron Pipe and fittings used for sewer shall have an epoxy ceramic interior protective lining and exterior protective coating. The ceramic epoxy lining will be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

2. Exterior:

Where requested by the City, or indicated in the specific design by the Engineer, all Ductile Iron Pipe and fittings used for sewer shall have in addition the interior ceramic epoxy lining an ceramic epoxy exterior coating meeting the same requirements of the ceramic epoxy interior protective lining, Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

Ductile Iron Pipe and fittings not required to have an epoxy ceramic exterior coating shall be supplied with manufacturer's standard 1 mil thickness asphaltic exterior coating per ANSI/AWWA C151/A21.51. Per the Ductile Iron Pipe Research Association (DIPRA) the 1 mil asphaltic coating is not a corrosion control method but furnished by the manufacturers to minimize atmospheric oxidation for aesthetic reasons (https://www.dipra.org/ductile-iron-pipe-resources/frequently-asked-questions/corrosion-control).

3. Ductile Iron Pipe and fittings shall be double wrapped in polyethylene tube or sheet materials conforming to the requirements of ANSI/AWWA C105/A21.5.

4. Additional corrosion control methods including cathodic protection may be required for specific sites and projects as requested by the City or designed by the Engineer and in accordance with DIPRA publication "The Design Decision Model for Corrosion Control of Ductile Iron Pipe" latest edition.

2.06 DUCTILE IRON FITTINGS

A. All ductile iron fittings for Ductile Iron Pipe (DIP) shall conform to the requirements of ANSI/AWWA C153/A21.53, latest revision, for Ductile Iron Compact Fittings. All fittings shall be MJ x MJ. All ductile iron fittings shall have an interior ceramic epoxy lining suitable for sewer service.

B. All ductile iron fittings for PVC pipe shall be full body, 350 PSI rating and shall conform to the requirements of ANSI/AWWA C110/A21.10, latest revision, for Ductile Iron and Gray Iron Fittings. All ductile iron fittings shall be MJ x MJ. All ductile iron fittings shall have an interior ceramic epoxy lining suitable for sewer service.

2.07 INTERIOR CERAMIC EPOXY LINING FOR DUCTILE IRON PIPE AND FITTINGS

A. Provide a minimum 40 mil nominal dry film thickness protective lining consisting of a ceramic epoxy specifically designed for wastewater environments. The ceramic epoxy will contain at least 20% by volume ceramic material.

The ceramic epoxy lining will be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

B. All cut ends and other areas requiring repair shall be immediately repaired with a manufacturers supplied field ceramic epoxy touch-up kit.

2.08 POLYETHYLENE ENCASEMENT (PIPE WRAP)

A. Polyethylene encasement shall be in conformance to ANSI/AWWA C105, latest revision. The virgin linear low-density polyethylene film shall have a minimum normal thickness of .008 inches (8 mils), and shall be provided in either flat tube or sheet form.

B. The color shall be black with nominal 2% carbon black UV inhibitor and printed per the AWWA C105 standard.

C. Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal, at least 2-inches wide, and installed as per the Polyethylene Encasement Installation Guide published by DIPRA. Duct Tape is not permitted.

D. All buried iron pipe and fittings shall be double poly wrapped.

2.09 CENTRIFUGALLY CAST FIBERGLASS GRAVITY SEWER PIPE

A. Fiberglass gravity sewer pipe is not a Standard Specification.

B. Fiberglass gravity sewer pipe will be considered on specific case by case basis in accordance with Sections 1000 1.01 B and 1000 1.07 A. Approval will be project specific and requires approval from the Utilities Director.

2.10 REINFORCED FLEXIBLE RUBBER COUPLINGS

A. Materials: Chemical resistant rubber. Flexible rubber coupling shall be Fernco or approved equal.

B. Flexible rubber coupling shall be reinforced with a stainless steel shear ring.

C. Clamping bands: two (2) each stainless steel bands.

D. Dimensions: Inside diameter to fit the outside diameter of the different pipe materials being connected: take care that proper alignment is maintained and the spacing between pipes does not exceed 1/2 inch as shown in the City Engineering Standard Detail Drawings.

2.11 SERVICE SADDLES

A. A composite saddle using a virgin SBR compound gasket (ASTM D-2000) and a ductile iron saddle casting (ASTM A 536), Romac or approved equal.

B. All saddles shall be approved by the Engineer prior to installation.

2.12 SERVICE WYES

A. The wye material and joint type must match that of the mainline pipe.

B. Wyes shall terminate in a bell suitable for connection of a 4 inch SCH 40 PVC service line pipe as specified herein.

2.13 MECHANICAL JOINT RETAINER GLANDS

A. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes greater than 18-inch are not a Standard Specification. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

B. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes 3-inch through 18-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

C. Mechanical joint retainer glands shall be made from ductile iron and shall be designed for a working pressure of at least 350-psi for 3-inch through 16-inch ductile iron pipe, at least 305-psi for 3-inch through 12-inch PVC, and at least 250-psi for 18-inch ductile iron pipe.

D. Retainer glands shall have an approved coating system for corrosion resistance equivalent to EBBA MEGA-BOND® and manufacturing traceability. Retainer glands shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

1. Retainer glands for pipe sizes 3-inch through 12-inch shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

2. Retainer glands for pipe sizes greater than 12-inches shall be manufactured by EBAA Iron, Inc. (USA only), or Star Pipe Products (USA only).

2.14 PIPE BELL RESTRAINTS

A. Bell restraint devices for nominal pipe sizes greater than 18-inch are not a Standard Specification. Bell restraint devices for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements, and as follows.

B. Bell restraints for AWWA C900 PVC sizes 4-inch through 12-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

C. Bell restraints for SDR26 PVC sizes 6-inch through 18-inch shall be provided as required. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

D. Bell restraints for Ductile Iron Pipe sizes 4-inch through 18-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

E. When all-thread attachments are required, **eye-bolt style attachments are not acceptable**. Romac "Ductile Lug" style attachments or approved equal shall be used. All-threads shall be made of 316 stainless steel.

2.15 BOLTS

A. All bolts and nuts for valves, fittings, and restraints shall be 316 stainless steel unless specified otherwise. **Anti-seize lubricant shall be used when assembling all stainless steel hardware to reduce galling.**

2.16 FORCE MAIN MATERIALS

A. Each material acceptable for force main construction is described below. **The Engineer shall submit a design fatigue analysis to determine which material will be used.**

B. The City may require that force main be constructed in such a fashion that they may be converted to gravity sewer lines at a later date with the only modification to be adding manholes.

2.17 POLYVINYL CHLORIDE (PVC) PIPE FOR FORCE MAINS

A. PVC pipe less than 4 inches in size shall be manufactured in accordance with ASTM D-2241 and be SDR 13.5.

B. PVC pipe 4 inches through 12 inches in size shall be manufactured in accordance with AWWA C900, latest revision, and shall be DR 14.

C. PVC pipe, couplings, and fabricated fittings shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454 as defined in ASTM D1784, latest revision. Clean, reworked material generated from the manufacturer's own production shall be acceptable as long as the pipe produced meets all the requirements of the Specifications.

D. Joints for PVC pipe shall conform to ASTM Specification D-3139, latest revision.

E. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

F. Marking on pipe and shall include the following and shall be applied at intervals of not more than 5 feet.

1. Nominal size in inches and OD base (for example, 4 CI).
2. PVC.
3. Dimension ratio (for example, DR 14).
4. AWWA pressure class (for example, PC 305).
5. Test pressure for hydrotested pipe (for example, T330) or if not tested, “NOT HYDROSTATIC PROOF TESTED.”
6. AWWA designation number for this standard (ANSI/AWWA C900 or ASTM D-2241).
7. Manufacturer’s name or trademark and production run record or lot code.
8. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable-water service.
9. “SEWER”.

2.18 DUCTILE IRON PIPE FOR FORCE MAINS

A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, latest revision.

B. Ductile iron pipe shall be designed in accordance with the requirements of "Thickness Design of Ductile-Iron Pipe", ANSI/AWWA C150/A21.50, latest revision. Minimum pressure class shall be 250 psi.

C. Joint connections, pipe and fittings (latest revision):

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

E. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14 in. (356 mm) and larger shall be not less than 1/ 2 in. (13 mm) in height.

F. Corrosion Control

1. Interior:

All Ductile Iron Pipe and fittings used for sewer shall have an epoxy ceramic interior protective lining and exterior protective coating. The ceramic epoxy lining will be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

2. Exterior:

Where requested by the City, or indicated in the specific design by the Engineer, all Ductile Iron Pipe and fittings used for sewer shall have in addition the interior ceramic epoxy lining an ceramic epoxy exterior coating meeting the same requirements of the ceramic epoxy interior protective lining, Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

Ductile Iron Pipe and fittings not required to have an epoxy ceramic exterior coating shall be supplied with manufacturer's standard 1 mil thickness asphaltic exterior coating per ANSI/AWWA C151/A21.51. Per the Ductile Iron Pipe research Association (DIPRA) the 1 mil asphaltic coating is not a corrosion control method but furnished by the manufacturers to minimize atmospheric oxidation for aesthetic reasons.

3. Ductile Iron Pipe and fittings shall be double wrapped in polyethylene tube or sheet materials conforming to the requirements of ANSI/AWWA C105/A21.5 and SECTION 3000 2.06 of this specification.

4. Additional corrosion control methods including cathodic protection may be required for specific sites and projects as requested by the City or designed by the Engineer and in accordance with DIPORA publication "The Design Decision Model for Corrosion Control of Ductile Iron Pipe" latest edition.

All cut ends and other areas requiring repair shall be immediately repaired with a manufacturers supplied field ceramic epoxy touch-up kit.

2.19 VALVES FOR FORCE MAINS

A. Gate valves up to 8-inch shall be the same as water valves as specified in Section 4000.

B. Valves greater than 8 inches require project specific design and City approval.

C. Full port (100% area) plug valves shall be AWWA C517, latest revision shall be manufactured by Val-Matic or Dezurik PEC.

D. Valves shall be installed along the length of the force main, not to exceed 1000' unless a variance is approved by the City for long force mains. All valve boxes shall be marked sewer. An empty valve box shall be installed in the vicinity of the discharge manhole and at fittings that cause a change in direction where the tracer wire can be brought to grade for a point of connection to aid in tracing the force main. A 2-inch SCH-40 PVC pipe shall be installed in the empty valve box. The pipe shall have a pipe marker label affixed and further labeled "No Valve, Tracer Wire Only." All lids shall have the word "SEWER" and a concrete pad with a minimum of 18 inches square or round dimension as appropriate. This shall be for both paved and unpaved applications.

2.20 AIR / VACUUM RELIEF VALVES

A. Sanitary sewer force mains shall be designed to avoid the need for air or vacuum release lines. If possible, force mains shall be designed without high points and with the top of the force main below the hydraulic grade line at the minimum pumping rate so that relief valves will not be needed.

B. If high points in the force main cannot be eliminated, a stainless steel A.R.I. Flow Control Accessories sewage air release valve or approved equal shall be installed at each significant high point where air could become trapped. The air release valve shall be installed in a manhole structure in accordance with the requirements of Section 3300-Manholes, and provisions shall be required for draining the structure. A high point shall be considered significant if it is 2 feet or more above the minimum hydraulic grade line, or, when pumping is intermittent, above the static head line.

2.21 TRACER WIRE

A. Tracer wire shall be 12-gauge solid coated copper or 14-gauge coated copper clad steel for underground burial.

B. Jacket color shall be GREEN, and made of High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE) designed for direct burial.

C. Connectors shall be used for all splices or repairs. Connectors shall be moisture displacement style as manufactured by 3M DBR, or equal.

D. A locate or conductivity test shall be performed prior to signing off on the project.

E. The tracer wire will terminate and/or connect at:

1. An approved site specific application tracer wire box as manufactured by Copperhead Industries, LLC. or approved equal or,
2. CAD welded to the cast iron manhole frame or,
3. Terminate in a valve box as designed by the Engineer of Record and approved by the designated City engineer or Utilities Director.

The termination or installation of tracer wire interior to a manhole is prohibited.

2.22 MARKING TAPE

A. Non-metallic sanitary sewer marking tape shall be warning tape as manufactured by Rhino Marking and Protection Systems, Harris Industries, Inc., or approved equal.

B. Tape shall have a minimum thickness of 4 mils and manufactured with heavy metal-free polyethylene tape that is impervious to all known alkalis, acids, chemical reagents, and solvents found in soil. The minimum overall width of the tape shall not be less than 3-inches. Standard rolls shall be 1000' length.

C. The tape shall be color coded Safety Green and imprinted with the following message: Caution – Buried Sewer Line Below.

2.23 SEWER LINE MARKERS

A. Sewer line markers shall be TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380), or approved equal. All markers shall be installed according to the manufacturer's recommendations. The uppermost portion of the Carsonite marker shall be made of Visibility Enhancer (CVE-360), or approved equal and must be bolted to the utility marker. TriView markers do not require visibility enhancers. The utility marker shall read as follows: "CAUTION, SEWER PIPELINE", "City of Fayetteville", and "Before Digging Call 1-800-482-8998". The label shall also include the official City Logo and be white in color with green and black lettering. The label shall be affixed to two sides of the marker. **An additional white 1" wide reflective tape (3M or equal) shall be placed around the full circumference of**

the top of the marker. Concrete shall be placed 6-inches around and 1-foot deep around the base of each marker.

B. Sewer line pipeline markers shall be installed beside all manholes that are located in easements and backyards. Manholes located in front yards and in streets do not require markers.

C. Sewer line pipeline markers shall be installed along sewer force mains at valves and at significant fittings that cause a change in direction.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Installation: refer to Section 2400

B. Sanitary Sewer Pipelines: Refer to Section 3100

C. Sanitary Sewer Service Lines: Refer to Section 3200

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END OF SECTION 3000

SECTION 3100 INSTALLATION OF SEWER PIPE, FITTINGS, AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Installation of sanitary sewer pipelines.

B. Installation of sanitary sewer service lines.

C. Point repairs on existing sanitary sewer pipelines.

1.02 DEFINITIONS

A. New Sewer Lines – Sewer lines installed in such a manner that there is no sewage flow during construction.

B. Replacement Sewer Lines – Sewer lines installed in a trench while there is a flow from "live" service connections.

C. Point Repairs - Replacement of a short section (less than 50 feet in length) in an existing sewer lines.

D. Force Mains - Sewer pipelines that transport wastewater under pressure from a pump station to a discharge point.

E. City Sewer Main - A public sanitary sewer in which all owners of abutting properties have equal rights and is maintained and controlled by the City of Fayetteville. No sewer line smaller than six (6) inches in diameter is a city sewer.

F. Service Line - The sewer which conveys the discharge from a building's plumbing system or other approved waste system to the city sanitary sewer system. The service line begins at the connection to the city sanitary sewer and ends at the building foundation.

1.03 GENERAL REQUIREMENTS

A. As specified elsewhere within these Specifications.

1.04 QUALITY ASSURANCE

A. Inspect all service lines per Section 5200 - Inspection and Testing of Sanitary Sewer Pipelines, Manholes, and Service Lines.

1.05 ADDITIONAL REQUIREMENTS

A. SHALLOW BURY

Ductile iron pipe for sewer shall be required when the existing grade or the proposed finish grade, whichever is less, provides less than 36 inches of cover. The ductile iron pipe shall extend from manhole to manhole. The ductile iron pipe shall meet the requirements of Section 3000 – Sewer Pipe, Fittings, and Materials, of these Specifications.

B. MAXIMUM DEPTH BURY PVC

The maximum depth of bury for PVC pipe is sixteen (16) feet. Any depths greater than sixteen (16) feet require ductile iron pipe. The ductile iron pipe shall extend from manhole to manhole. The ductile iron pipe shall meet the requirements of Section 3000 – Sewer Pipe, Fittings, and Materials, of these Specifications.

C. PIERS AND AERIAL CROSSINGS

1. Aerial crossings and sewer pipe on piers shall be encased.

2. Aerial crossings, sewer pipe on piers and piers shall be designed by the Engineer of Record for the specific project and included within the project documents submitted to the City for review and approval.

3. Install concrete piers as indicated on the approved plans and per Section 3600 - Cast-In-Place Concrete.

D. GRADES EXCEEDING 15%

1. Whenever the grade of the sewer line exceeds 15% (percent), ductile iron pipe shall be required. The ductile iron pipe shall meet the requirements of Section 3000 – Sewer Pipe, Fittings, and Materials, of these Specifications.

2. Sewers on 15 percent pipe slope or greater shall be anchored securely with concrete anchors in accordance with the Water Standard details prepared by the City of Fayetteville Engineering Division and spaced as follows:

1. Not over 36 feet center to center on grades 15 percent and up to 35 percent.

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

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

4. Anchor collars should be placed on downstream side of bell.

Where no bell is available, a retainer gland shall be installed.

E. COLD WEATHER INSTALLATION

1. The City reserves the right to order pipe installation discontinued whenever, in its opinion, there is danger of the quality of work being impaired because of cold weather. The Contractor shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints. Do not lay any pipe on frozen ground. No flexible or semi-rigid pipe shall be laid when the air temperature is less than 32° F unless proper precautions per the manufacturer's recommendations are taken by the Contractor and the method is approved by the Engineer and City.

2. When pipes with rubber gaskets or resilient-type joints are to be laid in cold weather, sufficiently warm the gasket or joint material so as to facilitate making a proper joint.

D. Reinforced Flexible Rubber Couplings

1. Install reinforced flexible rubber coupling only where dissimilar pipe materials are connected.

2. Take care that proper alignment is maintained and a maximum spacing between pipes does not exceed one-half inch.

3. Encase reinforced flexible rubber coupling in Class A concrete as shown on the City Engineering Standard Details.

PART 2 - PRODUCTS

A. Specified elsewhere within these Standards.

PART 3 – EXECUTION

3.01 WYE FITTINGS FOR SERVICE CONNECTIONS

A. Use in-line wye fittings for all service connections except on ductile iron pipe and polyethylene pipe.

B. The wye material and joint type must match that of the mainline pipe.

C. Use taps instead of wyes only on ductile iron pipe and polyethylene pipe.

D. Install wye branches at the location of live services or as indicated on the construction plans. Install wye connections for services in accordance with the manufacturer's recommendations.

E. Place Class "A" concrete under each wye branch to prevent cracking or twisting under earth loads.

F. Mark wyes for future connections using marking tape, tracer wire, yellow nylon rope, and 1/2” x 4’ rebar or fence tee-post.

G. Terminate wyes for future connections in a bell suitable for connection of a four-inch SCH-40 PVC service line. Securely plug all wyes and service stubs for future connections.

H. For Service Wye Details, see the City Engineering Standard Detail Drawings.

3.02 CLEANOUTS FOR SERVICE CONNECTIONS

A. Install cleanouts on service lines at the property line where the main line is in the paved right-of-way, as required by plumbing code, or as indicated on the construction plans and as further specified in Section 3200.

B. For Cleanout Details, see the City Engineering Standard Detail Drawings.

3.03 BACKFILLING AND INSPECTION

A. Before backfilling, place concrete encasement at transitions between different types of pipe and around all flexible rubber couplings as shown on the Drawings. Use Class A concrete per Section 3600-Cast-In-Place Concrete.

B. Before backfilling, install concrete anchor collars in accordance with the City Engineering or project specific details at the location and interval and shown on the Drawings. Use Class B concrete and reinforce with steel bars per Section 3600-Cast-In-Place Concrete.

C. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 2300-Excavation, Backfilling, and Compacting.

D. Test the pipeline per Section 5200-Inspection and Testing of Sewer Lines, Manholes, and Service Lines.

E. Repair all pavements per Section 6000-Pavement Repair.

F. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.

G. Repair sodded and grass areas to original condition.

3.04 CONNECTION OF NEW SEWER LINES TO EXISTING SEWER LINES

A. Construct, clean, test, and obtain Engineer's approval for sewer lines and manholes before connecting new sewer lines to the existing sewer.

B. If, in the opinion of the Engineer, conditions exist which require connection prior to final line acceptance, plug all lines entering the manhole connecting to the existing system until the new system is accepted. In addition, plug the line leaving the first manhole upstream. Never allow water being used to flush the new lines to enter the existing system.

C. All new sewer lines must connect to the existing system at a new or existing manhole. If a new manhole is built over an existing sewer line, do not break out the top of the existing pipe until the new line is accepted.

D. If a new sewer line is to discharge into an existing manhole, divert the sewage flow around the existing manhole while the tie-in is under construction. Intercept the sewage flow at the existing manhole first upstream from the tie-in construction. Provide suitable pumping equipment and re-routing conduit to pump the sewage around the tie-in construction. Discharge into an appropriate manhole downstream from the construction.

E. Connection to an existing manhole shall be made by core drilling. A concrete manhole adapter shall be installed on the sewer pipe, and the annular space grouted in accordance to Section 3300 – Manholes.

F. Connect new sewer lines to existing manholes in a neat, workmanlike manner, to ensure a watertight connection.

3.05 GRAVITY SEWER LINE INSTALLATION – LIVE SEWER LINES AND POINT REPAIRS

A. Install sewer lines and point repairs as detailed above for new sewer lines with the following exceptions:

1. Divert all upstream flow around the section to be replaced with plugs or pumps. The bedding must be kept dry during installation. If trench bottom is too wet, excavate wet portion and replace with bedding material.

2. Make transitions to original pipe using materials and procedures specified. Take care that replacement pipe is aligned properly with no offsets. Install concrete encasement around transitions. Take care that no concrete from the encasement enters the existing pipeline. If this occurs, remove the concrete.

3. At the end of each day's work, and when for any reason the laying of pipe will be discontinued for an appreciable period, place a temporary section of pipe in the live line.

4. Pressure testing is not required. Visual and television testing are required.

5. Mandrel testing is required.

6. Service line pressure testing is not required.

7. A temporary debris catcher, as shown in the City Engineering Standard Detail Drawings, shall be used in the downstream manhole.

3.06 FORCE MAIN PIPE INSTALLATION

A. Install all pipe and fittings to the line and grade as detailed on the Drawings. All bolted valves, fittings, etc. shall be installed the same as water lines. Refer to Section 4100.

B. The force main shall have tape marked sewer wrapped around the pipe with complete revolutions not to exceed six feet (6'). Tape marked sewer shall also be installed in the trench 18" above the top of the sewer force main.

C. Remove all dirt and other foreign matter from the inside of pipe and fittings before they are lowered into the trench. Keep pipe and fittings clean during and after laying. Take care to keep dirt out of the bells. Plug all pipe openings at the end of each day's work or when pipe laying is discontinued.

D. Use proper equipment for lowering sections of pipe into trenches. Lower pipe carefully into the trench so the spigot and bell will not become contaminated.

E. Cut pipe in a neat and workmanlike manner without damage to pipe or pipe lining when trimming joint length.

F. Install pipe with bell ends facing in the direction of laying. Face bells upgrade on lines on an appreciable slope.

G. When necessary to deflect pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, the pipe may be deflected in the joint the least of the manufacturer's recommendations, or a maximum of one degree (1°) (equal to 4 inches per 20 feet).

H. Pipe barrel bending shall not be allowed.

I. Before backfilling, install concrete thrust blocking and anchor collars in accordance with the project specific and/or City Engineering Standard Details on Plans and in accordance with SECTION 4100 Installation of Water Pipe, Fittings and Materials. Thrust blocking shall be designed based on pressures of at least 25 percent greater than the maximum pump design shutoff head plus a water hammer allowance with an appropriate factor of safety.

J. All force mains shall be equipped with a Pig Launch & Retrieval System. Refer to City Engineering Standard Details.

K. Sewer line pipeline markers shall be installed beside all manholes and valve boxes that are located in easements and backyards. Manholes and valve boxes located in front yards and in streets do not require markers.

L. Test the pipeline per Section 5200-Inspection and Testing of Sewer Lines, Manholes, and Service Lines.

M. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 2300-Excavation, Backfilling, and Compacting. Repair all pavements per Section 6000-Pavement Repair. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.

N. Repair sodded and grass areas to original condition.

3.07 WATER LINE CROSSINGS

A. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.

B. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.

C. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in twenty (20) feet of watertight encasement pipe, centered over the point of crossing. Crossings that are not perpendicular will require more than twenty (20) feet of encasement. The encasement shall extend a minimum of ten (10) feet perpendicular from the outside edges of the line that is not being encased. The ends of the encasement pipe shall be sealed watertight. Refer to Section 3400 – Steel Encasement Pipe.

3.08 STORM SEWER CROSSINGS

A. For maintenance purposes, sanitary sewers will be encased in steel encasement pipe wherever the sanitary sewer crosses significant utilities, significant drainage way(s), or other significant obstacles as determined by the design provided by the Engineer of Record or as requested by the designated City engineer.

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END OF SECTION 3100

SECTION 3200 INSTALLATION OF SEWER SERVICE LINES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers:

1. Installation of sanitary sewer service lines.

2. Point repairs on existing sanitary sewer service lines.

1.02 DEFINITIONS

A. City Sewer Main - A public sanitary sewer in which all owners of abutting properties have equal rights and is maintained and controlled by the City of Fayetteville. No sewer line smaller than six (6) inches in diameter is a city sewer.

B. Service Line - The sewer which conveys the discharge from a building's plumbing system or other approved waste system to the city sanitary sewer system. The service line begins at the connection to the city sanitary sewer and ends at the building foundation.

1.03 GENERAL REQUIREMENTS

A. Comply with the Arkansas Plumbing Code, the City of Fayetteville Codes and requirements and as specified elsewhere within these Specifications.

1.04 QUALITY ASSURANCE

A. Inspect all service lines per Section 5200 - Inspection and Testing of Sanitary Sewer Pipelines, Manholes, and Service Lines.

1.05 REFERENCES

A. Arkansas State Plumbing Code.

B. City of Fayetteville Ordinance Chapter 173 BUILDING REGULATIONS including but not limited to 173.06 Plumbing Code.

PART 2 - PRODUCTS

A. Specified elsewhere within these Standards.

PART 3 - EXECUTION

3.01 ADDITIONAL REQUIREMENTS

A. Bends

1. Avoid using short radius ninety degree bends on 4" service lines.
2. Use only long sweep bends where bends are absolutely necessary.

B. Cleanouts

1. At the building foundation.
2. On lines longer than one hundred (100) feet, cleanouts are required at one hundred (100) foot spacing.
3. Install cleanouts adjacent to any ninety degree bend.
4. Install pipe on cleanout riser up to finish grade.
5. The cleanout shall be the same diameter as the pipe on which it is installed.

C. Backwater Traps (Sewage check valve)

1. Provide backwater traps as required by Section 715 – Backwater Valves of the Arkansas Plumbing Code or as shown on the Drawings.
2. Place backwater traps in a meter box to allow periodic servicing.

D. Aerial Crossings and Piers

1. Comply with Section 3100.

E. Service line installation.

1. Lay the service line on a straight alignment and at a constant slope. Install pipe at a minimum slope of one percent (1.00%); this equal's one-eighth inch fall per lineal foot (1/8" / LF).

2. Install bends on 4" service lines at all changes in alignment and slope. Cleanouts are required at 90 degree bends and every 100 feet on lines longer than 100 feet. Bends on 6" and larger service lines are only permitted within 5 feet of the building foundation and 2 feet of the manhole being connected to; if longer than 150 feet, bends are not allowed and manholes must be built.

3. "No-Hub" type pipe connections are not permitted.

F. Reinforced Flexible Rubber Couplings

1. Install a reinforced flexible rubber coupling only where dissimilar pipe materials are mated.
2. Take care that proper alignment is maintained.
3. Encase reinforced flexible rubber coupling in Class A concrete as shown on the City Engineering Standard Details.

G. Tracer wire shall be installed from the public main to the building foundation and as further specified elsewhere.

3.02 SERVICE LINE CONNECTIONS TO CITY SEWER PIPELINES

A. Wye connection - Use existing wye or other prefabricated outlet if one has been left in the city sewer for sewer service to a lot unless it can be shown that the dwelling unit or building cannot drain by gravity to the wye.

B. Taps

1. Where a wye or other prefabricated outlet in the city sewer is not available to serve a lot, a tap connection shall be installed at a location approved by the City to connect the building sewer to the city sewer.
2. The City shall install all taps using approved materials and equipment after the tap fee has been paid.

C. Manhole Taps

1. Manhole taps are only permitted on end-of-line manholes. Make manhole tap connections into existing manholes as indicated on the Drawings.
2. Install manhole taps no more than twenty-four (24) inches above the manhole invert.
3. Make manhole tap watertight and flush with inside surface of manhole.
4. Manhole taps are considered as part of the service line and are subject to inspection.

3.03 SERVICE LINE REPLACEMENT/REPAIRS

A. Obtain permit per City of Fayetteville requirements.

B. When possible, the existing tap or wye should be used to connect a repaired or replaced service line.

C. When the existing wye or tap cannot be used, then the Contractor shall seal original wye or tap (to prevent entrance or rainwater or debris into the city sewer) and contact the City of Fayetteville to arrange for inspection of seal.

D. Repair damaged portion in accordance with these specifications.

E. If reinforced flexible rubber couplings are required, be sure to encase them in Class A Concrete as shown in the City Engineering Standard Details.

F. Contact the City of Fayetteville to arrange for inspection of service line repair.

3.04 RELOCATE SERVICE EXIT

A. Obtain Plumbing Permit from the City of Fayetteville.

B. Relocate where the sanitary sewer line exits the structure and plug the old sewer line where it was cut to be rerouted.

C. Coordinate the inspection of the work with the City Plumbing Inspector.

END OF SECTION 3200

SECTION 3300 MANHOLES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the materials and procedures used in the construction and repair of sanitary sewer manholes.

1.02 SUBMITTALS

A. Furnish Shop Drawings and Submittal Data for approval prior to the delivery of any pre-cast manhole sections.

B. Submit all materials for approval.

1.03 MANHOLE DIMENSIONS AND LAYOUT

A. The required dimensions on manholes are:

1. Cone section height: 24 inches, minimum; 36 inches, maximum.

2. Throat section height: 18 inches, maximum.

B. Locate the manhole so the centerlines of all pipelines entering and leaving pass through the center of the manhole.

C. The following are minimum manhole diameters for sanitary sewers entering/exiting a manhole at the following range of angles:

MANHOLE DIAMETERS

Pipe Size	Pipes Entering/Leaving at 0° - 45° Bend	Pipes Entering/Leaving at 45° - 90° Bend
8” - 15”	48”	48”
16” - 30”	60”	60”
33” - 42”	72”	72”

PART 2 - PRODUCTS

2.01 WATER FOR MORTAR AND GROUT

A. Water: Potable water free from injurious amounts of acids, alkalis, oils, sewage, vegetable matter, and dirt.

2.02 CEMENT

A. Portland Cement, conforming to AASHTO M 85, Type I.

2.03 MANHOLE GROUT

A. Cementitious non-shrink grout for use in manholes shall be one specially formulated for stopping active infiltration and filling voids in manholes and similar locations. Grout mix shall provide a quick-setting, volume-stable, cementitious product suitable for patching the interior of manholes when mixed and applied according to the manufacturer's recommendations. Grout mix shall be Strong Seal QSR, or approved equal.

2.04 CAST-IN-PLACE MANHOLES

A. Construct with Class B concrete only as outlined in Section 3600 - Cast-In-Place Concrete.

B. Reinforcement shall be as outlined in Section 3600 - Cast-In-Place Concrete.

C. The frame for the cover shall be installed when the manhole is constructed.

2.05 PRECAST CONCRETE MANHOLES

A. Conform to the latest requirements of ASTM C478.

B. Never transport sections to the site until they have achieved a minimum strength of 3,200 psi (80% of 4,000 psi design) as determined by a concrete cylinder test for the concrete batch.

C. Mark each piece plainly with manhole numbers and date of manufacture so it can be installed in the proper location, as shown on the plans.

D. Make sure factory-installed cutouts in the bottom section are appropriate for the pipe being laid.

E. Pipe connections at manhole - Cutouts should be equipped with rubber boots to ensure a watertight connection. Material shall be equal to A-Lok compression connector or A-Lok G3 Boot System, as manufactured by A-Lok Products, Inc.

F. Joint Sealant - Flexible rubber sealant for joints in pre-cast manhole sections shall provide permanently flexible watertight joints, shall remain workable over a wide temperature range and shall not shrink, harden or oxidize upon aging. Material shall be equal to RFS Prelubricated Gaskets by Press-Seal Gasket Corporation and shall meet ASTM C 443 and ASTM C 1619 (Classes C and E) requirements.

G. No supplemental joint sealant material is permitted.

H. All manhole joints shall be sealed with a 6-inch wide butyl external joint wrap material. Material shall be equal to Bidco Butyl Wrap as manufactured by NPC or Infi-Shield® Gator Wrap by Sealing Systems, Inc. The external joint wrap material must be approved by the City of Fayetteville.

I. The frame for the cover shall be installed after the cone section is installed in the field.

1. Joint surfaces between the frame, adjustments, and cone section shall be free of dirt, stones, debris, and voids to ensure a watertight seal. Place a flexible butyl gasket joint material, E-Z STIK as manufactured by Press-Seal Gasket Corporation, or equal to ASTM C 990, Section 6.2 Butyl Rubber Sealants, minimum 1/2 inch thick, in two concentric rings along the inside and outside edge of each joint. Position the butt joint for each length of joint material on opposite sides of the manhole. No steel shims, wood, stones, or any material not specifically accepted by the Engineer may be used to obtain final surface elevation of the manhole frame.

2. All grade adjustments, the exterior surfaces of the frame base, and four inches below the top of the manhole cone shall be cleaned with a wire brush and then waterproofed with trowelable bitumastic gasket material, Trowelable EZ-STIK #3 as manufactured by Press-Seal Gasket Corporation, or equal, in accordance with the manufacturer's specifications. A protective polyethylene cover shall be placed over the waterproofing material when backfilling, following sealing of the frame to the manhole. Trowelable bitumastic gasket material is not required if no grade adjustment rings are used.

3. When grade adjustment rings are placed on the manhole structure to obtain proper grade, no more than 18 vertical inches from the top of the frame to the top of the manhole cone may be used.

J. <u>REJECTION OF PRECAST MANHOLE SECTIONS</u>

Precast reinforced concrete manholes, risers and tops shall be subject to rejection for failure to conform to any of the following specification requirements:

1. Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint;
2. Defects that indicate imperfect proportioning, mixing and molding;
3. Surface defects indicating honeycombed or open texture;
4. Damaged ends, where such damage would prevent making a satisfactory joint;
5. Infiltration into manhole exceeding allowed limits;
6. The internal diameter of the manhole section shall not vary more than one (1) percent from the nominal diameter;
7. Not clearly marked date of manufacturer, trade name, size designation part number, and ASTM number;

8. Having a deviation more than 1/4" from the straight edge at any point across the top of manhole cone section or riser ring; and/or
9. Having any visible steel bars along inside or outside surface of the manhole except for reinforcement stirrups or spacers used to position the cage during manufacture.

2.06 CORROSION PROTECTION

A. Manholes located on 15-inch and larger sewer lines shall be epoxy coated on the interior.

B. Manholes on sewer lines within 100 feet of a 15-inch and larger sewer line shall be epoxy coated on the interior.

C. The products shall only be applied by personnel thoroughly familiar with handling of the coating material, and in accordance with the manufacturer's specifications, recommendations and requirements.

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

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

3. Tnemec Permasheild series systems may be submitted by the Engineer of Record for City review and approval.

3. All epoxies shall meet the following minimum requirements:

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

D. Any damage to an epoxy system on existing manholes shall be repaired by the City at the expense of the contractor.

E. The installation of the interior manhole corrosion epoxy for Capital Improvement Projects shall be a separate pay item further defined in the subsequent measurement and payment specifications prepared by the Engineer of Record.

2.07 MANHOLE DROP

A. Drop on the outside of the manhole: Concrete encased PVC pipe and fittings as specified in Section 3000 – Sewer Pipe, Fittings, and Materials.

2.08 STANDARD MANHOLE FRAME AND COVER

A. Covers located on manholes owned by the City of Fayetteville, generally within the Fayetteville City Limits, shall have the words FAYETTEVILLE ARKANSAS SANITARY SEWER and PERMIT REQUIRED CONFINED SPACE cast in the top. Also, include two closed pick holes in top side of cover.

B. Covers located on manholes operated and maintained by the City of Fayetteville, generally outside the Fayetteville City Limits, shall have the words SANITARY SEWER and PERMIT REQUIRED CONFINED SPACE cast in the top. Also, include two closed pick holes in top side of cover.

C. Minimum combined weights of the manhole frame and cover is 210 pounds. Minimum cover weight is 110 pounds. Minimum frame weight is 100 pounds.

D. All casting shall be Traffic- rated meeting the requirements of AASHTO M306 latest edition proof load representing a 2.5 safety factor over H-20 and HS-20 loading.

E. All castings shall be cast with the approved foundry's name, manufacturing foundry mark, part number, and production date in mm/dd/yy format. All castings shall be manufactured in the USA and shall be clearly marked "Made in USA."

F. All castings: Free from porosity, blowholes, hard spots, shrinkage, distortion and other defects; smooth and well cleaned by sandblasting; manufactured true to pattern.

G. Frame and cover dimensions: Refer also to the City Engineering Standard Detail Drawings. Final casting dimensions may vary one-half the maximum shrinkage possessed by the metal or no more than +/- 1/16 inch per foot.

H. Cover and frame bearing surface: smooth finish, non-rocking design or machined bearing surfaces to prevent rocking and rattling under traffic.

I. Cast Iron: ASTM A 48, Class 35B.

J. Ductile Iron: ASTM A 536, Grade 80-55-06.

K. Approved manufacturers East Jordan Iron works and Neenah.

2.09 HINGED AND GASKETED MANHOLE FRAME AND COVER

A. Manhole frame shall be cast or ductile iron. Manhole cover shall be ductile iron. Seal shall be by replaceable t-gasket. T-gaskets are required.

B. Covers located on manholes owned by the City of Fayetteville, generally within the Fayetteville City Limits, shall have the words FAYETTEVILLE ARKANSAS SANITARY

SEWER and PERMIT REQUIRED CONFINED SPACE, or CONFINED SPACE ENTRY PERMIT REQUIRED cast in the top.

C. Covers located on manholes operated and maintained by the City of Fayetteville, generally outside the Fayetteville City Limits, shall have the words SANITARY SEWER and PERMIT REQUIRED CONFINED SPACE or CONFINED SPACE ENTRY PERMIT REQUIRED cast in the top.

D. Hinged and gasketed manhole frame and cover shall open to, or past, 90° and have a safety stop at 90°.

E. All casting shall be Traffic- rated meeting the requirements of AASHTO M306 latest edition proof load representing a 2.5 safety factor over H-20 and HS-20 loading.

F. All castings shall be cast with the approved foundry's name, manufacturing foundry mark, part number, and production date in mm/dd/yy format. All castings shall be manufactured in the USA and shall be clearly marked "Made in USA."

G. All castings: Free from porosity, blowholes, hard spots, shrinkage, distortion and other defects; smooth and well cleaned by sandblasting; manufactured true to pattern.

H. Frame and cover dimensions: Refer to the City Engineering Standard Detail Drawings for EJIW, Neenah similar. Final casting dimensions may vary one-half the maximum shrinkage possessed by the metal or no more than +/- 1/16 inch per foot.

I. Cover and frame bearing surface: smooth finish, non-rocking design or machined bearing surfaces to prevent rocking and rattling under traffic.

J. Cast Iron: ASTM A 48, Class 35B.

K. Ductile Iron: ASTM A 536, Grade 80-55-06.

L. Frame shall be anchored to the manhole cone per the City Engineering Standard Detail.

M. Approved products are East Jordan Iron Works Ergo and Neenah Liftmate.

2.10 MANHOLE STEPS

A. Manhole steps shall NOT be installed in any manholes.

2.11 RUBBER WATERSTOP GASKETS

A. Waterstop gaskets shall be required at **ALL** manhole connections. Manhole seals shall be concrete manhole adapter by Fernco, A-Lok, or approved equal.

2.12 MANHOLE RISER RING

A. Manhole riser rings shall be compatible with the size and type of manhole cover with which it will be used.

B. A maximum of 6 inches of riser rings shall be permitted. Adjustments greater than 6 inches will require grade adjustment rings.

2.13 MANHOLE GRADE ADJUSTMENT RINGS

A. Grade adjustment rings shall be required to adjust the frame and cover to grade as required.

B. Sloped grade adjustment rings may be required to match the slope of paved areas.

C. Grade adjustment rings shall be injection molded, recycled HDPE as manufactured by Ladtech, Inc.

2.14 RAIN STOPPERS (MANHOLE INSERT)

Rain stoppers shall be installed in all manholes that are both located in a floodplain and such manholes do not utilize hinged covers complete with gaskets.

Rain stoppers shall be installed in other manholes in locations subject to inflow and infiltration as directed by the City's Utilities Director.

A. Polyethylene Insert

1. The manhole insert shall be of corrosion-proof high density polyethylene that meets or exceeds the requirements of ASTM D1248, Category 5, Type III with a minimum impact brittleness temperature of -180°F.
2. The minimum thickness of the manhole insert shall be 3/16".
3. The manhole insert shall have a strap for removing the insert. The strap shall be made of minimum 1" wide woven polypropylene or nylon webbing, with the ends treated to prevent unraveling, Stainless steel hardware shall be used to securely attach strap to the insert.
4. The manhole insert shall have one or more vent holes or valves to release gases and allow water inflow at a rate no greater than 5 gallons per 24 hours. The valve shall be installed by the manufacturer at the factory.
5. There shall be a minimum 10-year warranty on the body of the dish and a 5-year warranty on all other parts of the insert.
6. The insert shall have proof of durability in traffic impact loads and shall have an Engineer certified proof test passing H-20 loading.

B. Stainless Steel

1. Stainless steel inserts shall be installed at locations with pipe size diameters of outfalls 15 inches or greater and indicated on the plans by the Engineer of Record.
2. Insert shall be 304 stainless steel.
3. The manhole insert shall be as manufactured by “No Flow In FLOW” located in San Antonio, Texas, or approved equal.

PART 3 - EXECUTION

3.01 MANHOLES – GENERAL

A. Perform excavation and prepare base area in accordance with Section 2300 - Excavation, Backfilling, and Compacting.

B. Never install base in a water filled excavation.

C. Place base per the City Engineering Standard Detail Drawings and Section 3600 - Cast-In-Place Concrete. Extend base a minimum of six inches beyond finished sides of manhole.

D. Extend all pipes entirely through the manhole wall so that a joint occurs no closer than 24 inches outside the manhole wall.

E. Pipe installed for future extensions shall have one full joint of pipe installed.

F. After manhole is constructed, wait no less than 48 hours, then backfill per Section 2300 - Excavation, Backfilling, and Compacting.

3.02 CAST-IN-PLACE MANHOLES

A. Dimension and layout: Per City of Fayetteville Engineering Detail Drawings and Tables. The top section or cone must be concentric with the barrel unless otherwise noted.

B. The frame shall be set in accordance with City of Fayetteville Engineering Details. The frame shall be installed to match the slope of paved areas.

C. Install rubber waterstop gaskets in the walls around all pipes.

D. Interior finish: Smooth, free of fins or sharp edges.

E. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineering Standard Details.

F. Care should be taken to prevent the end of the pipe from deflecting, due to loads imposed by the weight of the concrete.

G. Construction joints on manholes of excessive depth shall be connected with reinforcement approved by the Engineer.

3.03 PRECAST MANHOLES

A. Dimension and layout: Per City Engineering Detail Drawings. The top section or cone must be concentric with the barrel unless otherwise noted.

B. The bottom section for pre-cast manholes shall be manufactured as an integral part of the manhole base slab.

C. Install remaining sections in a truly vertical plane.

D. The frame shall be set in accordance with City Engineering Details. The frame shall be installed to match the slope of paved areas.

E. Fill space between pipe and periphery of cutout on the interior of the manhole with non-shrink grout from the bottom of the invert to the spring line of the sewer pipe (1/2 pipe depth).

F. Grout joints between sections, interior only.

G. Interior finish: smooth, free of fins or sharp edges.

H. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineering Standard Details.

I. Grout and/or plug lifting holes for manholes.

J. All manhole joints shall be sealed with an external joint wrap material.

3.04 DROP MANHOLES

A. Install a drop manhole when the vertical difference between the pipe entering and leaving the manhole exceeds two (2) feet.

B. Construct manhole base, barrel, and top per the requirements for cast-in-place or pre-cast manholes.

C. Construct drop of PVC pipe and fittings per City Engineering Standard Details.

D. Encase the pipe and fittings in Class A or B concrete as per City Engineering Standard Details.

3.05 MANHOLE FRAME AND COVER

A. Set the manhole frame for Cast-In-Place manholes in Class B concrete as shown on the Standard Details as an integral part of the manhole construction.

B. Set manhole frame and cover top level and to the elevation shown on the Drawings. In public rights-of-way, set the ring and cover flush with pavements, sidewalks, or other paved surfaced areas.

3.06 MANHOLE INVERT

A. Invert depth at the flow line: the same as the pipe diameter.

B. In curved inverts, make curves with the longest possible radius to facilitate smooth flow and the insertion of cleaning and televising equipment.

C. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineering Standard Details.

D. Invert materials and finish: Class B Concrete, smooth finish.

E. Invert grade: Constant, smooth grade; no offsets.

F. Bench: Slope grout upward from the edge of the invert to the manhole wall.

G. Form a flow channel in the bench for any services stubbed into manhole. Form invert and finish per above.

H. Cut the upper half of any pipe extending inside the manhole wall flush with the wall. Smooth rough edges with grout.

3.07 MANHOLE REPAIRS

A. Make all repairs in accordance with these specifications.

B. Use manhole grout in patching around new taps.

C. Plaster all brickwork with mortar.

3.08 MANHOLE ADJUSTMENTS

A. Manhole riser rings may be used to raise manhole covers to grade.

B. Manhole riser rings shall be sealed with Adeka P-201 or Manus-Bond 75AM to create a water tight seal.

C. Adjustments greater than 6 inches will require grade adjustment rings in accordance with project specific approved details.

D. The exterior surfaces of the frame base, and four inches below the top of the manhole cone shall be cleaned with a wire brush and then waterproofed with trowelable bitumastic gasket material, Trowelable EZ-STIK #3 as manufactured by Press-Seal Gasket Corporation, 6-inch wide butyl external joint wrap material, or equal, in accordance with the manufacturer's specifications. A protective polyethylene cover shall be placed over the trowelable waterproofing material when backfilling, following sealing of the frame to the manhole.

E. The throat section height shall not exceed 18 inches. The throat section shall be defined as the distance from the bottom of the integral cast manhole ring to the top of the manhole cover.

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END OF SECTION 3300

SECTION 3400 BORES AND STEEL ENCASEMENT PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide encasement pipe jacked through bored tunnel for crossing of utility pipe lines under roadways, railroads and at other locations as indicated on the approved drawings.

B. Provide encasement pipe by open cut construction where shown on the Drawings.

C. Pulling or jacking carrier pipe through encasement pipe.

D. Providing synthetic end seals at ends of encasement pipe.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A139 Specification for Electric-Fusion (Arc) - Welded Steel Pipe (sizes 4” and over).

2. ASTM A211 Specifications for Spiral-welded Steel or Iron Pipe.

B. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Encasement pipe: Smooth wall steel pipe conforming to ASTM A-53 / ASTM A283 / ASTM A-135, Grade B, CW, physical tests only (no hydrostatic test required). The pipe shall have beveled ends prepared for welded joints. The pipe steel shall have a minimum yield strength of 35,000 psi.

B. Welding materials: Type required for materials being welded and conforming to applicable AWS Specifications.

C. Grout: Cementitious grout shall consist of a preblend of lightweight aggregate, cement, fly ash and admix to prevent segregation and promote expansion upon setting. Loose bulk density for the dry mix materials shall be 30 to 35 pounds per cubic foot. Grout shall equal or exceed Strong-Seal Grout 250 - Product Code 2133 and shall be packaged in 2 cubic foot bags.

D. Flowable Fill: Flowable fill shall conform to Section 206 – Flowable Select Material of the Arkansas State Highway and Transportation Department's Standard Specifications for Highway Construction, latest edition.

E. Casing Spacers: Shall be stainless steel, Cascade Model CCS as manufactured by Cascade Waterworks Mfg. Co., or approved equal.

F. Casing End Seals: Casing end seals shall be one-piece and be of the pull-over type construction. Overlapping style end seals are not permitted. Casing end seals shall be of a synthetic material that is designed for the specific application. Casing end seals shall be secured to the encasement pipe and the carrier pipe with stainless steel bands. Casing end seals shall be Cascade Model CCES, or approved equal.

G. Polyethylene Encasement: Polyethylene encasement shall be in conformance to ANSI/AWWA C105/A21.5, latest revision.

2.02 MINIMUM THICKNESS

A. The encasement pipe shall be capable of supporting all traffic and earth loads. The Contractor shall submit design calculations supporting the selection of the encasement pipe thickness used.

B. Minimum thickness for encasement shall be as follows:

Diameter of Casing Pipe	Minimum Thickness
20" OR LESS	.250"
24" – 30"	.375"
36"	.500"
48" – 60"	.625"
72"	.750"

Sizes not listed above shall be determined on an as-needed basis by the City.

C. When boring under railroad right-of-way, minimum thickness shall be determined by railroad standards.

2.03 MINIMUM DIAMETER

A. The minimum diameter for encasement pipe shall be such that the carrier pipe, along with casing spacers and joint restraints, will not bind against the inside of the encasement pipe during installation. The minimum diameter of encasement pipe shall be as follows:

Diameter of Carrier Pipe	Diameter of Encasement

2”	5”
3”	6”
4”	8”
6”	12”
8”	16”
10”	20”
12”	24”
14” – 16”	30”
18” – 20”	36”
24”	42”
30”	48”
36”	54”
42”	60”
48”	72”

3.01 EXCAVATION

A. The contractor shall inspect the location where encasement structures are to be installed and become familiar with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work.

B. The contractor shall satisfy themselves of soil conditions by means they deem necessary including but not limited to exploratory boring or exploratory pit excavations at tunnel/bore ends. All such exploratory work will be coordinated with City and the engineer of Record. All such exploratory work shall be performed in a manner not to endanger highway, railroad or street fill and embankments and shall be satisfactory backfilled and restored.

C. Highway Bore: Do not set up equipment or begin excavating pit on state highway without written permission/permit received from the Arkansas Highway and Transportation Department District Engineer or his authorized representative.

D. Railroad Bore: Do not set up equipment or begin excavating pit on or near railroad property without written permission/permit of the respective railroad company.

E. Highway and railroad permits for Capital Improvement Projects will be obtained by the City or the City’s designated representative.

3.02 INSTALLATION, ENCASEMENT PIPE

A. General.

1. Install encasement pipe at grade and alignment shown on Drawing. Allow for height of casement spacers when establishing grade for gravity line encasement pipe. Refer to City Engineering Standard Details.

2. When indicated on the approved plans or project specifications all street, roadway and highway crossings for water or sewer pipelines installed by jacking and bore methods shall be accordance with AHTD standards.

3. Excavation of bore pits and trenches within street right-of-way, roadways or highways shall be of sufficient distance from paving to permit traffic to safely pass without interference. The Engineer of Record shall be responsible to design the location of bore pits to permit traffic to safely pass without interference.

B. Bores:

1. Excavate pits and trenches required at each side of crossing to minimum width and length indicated or necessary for boring and jacking operation and carrier pipe installation.
2. Carefully set steel guide rails in pit to attain specified grade and alignment.
3. Keep pit pumped free of standing water. Maintain pit bottom to provide stable base for rails and equipment and firm footing for workmen.
4. Provide Trench Safety/Protective Systems meeting Federal requirements and these Specifications.
5. Bore tunnel and simultaneously jack encasement pipe forward one section at a time. Connect sections by full penetration butt welding performed in accordance with AWS D1.1.
6. Remove excavated soil from boring operation as it enters pit and dispose of it offsite.
7. Voids between the encasement pipe and the surrounding soil shall be pressure filled with grout.
8. Cathodic protection shall be installed on the steel encasement pipe. Use 17# HP magnesium anodes bonded to the steel encasement pipe.
9. End seal shall be installed after the carrier pipe has been installed.

C. Open Cut:

1. Excavate trench as required.
2. Steel encasement pipe shall be installed, bedded, and backfilled the same as ductile iron pipe.
3. Steel encasement pipe shall be double poly wrapped.
4. End seal shall be installed after the carrier pipe has been installed.

3.03 INSTALLATION, CARRIER PIPE

A. Joint pipe as specified in Section 3100 or 4100. Pull or jack carrier pipe through encasement pipe. Do not allow cables or jacks to be in direct contact with carrier pipe while pulling or jacking pipe. Use timber or padded steel member.

B. A minimum of three casing spacers shall be installed on pipe up to 20-foot pipe joints.

C. All carrier pipe installed through the encasement shall be fully restrained. Over-belling of the carrier pipe shall be prevented.

3.04 BACKFILL

A. Prior to backfill, seal ends of encasement pipe with and end seal as shown in the City Engineering Standard Details.

B. Use material excavated from pit.

C. Backfill against ends of encasement pipe.

D. Backfill pit and carrier pipe in same manner as specified in Section 2300 – Excavation, Backfilling, and Compacting.

3.05 CLEANUP

A. Backfill in same manner as specified for line work in Section 2300 - Excavation, Backfilling and Compacting.

B. Cleanup and restoration as specified in Sections 6000 PAVEMENT REPAIR and 6100 LAWN AND GRASS RESTORATION.

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END OF SECTION 3400

SECTION 3500 SEWER PUMP (aka LIFT) STATIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section pertains to the minimum requirements for the design and construction of submersible type pump (aka lift) stations, which are the primary type constructed as part of private development. Sewer pump stations installed by private development will meet or exceed the minimum standards within this section and as otherwise specified within these Standards.

Comply with the "Ten States Standards" and modifications and/or additional requirements as specified herein.

Sewer pump stations, for City Capital Projects will comply with this section and any other requirements determined necessary by the Engineer of record, or Utilities Director, or the City's designated engineer. Sewer pump stations for City Capital Projects will further be considered on specific case by case basis in accordance with Section 1000 General Requirements. Approval will be project specific and requires approval from both the Utilities Director and the designated City engineer.

B. A registered Civil Engineer shall seal the civil portion of the drawings. A registered Electrical Engineer shall seal the electrical portion of the drawings. All engineers shall be registered in the State of Arkansas.

C. These Standard Specifications provide the minimum requirements for sewer pump stations. The pump station dimensions, equipment, controls, etc. will be approved only upon the submittal of plans and specifications to the City, and upon the City's written approval.

D. Pump Stations, in general, shall be submersible type pump capable of passing a 3 inch (minimum) sphere. Multiple pumps shall be provided. Where only two pumps are provided, the pumps shall be of the same size with one (pump and motor) designated as duty and one (pump and motor) designated as stand-by with each pump capable of pumping the design flow for the proposed development (including provisions for future phases of the initial proposed development) with a minimum pumping capacity of 100 gpm each under site operating conditions. Firm capacity and one minimum standby pump shall be provided, pumps shall have the capacity such that with any one pump out of service the remaining pump(s) will have the capacity to pump the design hourly flow. Further the pump station will include: wet basin, separate valve pit, valves, piping, hatches, guide rails, pump removal components, control center, level controls, remote monitor package, interconnecting electrical wiring, incoming power and telephone supply, and all other features regularly and normally required as a part of a complete and functional facility. All work shall be in accordance with site requirements, details in the Drawings, the Engineer of Record's design, these Standards and the manufacturer's recommendations.

E. All Pump Stations shall be designed for and operate on 480 V, three (3) phase power. No deviation from this requirement shall be permitted without the express prior written approval of the City.

F. The station shall be equipped with a remote monitor capable of monitoring the status of the lift station and communicating with the City's existing SCADA system housed at the Noland WWTP. This system shall be purchased and installed by the City at the developer's or contractor's expense.

G. All of the mechanical and electrical equipment shall be an integral package supplied by the pump manufacturer with local representation so as to provide undivided responsibility. Pumps, motors and appurtenance mechanical and electrical equipment shall be Fairbanks Morse Pump equipment or Flygt Pump equipment and further comply with other specific requirements set forth herein and in the approved plans.

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

I. Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by the City prior to proceeding with the work.

J. All mounting and fastening hardware shall be stainless steel.

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

L. All valves and ductile iron fittings shall be ceramic epoxy coated inside and out. All ductile iron piping coming in contact with wastewater or installed in the wet well, dry well or valve pit shall be coated with epoxy inside and out. Acceptable interior epoxy for ductile iron pipe shall be specifically designed for wastewater environments and shall be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

M. All stainless steel hardware and accessories shall be protected from field applied coating of the epoxy.

N. Wet well access/hatches shall include an integral safety grate and integral safety chain/rail

system or a separate safety rail system designed by, or selected by, the engineer of Record and approved by the City.

O. Air-powered mixers. If the City determines the need for an Air-Powered Mixer (mixer), then the developer's engineer shall accommodate the City's purchase and installation of the mixer and controls, wiring, hoses, and mixer appurtenances (only) within, and connected to, the developer's installed pump station.

1.02 PUMP STATION SITE

A. The pump station site shall have minimum dimensions of 50' x 50' with a maximum cross slope of 5%. The site shall be an all-weather surface consisting of asphalt or concrete. Additional site area may be required depending on the diameter and depth of the wet well and other accessories. Final dimensions of the site shall be determined by the City Engineer.

B. The City of Fayetteville must own the land, by deed and not by plat, on which sewer pump stations are located or anticipated to be constructed.

C. The pump station shall be provided with an access drive to the nearest public road. The access drive shall be an all-weather surface with a stabilized gravel base and asphalt or concrete surface. If the slope is greater than 10%, the surface shall be constructed in such a way that the surface material cannot creep down slope. The drive shall enter the public road at a curb cut.

D. The pump station site shall be secured by a minimum 6' high wooden fence. Posts shall be a minimum of 3" SCH 40 galvanized steel. Gate posts shall be a minimum of 4" SCH 40 galvanized steel. Rails shall be 16-gauge galvanized steel, 2" x 4" nominal dimensions. Pressure treated wood shall be installed in the rails to anchor the pickets. All pickets shall be constructed of cedar, and shall be a minimum of 1"x6"x6'. All hardware used to anchor the cedar pickets to the steel rails shall be designated for use with cedar. A 12' wide double gate with lockable hasp shall be provided. A 3' wide man gate with lockable hasp shall be provided.

1.03 OPERATING CONDITIONS

A. The characteristics and operating conditions of the lift station and pumps shall be provided in detail as part of the ENGINEER'S design and submitted for approval to the City.

B. Prior to installation the Contractor shall submit the following information for each pump to the City for review and approval:

1. Pump capacity in gallons per minute;
2. Total dynamic head (TDH) and operating RPM; Use C=120 and C=140
3. Motor horsepower;
4. Motor rpm;
5. Motor voltage, phase and cycle;

6. Make and model number; and
7. Pump curves for the pumps to be provided.

C. Pump station acceptance will be based upon pump drawdown tests. The acceptable range is +10% and -5% of the reported pump capacity in GPM. Pump flows outside of this range will result in non-compliance of the standard and the pump station will not be accepted.

1.04 NOTES TO DESIGN ENGINEER

A. SIZING OF WET BASIN

1. The wetwell storage depth below the lowest inlet shall be a minimum of 5'-0" and shall also meet the following criteria:

   a. All pumps OFF shall be set at the pump manufacturer's recommended level but no less than 1'-6" from the bottom of the wet well.

   b. The distance between all pumps OFF and the lead pump ON shall be set to provide storage capacity equal to:

$$\frac{15 \times \text{RATED PUMP GPM}}{4}$$

   (i.e. 15 minute cycle minimum)

   c. Designs utilizing multiple pumps will include the lag pump ON set a minimum of 6" above the lead pump ON and a minimum of 12" below the lowest inlet invert.

   d. The high water alarm float shall be set a minimum of 6" above the lag pump ON and minimum of 6" below the lowest inlet invert.

   e. All level control elevations shall be set below the lowest inlet invert.

1.05 SMALL DIAMETER PRESSURE SEWERS

A. Small diameter pressure sewer systems are not permitted as a Standard Specification.

B. Small diameter pressure sewer systems will be considered on specific case by case basis in accordance with Sections 1000 1.01 B and 1000 1.07 A. Approval will be project specific and requires approval from the Utilities Director.

1.06 PUMP STATION WARRANTY

A. Pump station warranty shall be two (2) years from the date of acceptance per City maintenance bond requirements.

PART 2 – PRODUCTS

2.01 PUMPING EQUIPMENT

A. Pumps shall be of the submersible type for handling raw unscreened sewage. Pump volute, motor and seal housing are to be high quality gray cast iron. Impeller shall be either cast iron or cast bronze of a non-clog design capable of handling minimum three (3) inch sphere solids, fibrous material, heavy sludge, and other matter found in normal sewage applications. Impeller shall have pump-out vanes on the back shroud of the impeller to keep pumped material away from the seal area and increase operating life. Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. The pump volute shall be fit with a replaceable bronze wear ring to minimize wear on the impeller and help achieve longer balanced operating life. All fasteners shall be of stainless steel.

B. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Sealing shall be accomplished when metal-to-metal contact is made, resulting in controlled compression of the rubber O-rings without requirement of a specific torque limit.

C. The pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall consist of one (1) stationary seat and one (1) rotating ring held in place by its own spring. The lower seal shall be removable without disassembling the seal chamber. The upper seal between the motor and the seal chamber shall be of the same design with its own separate spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The shaft sealing system shall be capable of operating submerged to pressures equivalent to two hundred (200) feet. No seal damage shall result from operating the pump unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

D. The seal chamber shall also be equipped with a seal failure sensor probe which will sense water intrusion through the lower seal. This sensor is to be connected to an alarm in the control panel to indicate lower seal failure.

E. The stator winding, rotor and bearings are to be mounted in a sealed submersible type housing. Insulation utilized in the stator windings shall be Class F with maximum temperature capability of 155EC. Motor housing shall be filled with a high dielectric oil to give superior heat transfer and allow the bearing to run in a clean, well lubricated environment; or the housing shall be air filled with grease lubricated bearings. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump should not require cooling water jackets. Stator shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without use of heat or press. Shaft

shall be of stainless steel and supported by ball bearings. Motor shall be provided with heat sensing units attached to the motor windings which shall be connected to the control panel to shut down pump if overheating occurs.

F. Pump motor cable and heat sensor/seal failure sensor cable shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. Cable of the proper length shall be provided to eliminate need for splices or junction boxes between pump and "control center". The cable shall enter the motor through a cord cap assembly which is double sealed allowing disassembly and disconnect of the wires and the motor and still not damage the sealed characteristics of the motor housing. Each individual conductor shall be color coded in accordance with generally accepted industry standards. The color coding shall designate the application of the conductor.

G. The pump mounting base shall include adjustable guide rail supports and a discharge connection with a one hundred twenty-five (125) pound standard flange. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc. or equal.

H. A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The system shall not require a man to enter the wetwell to remove the pump and motor assembly. Two (2) rails of two (2) inch stainless steel pipe shall be provided for each pump. The guide rails shall be positioned and supported by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by attachment to the access hatch frame. One (1) intermediate guide rail support is required for each fifteen (15) feet of guide rail length for stainless steel pipe.

I. The pumps shall be equipped with sliding brackets or rail guides. To insure easy removal of the pumps, the rail guides attached to each pump shall not encircle the rails. A stainless steel lifting chain or manufacturer's pump removal system (Flygt Lift or approved equal) of adequate length for the basin depth shall be provided for each pump. Each pump shall be equipped with a permanent, stationary lifting handle with a minimum clearance of 12" between the top of pump and bottom of handle.

J. The rails and the rail guides shall function to allow the complete weight of the pumping unit to be lifted on dead center without binding and stressing the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable. The actual sealing of the discharge interface may be of the metal-to-metal contact. No sealing gaskets will be permitted.

K. Pump warranty shall be provided by the pump manufacturer and shall warrant the units being supplied to the Owner against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed

form and apply to all similar units. A copy of the warranty statement shall be submitted with the approval drawings.

2.02 BASIN, VALVE PIT AND ACCESSORIES

A. The basin and valve pit are to be constructed of precast concrete meeting the requirements of ASTM C-478. Cast-in-place monolithic structures may be substituted with the prior written approval of the City. Minimum valve vault and wetwell diameter shall be 6'-0'. The actual arrangement of the structures are to be as shown in the approved Plans. The wetwell basin top shall be provided with a six (6) inch stainless steel vent having a downward pointing inlet and screen over the inlet opening.

B. The basin, valve pit, flat tops, and base slabs are to be constructed of precast or cast-in-place reinforced concrete manhole sections conforming to ASTM C-478. All joints between precast sections shall be made with an approved rubber O-Ring in accordance with ASTM C-443 and a 1/2 inch diameter non-asphaltic mastic conforming to AASHTO M-198 and Federal Specification SS-521-A. All manhole joints shall be sealed with an external joint wrap material. Material shall be equal to Bidco Butyl Wrap as manufactured by NPC or Infi-Shield® Gator Wrap by Sealing Systems, Inc. In addition, the outside wall below grade is to be coated with bituminous waterproofing material. The top and bottom of the chambers shall be precast or may be poured in place concrete if approved by the City Engineer.

C. The wetwell pump basin and the valve pit chamber shall be enclosed at grade level with a reinforced concrete pad rectangular in shape and extending a minimum of 1'-0' from the chambers outside dimension.

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

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

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

3. The above epoxies shall meet the following minimum requirements:

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

4. A Tnemec system to include Tnemec Series 434 Permashield with a topcoat of

Tnemec Series 435 Perma Glaze will be reviewed on specific projects as an approved equal.

E. The pump supplier shall provide an aluminum two (2) door access hatch frame and door assembly to be installed in the concrete basin top. This door assembly shall provide access for removal of the pumps and shall support the guide rails. The doors shall be provided with lifting handle, safety latch to hold door in the open position and a hasp suitable for padlock. The doors shall have a nonskid finish and be designed for light, medium, or heavy duty, depending on the location of the pumping station.

F. An aluminum single door access hatch frame and door assembly similar to the one described above shall be provided for use as entry to the valve pit. Minimum opening for the valve box entry shall be thirty-six (36) inch by thirty-six (36) inch.

G. A swing check valve with external swing arm and a full port (100% area) eccentric plug valve shall be installed in the valve pit in each pump's discharge piping. A minimum clearance of twelve (12) inches shall be allowed from the bottom of the valves to invert of the pit. A drain pipe and p-trap shall be installed to drain the valve pit back to the wet basin but not allow the wet basin liquid to enter the valve pit. In addition, a 1/2" NPT tap and ball valve shall be provided on the discharge side of the pumps past the valves to facilitate pressure readings for the pump discharge.

H. All yard piping within the pump station site shall be centrifugally cast ductile iron and shall conform to ANSI Specifications A21.51 and AWWA C-151, latest revision and shall be Pressure Class 350, 300, 250, or 200 wall thickness dependent upon site conditions. All direct buried ductile iron pipe and fittings shall be double poly-wrapped.

I. Force main pipe downstream of the pig launch structure shall be DIP or PVC in accordance with these Standards. All force main pipe shall have tracer wire installed along its entire length. Gate valves (up to 10-inch) or full-port plug valves (12-inch) shall be installed along its length, not to exceed 1000' unless a variance is approved by the City for long force mains, and shall be marked sewer. An empty valve box shall be installed in the vicinity of the discharge manhole and at fittings that cause a change in direction where the tracer wire can be brought to grade for a point of connection to aid in tracing the force main. The valve box shall be marked sewer. A 2-inch SCH-40 PVC pipe shall be installed in the empty valve box. The pipe shall have a pipe marker label affixed and further labeled "No Valve, Tracer Wire Only." The force main shall have tape marked sewer wrapped around the pipe with complete revolutions not to exceed 6'. Tape marked sewer shall also be installed in the trench 18" above the top of the sewer force main.

J. Sewer line markers shall be TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380), or approved equal. All markers shall be installed according to the manufacturer's recommendations. The uppermost portion of the Carsonite marker shall be made of Visibility Enhancer (CVE-360), or approved equal and must be bolted to the utility marker. TriView markers do not require visibility enhancers. The utility marker shall read as follows: "CAUTION, SEWER PIPELINE", "City of Fayetteville", and "Before Digging Call 1-800-482-8998".

The label shall also include the official City Logo and be white in color with green and black lettering. The label shall be affixed to two sides of the marker. An additional white 1” wide reflective tape (3M or equal) shall be placed around the full circumference of the top of the marker. Concrete shall be placed 6-inches around and 1-foot deep around the base of each marker.

K. All force mains shall be equipped with a pig launch within the pump station site. A fire hydrant is required to be located within 100’ of the site to facilitate pigging of the force main.

2.03 GENERAL ELECTRICAL

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

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

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

D. A minimum four (4) inch PVC schedule 40 wall conduit shall be provided from the wetwell basin to the control center which will allow the pump power cables, sensor cables and level controls to be pulled through without difficulty and allow the use of one (1) piece cables from the pumps and level controls to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.

E. A minimum three-quarter (3/4) inch PVC schedule 40 wall conduit shall be provided from the valve vault to the control center for future remote monitoring of the swing check valves.

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

2.04 CONTROL CENTER

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

B. A circuit breaker and magnetic starter with three (3) leg overload protection and manual

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

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

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

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

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

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

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

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

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

K. The control center shall be suitable for connection to a remote monitor package as described in the section titled "Remote Monitor Package". The main control must include the following interconnection capability:

1. Circuit breaker to power remote monitor panel as described above.
2. Relay contact to signal high water alarm.
3. Relay contact to signal tripping of the overload of any of the pumps.
4. Relay contact to transmit signal of seal failure or heat sensor trip of any of the pumps.
5. Relay contact to indicate phase failure
6. Relay contact to signal pump motor starts, i.e. ON or OFF

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

M. Pump control shall be achieved by the use of a bubbler system. The bubbler system shall include integral air supply generated by an on-site air compressor unit, flow regulator, pressure sensing equipment for level indication and pump control, stainless steel tubing, bypass/blowdown valve for cleaning bubbler tube, and all other material, equipment, and labor required for a complete, tested, and accepted bubbler control system. The Controller shall be model SC2000 as manufactured by Motor Protection Electronics of Apopka, Florida (407) 299-3825, or approved equal by the City of Fayetteville.

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

2.05 SCADA REMOTE MONITOR PACKAGE

A. The station shall be equipped with a remote monitor capable of monitoring the status of the lift station and communicating with the City's existing SCADA system housed at the Noland WWTP. This system shall be purchased and installed by the City at the developer's or contractor's expense. The costs of the SCADA system charged to the developer or contractor will be the actual costs, not to exceed $7,500.00 in 2017, and such cost limit is subject to annual revision by the Utilities Director.

2.06 SPARE PARTS

A. The Contractor shall supply one set of spare parts for each pump for each station, including at a minimum the following:

1. Impeller;
2. Upper seal assembly;
3. Lower seal assembly;
4. Upper bearing assembly;
5. Lower bearing assembly;
6. Wear rings; and

7. O-Rings and gaskets (two (2) sets).

2.07 OPERATION AND MAINTENANCE MANUALS

A. Three (3) operation and maintenance manuals shall be submitted to the City

B. Manuals shall include, at a minimum:

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

2.08 GENERATOR SET

A. GENERAL

1. The pump station shall include an on-site backup power generator. The generator and lift station combination must include switching and control gear such that the backup power source is activated automatically without human action. The fuel source shall be natural gas. In the event that natural gas is unavailable, propane, or diesel shall be used with a minimum fuel tank/storage sized to run all pumps at full load for 48 hours. The generator must be capable of operating the lift station at full capacity, i.e., with the largest pumps, impellers, and motors, and the greatest number of pumps, that the lift station can physically contain, with all of the above operating at full speed simultaneously.

B. EQUIPMENT

1. The generator set shall be minimally rated at the kW rating as indicated on the drawings when operating at 277/480 volts, 0.8 lagging power factor. The generator set shall be capable of this rating while operating in an ambient temperature condition of 122°F (50°C).

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

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

4. Sound Attenuated Weather Protective Enclosure

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

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

c. Enclosure shall include the following features:

1) Foam insulation on all interior surfaces
2) Sound level not to exceed 68 dba within 7 meters of enclosure surface in any direction
3) All exterior and interior surfaces finished with baked-on powder-coat
4) Bottom flange with multiple mounting holes
5) Stainless steel door hardware and lift-off hinges
6) Lockable doors
7) Gasketed access doors

5. Automatic Transfer Switch (ATS)

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

b. ATS shall be sized as indicated on the drawings, 480 volt, 3 phase, 4 wire, 3 pole with solid neutral.

6. Submit motor starting calculations and generator sizing calculations for approval.

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

a. Generator status
b. Generator general alarm

8. Generac or approved equal.

PART 3 – EXECUTION

3.01 SYSTEM OPERATION

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

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

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

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

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

END OF SECTION 3500

SECTION 3600 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers cast-in-place concrete materials, reinforcing steel, forms, and finishing in conjunction with water and sewer construction.

B. Use specification defined "Class A" 3500 psi concrete for miscellaneous non-structural bedding and thrust blocking only.

C. Use specification defined "Class B" 4000 psi concrete for anchor collars and cast-in-place manholes.

D. Structural concrete for building and environmental structures shall comply with the applicable requirements of ACI 318 and ACI 350 latest editions. Concrete for structures is not a Standard Specification and shall require submittal, review and approval for specific case by case basis and in accordance with Sections 1000 General Conditions.

1.02 QUALITY ASSURANCE

A. If requested by the City, or the Engineer of Record, the concrete shall be tested as required in Table 11-1 , City of Fayetteville Arkansas Minimum Street Standards, as follows.

1.03 SUBMITTALS

All materials must be 100% Domestic United States of America (USA) manufacture.

A. Submit mix design, equipment details, and vendor name for field batched concrete.

Table 11-1
Materials Testing

Subgrade	AASHTO	ASTM	Frequency
Sampling	T87	D420	Per Soil Type Encountered
Soil Classification	M145	D3282 D2488/D2487	
Proctor			
Standard	T99/T310	D698	
Modified	T180/T310	D1557	
Density & Moisture Content	T191/T233/T310	D2922/D3017	1 per 300LF lane Min. 1 per lane
Hot Mix Asphalt			
Sampling	T168	D979	
Density			
Nuclear	--	D2950	As Directed by City
Coring	T166	D2726	1 per 500LF lane Min. 1 per lane
Concrete			
Sampling	T141	C172	
Mold and Cure	T23	C31	
Cylinder Tranport.	T23	C31	
Physical Properties			1 per 100 cy Min. 1 per day 1 per 1000 LF Curb
Slump	T119	C143	See Table 11-2
Air Content	T152	C231	
Comp. Strength	T22	C39	
Coring	T24	C42	As Directed by City
Comp. Strength	T24	C42	
Aggregate Base Course			
Gradation	T27	C136	1 Per Source
Proctor			
Modified	T180	D1557	
Standard	T99	D698	
Density & Moisture Content			1 per 300LF lane Min. 1 per lane

Table 11-2
Concrete Mix Designs

Concrete Class	Class A	Class B
28-Day Comp. Strength (psi)	3500	4000
Portland Cement (bags)	5.5	6.5
Max. Water/Cement Ratio	.49	.44
Slump Range (inches)	1-4	1-4
Air Entrainment (%)	4-7	4-7
Maximum Fly Ash Content	20%	20%

PART 2 - PRODUCTS

2.01 CONCRETE

A. Concrete: composed of Portland cement; fine and coarse aggregate; water; and, an air entraining agent. Provide either Class A concrete or Class B concrete as described below.

B. For Class A and Class B concrete use ready-mixed concrete; conform to ASTM C 94, latest edition; deliver and place within one hour after all materials have been placed in the mixing drum.

C. The concrete mix shall be designed so that the proportions will produce results that will meet the requirements of Class A or Class B concrete. Proportion components, except water, by weight. Water may be measured by volume. One sack of Portland Cement consists of one cubic foot or 94 pounds. Proportion components to meet these requirements:

1. Class A Concrete:

   a. Maximum net water/cement ratio = 0.49
   b. Portland cement (bags) 5.5 minimum
   c. Slump range: 1 - 4 inches
   d. Minimum 28 day compressive strength: 3,500 PSI
   e. Air Content: 4 - 7

2. Class B Concrete:

   a. Maximum net water/cement ratio = 0.44
   b. Portland cement (bags) 6.5 minimum
   c. Slump range: 1 - 4 inches
   d. Minimum 28 day compressive strength: 4,000 PSI
   e. Air Content: 4 - 7

D. Before beginning any concrete work, the Contractor shall have the concrete mix designed and the ingredients selected and proportioned by an approved independent testing laboratory meeting the requirements of ASTM E 329. Certified copies of all laboratory trial mix reports shall be sent to the Engineer from the testing laboratory for review. Do not place concrete prior to the Engineer's review and acceptance in writing of the concrete mix design.

E. Cement: Portland Cement conforming to AASHTO M 85, Type I. Use Type III cement (high early strength) only if approved by the Engineer.

F. Fly ash: Fly ash may be used as a partial cement replacement not exceeding 20% by weight of the cement when approved by the City. When fly ash is used, the total weight of both cement and fly ash will be used in design calculations.

G. Water: potable water free from injurious amounts of acids, alkalis, oils, sewage, vegetable matter and dirt.

H. Air entraining agent: use in all Class B concrete as required; conform to AASHTO M 154; add to the mixing water in solution; proportion to provide four (4) to seven (7) percent air in the concrete.

I. Fine aggregate: clean, hard, durable particles of natural sand free from injurious amounts of organic impurities; conform to the graduation requirements of AASHTO T 27.

J. Coarse aggregate: clean, hard and durable crushed stone or washed gravel; reasonably well graded from course to fine; per AASHTO T 27.

2.02 REINFORCING STEEL

A. Steel bars: deformed, conforming to ASTM A 615 or A 617.

B. Steel wire: conform to ASTM A 82, Cold-Drawn Steel Wire for Concrete Reinforcement.

C. Wire mesh: conform to ASTM A 185; gauge and mesh per plans.

D. Submit reinforcing steel bars shop drawings for approval.

E. All steel reinforcement: free from rust, scale, mortar, dirt, or other objectionable coatings.

PART 3 – EXECUTION

3.01 GENERAL

A. Perform excavation per Section 2300 - Excavation, Backfilling, and Compacting.

B. Build forms neat, square, and flat so concrete will have smooth finish when forms are pulled. Construct forms to provide finished concrete to dimensions shown on plans.

C. Place reinforcing steel accurately in accordance with details shown on the plans and properly secure in position.

D. Concrete shall not be placed when the temperature is below 40° F and dropping or below 35° F if the temperature is rising, unless approved by the Engineer.

E. Vibrate all structural concrete as it is placed using internal vibrators capable of transmitting vibration to the concrete at frequencies not less than 4,500 impulses per minute. Do not use form vibrators. Limit vibration to provide satisfactory consolidation without causing segregation. Do not insert vibrator more than six (6) inches into the lower courses previously vibrated. Use vibrators in a substantially vertical position; insert at uniformly spaced points no farther apart than the visible effectiveness of the vibrator.

F. Allow concrete to cure for at least 48 hours before stripping forms. If concrete is in a structural member, do not remove forms until the concrete can withstand safely all superimposed loads.

G. On all exposed surfaces, remove all fins and projections so the surface is smooth. Cut out and fill with grout any honeycombed areas. Extensive honeycombing is not allowable.

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END OF SECTION 3600

SECTION 4000 WATER PIPE, FITTINGS AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers pipe, pipe joints, fire hydrants, fittings, and other materials for water lines and service lines.

B. Use only materials approved by the City of Fayetteville.

C. The Standard Specification include pipe and fitting in diameters up to and including 24-inch diameter. Pipe and fittings for nominal pipe diameters/sizes greater than 24-inch are not a Standard Specification. Projects including pipe and fittings for nominal pipe sizes greater than 24-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

D. Any and all work for, on, or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) is not permitted as a Standard Specification. Work for, on or connecting to the City's PCCP will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 SUBMITTALS

A. The City of Fayetteville shall approve all materials.

B. Submittals will further include the manufacturer's certificate that the materials meet with these Specification requirements including material testing requirements.

1.03 LEAD-FREE BRASS

A. All brass shall be manufactured in accordance with the Safe Drinking Water Act (SWDA latest edition and as amended) to be LEAD-FREE brass.

1.04 LEAD-FREE PIPES, FITTINGS, FIXTURES, SOLDER and FLUX

A. Comply with the Safe Drinking Water Act (SWDA) latest edition and as amended.

PART 2 – PRODUCTS

2.01 GENERAL

A. DOMESTIC UNITED STATES OF AMERICA (USA) MANUFACTURE

Comply with SECTION 1000 GENERAL REQUIREMENTS 1.05 1.01 D. DOMESTIC USA MANUFACTURE.

B. MINIMUM WORKING PRESSURE

Unless approved otherwise in writing by both the Utilities Director and the designated City 's engineer, all pipe, fittings, materials, and appurtenances used in potable water line installation and repair will be rated for a minimum working pressure of 250 psi. Additional, higher than 250 psi requirements, apply to individual items as specified.

2.02 POLYVINYL CHLORIDE (PVC) PIPE FOR WATER LINES

A. PVC pipe for water lines shall be blue in color.

B. PVC pipe less than 4 inches is not permitted for water mains/lines per the Standard Specifications.

PVC pipe for water service extensions less than 4 inches diameter will be considered only on specific case by case basis in accordance with Section 1000 General Requirements and Section 2001 Design Standards – Water. PVC pipe for water service extensions less than 4 inch diameter, if approved, shall be ASTM D-2241 SDR 13.5 and further meeting all requirements of these Standards.

C PVC pipe 4 inches through 12 inches in size shall be manufactured in accordance with AWWA C900, latest revision, and shall be DR 14. Ten (10) inch diameter water main/pipe is not permitted.

D. PVC pipe, couplings, and fabricated fittings shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454 as defined in ASTM D1784, latest revision. Clean, reworked material generated from the manufacturer's own production shall be acceptable as long as the pipe produced meets all the requirements of the Specifications.

E. Joints for PVC pipe shall conform to ASTM Specification D-3139, latest revision.

F. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

G. Marking on pipe and shall include the following and shall be applied at intervals of not more than 5 feet.

1. Nominal size in inches and OD base (for example, 8 DI).
2. PVC.
3. Dimension ratio (for example, DR 14).
4. AWWA pressure class (for example, PC 305).
5. Test pressure for hydrotested pipe (for example, T330) or if not tested, "NOT HYDROSTATIC PROOF TESTED."

6. AWWA de2signation number for this standard (ANSI/AWWA C900, or ASTM D-2241).
7. Manufacturer's name or trademark and production run record or lot code.
8. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable-water service.

2.03 DUCTILE IRON PIPE FOR WATER LINES

A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, latest revision.

B. Ductile iron pipe shall be designed in accordance with the requirements of "Thickness Design of Ductile-Iron Pipe", ANSI/AWWA C150/A21.50, latest revision. Minimum pressure class shall be 250 psi.

C. Joint connections, pipe and fittings (latest revision):

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

E. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14 in. (356 mm) and larger shall be not less than 1/ 2 in. (13 mm) in height.

F. Interior Lining Required

The interior lining for use under normal conditions shall be a cement–mortar lining and seal coat in accordance with the latest revision of ANSI/AWWA C104/A21.4, latest revision and NSF 61.

G. Exterior Corrosion Control

Outside coating shall be manufacturer's standard 1 mil thickness asphaltic exterior coating per ANSI/AWWA C151/A21.51. Per the Ductile Iron Pipe Research Association (DIPRA) the 1 mil asphaltic coating is not a corrosion control method but furnished by the manufacturers to minimize atmospheric oxidation for aesthetic reasons.

Ductile Iron Pipe and fittings shall be double wrapped in polyethylene tube or sheet materials conforming to the requirements of ANSI/AWWA C105/A21.5.

Additional corrosion control methods, including but not limited to cathodic protection, may be required for specific sites and projects as requested by the City or designed by the Engineer and in accordance with DIPRA publication "The Design Decision Model for Corrosion Control of Ductile Iron Pipe" latest edition.

2.04 POLYETHYLENE (PE) PRESSURE PIPE AND TUBING

A. Polyethylene (PE) pressure pipe is not permitted as publically (City) maintained water main or water service lines.

2.05 COATED COPPER PIPE/SERVICE TUBING

A. Coated Copper Pipe 1" – 2 ":

Coated copper pipe shall be Type "K", soft tempered, seamless, annealed, copper pipe suitable for use for underground water service installation, in accordance with ASTM B88, and with an approved polyethylene coating system (minimum 25 mil). Coated copper pipe shall meet or better NSF-61 requirements.

Damage to the polyethylene coating for the coated copper pipe must be repaired with Polyken Tape Coating or Denso paste and tape, or equal as recommended by the coated copper pipe manufacturer's engineer.

B. Connections to ductile iron pipe (DIP) main lines including fittings for coated copper pipe to DIP main lines shall be double poly wrapped (polyethylene encasement) a minimum of three feet beyond the DIP main pipe onto the coated copper service line.

C. Coated copper pipe under roadways shall be encased in SDR9 polyethylene, ASTM D-2241 SDR13.5 pipe sleeve, or C900 PVC.

D. Polyethylene pressure pipe and tubing (PE or HDPE or variations) shall not be used for publically maintained water service materials.

2.06 POLYETHYLENE ENCASEMENT (PIPE WRAP)

A. Polyethylene encasement shall be in conformance to ANSI/AWWA C105/A21.5, latest revision. The virgin linear low-density polyethylene film shall have a minimum normal thickness of .008 inches (8 mils), and shall be provided in either flat tube or sheet form.

B. The color shall be black with nominal 2% carbon black UV inhibitor and printed per the AWWA C105 standard.

C. Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal, at least 2-inches wide, and installed as per the Polyethylene Encasement Installation Guide published by DIPRA. Duct Tape is not permitted.

D. All buried iron pipe, valves, and fittings shall be double wrapped.

2.07 DUCTILE IRON FITTINGS

A. All ductile iron fittings shall conform to the requirements of ANSI/AWWA C153/A21.53, latest revision, for Ductile Iron Compact Fittings. All fittings shall be MJ x MJ. All fittings shall be fusion-bonded epoxy coated inside and outside in accordance with ANSI/AWWA C116/A21.16.

B. All ductile iron fittings for PVC pipe shall be full body, 350 PSI rating and shall conform to the requirements of ANSI/AWWA C110/A21.10, latest revision, for Ductile Iron and Gray Iron Fittings. All fittings shall be MJ x MJ. All fittings shall be fusion-bonded epoxy coated inside and outside in accordance with ANSI/AWWA C116/A21.16.

C. Solid sleeves shall be long/full bodied only.

2.08 FOSTER ADAPTERS

A. Compact MJ restraints shall be Foster Adapter by Infact Corporation.

2.09 SWIVEL ADAPTERS AND HYDRANT TEES

A. Swivel adapters and hydrant tees shall be designed for a working pressure of at least 250-psi and to fit standard mechanical joint fittings (AWWA C111). One end of the swivel adapter and the branch of the hydrant tee shall be provided with a gland that may be rotated 360 degrees on the fitting. Lengths of swivel adapters shall be as specified.

2.10 MECHANICAL JOINT RETAINER GLANDS

A. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes 3-inch through 24-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

B. Mechanical joint retainer glands shall be made from ductile iron and shall be designed for a working pressure of at least 350-psi for 3-inch through 16-inch ductile iron pipe, at least 305-psi for 3-inch through 8-inch PVC, and at least 250-psi for 12- 24 inch ductile iron pipe.

C. Retainer glands shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability. Retainer glands shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

1. Retainer glands for pipe sizes 3-inch through 12-inch shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

2. Retainer glands for pipe sizes greater than 12-inches shall be manufactured by EBAA Iron, Inc.(USA only), or Star Pipe Products (USA only).

2.11 PIPE RESTRAINTS

A. Bell restraints for AWWA C900 PVC sizes 4-inch through 8-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

B. Bell restraints for Ductile Iron Pipe sizes 4-inch through 24-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

C. When all-thread attachments are required, eye-bolt style attachments are not permitted. Romac "Ductile Lug" style attachments or approved equal shall be used. All-threads shall be made of 316 stainless steel.

2.12 RESTRAINED FLANGED COUPLING ADAPTERS

A. Flanged coupling adapters used to transition from plain end pipe to a flanged fitting, above ground, shall be EBAA Iron Series 2100.

B. Pressure rating shall be a minimum of 250 psi.

2.13 RESTRAINED COUPLINGS

A. Restrained couplings to connect two pieces of pipe, size on size, shall be EBAA Iron Series 3800 Restrained Coupling.

B. Restrained coupling pressure rating shall be a minimum of 250 psi.

2.14 BOLTS AND NUTS

A. All bolts and nuts for valves, fittings, and restraints shall be 316 stainless steel unless specified otherwise. Anti-seize lubricant shall be used when assembling all stainless steel hardware to reduce galling.

2.15 GATE VALVES

A. Gate valves 4-inch through 8-inch nominal pipe size shall be resilient-seated type, non-rising stem gate valves, in conformance with the requirements of AWWA C509 or AWWA C515, latest revision. Ten (10) inch pipe and gate valves are not permitted for water main/pipe.

B. Gate valves shall be made in USA and shall be Mueller Series 2360, American Flow Control Series 2500, or American AVK Company Series 25 or Series 45, no approved equals.

C. All gate valves shall be designed for a minimum of 250 psi working pressure. All gate valves shall have 304 stainless steel bolts.

D. All gate valves shall have O-ring stem seals. The O-ring stem seal shall be so designed that the seal above the stem collar can be replaced with the valve under pressure in the full-open position.

E. Gate valves shall have standard mechanical joint ends unless otherwise indicated on the approved Drawings.

F. Buried gate valves shall be designed for operation with a nominal 2-inch square operating nut. The standard direction of opening shall be open left as viewed from the top.

G. Handwheels for gate valves shall be in conformance to AWWA C515, latest revision.

H. The interior and exterior of the valve body and bonnet shall have factory applied fusion bonded epoxy coating meeting AWWA C550, latest revision.

I. Valves shall be tested in accordance with AWWA C515, latest revision.

J. Markings shall be cast on the bonnet or body, or stamped on a permanently affixed corrosion-resistant tag of each valve.

1. Manufacturer's name or mark.
2. Year the valve casting was made.
3. Size of the valve.
4. Letters C509 or C515
5. Working water pressure (e.g. 250W)

2.16 BUTTERFLY VALVES

A. Butterfly valves are required for pipe 12-inch and larger. Butterfly valves shall conform to the requirements of AWWA C504, latest revision, for Rubber-Seated Butterfly Valves.

B. Butterfly valves shall be Pratt HP250II or Dezurik BAW.

C. Butterfly valves shall be designed for a minimum of 250 psi working pressure. Butterfly valves shall have 304 stainless steel bolts.

D. 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° 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° circumference and replaceable without dismantling operator, disc or shaft and without removing the valve from the line.

E. Valve discs shall utilize an on-center shaft and symmetrical design and be cast from Ductile Iron ASTM A536 Gr. 65-45-12. The disc edge shall be stainless steel type 316.

F. Butterfly valves shall have standard mechanical joint ends unless otherwise indicated on the Drawings.

G. Buried butterfly valves shall be designed for operation with a nominal 2-inch square operating nut. The standard direction of opening shall be open left as viewed from the top. The valve shaft shall be constructed of stainless steel and the bearings shall be corrosion resistant and self-lubricating. The valves shall be equipped with a totally enclosed type operator, fully gasketed and grease packed, suitable for direct burial.

H. The interior and exterior of the valve body and bonnet shall have factory applied epoxy coating system meeting AWWA C550, latest revision.

I. Valves shall be tested in accordance with AWWA C504, latest revision.

J. Markings shall be cast on the bonnet or body, or stamped on a permanently affixed corrosion-resistant tag of each valve.

1. Manufacturer's name or mark.
2. Year the valve casting was made.
3. Size of the valve.
4. Class (e.g. 250B)

K. Materials for 12 inch water mains will be PVC , except that ductile iron pipe may be required on each side of certain fittings and appurtenances including, but not limited to, 12-inch Butterfly Valves (BFV). This detail shall be provided by the Engineer of Record.

2.17 BALL VALVES

A. Ball valves shall be made in USA, and shall be Ford B11-777-NL or James Jones E1900, with "tee-head" style operating nut.

2.18 VALVE BOXES

A. Valve boxes shall be Made in USA, and shall be East Jordan Iron Works 8550 Series or Tyler Union 6850 Series, screw type, and shall be of correct length to match the bury of the main.

B. The valve box and appurtenances shall include a base and a top section with a drop lid. The lid shall be marked with the word “WATER”. All lids shall have a concrete pad with a minimum of 18 inches square or round dimension as appropriate.

C. Lids on valves on fire lines shall be marked with the word “FIRE”.

D. Lids on 2” valves shall be marked with the words “2” VALVE”.

E. Markings shall be cast on each part:

1. Manufacturer’s name or mark.
2. Model number
3. Year the casting was made.
4. Material of construction
5. USA

F. A valve box alignment device shall be provided and installed for each valve box installation. The device shall be of HDPE or Glass Filled Polypropylene construction. It shall be furnished in two pieces that will lock together under the operating nut of the valve without requiring the removal of the operating nut. The device shall not affect the operation of the valve. The device shall be AFC Alignment Ring as manufactured by American Flow Control.

2.19 OPERATING NUT EXTENSIONS

A. Operating nut extensions shall be used when the top of the operating nut is greater than 4 feet from the top of finished surface.

B. The stem shall be 1” SCH40 steel pipe with a 2-inch square bar steel operating nut attached to the upper end. The stem extension shall be of adequate length to reach from the valve operating nut to a point within 24-inches to 12-inches of the finished surface. A box wrench, 2 1/8" I.D. square, made from steel 3/16-inches thick shall be welded to the lower end of the stem extension which will fit over the valve operating nut. Two-inch valves with a tee-head operating nut will require a rectangular shaped box wrench on the end of the valve stem extension. The extension shall be secured to the valve operating nut by two 3/8” set screws. A round center guide made from 1/8-inch or 3/16-inch steel plate shall be placed on the valve stem extension approximately 6-inches from the upper end. The diameter of the guide shall be slightly less than the inside diameter of the valve box. The guide shall be affixed to the stem extension in such a way that it can rotate freely on the stem. Welds on stem extensions (top and bottom nut) shall be 1/8" - 3/16" fillet weld around full circumference.

C. Shop drawings shall be submitted to the City of Fayetteville for approval prior to installing the stem extension pieces.

2.20 FIRE HYDRANTS

A. Fire hydrants shall be dry barrel hydrants in conformance with AWWA C502, latest revision. Fire hydrants shall be designed for a working pressure of 250 pounds per square inch gauge. Fire hydrants shall be three-way, and painted white with reflective glass beads above the ground line. Coating system shall be compatible with Sherwin Williams SHER-CRYL™ HPA – High Performance Acrylic B66-300 Series that is used to color code the fire hydrants. Permitted fire hydrants are (only) American Flow Control 5-1/4" Waterous Pacer WB67-250 and Mueller Super Centurion 250 hydrants. No approved equals.

B. Hydrants shall have a 6 inch mechanical joint inlet in conformance to the dimensions shown in ANSI/AWWA C110/A21.10, latest revision. Three-way hydrants shall have a 5-1/4 inch valve opening.

C. Fire hydrants shall be equipped with a two-piece barrel with a safety stem coupling and a break-a-way flange at the ground line and shall be designed for a 48-inch bury.

D. Hydrants shall be equipped with two 2-1/2 inch hose nozzles and one 4-1/2 inch pumper nozzle. The operating nut shall be a nominal 1-1/2 inch pentagon, National Standard operating nut designed to open left (counterclockwise).

E. Hydrants shall be supplied WITHOUT nozzle cap chains.

F. Fire hydrants in non-paved areas shall be installed with a 24" x 24" square, 12" thick concrete pad, reinforced with 2 layers of #5 rebar, around the lower barrel of the hydrant six inches below the bottom of the break-away flange.

G. A fire hydrant extension shall be installed in all locations where the centerline of the pumper nozzle is less than 18-inches above the finished grade elevation. The extension shall bring the centerline of the pumper nozzle between 18-inches and 24-inches above the finished grade elevation. The centerline of the pumper nozzle shall be 24-inches above rough grade elevations where sidewalks and yards will be installed in the future, in new subdivisions only. Extensions shall be Waterous K562 or Mueller A-320, with no more than one extension allowed per hydrant.

H. Identifications tags shall be installed indicating the depth of bury of all hydrants. Additional tags shall be installed indicating the length of any extension installed.

2.21 BLOW-OFFS

A. Blow-offs shall have a 2-1/2” hose nozzle, traffic break-away, locking cover and be designed for 48-inch bury. Blow-offs shall be Mainguard #77 as manufactured by The Kupferle Foundry Company or approved equal.

2.22 AIR RELIEF VALVES

A. All water mains shall have 1”-2” single bodied air and or combination air and vacuum valves or 3”-10” dual bodied combination air and vacuum valve where indicated on the drawings. Valves shall have fiberglass reinforced nylon body or epoxy coated and lined cast iron bodies with stainless steel or non-metallic internal parts. Valve shall have rolling seal mechanism to allow full or partial opening and sealing of orifice or metal to metal stainless steel seating. The 1” – 2” valves float shall be made of foamed polypropylene and shall disrupt vortex and allow float to remain open until a 11 psi differential is achieved. Valves shall have a 250 psi working pressure. Valves shall be listed under NSF-61 and shall have ISO 9001 certificate. Valves shall be supplied with a male thread outlet or flanged outlet. All nipples and isolation valves for 1”-2” valves shall be brass or stainless steel. Ball style isolation valve shall be full port. Isolation valves for 3”-10” shall conform to Paragraph 2.12 – Gate Valves.

B. Air release valves shall be A.R.I. Model D-040 for 1” and 2” or A.R.I. Model D-060-C HF NS for 3” – 10”, or approved equal.

2.23 SERVICE SADDLES

A. Service saddles for 1” and 2” NPT service taps shall be sized for use on C900 PVC. Service saddles shall be Romac 101NS.

2.24 TAPPING SLEEVES

A. Tapping sleeves shall be designed for a minimum 250 psi working pressure and the material being tapped. All bolts and nuts shall be stainless steel.

1. Tapping sleeves for 4-inch through 24-inch shall be stainless steel and shall be 100% domestic made in the USA. Tapping sleeves shall have a MJ outlet. Tapping sleeves shall be Ford FAST or approved equal.

2.25 SERVICE CONNECTION MATERIALS, FITTINGS AND BRASS

A. All service connection materials, fittings and brass shall be 100% domestic USA. All service connection materials, fittings and brass shall be manufactured in accordance with the Safe Drinking Water Act (SWDA latest edition and as amended) to be LEAD-FREE brass (aka No-Lead). Unless approved otherwise in writing by the Utilities Director all service connection materials, fittings and brass shall be rated for a working pressure of 300 psi.

If a specific item is listed in the following table(s) insert the designation required for 100% domestic USA and Lead-Free (or No-Lead). All service connection materials, fittings and brass shall be designed for a minimum working pressure of 250 psi.

B. All service connection materials, fittings and brass shall be manufactured by Ford Meter Box Company, Inc. or Mueller Company and as further specified below. Equivalent cross referencing for corporation stops and meter setters shall be permitted if approved in writing by the City of Fayetteville's designated City engineer.

C. Materials proposed for all service connection materials, fittings and brass shall be submitted to the designated City engineer for review after the Engineer of Record's review and recommended approval.

D. Materials for standard meter sets 5/8", 1", 1-1/2", and 2" are indicated in the following tables. Materials and standards for larger meters (3" and greater) are not listed in the standard specifications. Larger meter installations require a site specific design. Please contact the City of Fayetteville Meter Department for information concerning meter size 3" or greater. Please contact the City of Fayetteville Engineering Department for standard drawings that may be incorporated for meter size 3" or greater.

E. Design for 1-1/2" and 2" meter locations require project specific design of the piping from the main to the meter to avoid stress of the 2" coated copper pipe and to avoid excessive fittings. Alternate ductile iron piping and fittings (4 inch and greater) may be required for elevation changes between the water main and the 2" coated copper. All water service piping for meters settings greater than 1" shall be further designed by the Engineer of Record and submitted to the designated City engineer for review.

Single Meter Set

main diameter x 1" saddle	Romac 101NS
1" corporation stop	Ford FB1000-4-Q-NL
	Mueller B25008N
1" coated copper – City side	
5/8" x 3/4" x 12" meter yolk	Ford VB72-12W-44-43-SQ-NL
	Mueller 238B2567-R--93N
1/2" x 16" SCH 40 PVC brace	
3/4" coated copper tail piece 4' long	
18" diameter x 24" deep SDR51 PVC meter box	
18" cast iron flat meter lid	East Jordan 109, w/ Fayetteville logo (35109014)

Double Meter Set

main diameter x 1" saddle	Romac 101NS
1" corporation stop	Ford FB1000-4-Q-NL
	Mueller B25008N
1" coated copper – City side	
1" x 7.5" x 3/4" U branch	Ford U48-43-7.5-Q-NL
	Ford multipurpose end C31-23-NL (x2)
	Mueller H15363N (1" compression inlet)
	Mueller end connection H14222N (x2)
5/8" x 3/4" x 12" meter yolk x 2	Ford VB72-12W-14-33-Q-NL
	Mueller 238B2567-RN
1/2" x 16" SCH"40 PVC brace	
3/4" coated copper tail piece 4' long	
18" diameter x 24" deep SDR51 PVC meter box	
18" cast iron flat meter lid	East Jordan 109, w/ Fayetteville logo (35109014)

1-inch Meter Set

main diameter x 1" saddle	Romac 101NS
1" corporation stop	Ford FB1000-4-Q-NL
	Mueller B25008N
1" coated copper – City side	
1" x 12" meter yolk	Ford VB74-12W-44-44-Q-NL
	Mueller B24701RN
3/4" x 16" SCH40 PVC brace	
1" coated copper tail piece 4' long	
24" diameter x 24" deep SDR51 PVC meter box	
24" cast iron flat meter lid	East Jordan 111, w/ Fayetteville logo (35108004)

1-1/2 inch and 2-inch Meter Set

main diameter x 2" saddle	Romac 101NS
2" brass close nipple	
2" ball valve	Ford B11-777-NL
2" MIP x quick joint	Ford C84-77-Q-NL
	Mueller H15428N
2” coated copper – City side	
2" MIP x quick joint	Ford C84-77-Q-NL
	Mueller H15428N
2" meter setter	Ford Custom setter Item VBB77-95082-110-NL
1" x 24" SCH40 PVC brace (x2)	
2" coated copper tail piece 2’ long	
36" diameter x 36" deep composite meter box w/ top ring	East Jordan 8428 Assembly (38003636A01)
28" outer cover, w/ lock	East Jordan 8428E, w/ Fayetteville lettering (00842845A01)
11" inner cover, w/o lock	East Jordan D Meter Cover (32193001)

2.26 TRACER WIRE

A. Tracer wire shall be 12-gauge solid coated copper or 14-gauge coated copper clad steel for underground burial.

B. Jacket color shall be BLUE, and made of High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE) designed for direct burial.

C. Connectors shall be used for all splices or repairs. Connectors shall be moisture displacement style as manufactured by 3M DBR, or equal.

D. A locate or conductivity test shall be performed prior to signing off on the project.

2.27 MARKING TAPE

A. Non-metallic water marking tape shall be warning tape as manufactured by Rhino Marking and Protection Systems, Harris Industries, Inc., or approved equal.

B. Tape shall have a minimum thickness of 4 mils and manufactured with heavy metal-free polyethylene tape that is impervious to all known alkalis, acids, chemical reagents, and solvents found in soil. The minimum overall width of the tape shall not be less than 3-inches. Standard rolls shall be 1000’ length.

C. The tape shall be color coded Safety Blue and imprinted with the following message: Caution – Buried Water Line Below

2.28 WATER LINE MARKERS

A. Water line markers shall be TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380), or approved equal. All markers shall be installed according to the manufacturer's recommendations. The uppermost portion of the Carsonite marker shall be made of Visibility Enhancer (CVE-360), or approved equal and must be bolted to the utility marker. TriView markers do not require visibility enhancers. The utility marker shall read as follows: "CAUTION, WATER PIPELINE", "City of Fayetteville", and "Before Digging Call 1-800-482-8998". The label shall also include the official City Logo and be white in color with blue and black lettering. The label shall be affixed to two sides of the marker. An additional white 1" wide reflective tape (3M or equal) shall be placed around the full circumference of the top of the marker. Concrete shall be placed 6-inches around and 1-foot deep around the base of each marker.

B. Markers in rural areas shall be placed adjacent to valves and hydrants and spaced along the length of the water line a maximum of 500 feet.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Installation Section 2400
B. Water Lines: Refer to Section 4100
C. Water Service Lines: Refer to Section 4100

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END OF SECTION 4000

SECTION 4100 INSTALLATION OF WATER PIPE, FITTINGS, AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Installation of water lines.

B. Installation of water service lines.

1.02 WORK EXCLUDED

A. Any and all work for, on or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) is not permitted as a Standard Specification.

B. Any and all work for, on, or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) will be considered only on specific case by case basis in accordance with Section 1000 General Requirements. Approval will be project specific and requires approval from the Utilities Director.

PART 2 – ADDITIONAL REQUIREMENTS

2.01 ADDITONAL REQUIREMENTS

A. PIERS

1. Water pipe on piers shall be Ductile Iron Pipe. The ductile iron pipe shall meet the requirements of Section 4000 – Water Pipe, Fittings, and Materials, of these Specifications.

2. Piers shall be designed by the Engineer of Record for the specific project and submitted per Section 1000 General Requirements.

3. Install concrete piers as indicated on the approved plans and per Section 3600 - Cast-In-Place Concrete.

B. COLD WEATHER INSTALLATION

1. The City reserves the right to order pipe installation discontinued whenever, in its opinion, there is danger of the quality of work being impaired because of cold weather. Do not lay any pipe on frozen ground. No water pipe shall be installed when the air temperature is less than 32° F unless proper precautions per the manufacturer's recommendations are taken by the Contractor and the method is approved by the Engineer <u>and</u> City.

2. When pipes with rubber gaskets or resilient-type joints are to be laid in cold weather, sufficiently warm the gasket or joint material per manufacturer's recommended methods to facilitate making a proper joint.

C. SOLID SLEEVE INSTALLATION

1. Solid sleeves shall be installed the same as mechanical joint connections for pipe installation.

2. The maximum gap between the two pipes being connected by a solid sleeve shall be one-half (1/2) inch.

PART 3 – EXECUTION

3.01 VALVE INSTALLATION

A. Valves shall be jointed in accordance with the methods of jointing pipe as specified elsewhere herein. Valve stems shall be plumb and there shall not be any obstructions that will prohibit the installation of valve boxes directly over the stem. Mechanical joint retainer glands shall be installed on all valves with mechanical joint ends.

B. All valves shall be firmly supported from below with compacted crushed stone up to and including 8-inch valves, or concrete for all valves greater than 8-inches.

C. All valves shall be shall be double poly wrapped

D. Valve boxes shall be installed over the operating nut of each valve and be of adequate length to reach the finished ground or paved surface. Valve boxes shall be installed with a HDPE Valve Box Alignment Device of the proper size and manufacture to fit the valve and the valve box. Boxes shall be firmly supported, plumb, and centered over the valve operating nut. No part of the box shall rest on the valve. The box cover shall be flush with the finished surface.

E. Operating nut extensions shall be used when the top of the operating nut is greater than 4 feet from the top of finished surface. The stem extension shall be of adequate length to reach from the valve operating nut to a point within 24-inches to 12-inches of the finished surface.

F. Tracer wire shall be brought up on the OUTSIDE of the valve box. A hole or notch shall be made through the valves box approximately 4-inches below the top. The tracer wire shall be pushed through the hole or notch. Approximately 12-inches of wire shall be coiled inside the valves box for traceability. The tracer wire shall not interfere with the insertion of the lid onto the valve box.

G. All lids shall have a concrete pad with a minimum dimension of 18 inches square or round as appropriate. A concrete pad with a minimum dimension of 36 inches square or round as appropriate shall be installed for all valves 24-inches and larger.

H. Install ductile iron pipe DIP and anchor collars on each side of all butterfly valves unless specifically approved otherwise by the City.

3.02 FIRE HYDRANT INSTALLATION

A. Pipe used to install fire hydrants from the required auxiliary valve on the water main to the fire hydrant shall be fully restrained. An additional valve for maintenance may be required for significantly long fire hydrant leads as determined by the designate City engineer.

B. Hydrants shall be thoroughly cleaned before setting, removing all dirt and foreign matter from the barrel and bottom section up to the main valve. The main valve shall be in the "closed" position and the waste outlet shall be free of any obstructions.

C. The Contractor shall take great care to protect the factory applied coating system. Means and methods for the protection of the fire hydrant are the responsibility of the Contractor. At no time shall chains or other abrasive materials come into contact with the factory applied coating system.

D. Minor touchup for “incidental” scratches is permitted using factory provided touchup kits.

E. When the factory applied coating system (from the bury line up), as identified by the City of Fayetteville, has damage other than “minor scratches,” a new upper barrel section shall be ordered and delivered from the factory, inclusive of all internal working parts up to the operating stem breakaway. The upper barrel shall be replaced, and the damaged upper barrel returned to the factory at no cost to the City of Fayetteville. This includes, but is not limited to, excessive scratches, appearance of rust, or other aesthetic flaws. Field repainting of new fire hydrant installations is not permitted.

F. Hydrants shall be located a safe distance from driveways, roadways and narrow type sidewalks and in a manner to provide complete accessibility, and they shall stand plumb with nozzles at proper elevation. The hydrant’s “bury line” shall be set at or no more than four (4) inches above the finished grade elevation; therefore the bottom of hydrant nozzles shall be 18 to 22 inches above the finished grade elevation.

G. Installation of fire hydrant extensions shall be made in the presence of the Engineer or the Engineer’s representative and shall be per the manufacturer’s instructions. The breakable flange and breakable stem coupling shall be removed and installed above ground level.

H. The Contractor shall, if necessary, rotate the hydrant barrel or nozzle section at the flanged joint to obtain the desired nozzle position as specified by the Engineer. The pumper nozzle shall be at a right angle to and face the street unless otherwise directed by the Engineer.

I. The bowl or bottom of the hydrant shall be supported firmly on the bottom and shall be braced against unexcavated earth at the end of the trench with concrete reaction backing. Solid concrete blocks may be used to support the bottom of the hydrant. If considered necessary by

the Engineer, the hydrant shall be tied to the branch pipe with suitable Series 300 STAINLESS STEEL rods or clamps. These rods or clamps shall be furnished by the Contractor without additional compensation.

J. A drainage bed shall be provided under and around the base of the hydrant of at least six (6) cubic feet in volume and extending at least six inches (6”) above the drain outlet and shall consist of approved embedment aggregate material. Under no circumstances shall the drain outlet on the hydrant or the drainage bed be connected to a sewer.

K. Backfilling and tamping around hydrant barrels shall be continuous in operation.

L. If a fire hydrant is not located inside a concrete paved area, then a minimum 2.0' x 2.0' square x 0.5’ (deep) Class "A" concrete pad shall be placed just below the break-away joint of the fire hydrant barrel as recommended in AWWA M-17 and as detailed.

M. Fire hydrants, immediately after installation, shall be covered and wrapped with a heavy cloth, water-resistant sack, or black polyethylene sheeting, well taped in place around the hydrant, to identify the hydrant as being “not in service”.

N. All fire hydrants installed within the City of Fayetteville water operational territory shall be painted white with glass reflective beads above the ground line. Factory coating system shall be compatible with Sherwin Williams SHER-CRYL™ HPA – High Performance Acrylic B66-300 Series that is used to color code the fire hydrants. Sherwin Williams DTM ACRYLIC COATING shall be used for the Safety Orange color only, as it is not available in HPA.

O. All fire hydrant nozzle caps, bonnets and operating nuts shall be painted with two coats of paint according to the following table:

Flow Under Fire Conditions	Color	Color Specification
More than 1500 gpm	Light Blue	Robotic Blue SW4063
1000 to 1499 gpm	Green	Safety Green SW4085
500 to 999 gpm	Orange	Safety Orange SW4083
Less than 500 gpm	Red	Safety Red SW4081

P. The City of Fayetteville may provide the flow under fire conditions for each new fire hydrant installation based upon the current water modeling software or the Engineer of Record may furnish flow data based upon a current fire hydrant fire flow test performed in the area.

3.03 METER SETTINGS

A. Meter settings shall be installed where shown on the Drawings and/or as directed by the City. Installation shall be as per the City Engineering Standard Details. Meter setters shall be installed in a horizontal and plumb position within the meter box and at a depth to provide the required space between the top of the meter and the bottom of the meter box lid.

B. A drainage bed consisting of approved embedment aggregate material shall be placed a minimum of 6-inches thick and 6-inches outside the edge of the bottom of the meter box. Non-woven filter fabric consisting of 8 oz/sy shall be placed on top of the drainage bed. The filter fabric shall extend 12-inch outside the edge of the bottom of the meter box. After the installation of the water service line, meter setter, meter box, and lid, the filter fabric shall be wrapped up the meter box and service line penetrations and taped securely to the meter box to provide a “dirt seal” before backfilling.

C. Tracer wire shall be brought up on the INSIDE of the meter box with the water service line. Sufficient tracer wire shall be provide such that approximately 12-inches of wire will extend beyond the top of the box when pulled taunt. The tracer wire shall be loosely coiled and place inside the meter box. Do not wrap the tracer wire around the meter setter. An additional tracer wire shall be installed at the appropriate time from the meter to the building.

D. The bottom of the meter setter connections shall be visible at the bottom of the meter box at the time of testing and of final inspection. Any dirt or debris in the bottom of the meter box shall be removed before the project is released for final payment and/or acceptance.

E. The final grade at the meter box location shall be determined by the Engineer of Record and the meter box shall be placed at that grade. Final grade should take into account probable future installation of topsoil and/or sod. Any boxes falling in driveways or sidewalks shall be relocated at the expense of the developer or lot owner. No meters shall be set by the City until the meter box is adjusted to the proper grade.

3.04 BLOW-OFF INSTALLATION

A. Blow-off hydrants shall be thoroughly cleaned before setting, removing all dirt and foreign matter from the barrel and bottom section up to the main valve. The main valve shall be in the "closed" position and the waste outlet shall be free of any obstructions.

B. Blow-offs shall be so located that the distribution system may be properly flushed, and so that danger of contamination of the water line by backflow will be eliminated. No blow-off shall be connected to any sewer or storm drain, submerged in any surface water or installed in any manner that will permit backsiphonage into the distribution system. The discharge of the blow-off shall be located above natural grade, and be screened, capped or plugged.

C. Blow-off hydrants shall be installed in such a manner to provide complete accessibility, and they shall stand plumb with nozzles at proper elevation. The discharge nozzle shall be a minimum of 24-inches above finished grade elevation.

D. The bowl or bottom of the blow-off hydrant shall be supported firmly on the bottom and shall be well braced against unexcavated earth on the backside of the blow-off hydrant. Solid concrete blocks, or other suitable material may be used to block the blow-off hydrant.

E. A drainage bed shall be provided under and around the base of the blow-off hydrant of at least six (6) cubic feet in volume and extending at least six inches (6”) above the drain outlet and shall consist of ASTM #67 gravel. Under no circumstances shall the drain outlet on the hydrant or the drainage bed be connected to a sewer.

F. Backfilling and tamping around blow-off hydrant barrels shall be continuous in operation.

G. Blow-off hydrants, immediately after installation, shall be covered and wrapped with a heavy cloth, water-resistant sack, or black polyethylene sheeting, well taped in place around the hydrant, to identify the hydrant as being “not in service”.

3.05 TAPPING SADDLE INSTALLATION

A. Tapping saddles shall be used for 1-inch and 2-inch service taps.

B. The pipe shall be free of dirt and other debris before attaching tapping saddle. That part of the pipe barrel, other than concrete pipe, which will be in contact with the gasket of tapping saddles, shall be smooth. All rough areas on the pipe barrel shall be smoothed. The Contractor shall field verify all pipe and fitting dimensions. Tapping saddles shall be installed at least twenty-four (24) inches from bell joints, fittings, end of pipe joint, or another tap.

C. Tapping saddles shall be bolted securely to the pipe. The face of the outlet shall be zero to ten (0-10) degrees from horizontal. The bolts for tapping saddles shall be alternately tightened "snug" and then alternately tightened to a torque as recommended by the manufacturer.

D. The tapping valve shall be attached securely to the tapping saddle to provide a water tight seal. Proper tools for installing brass hardware shall be used.

E. The pilot drill and shell cutter shall be in good condition. The pilot, shell cutter, and any other component of the tapping machine that will or may come into contact with the interior of the tap valve or potable water pipe, shall be thoroughly sterilized with straight bleach or super-chlorinated solution. The shell cutter shall be the size required to cut the full opening specified and with a sufficient depth greater than the wall thickness of the pipe being tapped.

F. After the tap is complete and the tapping machine has been removed, the bolts for the tapping saddle must be re-torqued per the manufacturer’s specifications to ensure a proper seal.

G. The tapping saddle shall be enclosed in polyethylene material in accordance with Paragraph 3.14 of these specifications.

H. The contractor will follow the manufacturer's requirements and follow the current version of the "Tapping Guide for PVC Pressure Pipe", UNI-PUB-8, by the Uni-Bell PVC Pipe Association. The Contractor shall provide the removed pipe coupon to the City.

3.06 TAPPING SLEEVE INSTALLATION

A. The pipe shall be free of dirt and other debris before attaching tapping sleeve. That part of the pipe barrel that will be in contact with the gasket of tapping sleeve, shall be smooth. All rough areas on the pipe barrel shall be smoothed. The Contractor shall field verify all pipe and fitting dimensions. Tapping sleeves shall be installed at least twenty-four (24) inches from bell joints, fittings, end of pipe joint, or another tap.

B. Tapping sleeves shall be bolted securely to the pipe. The face of the outlet shall be plumb. Mechanical joint glands for tapping sleeves shall be installed in accordance with Paragraph 3.06 herein. The bolts for tapping sleeves shall be alternately tightened "snug" and then alternately tightened to a torque as recommended by the manufacturer.

C. The tapping valve shall be bolted securely to the tapping sleeve. The tapping valve shall be adequately supported from beneath. The weight of the tapping valve shall not be supported by the tapping sleeve. A concrete "mud slab" at least six (6) inches thick shall be poured under the location of all tapping valves 12 inches and larger and the weight of the valve shall be supported by the mud slab. The tapping machine shall be bolted securely to the valve.

D. After installation of the tapping sleeve and the tapping valve and before drilling through the pipe, the assembly shall be hydrostatically tested at the pressure specified in Section 5300, herein, by introducing water through the sleeve test tap.

E. The pilot drill and shell cutter shall be in good condition. The pilot, shell cutter, and any other component of the tapping machine that will or may come into contact with the interior of the tap valve or potable water pipe, shall be thoroughly sterilized with straight bleach or super-chlorinated solution. The shell cutter shall be the size required to cut the full opening specified and with a sufficient depth greater than the wall thickness of the pipe being tapped.

F. Openings in the pipe barrel for tapping saddles installed on dry pipe shall be cut with a pilot drill and shell cutter. Torch cutting is not permitted.

G. Tapping operations must not commence before inspection by the Engineer or his authorized representative. Tapping operations must not commence before the tapping assembly has passed a pressure test as detailed in Section 5300 herein.

H. Only qualified operators shall operate the tapping machine. The "coupon" shall be withdrawn and be given to the Engineer for inspection. Care shall be exercised to avoid drilling or cutting the backside of the pipe by carefully assuring the engagement of the pilot drill and shell cutter shaft.

I. After the tap is complete and the tapping machine has been removed, the bolts for the tapping sleeve must be re-torqued per the manufacturer's specifications to ensure a proper seal.

J. All taps 12-inch and larger shall require the installation of a butterfly valve immediately after the tapping valve. The tapping valve shall be fully opened and abandoned in place.

K The tapping sleeve shall be enclosed in polyethylene material in accordance with Paragraph 3.14 of these specifications.

L. Tapping sleeves shall be adequately thrust blocked with concrete.

3.07 CONCRETE THRUST BLOCKS AND ANCHOR COLLARS

A. Concrete thrust blocks and anchor collars shall be provided along the water line in accordance with the construction details, plan sheets, or as directed by the Engineer. The concrete mix (as defined in Section 3600 herein) shall be Class "B" for anchor collars and Class "A" for thrust blocks. All bends, tees, caps, plugs, and fire hydrants shall be thrust blocked unless specifically detailed in the construction drawings that no thrust blocking is required. Anchor collars shall be constructed on ductile iron pipe only; if the pipeline being restrained is primarily PVC or other non ductile iron pipe, at least one full joint of ductile iron pipe shall be inserted in the pipeline run to receive the concrete anchor collar. All vertical bends shall be both fully restrained and fully thrust blocked. Horizontal bends will be both fully retrained and fully thrust blocked when required by the City.

B. Concrete for thrust blocks and anchor collars shall be placed against undisturbed soil. The excavation shall be hand shaped and free of loose material. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of the thrust.

C. No concrete shall be placed around any part of a joint or placed so that it interferes with the removal of any joint accessories such as bolts, followers, threads, collars, couplings, etc. Fire hydrant drains shall not be restricted.

D. The top of the concrete thrust block or anchor collar shall be struck off with a wood straight edge or float.

E. Concrete shall not be placed when the temperature is below 40° F and dropping or below 35° F if the temperature is rising, unless approved by the Engineer.

F. Admixtures are not to be used without the approval of the Engineer.

G. All reinforcement shall be inspected by the Engineer prior to placement of concrete. All placement of concrete must be in the presence of the Engineer or his representative. The Contractor is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the Engineer or his representative.

H. Backfill over concrete thrust blocks or anchor collars shall not be placed before the concrete has attained initial set.

I. No thrust blocks shall be less than six inches (6”) thick between the pipeline or appurtenances and undisturbed soil in the direction of thrust on pipes 12-inch diameter and smaller. On larger pipes, the thickness of thrust blocks shall be as directed by the Engineer. A thrust block with any component of its length to width to depth ratio exceeding two (2) shall be reinforced with steel reinforcement bars as directed by the Engineer. The Engineer will consider the size of the thrust block, the size of the water main, and the system pressure in the determination of the size and spacing of the steel reinforcement.

J. The excavation shall be free of water before concrete is placed. Steel reinforcement shall be placed as specified on the drawings.

K. The pipe or appurtenances to be in direct contact with concrete shall be cleaned before placing the concrete.

L The area of contact of the thrust blocks and anchor collars shall be sufficient to resist the thrust. This will vary depending on the safe bearing value of the soil.

The Engineer of Record is required to design the thrust blocks, anchors and other restraints and submit to the City for review and approval.

If requested by the City, the engineer of record shall provide a geotechnical report to include soil valves for thrust blocking design.

N. Thrust blocks for vertical bends shall be adequate to resist the thrust by mass alone when the thrust is upward.

O. Thrust blocks and anchor collars shall be adequate to restrain the pipeline and appurtenances at design pressure equal to 150% of the static pressure at the lowest point with a minimum pressure of 200 psi. The Engineer of Record shall provide calculations for review for all thrust blocks, anchor collars and other thrust restraints.

P. Concrete thrust blocks and anchor collars on 12-inch and smaller pipelines shall have a minimum curing time of three days (72 hours) before any pressure is placed against the block or collar. Concrete thrust blocks and anchor collars on 14-inch and larger pipelines shall have a minimum curing time of seven days before any pressure is placed against the block or collar.

Q. Concrete thrust blocks or anchor collars that fail to restrain the pipe or appurtenances shall be replaced by the Contractor at his expense.

R. Reducers receiving an anchor collar shall be long bodied fittings.

S. All water lines with dead ends shall be installed with an upstream valve, one full joint of ductile iron pipe with a MJ restraining gland, concrete anchor collar, a MJ cap with restraint, and a blow off assembly. The seat of the MJ restraining gland on the ductile iron pipe shall face the valve.

T. Anchor collars subject to two-way thrust shall have two identical "A"/"B" reinforcement steel mats as shown in the City Engineering or project specific detailed drawings. Anchor collars for 18" and smaller diameter pipe with two-way thrust shall have two (2) Mega-Lug retaining glands placed back-to-back, spaced just inside the two reinforcing steel mats.

U. Unless approved otherwise by the Engineer of Record and the designated City engineer, Two anchor collars shall be provided at each cut –in or "Inserta" valves, and two anchor collars shall be provided at all inline valves.

V. The use of wood or any material that may deteriorate is strictly prohibited.

3.08 BACKFILLING AND INSPECTION

A. Before backfilling, install concrete thrust blocks and anchor collars in accordance with the plans and details at the location and interval and shown on the Drawings. Use concrete as specified in Section 3600-Cast-In-Place Concrete.

B. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 2300-Excavation, Backfilling, and Compacting.

C. Test the pipeline per Section 5300-Inspection and Testing of Water Lines and Service Lines.

D. Repair all pavements per Section 6000-Pavement Repair.

E. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.

F. Repair sodded and grass areas to original condition per Section 6100-Lawn and Grass Restoration.

3.09 WATER LINE INSTALLATION - AERIAL CROSSINGS

A. Construct piers as shown on the approved Drawings.

B. Install encasement pipe on piers as shown on the approved Drawings.

C. Insulate encasement as required by the City.

3.10 SEWER LINE CROSSINGS

A. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.

B. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.

C. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in watertight steel encasement pipe a minimum of 10 feet either side of the line, centered over the point of crossing. The ends of the encasement pipe shall be sealed watertight. Refer to Section 3400 – Steel Encasement Pipe for end seals.

3.11 STORM SEWER CROSSINGS

A. All water lines crossing under all concrete storm drains, or any storm drain 30-inch diameter and larger, or all storm drains with multiple pipe runs, shall be steel encased a minimum of 5 feet either side of the storm drain.

3.12 CUT AND CAP

A. Water lines that are to be abandoned shall be cut and capped as shown on the CIty Engineering standard details.

B. Mechanical joint restraints and concrete shall be used to resist thrust loads.

3.13 ABANDON CORPORATION STOP

A. All corporation stops used for testing and/or chlorination need to be properly abandoned by fully closing the corporation stop, removing all service line materials, installing a solid copper disk, and reinstalling the corporation nut resulting in a water tight seal in the event that the corporation valve fails.

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END OF SECTION 4100

SECTION 4200 WATER LINE PRESSURE REDUCTION PROCEDURES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the procedures associated with reducing water line pressure for construction.

1.02 PROCEDURES

A. Water lines may need to have the pressure significantly reduced to facilitate construction in a project area, i.e. tie-ins or cut and caps.

B. Water pressure reductions shall be approved and coordinated with the City of Fayetteville Water & Sewer Department.

C. The maximum amount of time that the line is permitted to be shut down shall be determined by the City of Fayetteville Water & Sewer Department.

D. The Contractor shall have sufficient materials, labor, and necessary backup provisions in place prior to initiating water line pressure reduction to ensure that construction activities can be completed within the time determined by the City of Fayetteville Water & Sewer Department.

E. A minimum of 72-hour notice shall be provided to each affected customer using the attached water pressure reduction notice.

F. The Contractor shall distribute the notices and generate a list of each address that the notices are delivered to. The list shall be given to the City of Fayetteville Water & Sewer Department for their files.

1.02 CONSTRUCTION REQUIREMENTS

A. The excavation in the project area shall be dewatered prior to pressure in the water main being reduced.

B. All water pipe, fittings, and materials shall be disinfected per AWWA C651, latest revision.

C. Immediately after construction is complete, the existing water lines shall be flushed thoroughly and background chlorine levels re-established.

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CITY OF FAYETTEVILLE ARKANSAS

WATER SYSTEM NOTICE TO THE CUSTOMER

WATER PRESSURE REDUCTION

DATE: _____

Due to scheduled water system maintenance in your area, the contractor listed below, under supervision of the engineer listed below, must significantly reduce the water pressure in the area serving your business or residence. The water pressure will be reduced at the following time:

DATE TURNED DOWN: _____

TIME TURNED DOWN (approximate): _____

TIME TURNED BACK ON (approximate): _____

The pressure will probably be reduced such that you will not have water available in your residence or business. We are attempting to make the repairs in this way to avoid having to put your home or business on a precautionary boil order. Your water will be perfectly safe to drink as soon as full pressure is restored.

If the repair does not work as we expect and a boil order becomes necessary, you will be notified, in writing, when the need for the boil order is identified.

If you need to draw water for use, please do so before the time we will be reducing pressure.

If you have any questions, please call one of the following:

Engineer: _____ _____
Company and Contact Name Phone

Contractor: _____ _____
Company and Contact Name Phone

Thank you for your patience and consideration.

Water & Sewer Division
479-575-8386

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END OF SECTION 4200

SECTION 5000 SEWER LINE CLEANING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section covers the cleaning of sewer lines.

1.02 SUBMITTALS

A. The Contractor shall submit for approval manufacturer's brochures and specifications for his proposed cleaning equipment. The equipment and methods selected for cleaning shall be approved by the City and the Engineer of Record.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Equipment selected for cleaning shall be of a type generally recognized by the trade for the purpose being used and that has proved satisfactory. The equipment shall be capable of removing all roots, dirt, grease, rock and other deleterious material and obstructions from the sewer lines and manholes that would prevent efficient use of the inspection equipment.

1. Hydraulic cleaning equipment shall be of a movable dam type and shall be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. Sewer cleaning balls or other such equipment which cannot be collapsed instantly will not be considered acceptable cleaning equipment. The moveable dam shall be of the same diameter as the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure total removal of grease. If a line segment is found to be completely stopped up or plugged or heavily intruded with roots, then a mechanical root cutter shall be used.

2. High velocity hydro-cleaning equipment shall be truck mounted for ease of operation. The equipment shall have minimum of 600 feet of 1 inch I.D. high pressure hose with a selection of two or more high velocity nozzles. The nozzles shall have a capacity of 60 GPM at a minimum working pressure of 1000 pounds per square inch (psi). The nozzles shall be capable of producing a scouring action from 15 degrees to 45 degrees in all size lines designated to be cleaned. Equipment shall also have a high velocity gun for washing and scouring manhole walls and floor. The equipment shall carry its own water tank capable of holding corrosive or caustic cleaning or sanitizing chemicals, auxiliary engines, pump and a hydraulically driven hose reel. All controls shall be located so that equipment can

be operated above ground with minimal interference to traffic and/or danger to the operator.

3. Mechanical cleaning equipment shall be used to remove heavy accumulations of silt, sludge, etc., and roots. Bucket machines shall be operated in pairs with each machine powered by an engine with a minimum of 16 horsepower (HP) to ensure sufficient pulling power. Machines shall be capable of operating at least two speeds to match job conditions. Sufficient accessories and tools shall be furnished to accomplish the required cleaning in a complete and efficient manner.

4. Power rodding machines shall be of a continuous rod type, capable of holding a minimum of 1000 feet of rod. The rod shall be specifically treated steel. The machine shall have a positive rod drive and produce a 2000 pound rod pull. To insure safe operation, the machine shall have a fully enclosed body and an automatic safety throw-out clutch.

5. Cleaning equipment shall be provided that includes an air conveying vacuum system to provide for the simultaneous removal of the debris flushed to the manhole.

6. A temporary debris catcher, as approved by the Engineer, shall be used in the downstream manhole.

2.02 PERSONNEL

A. Contractor personnel shall be thoroughly familiar with all phases of sewer line cleaning to insure satisfactory end results without causing damage to the sewer lines or adjacent property.

PART 3 - EXECUTION

3.01 CLEANING EQUIPMENT

A. Since the success of related work depends a great deal upon the cleanliness of the lines, the importance of the cleaning operation cannot be too strongly emphasized. The equipment selected for cleaning shall be capable of removing all dirt, grass, rocks and other deleterious materials from the sewer lines and manholes. Particular emphasis is placed on the removal of grease accumulations so that cracks and breaks can be observed during television inspection and so that joints can be isolated during testing and sealing operations.

B. The Contractor shall make an inspection of the lines to be cleaned in order to determine the type of cleaning equipment that is required. It is anticipated that hydraulic cleaning will be adequate for most of the line segments.

3.02 CLEANING REQUIREMENTS

A. Prior to inspection, the designated sewer lines, as shown on the project drawings, will be thoroughly cleaned as specified below:

1. The sewer lines shall be cleaned by using standard mechanically powered or hydraulically propelled cleaning tools or combinations thereof, such as rodding machines, boring machines, hydraulic balls, cones, ferrets, or other similar devices.

2. All roots, sludge, dirt, sand, rock, grease and other solid or semi-solid material resulting from the cleaning operations shall be removed at the downstream manhole without passing the material from section to section, which could cause stoppage of the lines or accumulation in the wet well and damage to pumping equipment. When cleaning equipment is used, a debris catch riser as shown in the project specific or City engineering standard details shall be used in the downstream manhole so that both solids and water shall be trapped. All solids or semi-solids resulting from the cleaning operations shall be removed from the site and disposed of at no additional cost to the Owner. It the responsibility of the Contractor to secure a legal dump site for the disposal of this material.

3. Satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools, which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer lines are used, precautions shall be taken to insure that the water pressure created does not cause any damage or flooding to public or private property being served by the manhole section involved. The flow of sewage present in the sewer lines shall be utilized to provide necessary fluid for hydraulic cleaning devices whenever possible. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed or used when there is a fire in the area. Before using any water from the City water supply system, the Contractor shall obtain a hydrant meter from the Meter Department. The Contractor shall be responsible for the water meter and related charges for the setup, including the water usage bill. All expenses shall be considered incidental to cleaning.

4. UNDER NO CIRCUMSTANCES SHALL SEWAGE OR SOLIDS REMOVED THEREFROM BE DUMPED ONTO STREETS OR INTO DITCHES, CATCH BASINS, STORM DRAINS OR SANITARY SEWER MANHOLES.

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END OF SECTION 5000

SECTION 5100 SEWER LINE TELEVISION INSPECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. All new sewer lines constructed shall be inspected via internal television inspection.

B. This section covers the television inspection (closed circuit television inspection – CCTC) of sewer lines.

1. The inspection of each line shall be by a television (TV) camera especially designed to accurately show the condition of the lines from the interior and with the ability determine the depth of water in the event of any pooling and to pinpoint the locations of line faults and necessary repairs.

2. A sewer line joint means the junction of two adjacent lengths of sewer pipe, and a fault is any crack too small to warrant pipe replacement. The term "manhole section" as used in these specifications shall mean the length of pipe connecting two manholes.

1.02 SUBMITTALS

A. The Contractor shall submit for approval manufacturer's brochures and specifications for proposed TV equipment.

1.03 INSPECTION

A. Immediately upon cleaning the sewer line in one location, it shall be televised to determine the condition of the line and location of existing service connections, etc.

B. The sewer lines shall be visually inspected by TV camera. The section being inspected shall be suitably isolated from the remainder of the sewer line as necessary.

C. The camera shall be moved through the line in either direction at a uniform slow rate not to exceed 60 feet per minute, by means of cable winches, or similar mechanisms. Under no circumstances shall the camera be tethered to a hydraulically propelled or high-velocity jet cleaning device while the cleaning device is on.

D. The camera shall stop at each service connection and provide a view up the service line.

E. Telephone, or similar suitable means of communications, shall be set up between the two winches, the pumping unit and the monitor control.

F. Under certain conditions, it may be impossible for inspection equipment to pass through a manhole section due to damaged pipe or other obstructions not correctable by internal methods. In such cases, the Engineer will be notified.

G. TV inspection will be done one manhole section at a time and the flow in the section being inspected will be suitably controlled. Sewer flow will not exceed those shown below as measured in the manhole:

6” - 10” Pipe	1 inch
12” - 14” Pipe	2 inches
14” - 24” Pipe	3 inches
Over 24” Pipe	4 inches

H. The Contractor will make all provisions for pumping or bypassing the flow around the manhole section and the cost shall be incidental to TV inspection. Contractor shall not be allowed to float the camera unless permitted by the City.

I. It is possible that some sections of the sewer line cannot be televised; therefore, house or building connection lines will have to be located on the ground by the Contractor. All cost for locating these service lines shall be included in the cost bid for house or building service line reconnection.

PART 2 - PRODUCTS

2.01 TELEVISION INSPECTION EQUIPMENT

A. The television camera and monitoring equipment shall be specifically designed and constructed to perform the work as specified. The camera shall be operative in conditions of 100% humidity and/or under water. The camera shall be small enough to pass through a 6 inch diameter sewer and shall be waterproof with a self contained lighting system capable of producing enough light to produce clear, bright, sharp pictures on the monitor.

The lighting and camera quality shall be suitable to allow a clear, in focus picture of a minimum of 6 linear feet of the entire inside periphery of the sewer pipe and the measuring device to determine the depth of water in the event of any pooling. Picture quality and definition shall be to the satisfaction of Engineer; otherwise, the equipment shall be removed from the line without pay.

B. The monitor shall be located within a temperature controlled television unit that will accommodate three people to watch the sewer line inspection. The monitor will have a 12-inch minimum viewing screen. The Engineer will have access to view the television monitor at all times.

C. The camera must be capable of measuring depth (in inches) of pooled water within the pipe. This can be accomplished by measuring equipment mounted directly to the camera,

software within the recording system that tracks depth based on grade changes, or other methods as approved by the Utilities Director.

PART 3 - EXECUTION

3.01 TELEVISION INSPECTION BY THE CONTRACTOR

A. The Contractor shall furnish video media of the lines televised to the Engineer for review and comments, which may require up to thirty (30) calendar days from the date submittal to the City. Unless approved otherwise by the City, the video media shall be DVD format. Video shall play in a standard DVD player without the need of viewing software. Each video media shall be permanently labeled with the following information furnished:

1. Project Job Number
2. Manhole to Manhole Designation
3. Name of Contractor
4. Date Televised

B. The following information shall be recorded and visible onscreen for 10 seconds immediately before the start of televising each line segment:

1. Project Job Number
2. Manhole to Manhole Designation (Number, Pipe Material, Size of Line, and Direction of Televising)
3. Name of Contractor
4. Date Televised
5. Street and or Easement Location
6. Drawing Sheet Number

C. A continuous uninterrupted recording of distance from the insertion manhole shall be visible at the lower left corner of the screen at all times during inspection.

D. The following information shall be provided in hard copy to accompany each tape:

1. Project Job Number
2. Name of Contractor
3. Date Televised

4. Street or Other Location
5. Upstream Manhole Designation
6. Downstream Manhole Designation
7. Pipe Material
8. Pipe Diameter
9. Direction of Televising (Downstream or Upstream)
10. Continuous Time Log Designating Start and Finish of Each Line Segment Televised. Time shall begin at 0hr 0min 0sec at the beginning of each tape.
11. Location of Service Connections

E. Media will become the property of the City. If the video is of such poor quality that the Engineer is unable to evaluate the condition of the sewer line or to locate service connections, the Contractor will be required to retelevise and provide a good video of the line at no additional cost to the City.

PART 4 - PASS/FAIL CRITERIA

4.01 CRITERIA

A. The PASS/FAIL decision will not be made in the field.

B. The following items will be reviewed during the inspection:

1. Pipe bell ends facing downstream
2. Manhole Inverts:
   Geometry compared to city details. Invert shape, size, and roughness.
3. Service Connections
   Proper placement and connection to pipe per city details and specifications.
4. Loose or missing pipe joint gaskets
5. Pipe Joints not fully seated, or over-inserted.
6. Pipe integrity
   Crushed (or out of round)
   Damaged pipe (cracks, chips, etc.)
7. Pooling of water in the pipe.
   Any pooling of water that is deeper than ¾” will require the sewer main line to be adjusted to eliminate the problem.
8. Debris / Sediment.
   The line should be clear of all sediment and debris.

END OF SECTION 5100

SECTION 5200 INSPECTION AND TESTING OF SEWER LINES, MANHOLES, AND SERVICE LINES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the inspection and testing of sewer lines, manholes, and service lines. Holiday testing shall be required on all epoxy line manholes and sewer wet wells. Testing is required before final acceptance of sewer lines and service lines by the City.

1.02 SCOPE OF WORK

A. All pipelines shall be inspected and tested before final acceptance. The methods to be used are as follows:

1. New Gravity Sewer Lines

    a. Visual inspection during installation and before backfill.
    b Low pressure air test.
    c. Television inspection.
    d. Mandrel test (Flexible pipes only)
    e. Final Visual Inspection
    f. Infiltration/exfiltration
    g. Tracer wire continuity test.

2. Manholes

    a. Visual inspection during installation and before backfill.
    b. Vacuum testing.
    c. Final visual inspection.
    d. Holiday test (epoxy coatings).

3. Replacement Sewer Lines and Point Repairs

    a. Visual inspection during installation and before backfill.
    b. Low pressure air test/exfiltration, infiltration.
    c. Television inspection.
    d. Mandrel test.
    e. Final visual inspection.

4. Force Mains

    a. Visual inspection during installation and before backfill.
    b. Hydrostatic pressure test.
    c. Tracer wire continuity test.

5. Service Lines

a. Visual inspection during installation and before backfill.
b. Low pressure air test.
c. Exfiltration test.

1.03 DELIVERABLES

A. The Engineer shall provide a complete and comprehensive testing report summary complete with all inspection and testing dates and results.

PART 2 - PRODUCTS

A. As specified elsewhere within these Standards.

PART 3 - EXECUTION

3.01 VISUAL INSPECTION DURING INSTALLATION AND BEFORE BACKFILL

A. The Engineer shall be responsible for inspecting sewer lines, manholes, and service lines during all phases of construction. The Engineer shall provide full time inspection services. All work not conforming to these specifications that is discovered during this inspection phase will be corrected by the Contractor.

3.02 PRESSURE TEST FOR GRAVITY SEWER PIPELINES

A. The Contractor will perform pressure tests on all gravity sewer lines.

B. Lines will not be accepted until they pass all required tests.

C. Perform the tests in the presence of the City representative. Provide at least 48 hours' notice before beginning testing.

D. The primary test method is the Low Pressure Air Loss test.

3.03 LOW PRESSURE AIR LOSS PROCEDURE FOR GRAVITY SEWER PIPELINES

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

B. Pipe air supply to pipeline to be tested so that air supply may be shut off, pressure observed, and air pressure released from the pipe without entering the manhole. Install a valved branch in the supply line past the shut-off valve terminating in a 1/4" female pipe thread for installation of the test gauge.

C. Add air slowly to portion of pipe under test until test gauge reads at least 4 psig, but less than 5 psig.

D. Shut air supply valve and allow at least two minutes for internal pressure to stabilize.

E. The pressure shall then be decreased to 3.5 psig.

F. Upon reaching 3.5 psig, the time in minutes, seconds for the pressure to fall 1 psig so that pressure at the end of time of the test is at least 2.5 psig shall be observed.

G. Compare observed time with minimum allowable times in the following chart for pass/fail determination.

TEST CHART FOR AIR TESTING SEWERS

Leakage Testing of Sewers by Low Pressure Air Loss

(Time Pressure Drop Method)

Table 1 - Minimum Test Times in Minutes.Seconds for 1 psig drop (3.5 psig to 2.5 psig)										
Distance Between Manholes	Nominal Pipe Diameter (inches)									
	8	10	12	15	18	21	24	30	36	42
100	7.33	9.26	11.20	14.10	17.00	19.49	22.47	35.36	51.17	69.48
150	7.33	9.26	11.20	14.10	17.00	26.1	34.11	53.25	76.55	104.42
200	7.33	9.26	11.23	17.48	25.38	34.54	45.35	71.13	102.34	139.36
250	7.33	9.53	14.14	22.15	32.03	43.37	56.59	89.02	128.12	174.3
300	7.35	11.52	17.05	26.42	38.27	52.21	68.22	106.5	153.51	209.24
350	8.51	13.51	19.56	31.09	44.52	61.04	79.46	124.39	179.29	244.19
400	10.07	15.49	22.47	35.36	51.17	69.48	91.10	142.27	205.08	279.13
450	11.23	17.48	25.38	40.04	57.41	78.31	102.34	160.16	230.47	314.07
500	12.39	19.47	28.29	44.31	64.06	87.15	113.58	178.04	256.25	349.01
550	13.55	21.45	31.20	48.58	70.31	95.58	125.21	195.52	282.04	383.55
600	15.11	23.44	34.11	53.25	76.55	104.42	136.45	213.41	307.42	418.49

H. Where groundwater level is above the crown of the pipe being tested, increase test pressure at the rate of 1 psi for every 2.5 feet of water above the crown.

I. Air Testing Safety Requirements:

1. Securely brace plugs used to close the sewer pipe for the air test; this is to prevent the unintentional release of a plug which can become a high velocity projectile. For example: four pounds (gauge) air pressure develops a force against the plug in a 12" diameter pipe of approximately 450 pounds; this force can propel a 12-inch plug weighing 10 pounds to supersonic speeds.

2. Locate gauges, air piping manifolds, and valves at the top of the ground. Entry by anyone into a manhole where a plugged pipe is under pressure is strictly prohibited.

3.04 HOLIDAY TESTING FOR EPOXY LININGS

A. High voltage holiday detection for coating systems installed in corrosive environments, when it can be safely and effectively employed, shall be performed to ensure monolithic protection of the substrate. After the coating product(s) have cured in accordance with manufacturer recommendations, all surfaces shall be inspected for holidays in accordance with NACE RPO 188-99, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates. All detected holidays shall be marked and repaired according to the coating product(s) manufacturer's recommendations.

B. Test voltage shall be a minimum of 100 volts per mil of coating system thickness.

C. Detection of a known or induced holiday in the coating product shall be confirmed to ensure proper operation of the test unit.

D. All areas repaired shall be retested following cure of the repair material(s).

E. In instances where high voltage holiday detection is not feasible a close visual inspection shall be conducted and all possible holidays shall be marked and repaired as described above.

F. Documentation of areas tested, equipment employed, results, and repairs made shall be submitted to the City/Engineer by Contractor.

3.05 TELEVISION INSPECTION

A. The Contractor shall televise all newly installed sewer mains as follows:

1. Television inspection shall be performed no less than 30-days after the pipe has been backfilled. Inspection shall be performed after mandrel testing, if applicable.
2. The Contractor shall clean all lines thoroughly prior to the start of televising.
3. Prior to performing the video test, a 5 gallons of clean water per 100 feet of sewer line shall be poured down the sewer main in order to highlight low spots.
4. The Contractor shall televise each segment of pipe.
5. The Contractor shall review the video for possible defects in material or workmanship.
6. The Contractor shall correct any defects discovered during the television inspection at the Contractor's expense.
7. The Contractor shall deliver to the Engineer final video and logs after all defects have been repaired.

3.06 MANDREL TEST

A. Mandrel testing shall be performed no less than 30-days after the pipe has been backfilled.

B. The maximum allowable pipe deflection is five (5) percent of the inside pipe diameter.

C. Any sewer pipe which fails the mandrel test prior to final acceptance will not be accepted by the City until the defects are corrected.

D. All mandrel tests shall be performed by the Contractor while observed by City personnel.

3.07 SUPPLEMENTAL MANDREL TESTING

A. The City may at any time after final acceptance perform supplemental mandrel testing on pipelines constructed of flexible pipe material. These supplemental tests will be performed as detailed above with a maximum allowable long term deflection of five percent (5%).

B. Any sewer pipe which fails the mandrel test prior to expiration of the maintenance bond will be corrected by the Contractor at the Contractor's expense. If the Contractor fails to correct these defects after a reasonable time, the City will correct the defects and file a claim with the bonding company.

3.08 FINAL VISUAL INSPECTION

A. Upon completion of the above tests the Engineer will perform a final visual inspection of sewer lines and manholes.

B. A punch list of defects (including obvious running leaks) will be prepared and sent to the Contractor for correction at the Contractors' expense.

3.09 INSPECTION FOR SERVICE LINES

A. All building sewer installations shall be inspected and approved by an authorized City inspector.

B. Backfill may only be placed on the completed portions of a building sewer following inspection. No approval certificate shall be issued until all portions of a building sewer from the main connection to the building foundation have been inspected and approved by an authorized inspector. At the time of inspection, the pipe should be in place in the trench with the top half of the pipe barrel exposed. No approval will be given for building sewers all or a portion of which are covered at the time of inspection.

C. All building sewers are subject to testing to insure water tightness. All tests must be performed in the presence of the Engineer. Tests may be either by:

1. Water Loss Test Procedure; or,

2. Low Pressure Air Loss Procedure.

D. If, in the opinion of the Engineer, the line in question is properly installed and free from open joints and breaks, building sewers constructed entirely of cast iron soil pipe may be connected to the city sewer without testing.

E. Low Pressure Air Loss Procedure

1. Plug securely both ends of the line to be tested.
2. Charge the line with air to a pressure of 4.5 psig.
3. Allow at least five minutes for the temperature in the pipe to stabilize.
4. Measure the time required for a one (1.0) psi drop in pressure.
5. The minimum time for a one psi loss is 28.5 x d seconds where d = the nominal diameter in inches of the pipe being tested.

3.10 PRESSURE TEST FOR FORCE MAINS

A. Perform hydrostatic leakage tests for force mains the same as water pipe, see Section 5300, by filling the force main with water and increasing the pressure to a testing pressure of 150% of the working pressure with a minimum of 100 psi and a maximum pressure of 250 psi.

B. The duration of the leakage test shall be two hours.

C. The maximum allowable leakage rate shall be 1 gallon per foot diameter of pipe per 1000 feet of force main for the duration of the 2 hour test.

D. The force main will not be accepted until the actual leakage is equal to or less than the allowable. In addition, all obvious leaks shall be repaired.

3.11 MANHOLE TESTING

A. The Contractor shall vacuum test all new manholes constructed.

B. Precast manholes shall be vacuum tested prior to backfill.

C. The Contractor shall vacuum test all manholes that have been sealed (waterproofed).

D. The Contractor shall vacuum test all manholes that have been epoxy lined.

E. Manholes shall be tested in accordance with ASTM C 1244, latest edition. Vacuum test shall not be performed earlier than 7 days after construction for cast in place manholes. The Contractor shall provide all testing equipment, pump, hosing, seal, and other incidentals. Vacuum test head shall be positioned at the top of the casting (the surface on which the manhole cover rests, to include grade rings) in accordance with the equipment manufacturer's instructions. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump isolated by the shut-off valve on the test head connection. When valve is closed, time measurement shall commence, and the time required for vacuum drop to 9-inches of mercury shall be observed and recorded. Manholes shall pass if the time for the vacuum reading to drop from 10-inches of mercury to 9-inches of mercury meets or exceeds the time values in seconds in the following table.

Table 2 - Minimum Test Times for Various Manhole Diameters (seconds)									
Depth	Diameter (inches)								
(feet)	30	33	36	42	48	54	60	66	72
<10	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	57	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	70	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

F. Manholes showing greater than the allowable leakage shall be repaired and re-tested until a satisfactory leakage result is obtained.

3.12 TRACER WIRE CONTINUITY TESTING

A. Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer or the Engineers' representative. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at their own expense.

B. A final continuity test shall be performed by a Water and Sewer Department representative before the project will be accepted by the City. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at his own expense.

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END OF SECTION 5200

SECTION 5300 INSPECTION AND TESTING OF WATER LINES AND SERVICE LINES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the inspection/observation and testing of water lines and services lines. Testing is required before final acceptance of water lines and service lines by the City.

1.02 SCOPE OF WORK

A. All pipelines shall be inspected and tested before final acceptance. The methods to be used are as follows:

1. New Water Pipelines

    a. Visual inspection during installation and before backfill.
    b Hydrostatic pressure test.
    c. Disinfection.
    d. Bacteriological sampling.
    e. Final Visual Inspection.
    f. Tracer wire continuity test.

2. Water Meter Setters

    a. Visual inspection during installation and before backfill.
    b. Final Visual Inspection.

3. Service Lines

    a. Visual inspection during installation and before backfill.
    b Hydrostatic pressure test.
    c. Final Visual Inspection
    d. Tracer wire continuity test.

1.03 DELIVERABLES

A. The Engineer shall provide a complete and comprehensive testing report summary complete with all inspection and testing dates and results.

PART 2 - PRODUCTS

A. As specified elsewhere within these Standards.

PART 3 - EXECUTION

3.01 VISUAL INSPECTION DURING INSTALLATION AND BEFORE BACKFILL

A. The Engineer shall be responsible for observing/inspecting water lines, water meter setters, and service lines during all phases of construction. The Engineer shall provide comprehensive observation/inspection services. All work not conforming to these specifications that is discovered during this inspection phase will be corrected by the Contractor.

3.02 PRESSURE TEST FOR TAPPING SLEEVES

A. The contractor shall provide all pumps or other equipment necessary to test the tapping sleeve before making a tap. The duration of the hydrostatic leakage test on tapping sleeves shall be thirty (30) minutes at 225 psi with zero leakage.

3.03 PRESSURE TEST FOR WATER PIPELINES AND SERVICE LINES

A. After completion of construction of all water lines or sections thereof, the Contractor shall flush, test and disinfect the new water lines and in accordance with the Engineer of Record's plan as described below.

B. Flushing

1. All water for flushing, testing and disinfecting water lines shall be supplied and paid for by the Contractor. Water meters shall be obtained from the City of Fayetteville Meter Division. Water used for high rate flushing shall not be metered through a contractor issued water meter. Actual water flow rates used during flushing operations shall be determined by the City of Fayetteville by using either pitot style gauges or high rate water meters. Volume shall be determined by multiplying the measured flow rate times the duration of flushing in minutes. Water used for flushing shall be billed to the contractor at the current wholesale water rate plus applicable taxes.

2. The work shall be coordinated to ensure that it will not be carried on during periods of high water usage. Water valves or other appurtenances on the existing water system, new tapping valves, or valves or appurtenances that have been accepted by the City, shall only be operated by a City employee who has a valid ADH Water Operator's License and under the direct supervision of the City of Fayetteville Water & Sewer Maintenance Division.

3. The Contractor shall fill and flush the newly constructed lines and visually check all combination air release and vacuum valves, blow-off valve assemblies, line valves, fire hydrants, and meter setters to assure proper operation.

4. The Engineer of Record shall develop a flushing plan to ensure that all lines are properly flushed. The plan should specify the sequence in which valves and hydrants are to be opened and the duration thereof, ensuring complete flushing and protecting the City's water system from construction contaminated water. The volume to be flushed shall be no less than three (3) but no more than five (5) times the volume of the main to be flushed, and shall be metered by the City. The flow shall be such that a flushing velocity of not less than 2.5 feet per second and preferably 3.5 feet per second or greater is attained.

C. Hydrostatic Testing

1. All pipe shall be tested as set out in AWWA C600, latest revision. Tests will be conducted only after the line is completed, including all taps and meter settings as required and the backfill completed. These tests shall be performed by the Contractor in the presence of the City Inspectors and the Engineer of Record. The Contractor shall furnish all necessary pressure gauges, meters, and pumps and make all taps and connections.

2. Each valved section of pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Before applying the test pressure, all air shall be expelled from the pipe by permanent taps or corporation cocks where necessary.

3. Test pressure shall be either 150 percent of the static pressure at the lowest points or 200 psi, whichever is greater, not to exceed 250 psi at the lowest point. The contractor shall provide all pumps or other equipment necessary to maintain the test pressure within +/-5 psi at the test point for a period of two (2) hours. All interior valves including guardian valves on fire hydrants and other appurtenances shall be open during all tests.

4. The test pressure shall not vary by more than ± five (5) psi for the duration of the test. During the duration of the two hour test, if the test pressure drops more than 5.0 psi from the start pressure, the test shall be terminated and considered failure due to assumed leaks in the tested pipe section. If the pressure rises beyond the allowed 5 psi variance, the test shall be terminated and remaining air shall be purged from the pipeline.

D. Leakage

1. The leakage test shall be conducted concurrently with the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the above specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

2. The maximum allowable leakage rate shall be 1 gallon per foot diameter of pipe per 1000 feet of water line for the duration of the 2 hour test.

D (inches)	6	8	10	12	14	16	18	20	24	36	42
Allowable	0.50	0.67	0.83	1.00	1.17	1.33	1.50	1.67	2.00	3.00	3.50

3. Upon completion of a two hour test where the test pressure did not vary by more than ± five (5) psi, the CONTRACTOR shall determine the leakage amount by measuring the amount of "make-up" water necessary to restore the original starting pressure.

4. Should any test of pipe laid disclose leakage greater than that specified, the leak(s) shall be located and repaired and the line shall be re-tested at the Contractor's expense. All visible leaks shall be repaired regardless of the amount of leakage. It may be necessary to utilize leak detection equipment to locate not visible leaks at the Contractor's expense.

3.04 DISINFECTION

A. After successful pressure testing, the line(s) shall be flushed at a velocity equal to or greater than 2.5 feet per second. The line shall then be disinfected in accordance with AWWA C651, latest revision, for Disinfecting Water Mains, continuous feed method, except that the placing of hypochlorite granules into the main during construction will not be permitted.

B. The Contractor shall provide a test/chlorine tap no greater than 10' downstream from the beginning of the new water line. All excavation, installation, use of and proper abandonment of the test tap is the responsibility of the Contractor.

C. The final concentration of chlorine inside the main shall be 25 parts per million (ppm) at all locations and shall be maintained for a minimum of 24 hours. The chlorine residual at the end of the 24 hour period shall not be less than 10 ppm. The contractor shall supply all test kits necessary to verify chlorine concentrations.

D. The contractor shall operate all valves and hydrants in the treated section of water line during the initial 24 hours to ensure disinfection of the appurtenances.

E. The contractor shall take great care when flushing the line to assure proper drainage is available to prevent harm at any adjacent downstream location.

F. Disposal of the disinfecting water shall be in a manner that will protect the public and the receiving waters from harmful concentrations of chlorine. Decholorination of the

disinfecting water shall be in accordance with AWWA C655, Field Dechlorination, latest edition. A dechlorination plan shall be prepared by the Engineer of Record.

G. After disinfection is complete, the Contractor shall then flush the disinfecting solution from the lines to a point that the chlorine concentration is back down to the same level as the treated water from the distribution system. The treated water lines will then be tested before being placed into service.

3.05 BACTERIOLOGICAL SAMPLES

A. Bacteriological samples shall be taken by City personnel only. Samples shall be taken on two consecutive days and shall be taken only on Monday, Tuesday, Wednesday, or Thursday. Before a line is placed in service, two consecutive series of samples which are not collected on the same day and are taken no more than 4 days apart must show that the water is bacteriologically safe for drinking purposes.

3.06 FINAL VISUAL INSPECTION

A. Upon completion of the above tests the Engineer will perform a final visual inspection of water pipelines and meters.

B. A punch list of defects (including obvious running leaks) will be prepared and sent to the Contractor for correction at the Contractors' expense.

3.07 TRACER WIRE CONTINUITY TESTING

A. Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer or the Engineers’ representative. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at their own expense.

B. A final continuity test shall be performed by a Water and Sewer Department representative before the project will be accepted by the City. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at his own expense.

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END OF SECTION 5300

SECTION 6000 PAVEMENT REPAIR

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the materials and procedures used in the repair of roads, streets, or other public rights-of-way where a water lines, sewer lines or appurtenances are constructed as part of private or development projects.

B. Capital Improvement Projects and City maintenance projects are not a standard specification. Capital Improvement Projects and City maintenance projects will be considered only on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 REGULATIONS AND STANDARDS

A. All permanent repairs of streets, roads, trails, sidewalks, other public rights-of-way, private drives, private parking lots, etc. shall comply with the requirements shown on the City Engineering Standard Detail Drawings and as further defined in the City's Minimum Street Standards and details. Also refer to:

http://www.fayetteville-ar.gov/DocumentCenter/View/6805

ftp://ftp.fayetteville-ar.gov/published/engineering/standard%20details/street%20trail%20details/

B. The Contractor is responsible for following the requirements of all State or local Ordinances, Regulations, or Codes governing the repairs to roads, streets, or other public rights of way. In particular:

1. Repair of State Highways: per requirements of the Arkansas State Highway Commission.

2. Repair of county roads: per requirements of the County Roads Department.

3. Repair of City of Fayetteville streets, sidewalks, and driveways: per the requirements of the City of Fayetteville.

4. Permit for street cut and repairs shall be furnished by the Contractor.

C. Temporary Repairs: Comply with Section 1000 General Requirements and as follows.

1. Per requirements of the governmental agency having jurisdiction and these specifications.

1.03 TRAFFIC CONTROL

A. Comply with Section 1000 General Requirements and as follows.

A. Whenever traffic flow restrictions of any kind are anticipated, the Contractor will be required to contact the City of Fayetteville to be given permission to obstruct traffic flow.

B. Street closing permits must be obtained from proper government agencies.

C. Construction signs shall be placed immediately adjacent to the Work, at such locations as traffic demands.

D. Contractor will be required to submit a Traffic Control Plan to City of Fayetteville and the Engineer.

END OF SECTION 6000

SECTION 6100 LAWN AND GRASS RESTORATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section covers the replacement of native grass or sod in lawns disturbed by the construction.

B. Consists of furnishing and applying fertilizer, seed, mulch cover, and water at all other locations disturbed by the construction.

C. Maintenance service.

1.02 SCOPE OF WORK

A. This Section covers the furnishing and placing of sod to form solid mats on areas shown on the Drawings (generally lawns or commercial green spaces) or seed and mulch all other areas disturbed by the Contractor.

B. It covers the furnishing and applying of water.

C. It covers the furnishing and placing of four (4) inches of topsoil on all areas disturbed during construction.

D. It covers the furnishing and placing of fertilizer.

E. All work shall be in accordance with details shown on the Drawings and within these Specifications.

F. The Contractor is responsible for following the requirements of all local Ordinances, Regulations, or Codes governing re-vegetation and slope stabilization,

1.03 WARRANTY

A. Provide one year warranty from date of final acceptance.

B. Replace areas found dead, or not in a healthy growing condition.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be reasonably free from subsoil, clay, lumps, brush, objectionable weeds and/or other litter and shall be free from roots and toxic substances or other material or substances that might be harmful to plant growth or be a hindrance to grading, planting and maintenance operations.

2.02 FERTILIZER

A. Fertilizer shall be a standard commercial product complying with State and Federal laws and with the requirements issued by proper authorities.

B. Fertilizer shall be delivered to the site in the manufacturer's original container, on which shall be plainly marked the manufacturer's name and the guaranteed chemical analysis.

C. Except as noted in the following sentence, fertilizer shall contain not less than the percentages by weight of ingredients as follows:

Nitrogen	- 13 percent
Phosphorus, P205	- 13 percent
Potash, K2	- 13 percent

Other 1:1:1 ratio fertilizers may be used, provided the available plant food remains the same as herein specified.

D. All fertilizer shall be solid and shall be in a condition which will permit proper distribution.

2.03 SOD

A. Solid sod shall be cut from well-established viable Bermuda, Zoysia or St. Augustine grass. Sod type shall match that established in the disturbed areas.

2.04 SEED

A. Contractor shall apply seed mixture appropriate for the season and disturbed area.

B. Contractor shall apply a mixture of various annuals and perennials to provide overlapping times of seasonal peak vegetative cover. Seeding shall only be done just prior to the vegetation’s peak season for best results. Seeding shall be used when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control.

C. To optimize soil stabilization, Contractor shall utilize a nurse crop of quick growing annuals within a mix of perennials appropriate for the season. The nurse crop germinates and grows rapidly, holding the soil until the slower-growing perennial seedlings become established. Permanent vegetation shall not be considered established until a ground cover of perennial vegetation is achieved that is uniform and mature enough to survive and be of sufficient density to preclude erosion.

D. Contractor shall conduct seeding activities to achieve stabilization that are generally congruent with the following schedule:

Dormant Cold Season Temporary Stabilization (November 1 – February 28)

Seeding at this time of the year typically does not produce successful results, as cold temperatures inhibit seed germination. Contractor shall be responsible for achieving temporary stabilization via mulching, erosion control blankets, matting, compost, and/or other appropriate structural/nonstructural methods for temporary stabilization until seasonal weather conditions become more conducive to establishment of permanent perennial vegetative cover. Fertilizers shall be added at this time in preparation for seeding. Contractor shall be responsible for achieving temporary stabilization at all areas that are unstable and subject to erosion. Contractor shall apply temporary seeding, as follows:

Dormant Cool Season Temporary Cover Crop Seed Mix (November 1 – February 28)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Winter rye (*Secale cereale)*	cool season annual	75 lb/ac
Perennial Ryegrass *(Lolium perenne)*	cool season perennial	75 lb/ac

Pre Warm Season (Spring) Seeding (March 1 – May 31)

As the growing season approaches, Contractor shall apply a mix of quick germinating cool season species combined with warm season species listed below. The cool season species will serve to hold the soil until warmer weather arrives stimulating the warm season species to germinate.

Pre Warm Season (Spring) Seed Mix (March 1 – May 31)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Oats (*Avena sativa)*	cool season annual	20 lb/ac
Perennial Ryegrass (*Lolium perenne)*	cool season perennial	20 lb/ac
White clover (*Trifolium repens)**	cool season perennial	20 lb/ac
Korean (Kobe) lespedeza (*Kummerowia stipulacea)**	warm season annual	20 lb/ac
Bermuda (*Cynodon dactylon)*	warm season perennial	30 lbs/ac
Bahiagrass (*Paspalum notatum)*	warm season perennial	30 lbs/ac
Weeping love grass (*Eragrostis curvula)*	warm season perennial	30 lbs/ac

*All legume seed must be properly inoculated with appropriate inoculant.

Warm Season Seeding (June 1 – August 31)
In the midst of the growing season, Contractor shall apply a mix of warm season annuals and perennials, as follows:

Warm Season Seed Mix (June 1 – August 31)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Sudan grass *(Sorghum bicolor)*	warm season annual	20 lb/ac
Alyce clover *(Alysicarpus ovalifolius)*	warm season annual	20 lb/ac
Brown-top millet *(Panicum ramosum)*	warm season annual	20 lb/ac
Bermuda (*Cynodon dactylon)*	warm season perennial	25 lbs/ac
Bahiagrass (*Paspalum notatum)*	warm season perennial	25 lbs/ac
Weeping love grass (*Eragrostis curvula)*	warm season perennial	25 lbs/ac
Buffalo grass (*Bouteloua dactyloides)*	warm season perennial	25 lbs/ac

Late Season Seeding (September 1 – October 31)
During late summer to early fall, Contractor shall apply the following mix:

Late Season Seed Mix (September 1 – October 31)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Oats (*Avena sativa)*	cool season annual	30 lb/ac
Winter rye (*Secale cereale)*	cool season annual	30 lb/ac
White clover (*Trifolium repens)**	cool season perennial	25 lb/ac
Perennial Ryegrass *(Lolium perenne)*	cool season perennial	50 lb/ac
Virginia wildrye (*Elymus virginicus)*	cool season perennial	25 lb/ac

*All legume seed must be properly inoculated with appropriate inoculant.

E. Contractor has option of adding warm season perennials to Late Season Seed Mix (September 1 – October 31) and/or Dormant Cool Season Temporary Cover Crop Seed Mix (November 1 – February 28) or seeding with warm season perennials during other seeding periods. This is to be determined on a site-specific basis. Contractor shall confer with City of Fayetteville prior to seeding activities to determine specific seed mix.

F. Contractor shall submit all labels/tags from seed bags and seed purchase invoices to the City of Fayetteville.

2.05 MULCH

A. Mulching shall be used in conjunction with both temporary and permanent seeding practices to enhance their success by providing erosion protection prior to the onset of vegetative growth. Straw mulching shall be of oat, wheat, or rice straw mulch. Hay mulch shall be prairie grass, Bermuda grass, or other hay as approved. Mulch shall be dry and reasonably free from Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All material will be inspected and approved prior to use.

B. Mulching shall be spread in a uniform continuous blanket, at a rate of 1 to 3 tons per acre (air dried weight) or to a uniform 2-inch depth. Mulch shall be spread by hand or by an

approved blower type mulch spreader. Care shall be taken to remove all wire and/or twine from baled hay/straw when the control structures are removed from the site. Mulch shall be anchored in the soil to a depth of two to three inches to form a soil-binding mulch to prevent loss or bunching, or held in place with a tackifier.

2.06 WATER

A. Water shall be free from any substances, in solution or in suspension, which would inhibit the rapid growth of grass.

PART 3 - EXECUTION

3.01 FERTILIZER APPLICATION

A. Fertilizers shall be applied at appropriate agronomic rate. If necessary to achieve final stabilization, fertilizer shall be applied at a minimum rate of 250 pounds per acre (0.0057 pounds per square foot) in advance of tilling/seedbed preparation operations. When soil samples are not practical, fertilizer shall consist of 13-13-13 (nitrogen, phosphorus, and potassium content). The fertilizer distributor box shall be equipped with baffle plates to prevent downward movement of fertilizer when operating on a slope. The fertilizer shall be raked in and thoroughly mixed with the soil to a depth of approximately 2 inches prior to the application of seed or mulch.

3.02 SEEDING

A. Areas to be seeded shall be dressed to natural shape.

B. The Contractor shall obtain an approved topsoil from any available source and place uniformly on the designated areas and spread evenly to a minimum thickness of four (4) inches. Irregularities in the surface shall be corrected so as to prevent formation of depressions where water will stand. TOPSOIL SHALL NOT BE PLACED WHEN THE SUBGRADE IS FROZEN, EXCESSIVELY WET, OR IN A CONDITION DETRIMENTAL TO THE PROPOSED PLANTING AND PROPER GRADING.

C. Broadcast sowing of seed may be accomplished by hand seeders or by approved power equipment. Either method shall result in uniform distribution and no work shall be performed during high winds. The area seeded shall be lightly firmed with a cultipacker immediately after broadcast.

D. The contractor shall water and maintain seeded areas from time of completion until final acceptance of the project.

E. The contractor shall be responsible for establishing ground cover on all disturbed areas. Repeated seeding shall be required if necessary throughout the warranty period.

3.03 SOD PLACEMENT

A. In this paragraph, "Solid Sod" is interchangeable with the word "sod."

B. Solid sod or topsoil shall not be placed until all other items of work are complete.

C. Prior to placing the sod and topsoil in the areas designated, the ground surface shall be cleared of materials that might hinder proper grading, tillage, or subsequent maintenance operations such as stumps, stones, roots, cable, wire, grade stakes, etc., and brought to four (4) inches below the finished grade. The areas shall then be thoroughly tilled to a depth of at least two (2) inches by plowing, disking, harrowing or other acceptable means.

D. The Contractor shall then obtain an approved topsoil from any available source and place uniformly on the designated areas and spread evenly to a minimum thickness of four (4) inches. Irregularities in the surface shall be corrected so as to prevent formation of depressions where water will stand. TOPSOIL SHALL NOT BE PLACED WHEN THE SUBGRADE IS FROZEN, EXCESSIVELY WET, OR IN A CONDITION DETRIMENTAL TO THE PROPOSED PLANTING AND PROPER GRADING.

E. After the topsoil has been spread and graded, the surface shall be cleared of stones, stumps or other objects that might hinder planting or maintenance preparations. Paved areas over which hauling operations are conducted shall be kept clean.

F. Where any portion of the surface becomes gullied or otherwise damaged, the affected areas shall be repaired to the aforementioned condition.

G. Areas to be sodded shall be shaped in such manner that they will, after placement of sod, conform to the typical sections.

3.04 WATERING

A. Prior to placement of seed or sod, areas shall be sprinkled with water sufficiently to make them moist, but not muddy. The initial application of water may be omitted if the area is sufficient moist from rainfall.

B. Immediately following the placing and tamping of sod, the covered area shall be wetted thoroughly. **Subsequent applications of water shall be as required**.

C. Immediately following the application of the mulch cover for seeding, water shall be applied in sufficient quantity to thoroughly moisten the soil to the depth of pulverization and then as necessary to germinate the seed and maintain growth.

3.05 COMPLETENESS

A. The lawn and grass operations shall not be considered complete until a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 80% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures.

3.06 INTERMITTENT CLEANUP

A. Immediately following the lawn and grass restoration operations, all gutters, sidewalks, driveways, street pavement, yard or other areas shall be cleaned of all debris, excess sod, topsoil or other objectionable matter. All such cleanup operations shall be completed before sodded areas are measured for payment.

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END OF SECTION 6100

SECTION 6200

REPORTING FORMS

The following forms may be revised and/or additional forms added as determined by the Utilities Director or City engineer.

It is the Contractor's responsibility to request the latest edition of Reporting Forms.

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Fire Hydrant Information Sheet

City of Fayetteville

Hydrant ID:	Assigned by Water/Sewer	Manufacturer:	Mueller, Waterous, Other
Address:	Nearest House Number	Model:	
Street:	Street Name	Year:	
Cross Street:	Nearest Cross Street	Installation Date:	
Main Diameter:		Installed By:	City or Contractor Name
Feeder Diameter:		Static Pressure:	psi
Depth of Bury:	Include Extensions	Ownership:	City, Private, WWA, Other

Number of Nozzles: 3 2 Other:____

Nozzle Diameters: 4 1/2"-_____; 2 1/2"-_____; Other-_____

Fire Flow Data		Secondary Fire Hydrant for Test	
Pitot Pressure:	psi	Hydrant ID:	
Measured Flow:	gpm	Static Pressure:	psi
20 psi Residual Flow:	gpm	Residual Pressure:	psi

Current Color: Blue Green Orange Red Other:_____

Residual Flow is 1500 gpm > - Blue; 1000 to 1499 - Green; 500 to 999 - Orange; < 500 - Red

Correct Color:

Date of Flow Test: _____ Initials of Testor: _____

Date of Inspection: _____ Initials of Inspector: _____

Date of Maintenance: _____ Intitials of Maint.: _____

Notes: _____

Manhole Vacuum Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____ _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____ _____

Drawing Sheet Number	Manhole ID	Manhole Sta. Number	Start Time	Start Pressure (inches of Hg)	End Time	End Pressure (inches of Hg)	Pass or Fail

_____

City of Fayetteville

Water Line Data

City of Fayetteville

Project Name: _____ Contractor / Superintendent: _____

City Project Number: _____ _____

Location: _____ Engineer / Inspector: _____

_____

Location					
Sheet Number	Station Number	Manufacturer	Material	Diameter	Production Run Code or Lot Code

Sewer Line Low Pressure Air Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____ _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____ _____

Plan Sheet Number	Upstream Manhole	Upstream Sta. Number	Downstream Manhole	Downstream Sta. Number	Start Time	Start Pressure (psi)	End Time	End Pressure (psi)	Pass or Fail

_____

City of Fayetteville

Sewer Line Mandrel Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____ _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____ _____

Plan Sheet Number	Upstream Manhole	Upstream Sta. Number	Downstream Manhole	Downstream Sta. Number	Pass or Fail

_____

City of Fayetteville

Water Valve Data

City of Fayetteville

Project Name: _____ Contractor / Superintendent: _____

City Project Number: _____

Location: _____ Engineer / Inspector: _____

Location						
Sheet Number	Station Number	Manufacturer	Model Number	Year	Type (Gate Butterfly Ball)	Diameter

Water Line Disinfection Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____ _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____ _____

Pipe Diameter (inches)	Total Length of Pipe (feet)	Volume of Water (gallons)	Make-up Water Chlorine (ppm)	Chlorine Residual (ppm)	Date and Time	Chlorine Residual after 24 Hours (ppm)	Date and Time

After chlorine residual in the water line has been achieved at a minimum of 25 ppm, all valves and hydrants in the treated section of water line shall be operated during the initial 24 hours to ensure disinfection of the appurtenances.

Diameter (inches)	Volume (1000')
2	163
3	367
4	653
6	1469
8	2611
12	5875

_____

City of Fayetteville

Water Line Flushing Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____ _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____ _____

Pipe Diameter (inches)	Total Length of Pipe (feet)	Volume (gallons)	Start Time	Flushing Rate min. 2.5 fps (gpm)	Measured Flushing Rate (gpm)	End Time	Volume (gallons)

Diameter (inches)	Volume (1000')	gpm at 2.5 fps
2	163	24
3	367	55
4	653	98
6	1469	220
8	2611	392
12	5875	881

_____

City of Fayetteville

Water Pressure and Leakage Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____ _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____ _____

Pipe Diameter (inches)	Total Length of Pipe (feet)	Test Pressure (psi)	Allowable Leakage (gallons)	Start Time	Start Pressure (psi)	End Time	End Pressure (psi)	Make-up Volume (gallons)	Pass or Fail

D (inches)	Allowable per 1000'
6	0.50
8	0.67
10	0.83
12	1.00
14	1.17
16	1.33
18	1.50
20	1.67
24	2.00
36	3.00
42	3.50

_____

City of Fayetteville

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SECTION 7000 QUALIFIED PRODUCTS LIST

PART 1 - GENERAL

1.01 GENERAL INFORMATION

A. Domestic United States of America (USA) manufacture.

1. In so much as possible, all material, pipe, fittings, castings, products, concrete, reinforcement and appurtenances must be 100% Domestic United States of America (USA). If a material or product is available as 100% Domestic United States of America (USA), then that material or product shall be provided.

2. If a material or product is not available as 100% Domestic United States of America (USA) then the products shall comply with the following:

a. Based upon the experience and history of the City of Fayetteville, certain named product exceptions to the domestic USA requirement are included within these specifications. These named product exemptions are limited to the specific product(s) or manufacturers named or listed within these Specifications.

i. Where a specific named exception for manufacturer, product, or products are listed within the Specifications without the statement "or approved equal" then that (listed) product, or products, shall be the only product(s) furnished for the specified application.

3. "Approved equal" within the Standard Specifications including the Qualified Products List shall require written approval from the Utilities Director.

B. American Iron and Steel (AIS) requirements.

a. The American Iron and Steel (AIS) requirements of the Consolidated Appropriations Act of 2014 Public Law 113-76 and further requirements including, but not limited to P.L. 113-121, 114-113 and 608 of Title 33 of the United States Code and latest codes/laws as may be provided, are a separate and additional consideration to these Specifications based upon Clean Water and Safe Water SRF Federal and State funding sources.

Refer also to https://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement

1.02 SPECIFIC NAMED PRODUCTS

A. SECTION 3000 SEWER PIPE, FITTINGS AND MATERIALS

1. Reference: 2.03 CLEANOUTS

Cast iron short bodied valve box, Model 70 as manufactured by East Jordan Iron Works or approved equal.

2. Reference: 2.07 INTERIOR CERAMIC EPOXY LINING FOR DUCTILE IRON PIPE AND FITTINGS

The ceramic epoxy lining specifically designed for wastewater environments shall be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

3. Reference: 2.08 POLYETHYLENE ENCASEMENT (PIPE WRAP)

Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal

4. Reference: 2.10 REINFORCED FLEXIBLE RUBBER COUPLINGS

Fernco or approved equal.

5. Reference: 2.11 SERVICE SADDLES

Romac or approved equal.

6. Reference: 2.13 MECHANICAL JOINT RETAINER GLANDS

a. Retainer glands for pipe sizes 3-inch through 12-inch shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

b. Retainer glands for pipe sizes greater than 12-inches shall be manufactured by EBAA Iron, Inc. (USA only), or Star Pipe Products (USA only).

7. Reference: 2.14 PIPE BELL RESTRAINTS

a. Bell restraints for AWWA C900 PVC sizes 4-inch through 12-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc.

b. Bell restraints for Ductile Iron Pipe sizes 4-inch through 18-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc.

c. All-thread attachments - Romac “Ductile Lug” style attachments 316 stainless steel or approved equal.

8. Reference: 2.19 VALVES FOR FORCE MAINS

a. Full port (100% area) plug valves shall be AWWA C517, latest revision shall be manufactured by Val-Matic or Dezurik PEC

9. Reference: 2.20 AIR / VACUUM RELIEF VALVES

a. Stainless steel A.R.I. Flow Control Accessories sewage air release valve or approved equal.

10. Reference: 2.21 TRACER WIRE

a. Connectors shall be moisture displacement style as manufactured by 3M DBR, or qual.

11. Reference: 2.22 MARKING TAPE

a. Non-metallic sanitary sewer marking tape shall be warning tape as manufactured by Rhino Marking and Protection Systems, Harris Industries, Inc., or approved equal.

12. Reference: 2.23 SEWER LINE MARKERS

a. Sewer line markers shall be TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380), or approved equal.

b. White reflective tape 3M or equal.

B. SECTION 3300 MANHOLES

1. Reference: 2.03 MANHOLE GROUT

Grout mix shall be Strong Seal QSR, or approved equal.

2. Reference: 2.05 PRECAST CONCRETE MANHOLES

E. Pipe connections A-Lok Products, Inc.
F. Joint Sealant RFS Gaskets by Press-Seal Gasket Corporation or approved equal.
H. Joint wrap Bidco Butyl Wrap as manufactured by NPC or Infi-Shield® Gator Wrap by Sealing Systems, Inc or approved equal.

I. Frame gasket material E-Z STIK as manufactured by Press-Seal Gasket Corporation, or equal to ASTM C 990, Section 6.2 Butyl Rubber Sealants.

3. Reference: 2.06 CORROSION PROTECTION

Raven Ultra High-Build Epoxy Coating, designated as Raven 405; Warren Environmental Systems, or approved equal.

4. Reference: 2.08 STANDARD MANHOLE FRAME AND COVER

Approved manufacturers are East Jordan Iron Works and Neenah.

5. Reference 2.09 HINGED AND GASKETED MANHOLE FRAME AND COVER

Approved products are East Jordan Iron Works Ergo and Neenah Liftmate.

6. Reference: 2.11 RUBBER WATERSTOP GASKETS

Fernco, A-Lok, or approved equal.

7. Reference: 2.13 MANHOLE GRADE ADJUSTMENT RINGS

Ladtech, Inc. or approved equal.

8. Reference: 2.14 RAIN STOPPERS (MANHOLE INSERT)

"No Flow In FLOW" located in San Antonio, Texas, or approved equal.

C. SECTION 3400 BORES AND STEEL ENCASEMENT PIPE

1. Reference: 2.01 Materials

C. Grout

Grout shall be Strong Seal Grout 250, or approved equal.

E. Casing spacers

Cascade Model CCS as manufactured by Cascade Waterworks Mfg. Co., or approved equal.

F. Casing End seals

Casing end seals shall be Cascade Model CCES, or approved equal.

D. SECTION 3500 SEWER PUMP (AKA LIFT) STATIONS

1. Reference: 1.01 General Requirements

G. Pumps, motors and appurtenance mechanical and electrical equipment shall be Fairbanks Morse Pump equipment or Flygt Pump equipment.

2. Reference: 2.08 GENERATOR SET

B.8. Generac or approved equal.

E. SECTION 4000 WATER PIPE, FITTINGS AND MATERIALS

1. 2.05 COATED COPPER PIPE/SERVICE TUBING

Mueller Industries or Kamco.

2. Reference: 2.06 POLYETHYLENE ENCASEMENT (PIPE WRAP)

Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal

3. 2.08 FOSTER ADAPTERS

Compact MJ restraints shall be Foster Adapter by Infact Corporation.

4. 2.10 MECHANICAL JOINT RETAINER GLANDS

a. Retainer glands for pipe sizes 3-inch through 12-inch shall be manufactured by EBAA Iron, Inc.(USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).
b. Retainer glands for pipe sizes greater than 12-inches shall be manufactured by EBAA Iron, Inc. (USA only), or Star Pipe Products (USA only).

5. 2.11 PIPE RESTRAINTS

a. Bell restraints for AWWA C900 PVC sizes 4-inch through 12-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

b. Bell restraints for Ductile Iron Pipe sizes 4-inch through 18-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have

an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

c. When all-thread attachments are required, **eye-bolt style attachments are not permitted**. Romac "Ductile Lug" style attachments or approved equal shall be used. All-threads shall be made of 316 stainless steel.

6. 2.12 RESTRAINED FLANGED COUPLING ADAPTERS

EBAA Iron Series 2100.

7. 2.13 RESTRAINED COUPLINGS

EBAA Iron Series 3800 Restrained Coupling.

8. 2.15 GATE VALVES

Gate valves shall be made in USA and shall be Mueller Series 2360, American Flow Control Series 2500, or American AVK Company Series 25 or Series 45.

9. 2.16 BUTTERFLY VALVES

Butterfly valves shall be Pratt HP250II or Dezurik BAW.

10. 2.17 BALL VALVES

Ball valves shall be made in USA, and shall be Ford B11-777-NL or James Jones E1900, with "tee-head" style operating nut.

11. 2.18 VALVE BOXES

Valve boxes shall be Made in USA, and shall be East Jordan Iron Works 8550 Series or Tyler Union 6850 Series

12. 2.20 FIRE HYDRANTS

Permitted fire hydrants are (only) American Flow Control 5-1/4" Waterous Pacer WB67-250 and Mueller Super Centurion 250 hydrants, no approved equals.

13. 2.21 BLOW-OFFS

Mainguard #77 as manufactured by The Kupferle Foundry Company or approved equal.

14. 2.22 AIR RELIEF VALVES

Air release valves shall be A.R.I. Model D-040 for 1” and 2” or A.R.I. Model D-060-C HF NS for 3” – 10”, or approved equal.

15. 2.23 SERVICE SADDLES

Service saddles shall be Romac 101NS.

16. 2.24 TAPPING SLEEVES

Ford FAST or approved equal.

17. 2.25 SERVICE CONNECTION MATERIALS, FITTINGS AND BRASS

All service connection materials, fittings and brass shall be 100% domestic USA. All service connection materials, fittings and brass shall be manufactured in accordance with the Safe Drinking Water Act (SWDA latest edition and as amended) to be LEAD-FREE brass (aka No-Lead). All service connection materials, fittings and brass shall be manufactured by Ford Meter Box Company, Inc. or Mueller Company and as further specified in Section 4000.

18. 2.27 MARKING TAPE

Rhino Marking and Protection Systems, Harris Industries, Inc., or approved equal.

19. 2.28 WATER LINE MARKERS

TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380), or approved equal.

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END OF SECTION 7000

APPENDIX A

SEWER SERVICE LINE AND CONNECTION POLICY

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CITY OF FAYETTEVILLE, ARKANSAS
POLICY AND PROCEDURE

Subject:	**SEWER SERVICE LINE AND CONNECTION POLICY**
Policy Number:	**OP-01**
Original Policy Date:	**June 23, 1988**
Effective Date of New/Revised Policy:	**August 1, 2005**
Revision Dates:	**July 21, 2005**
Custodian: (Division)	**WATER AND WASTEWATER**
Mayor's Signature and Date	

OP-1.0 PURPOSE:

To establish a uniform policy concerning sewer service connections and sewer service lines.

OP-1.1 POLICY:

General. There have been numerous pipe configurations installed underground since the City of Fayetteville's sewer system was first designed and installed in 1889. This policy is correct and appropriate for over 99% of the situations found. It does not eliminate using sound judgment for the remaining 1% of the cases. Judgment calls shall be the responsibility of the Mayor or his designated representative, who is currently the Water/Sewer Maintenance Superintendent. Grandfather clauses do not apply in cases where public health and safety is compromised, and thus do not apply for sewer issues. Ordinance references are based on the City of Fayetteville Code of Ordinances as in effect on 1 April, 2003.

1. Connection permit required. [Section 51.035, City of Fayetteville Code of Ordinances]. *"No unauthorized person shall uncover, make any connection with or opening into, use, alter, or disturb, any public sewer or appurtenance thereof without first obtaining a written permit from the approving authority. No permit shall be issued to allow any person to tie his property to the sewer system until the connection fee prescribed by Section 51.114 as presently amended or as may be amended in the future is paid."*

2. Separate building sewer provided for every building;, exceptions. [Section 51.039, City of Fayetteville Code of Ordinances]. *"A separate building sewer shall be provided for every building except as follows:*

(A) Where multiple buildings are constructed in an apartment complex or condominium on a single lot or tract of land which cannot be subsequently subdivided and sold in parcels, the individual buildings may be connected to a collector building sewer, provided that only one person is responsible for maintenance of the building sewer.

(B) Temporary buildings, mobile homes, or similar portable structures may be connected to a building sewer installed to serve a previously constructed permanent building, provided that both the permanent and temporary buildings are located on the same lot."

The temporary status is null and void if the structure is in place for more than 365 days. At that time, a separate building sewer must be provided.

Two buildings, or two parts of one building which may have different owners (i.e., townhouses) may not be attached to one 4" or 6" private service line. This has never been legally allowed. If two buildings, or two parts of one building which may have different owners, are attached to a single private service line, this situation must be corrected by the owners and each structure must have a dedicated tap onto the main. The only exceptions are listed above. Multiple structures hooked to one sewer service line are not covered by any grandfather clause, and the situation must be corrected.

Condominiums and other structures which can have separate ownership must each have their own dedicated sewer service line which remains on the same lot/property as the building or portion of the building which it serves.

3. Service Line Crossing Adjacent Lots. Sewer service lines must run directly from the lot which they serve to the main without crossing another lot. The service may cross street right of way and/or the easement to access the main. It may not run parallel to the main, but can run at an angle between 45° to and perpendicular to the main if the main is already installed prior to the development of said land and said service line will be no more than 60' in length within the combined easement/right of way area. Ownership is not the deciding factor; lot lines or parcel lines are the issue. Thus, if one Owner owns two adjacent lots, and builds on one lot, the service for this structure and lot cannot cross the other lot. If the service line would have to be more that 60' in length within the combined easement/right of way area, then the main must be extended so the service line can connect at a 90° angle to the main.

4. Sewer Mains Accessing Every Lot. Sewer mains shall be installed so as to adjoin each lot such that all service lines meet the above requirements. Sewer main extensions are the responsibility of the owner of the lot receiving the service.

5. Sewer Easements for Private Lines. Sewer line easements for private lines to cross adjacent lots are prohibited except in very rare cases. In general, these are when a given

private residence tandem lot, containing only one structure which requires sewer service, is “landlocked” from a sewer main, all adjacent lots have legal access to a main, and the sewer line easement is collocated with an above ground access easement. Private easements shall not be used in cases where sewer main extensions are in the public best interest, such as where a sewer main shall be made accessible to other lots or where a future main may be required.

6. City and Owner Service Line Maintenance and Repair Responsibilities.

There are two general situations which cover sewer service line configurations in the City of Fayetteville. The following two paragraphs explain City and Customer responsibilities for each of these situations.

A. Situation 1, No City Cleanout is Present.

If no City cleanout is present, the Customer owns the service lateral all the way to the main. They are responsible for any and all repairs, clearing any blockages, etc., with the following caveat. If there is a blockage under the paved or concreted portion of the street (from a vertical line drawn at the back of curb to the back of curb, or from the actual edge of the asphalt if no curb is present) which cannot be cleared via rodding or washing, then the City will repair the pipe under the street. If the blockage is determined to be caused by anything which should not be placed in a sewer line (grease, paper towels, toys, croquet balls, cleanout caps, sticks, gravel, kitty litter, or any other materials which are not allowed per the sewer use ordinance) then the Customer will be billed for the work. The burden of proof of the location of the blockage rests on the Customer. The City will meet the Customer or their representative (plumber, rooter, etc.) and try to help them determine the location of the blockage. The City will not place a City owned rod, camera, tape, or other item into the Customer’s cleanout or sewer system to determine the location of a blockage- anything placed inside the pipe at this time must belong to or be working for the Customer. If the combined forces determine beyond a reasonable doubt that the blockage is under the street, then we will investigate as necessary to determine what type of repair is necessary. This is the only time we will place City tools inside the Customer’s piping system. If there used to be a City cleanout and the cleanout has been removed or damaged, then the situation is the same as when there is no City cleanout present.

If the blockage is outside the area of the paved or concreted portion of the street (from a vertical line drawn at the back of curb to the back of curb, or from the actual edge of the asphalt if no curb is present), then the City grants the property owner who owns the service line the right to perform maintenance on said service line within the easement and/or right of way. This includes work performed on both sides of the road or right of way, to include work performed under a sidewalk.

B. Situation 2, City Cleanout is Present.

A City cleanout is defined as a 4" cleanout located behind the curb or at the easement line (for back yard lines). These cleanouts are typically within 10' of the edge of the roadway or within 10' of the main, respectively. Cleanouts smaller than 4" are never City cleanouts, and are always the responsibility of the property owner.

When a City cleanout is present, the City assumes ownership and responsibility for any blockages between the City cleanout and the main, and which can be cleared by rodding from the City cleanout. If the blockage is determined to be caused by anything which should not be placed in a sewer line (paper towels, toys, croquet balls, cleanout caps, sticks, gravel, kitty litter, or any other materials which are not allowed per the sewer use ordinance) then the owner will be billed for the work. Any blockages prior to the City cleanout shall be the Customer's responsibility. This includes any work to attach to the Customer's side of the tee or wye where the cleanout riser ties to the service lateral.

7. Billing. If a bill is required, the bill will be processed through the accounts receivable process, rather than by being added to the Customer's utility bill. If the bill is not paid or payment terms negotiated within 60 days of first issuance, then the bill will be transferred to the utility bill. Job costs will be based on an actual time and materials basis. Personnel rates will include the full hourly salary costs.

8. Use of old building sewers with new buildings. [Section 51.040, City of Fayetteville Code of Ordinances]. *"Old building sewers, or portions thereof, may be used in connection with new buildings only when they are found on examination and test by the approving authority to meet all requirements of this subchapter."*

Complete remodeling is included in the definition of "new building" if the remainder of the plumbing system is being replaced and must meet current plumbing codes, or if the value of the renovation is equal or grater than 50% of the value of the structure.

The cost of this examination and test is borne by the Owner. Current Environmental Protection Agency regulatory requirements and plumbing codes require that the lines be completely water tight and capable of passing a test with pressurized air. In these cases, a new tap shall be purchased, with the note that the Owner would like to use the existing service lateral. If the latter is determined to be acceptable, then the Owner will be reimbursed the tapping fee less the actual cost of the inspection and testing. It is the owner's responsibility to identify the location of the service lateral.

9. Separation Between Water and Sewer Services. City sewer connections shall be made at least ten feet away from water connections. The sewer service shall have ten (10) feet of separation from the City portion of the water service, measured from the outside of the respective pipes.

10. Service Line Unusual Installation Requirements.

A. Exposed Ditch or Creek Crossings. To protect such service lines from the hazards of water flow, debris damage, freezing, leakage, drainage system maintenance, vandalism, and other factors, sewer service lines which are exposed or which have less than 12 inches of cover where they pass through or under a drainage ditch, creek, swale, intermittent stream, or any other feature whereby they have insufficient cover and/or are exposed shall have special protection in these areas. Sewer service lines in these circumstances shall be installed in a continuous smooth steel encasement across the entire exposed or shallow area. Water tight boots shall be installed on both ends of the steel encasement. Where the line is exposed, the encasement shall be anchored by concrete no less than two feet long along the length of the pipe and surrounding the pipe by six inches in all directions inside the bank. The concrete shall be placed against undisturbed soil in the same fashion as blocking on water lines.

B. Pump Systems. Pump systems are sometimes required in the City of Fayetteville to provide sewer service to facilities which are physically lower than the sewer main which provides them service or in other special cases. Pumps for these type systems shall be grinder or solids handling type pumps specifically designed to handle sanitary sewage, the flow volume, and to pump against the head for the specific circumstance in which the pump is installed. Pumps designed for use with septic systems and for ground water sumps shall not be used for sanitary sewer uses. If physically possible, the service lines that come from these pumps shall flow to a gravity section of service lateral prior to entering the sewer main so as to enter the main with a standard four inch gravity flow service lateral connection.

11. Tapping Procedures.

A. Making Taps. The City will make all taps on existing sewer mains, either by contract supervised by the City or by City crews.

B. The City will provide a wooden stake that is marked “sewer”. Please drive this stake in the ground at your property line where you need the service connection. If this is not done, the connection will not be made. Failure to place the stake promptly could delay your construction process.

C. Write the desired depth of the service connection on the stake in feet and inches. (Note: Due to the depth of the sewer main, conflicts with other existing utilities, and other underground circumstances, it may not be possible at all times to achieve the desired depth, in which case the Owner and/or plumber will be notified by the City personnel). It is the owner’s responsibility to determine if the depth is adequate for the service line. The City will not determine grades on either the service or the mains for purposes of determining whether a structure can tie onto a main using a gravity line.

D. It is safer to wait for the service connection to be installed by the City so that the yard line’s grade can be adjusted accordingly. This will assure that unnecessary

bends will not be needed at the point of connection. Also, the plumber will have the exact depth to work with. The builder and/or plumber are responsible for determining grades and building elevations for service. The grade on the City installed portion of the service line can be affected by a number of factors which cannot be identified prior to installation, to include location and depth of other utilities, etc.

E. The City service connection will terminate at the property line. However, the customer will be responsible for maintenance of that service line from the building to the City main.

F. If the service connection exceeds sixty (60) feet in length (as in a street right-of-way crossing) the property owner will be charged for the excess footage. Prior arrangements must be made for long service connections. All other sewer service connections will consist of one joint of pipe or approximately ten (10) feet. In no case will the line stub out beyond the easement or right-of-way line.

G. If the excavation for the tap exceeds eight (8) feet in depth, the property owner may be charged for excess time required to make the connection. Prior arrangements must be made for deep service connections.

H. Permanently marking the location of the sewer service connection for future reference shall be the responsibility of the property owner. Unless the customer's plumber is on site, the City will backfill their entire excavation, to include the end of the stubbed out pipe, immediately.

I. The stubbed out piece of service pipe (coming from the new tap on the main) will be left plugged when installed. The customer's plumber is required to connect the customer's yard line to this piece of pipe. City crews will not connect the stub out from the tap to the customer's service line.

J. If the City crews have to return to the site to make any adjustments which are necessitated because of the property owner's change of plans, the labor, materials, and equipment will be charged to the owner.

K. A new sewer connection could take as long as four to six weeks or more. All connections are made on a first-come first-served basis, and the demand can fluctuate greatly. Jobs adjacent to or on Arkansas State Highway rights of way require a permit from the Arkansas Highway and Transportation Department, which generally add an additional four weeks. Please allow enough time in your construction plans.

12. Taps Installed When Areas Are Developed. Sewer lines are generally installed when land is developed. Taps, with a section of private service line attached, are generally made for each lot at this time. The City and the lot owner rely on accurate information from the developer, his Engineer, and his contractor as to the location and grade of these taps and service lines.

A. If a tap for a lot is installed when the sewer main is installed, the building on that lot is required to use the tap installed for that lot.

B. If the service line coming off the main cannot be found by the owner or his representatives, then the owner is responsible to buy a tap from the City using the process described in this document. The Water/Sewer Superintendent will then determine if it is optimal to make a new tap or to televise to find the tap that is supposed to be present. If televising is performed and the cost of the televising is less than that of the purchased tap, then the difference between the two costs shall be reimbursed to the owner. If a tap is found by televising, the City will mark the location of the tap (at the main) for the owner. If no tap is found, the cost of the televising will not be added to the tapping fee.

C. If a tap is not in the most desirable location due to slope, building design, etc., then all expenses related to making a different connection shall be paid by the owner. This includes installation of the new tap and proper abandonment of the tap which is not used. The latter involves excavating at the point of connection to the main and removing the connection to the main. The owner shall purchase a new tap paying the normal tap fee, and will pay the actual costs of abandoning the unused connection.

D. Owners are responsible for hooking to the correct tap for that lot, as shown on the developer's as-built plans. If there is a discrepancy between the as-built drawings and the actual installation on the ground, that discrepancy must be resolved between the lot owner and the developer. If an owner inadvertently connects to a tap which is designated for an adjacent lot, then all costs of remediation for all involved lots shall be borne by the owner of the lot which connected to the incorrect tap. No additional taps shall be made until the lot which does not have a connection purchases a tap through the city Engineer's office, using the process described in this document.

13. Taps Prohibited on Transmission Mains Force Mains, and on Sewer Pump Station or Detention Basin Sites. For public health and building safety reasons, individual user or structure sewer taps shall not be made on transmission mains, defined as any sewer main 15" and larger, or any pressurized force mains. Dead end main line extensions off of transmission mains shall only be approved on a case by case basis, and may be rejected. Individual user sewer taps shall not be made on sewer pump station or detention basin sites. Taps for lots adjacent to these sites shall only be made on the collection (as opposed to transmission) mains outside these sites.

14. Control of Extraneous/Illegal Flows. It violates federal, state and local regulations to have any extraneous flows in the sewer system. These flows include but are not limited to rain water, ground water, sump pump water, water from area drains exposed to outside weather (including external stairwell drains, loading docks, etc.), defective pipe joints, defective cleanouts, cellar drains, catch basins, foundation drains, yard drains, and roof down spouts. These flows must be routed to the storm water system, and cannot be routed to the sewer system. Owners are responsible for maintaining their portion of the sewer system in such a way that these flows are prevented from entering the sewer system.

A. Cleanout caps must be properly installed and must meet current plumbing codes. Caps shall not be removed to allow extraneous flows (ponded yard water, etc.) into the sanitary sewer system.

B. If caps are removed such that they allow extraneous flows to enter the sewer system, the City shall replace the cap at the owner's expense.

C. If the cap is removed after the first time the City replaces the cap, then a riser will be installed in the cleanout so that extraneous flows cannot enter the sewer system through the cleanout. All associated work will be billed to the owner.

15. Grease Control. Grease is a significant problem in our sewer system. Many people assume that running grease down the drain is okay, as long as they use plenty of hot water. Unfortunately, the hot water cools in the pipes, and the grease coagulates further down the line. Sometimes people assume that putting grease in the line through the garbage disposal or with cleansers is acceptable. These do not prevent the grease from coagulating in the pipes. No amounts of grease, cooking oil, animal fat grease or byproducts, cooking fats or solid animal fat or meat products can be put down any part of the sewer system. These materials should be disposed of in the trash. Grease covered pans or dishes should be wiped down first with a paper towel or rag, which should then be disposed of in the trash.

16. Items Which Are Allowed To Go Down the Sewer.

A. Water from showers, bath tubs, dishwashers, laundry facilities, sinks and non-basement floor drains.

B. Body wastes from toilets.

C. Toilet paper.

D. Household chemicals that are specifically designated for use in sinks, showers, and toilets.

17. Items Which Are Not Allowed To Go Down the Sewer. The following cannot be placed in a sewer system under any circumstances. Repair costs incurred due to a blockage caused by any of these items being placed in a sewer line, either intentionally or unintentionally, will be billed to the customer who owns or resides in the building to which the sewer line provides service.

A. Grease of any type, to include cooking oil, cooking grease, cooked animal fats, etc. Grease should be handled as specified above.

B. Meat, meat by products, animal fats.

C. Paper towels.

D. Feminine Hygiene Products, including those that claim to be "flushable."

E. Any items greater than ½" in any measured dimension except body wastes and toilet tissue.

F. Chewing gum.

G. Household chemicals other than those specifically designated for use in sinks, showers, and toilets.

H. Baby wipes and other similar wipes, including those that claim to be "flushable."

I. Kitty litter.

J. Animal wastes.

K. Diapers.

L. Foreign materials such as toys, sticks, cleanout caps, gravel, etc.

M. Air conditioner condensate.

N. Uncontaminated cooling water from cooling towers. If said water is too hot to be discharged into the storm drain, the owner is responsible to hold the water until it cools enough to be discharged into the storm drain. Cooling tower water which is treated, and is thus contaminated, shall be discharged to the sanitary sewer.

O. Clean or uncontaminated natural water to include but are not limited to rain water, ground water, sump pump water, water from area drains exposed to outside weather (including external stairwell drains, loading docks, etc.), defective pipe joints, defective cleanouts, cellar drains, catch basins, foundation drains, yard drains, and roof down spouts. These flows must be routed to the storm water system, and cannot be routed to the sewer system. Owners are responsible for maintaining their portion of the sewer system in such a way that these flows are prevented from entering the sewer system.

P. Automobile or engine mechanical lubricant liquids, semi-liquid materials or solids.

Q. Wastewater having a pH less than 5.0 or more thean 12.5, or otherwise causing corrosive structural damage to the wastewater collection system, the wastewater plant or equipment.

R. Wastewater having a temperature greater than 150 degrees Fahrenheit (65° C).

S. Pollutants which create a fire or explosive hazard, to include but not limited to liquids with a closed-cup flashpoint of less than 140 degrees Fahrenheit (60° C).

T. Pollutants which result in the presence of toxic gasses, vapors, or fumes within the collection system or wastewater treatment plant which may cause the potential for acute worker health and safety problems.

U. Wastewater which imparts color which cannot be removed by the treatment process, to include but not limited to dye, wastes and vegetable tanning solutions which consequently impart color to the treatment plant's effluent.

V. Any radioactive wastes or isotopes except in compliance with applicable federal or state regulations and approved by the City.

W. Medical wastes.

18. Access to Easements. The City of Fayetteville is required by federal law to properly operate and maintain its utilities. Doing this requires periodic work on said utility system to include but not limited to clearing easements, adjusting manholes to grade, inspecting manholes and cleanouts, installing and inspecting marking signs, locating lines, testing lines with dye and smoke, televising lines, washing lines, and more. In order to do this work, City employees and contractors working for the City are required by law to access the pipe. This often requires crossing private property to get to our easement. By having

an easement on a lot, these workers are granted the legal right to cross said lot to get to the utility easement. Lots containing an easement shall have a double wide gate installed to allow vehicular access to the main.

APPENDIX B

WATER SERVICE LINE AND CONNECTION POLICY

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CITY OF FAYETTEVILLE, ARKANSAS
POLICY AND PROCEDURE

Subject:	**WATER SERVICE LINE AND CONNECTION POLICY**
Policy Number:	**OP-02**
Original Policy Date:	**June 23, 1988**
Effective Date of New/Revised Policy:	**August 1, 2005**
Revision Dates:	**July 21, 2005**
Custodian: (Division)	**WATER AND WASTEWATER**
Mayor's Signature and Date	

OP-2.0 PURPOSE:

To establish a uniform policy concerning water service lines and water service connections.

OP-2.1 POLICY

General. There have been numerous pipe configurations installed underground since the City of Fayetteville's water system was first designed and installed in 1889. This policy is correct and appropriate for over 99% of the situations found. It does not eliminate using sound judgment for the remaining 1% of the cases. Judgment calls shall be the responsibility of the Mayor or his designated representative, who is currently the Water/Sewer Maintenance Superintendent. Grandfather clauses do not apply in cases where public health and safety is compromised, and thus do not apply for water system issues.

1. Tapping Procedures.

A. Making Taps. The City will make or supervise all taps on existing water mains, either by City crews making the tap or by contract supervised by the City Engineering inspectors.

B. When the tap is purchased, the City will provide a wooden stake that is marked "water" and with the size of the connection to be made. Please drive this stake in the ground on the City side of your property line where the center of the meter box is to

be located. If this is not done, the connection will not be made. Failure to place the stake promptly could delay your construction process.

C. Double water service connections should be placed at the common property line for the two addresses being served, when applicable.

D. The meter box will be installed at the existing grade unless otherwise specified. If special instructions are necessary, please make an appointment with a Water and Sewer Division service representative and give instructions at that time. Making a special note and attaching it to the tap paperwork when the tap is purchased will reduce potential delays for special requirements. The owner is responsible for knowing the final grade, as required by the owner's work or ordinances which govern the grade for sidewalks and trails, and areas parallel to streets, drainage ways, etc.

E. Meter boxes are generally located on the City side of the property line (edge of easement and/or right of way). If you have a special situation, consult with a Water/Sewer Department service representative. Deviations are only approved on a case-by-case basis, and may not be approved. If the Water/Sewer Department feels the meter box needs to be located at a different location other than where staked, a field representative will contact the individual who purchased the tap.

F. When locating your meter box, please avoid the following: driveways, sidewalks, parking lots, enclosed areas, drainage ditches, flower beds, and low areas where water stands. Meters shall not be installed in or allowed to remain in driveways or areas where meter readers cannot easily get to the meter box to read the meter. They will not be installed in locations where the meter box will regularly be filled with ground water, nor in places where it is difficult for a meter reader to get to the meter to read it. When driveways are constructed or created with either gravel, asphalt, concrete, or any other similar material, existing water meters shall be moved out of the driveway area at the owner's expense.

G. The connection to the customer's side of the meter is done by the customer's plumber after the meter loop and box is in place. The plumber will tie the yard line to the service pipe that is stubbed out of the meter box, City crews will not make this connection. Pressure regulators shall be installed no closer than 5 feet from the water meter box.

H. Connections are made on a first come first served basis, and could take three to six weeks or more to be installed, depending on workload. In cases of connections in or adjacent to Arkansas State Highways or railroads, a permit must first be obtained which often takes up to an additional six weeks. This will greatly lengthen the tap process.

I. City water connections shall be made at least ten (10) feet away from sewer connections. The City portion of the water service shall have ten (10) feet of separation from the sewer service, measured from the outside of the respective pipes.

J. Connections shall not be made in circumstances where they will degrade the operating pressure or flow available to existing domestic or building water meters. In these cases, the owners requiring the connection shall be responsible for increasing the capacity on the City's water distribution system such that the required capacity is available.

2. Water Meter Adjustments. If City crews have to return to the site to make any adjustments on the meter box which are necessitated because of the property owner's change of plans, such as landscaping, driveway location, grade, etc., all labor, materials and equipment costs shall be charged to the owner. This also applies to meters which are installed by a developer when a development is first constructed and to preexisting meters.

3. Service Line Depth. A water service line must have at least 24" of ground cover to prevent freezing. If the grade is changed such that the service line does not have sufficient cover, the service line must be lowered so that it does have sufficient cover. The labor, materials and equipment costs will be charged to the owner.

4. Access to and Visibility of Water Meters.

A. Brush, landscaping or other items which cause the meter box to be difficult to see from the right-of-way or easement, or which causes difficulty for meter readers to get to the box, shall be removed at the owner's expense. This includes plants, decorative landscaping, retaining walls, private side walks, stairs, decks, large decorative rocks, concrete statues, and other similar items. These shall not be placed over the City's portion of the service line or within two feet of the box on the customer's side of the box, three feet of the box parallel to the edge of the right of way or easement, or at all on the City's side of the right of way or easement.

B. Meters shall be accessible without going through fences or gates except in special circumstances.

C. Meters shall be placed on the City side of any private retaining walls of any type, including those constructed immediately beside the sidewalk. The City portion of the service line shall not go under any type of private wall or other structure.

5. Owner Responsibility. The owner is responsible for the service line from the outside edge of the meter box to the home. This includes the point where the plumber hooks up to the tail piece which comes out of the meter loop, and any pressure regulator or other hardware installed on the owner's side of the meter box.

6. Irrigation Taps. The City reserves the right to refuse to make irrigation taps, if said tap has the potential to degrade the operating pressure or flow available to domestic or building water meters. In general, irrigation taps shall not be made on mains which are 3" or smaller. Irrigation meters and irrigation systems shall not be installed on double

meters servicing another residence, as this can degrade the other residence's water pressure. The City must maintain positive control over the amount of flow on marginal irrigation installations, The City shall not rely on verbal or written commitments from the owner, as owners change and companies and individuals operating and maintaining irrigation systems can not be reasonably expected to pass information regarding agreed upon flow restrictions through the life of the irrigation system. Flow tests shall not be used to change this policy, as the water line flow will gradually degrade with time and with peak usage, and the flow test represents only the best case situation.

7. Two Inch Taps. Two inch taps shall not be made on any mains 3" or smaller. If a customer requires a two inch (2") tap and if said tap has the potential to degrade the operating pressure or flow available to other domestic or business meters, then the customer, at his expense, shall be responsible to reinforce the water distribution system such that the point demand from the two inch meter shall not degrade the operating pressure or flow available to other domestic or business meters.

8. Sewer Service Required. Water services can not be installed until after the lot has legal, approved and installed access to public sewer or an a septic system approved by the Arkansas Department of Health.

9. Relocating Existing Meters. Meters are typically located on the City side of the easement or right of way. In the past, some meter boxes were placed further in the property than the easement or right of way. These meters shall be moved to the property line at such time as the City side of the meter loop needs work or needs to be replaced. The existing yard line will remain in service as long as it meets the current plumbing codes and has had no documented problems. The new meter location will conform to this policy. Meters shall be placed on the City side of any private retaining walls of any type, including those constructed immediately beside the sidewalk. The City portion of the service line shall not go under any type of private wall, sign, or other structure. Meters shall not be allowed to remain in a driveway.

10. Site Restoration. In the event maintenance work is required on a service line, meter, or meter box, the site restoration will match that done for main line repairs. The utility shall repair only the following in an easement area or within two feet of the meter box: grass, asphalt, normal (standard) concrete, irrigation systems which are damaged, mail boxes which are damaged, and/or private wiring (such as for on-premises lighting, etc.) which is damaged. The City shall not pay for relocation, repair, or damage caused to any landscaping, unusual concrete, plants, planters, playground equipment, decorative rock, rip rap, and other items placed on the easement or within two feet of the meter box. The latter items can be removed by the City, at the owner's expense, if their movement is required to make a repair.

11. Water Service Line Location.

A. Crossing Public Easements or Rights of Way. The customer's portion of a water service line shall not be installed in a public easement or right of way, except for the last two feet required to access the meter box.

B. Service Line Crossing Adjacent Lots. Water service lines must run directly from the lot which they serve to the main without crossing another lot. The service may cross street right of way and/or the easement to access the main. It may not run parallel to the main, but can run at an angle between 45° to and perpendicular to the main. Ownership is not the deciding factor; lot lines and separate property parcels are the deciding factor. Thus, if one owner owns two adjacent lots, and builds on one lot, the service for this structure and lot cannot cross the other lot.

12. Water Mains Accessing Every Lot. Water distribution mains shall be installed so as to adjoin each lot such that all service lines meet the above requirements. Installing and paying for water main extensions is the responsibility of the owner of the lot receiving the service.

13. More Than One Water Main Available. In cases where more than one water main is available to a given lot, the City reserves the right to decide which main may be used to provide service to that lot. This is required in cases where some mains are on different pressure planes, where some lines have a longer life expectancy than others, etc.

14. Water Easements for Private Lines. Water line easements for private lines to cross adjacent lots are prohibited except in very rare cases. In general, these are when a given for private residence tandem lot containing only one structure which requires water service, wherein the lot is "landlocked" from a water main, all adjacent lots have legal access to a main, and the water line easement is collocated with an above ground access easement. Private easements shall not be used in cases where water main extensions are in the public best interest, such as where a water line shall be made accessible to other lots, where a future main may be required, where a water main loop is desirable to provide better public service, or where fire protection is required.

15. Use of old building water service lines with new or renovated buildings. Old building water service lines may be used in connection with new buildings only when they are found on examination and test by the approving authority to meet all current plumbing requirements.

Complete remodeling is included in the definition of "new building" if the remainder of the plumbing system is being replaced and must meet current plumbing codes, or if the value of the renovation is equal or grater than 50% of the value of the structure.

The cost of this examination and test is borne by the Owner. In these cases, a new tap should be purchased, with a note that the Owner would like to use the existing service line. If the latter is determined to be acceptable, then the Owner will be reimbursed the

tapping fee less the actual cost of the inspection and testing. It is the owner's responsibility to identify the location of the service line.

16. Taps Prohibited on Transmission Mains and on Water Tank or Pump Station Sites. Individual user water taps shall not be made on transmission mains, defined as any water main 16" and larger. Main line extensions off of transmission mains shall only be approved on a case by case basis, and may be rejected. Individual user water taps shall not be made on water tank or pump station sites. Taps for lots adjacent to these sites shall only be made on the distribution (as opposed to transmission) mains outside these sites.

17. Water Pressure Provided.

A. The City shall provide normal operating water pressure of at least 25 pounds per square inch (psi) at the City's side of the meter loop. The City does not guarantee this water pressure at all times, as the pressure will occasionally be lowered or the mains may have to be turned off for scheduled and unscheduled maintenance. It is possible that some customers at some locations shall need a pump on their side of the meter to provide the pressure desire for their water use. These pump systems cannot have such capacity that they reduce pressure on the City's main such that degrade the operating pressure or flow available to existing customers.

B. Taps shall not be made for locations where there is not a reasonable expectation of the City being able to provide 25 psi operating pressure at the City's side of the meter under summer high flow operating conditions.

C. The water pressure at the City's side of the meter may exceed that for which domestic plumbing is designed. If the pressure at the City's side of the meter exceeds 70 psi, the owner is required to install a pressure regulator on his system on his side of the meter. The pressure regulator is the owner's property and responsibility.

18. Access to Easements. The City of Fayetteville is required by federal law to properly operate and maintain its utilities. Doing this requires periodic work on said utility system to include but not limited to clearing easements, checking valve boxes, raising, exercising and operating valves, installing and inspecting marking signs, locating lines and more. In order to do this work, City employees and contractors working for the City are required by law to access the pipe. This often requires crossing private property to get to our easement. By having an easement on a lot, these workers are granted the legal right to cross said lot to get to the utility easement. Lots containing an easement shall have a gate installed to allow vehicular access to the main.