ORDINANCE NO. 2013-06-429

AN ORDINANCE ADOPTING STANDARD WATER AND SEWER SPECIFICATIONS FOR THE CITY OF TONTITOWN'S WATER UTILITY

WHEREAS, the City Council of Tontitown, Arkansas deems it necessary to adopt certain standards for development, which are implemented for the purposes of promoting the health, safety, and general welfare of the citizens of Tontitown, Arkansas.

WHEREAS, the City Council has reviewed the standard water and sewer specifications of the Tontitown Water Utility and recommends the codification of this section.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF TONTITOWN, ARKANSAS, that there is hereby standard water and sewer specifications for the City of Tontitown Water Utility, a copy of which is attached hereto and made part of this ordinance by reference. Any prior regulations or code sections in conflict with the attached Code Section herein adopted are hereby repealed.

SECTION 1. The attached terms and standard water and sewer specifications for the City of Tontitown Water Utility is incorporated herein.

PASSED AND APPROVED THIS 4 DAY OF June, 2013.

Mayor of the City of Tontitown

ATTEST:

Recorder-Treasurer of City of Tontitown

SPONSOR:

4849-2952-2452.1

CITY OF TONTITOWN

STANDARD WATER AND SEWER SPECIFICATIONS

Adopted June 4th, 2013, Ordinance 2013-06-429

Revised April 2, 2013

CITY OF TONTITOWN, ARKANSAS
WATER AND SEWER DEPARTMENT
P.O. BOX 127
TONTITOWN, ARKANSAS 72770

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STANDARD WATER AND SEWER SPECIFICATIONS FOR THE TONTITOWN WATER AND SEWER DEPARTMENT

SECTION 1 – GENERAL INFORMATION

1.1 The intent of this publication is to simplify and expedite the process of water and sewer extensions within the jurisdiction of the City of Tontitown. This publication specifically applies, but is not limited to "Subdivision" and "Large Scale Development". All rules and regulations set forth by the Arkansas Department of Health (ADH) – Engineering Section, shall be the minimum standard of all construction and development practices to be approved by the Tontitown City Council. In such case as the standard specifications herein set forth exceeds the Arkansas Department of Heath specifications, this document as approved by the City Council of Tontitown, Arkansas shall govern.

1.2 These general and detailed specifications shall govern the handling and installation of pipe and appurtenances for the City of Tontitown. Specifications stipulate general requirements for the preparation of reports, plans, specifications, methods of construction, inspection, testing, and final approval of any proposed water and/or sanitary sewer lines, appurtenances, or other structures that are within the jurisdiction of Tontitown Water and Sewer Department. Any requested deviation from the specifications herein set forth, shall be reviewed on a case by case basis by the DEPARTMENT and approved or denied by written authorization of the MANAGER.

1.3 Special conditions may arise on projects that are not covered in these specifications or that may require special handling. In case of such special conditions, complete detail as to materials, method of construction or other procedures shall be submitted to the Tontitown Water and Sewer Department for review and approval. Standard construction details are incorporated and made a part of the specifications and shall become a part of the standard requirements for water line, sewer line and lift station construction. The standard details are included in these appendices at the back of these specifications. Where reference is made to a particular industry specification (ASTM, etc) it is hereby understood that reference is made to the latest specification revision in effect.

1.4 These specifications are intended to set forth minimum standards of quality for the construction of water and sewer facilities which are to be accepted by the City of Tontitown. These specifications do not replace the ENGINEER's specifications and contract documents; however, construction of all water and sewer facilities must meet these standards of quality as a minimum. The City of Tontitown shall not be responsible nor shall it bear any liability for CONTRACTORS means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, nor shall the City of Tontitown be responsible for any actions resulting from direction of the project by a City of Tontitown Water and Sewer Department ENGINEER/Inspector. The City of Tontitown shall not be

responsible for the acts or omissions of the CONTRACTOR, Sub-Contractor, supplier, or of any other person or organization performing or furnishing any of the work. Nothing contained in these specifications shall be construed as an endorsement or warranty by the City of Tontitown of any product, material, or workmanship. The City of Tontitown shall not be responsible nor shall it bear any liability for the durability of any material or method of construction. Material used on any project shall be warranted against defects and workmanship by responsible CONTRACTOR for one calendar year from date of acceptance. Upon completion of the project and after all defects have been corrected in accordance with the final inspection, a maintenance bond in a form acceptable to the Manager or his representative for an amount equal to 50% of the construction cost shall be submitted to the Department. The bond shall be for a period of one year and shall cover all defects in materials and workmanship. The bond shall be binding on the owner, developer, or the contractor.

SECTION 2 – DEFINITIONS AND ABBREVIATIONS

DEPARTMENT: Refers to the Tontitown Water and Sewer Department, under the jurisdiction of the Tontitown City Council, hereinafter referred to as "DEPARTMENT"; having full and complete authority to manage, operate, improve, extend and maintain the City water distribution system and sewer collection system.

MANAGER: Designated individual appointed by the Tontitown Water & Sewer Commission to serve in a managing capacity.

DEVELOPER: Industrial partnership, corporation, or other legal entity such as an improvement district, desiring to construct water and/or sanitary sewer facilities for immediate or contemplated future inclusion in the city system.

ENGINEER: Individual registered to practice Engineering in the State of Arkansas who is responsible for the preparation of reports, plans, specifications and inspection of the work herein approved.

CONTRACTOR: The person, firm or corporation with whom the developer has entered into an agreement to construct the water and/or sewer improvements.

CITY INSPECTOR: City of Tontitown Public Works Inspector responsible for inspection, and notified of proposed reconstruction or alterations and inspections involving the City of Tontitown’s water and sewer system.

RESIDENT INSPECTOR: An authorized representative of the ENGINEER responsible for the inspection of construction for compliance with approved plans, specifications and other contract documents.

NORMAL WORK SCHEDULE: The City of Tontitown’s normal work schedule is Monday through Friday 8:00 AM to 4:30 PM except Holidays.

HOLIDAYS: New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Friday following Thanksgiving Day, Christmas Eve and Christmas Day.

TERMS: "As specified" shall mean as specified by the DEPARTMENT in plans, proposals, specifications, and other written instructions.

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

The term "these specifications" shall refer to the "Design Materials and Construction Specification of Water and Sewer Facilities", latest revision, written by the DEPARTMENT. It is the responsibility of the contractor, ENGINEER, developer or owner, etc. to obtain copies and to comply with the latest revision of these specifications.

Abbreviations used throughout these specifications have meanings as follows:

ASTM	American Society for Testing and Materials
AASHTO	American Association State Highway & Transportation Officials
AHTD	Arkansas Highway Transportation Department
ADEQ	Arkansas Department Environmental Quality
ADH	Arkansas Department of Health
ANSI	American National Standards Institute
AWWA	American Water Works Association (Latest Revision)
CTS	Copper Tubing Size
CI	Gray Cast Iron
CS or CC	AWWA (Mueller Corp Stop Thread)
DI	Ductile Iron
DFT	Dry Film Thickness
FCCCHR	Foundation for Cross Connection Control & Hydraulic Research
FIP	Female Iron Pipe
HDPE	High Density Polyethylene
ID	Inside Diameter
IP	Iron Pipe
MIP	Male Iron Pipe
NFPA	National Fire Protection Association
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
PE	Polyethylene

PSI/PSIG ..... Pounds Per Square Inch (gauge)
PVC ..... Polyvinyl Chloride
SSPC ..... Steel Structures Painting Council

SECTION 3 - LAWS, REGULATIONS AND ORDINANCES

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

3.2 All Federal, State, County and City Laws, Regulations or Ordinances shall be complied with on all projects. This shall include, but not be limited to the obtaining of approval from ADH and ADEQ. Submission to, and approval by, ADH and ADEQ shall be the ENGINEER's responsibility, including payment of any applicable fees. Two sets of approved plans and specifications shall be returned to the DEPARTMENT for file and inspection during construction. An electronic copy, in PDF format, shall also be provided.

SECTION 4 - PERMITS AND LICENSES

4.1 All permits and licenses required by a Federal, State, County or City shall be obtained in strict accordance with requirements of the governing agency. When required by the licensing agency, the DEPARTMENT will assist in application for permits and licenses, but the cost of any permit, fee or bond required will be borne by the developer. Permits for all street bores within the City of Tontitown's corporate limits shall be permitted by the Tontitown Water & Sewer. All street crossings shall be bored with a steel encasement pipe using casing spacers to support the carrier pipe. This provision shall only be waived by the Department in the case of extenuating circumstances. Permits for boring of state highways will be permitted via the DEPARTMENT after obtaining permission from the AHTD. The project ENGINEER shall provide footage's, profiles, and any other documented information necessary to the DEPARTMENT for State boring permits.

SECTION 5 - PLANS AND SPECIFICATIONS

5.1 This section covers the requirements for submittal of plans and specifications to the DEPARTMENT in order to obtain approval for the construction and development of future water and sewer extensions.

5.2 The DEPARTMENT strongly suggests that the ENGINEER submit proposals to the DEPARTMENT prior to formal submittal to the PLANNING DEPARTMENT. The ENGINEER shall prepare and submit a preliminary Engineering report prior to approval of construction plans. The report shall conform to accepted Engineering criteria including the requirements of the ADH and/or the ADEQ. The size, scope, and contemplated land use of the proposed development will determine the need and content for a preliminary report. Such report shall define populations, maximum

and peak flow requirements, fire flows, minimum pressures and/or relocates etc. Design criteria computations utilized will be submitted. All plans are required to be stamped approved by the DEPARTMENT before submitting to the ADH. The DEPARTMENT has specifically requested the ADH to not approve plans unless stamped approved by the DEPARTMENT. Plan revisions made at the request of the ADH shall be submitted to the DEPARTMENT for review and approval prior to resubmittal to the ADH. Plans submitted to Building Inspection Department for the purpose of obtaining a building permit shall be identical to plans reviewed and approved by the Department and must be stamped, dated and signed by a Water Department representative.

5.3 No water or sewer main extensions may be approved for connection to the City of Tontitown's Water or Sewer System prior to approval of construction plans and specifications by the DEPARTMENT or which was not constructed in accordance with said approved plans and specifications. Construction plans and specifications shall conform to the requirements herein. The submission of construction plans for approval shall be accompanied by a statement or letter from the ENGINEER stating that materials and workmanship will be in accordance with these specifications and standard details.

5.4 All plans shall be drawn to a scale suitable for adequately showing the facilities proposed, except as stipulated herein. All plans and profiles of sewer lines shall be drawn to scale with the profile vertical scale at 1" = 5' and plan horizontal scale for water and/or sewer lines of 1" = 30' or larger. All drawings shall be on 24" X 36" sheets. All elevations shall be based on mean sea level. An overall project map shall be a minimum 24"X 36" and shall depict the entire project and show all proposed water and/or sewer lines properly labeled as to size and pipe material. All other utilities shall be shown along with the proposed road profile if applicable. A vicinity map at a scale of 1" = 2000' shall be furnished indicating the location of the project in relation to arterial streets and major highways.

5.5 Any changes from the approved construction plans and specifications shall only be authorized in writing by the MANAGER or authorized representative of the DEPARTMENT prior to the start of construction. After a proposal is accepted by the ADH and the DEPARTMENT, any deviations to accepted plans shall cause re-submittal both to the ADH and the DEPARTMENT. If construction of water or sewer main extensions are in progress at the time of plan changes, the DEPARTMENT reserves the right to halt construction until approval has been obtained.

5.6 Request for deviation or relief from any of the provisions of these specifications shall be submitted in writing to the MANAGER. The MANAGER may grant a variance if not in conflict with the spirit and intent of the specifications.

5.7 If request for deviation has been submitted, the requested party shall not proceed with any construction or installation of assemblies without the written permission of all applicable approving authorities.

5.8 As a minimum, design and layout shall meet the scale requirements referred to above in Section 5.4. In addition, the following principals shall be adhered to when submitting any utility proposal:

5.8.1 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.

5.8.2 Designated utility design sheets shall be void of contour lines or symbology that conflicts with plan review by the DEPARTMENT.

5.8.3 All bends and appropriate fittings proposed for construction shall be represented on the plans. The required pipe invert drop across all proposed sewer manholes must be 0.10 ft. Label flow line elevations in and out of manholes for all mains. Label rim elevation, and ring/cover type (i.e. traffic duty, bolt down water tight, etc.). Match pipe crown elevations where pipe diameters change. The DEPARTMENT will withhold approval of plans without these illustrations.

5.8.4 Fire Suppression System plans must be submitted to the Tontitown Fire Department, Tontitown Water & Sewer Department, Tontitown Building Inspection Division and Arkansas Department of Health for approval. If applicable, provide a profile of the fire line from the main to the riser including thrust restraint details.

5.9 PLAN APPROVAL

5.9.1 Construction plans shall be furnished to the following offices:

- Tontitown Water & Sewer Department
- Tontitown Street Committee
- Tontitown Planning Commission
- Tontitown Fire Department
- Arkansas Department of Health– Engineering Section

5.9.2 These proposals shall meet approval by all officials before construction can begin. Prior to construction, the responsible ENGINEER will be required to schedule a pre-construction meeting with the DEPARTMENT. The CONTRACTOR and/or SUB-CONTRACTOR'S must attend this meeting. A minimum of three (3) sets of plans, and specifications if separate from plans, will be required for construction approval during the pre-construction meeting. An electronic copy, in PDF format, shall also be provided.

5.10 PREPARATION OF PLANS

5.10.1 All plans, specifications and construction procedures shall conform to the standards as established by the DEPARTMENT. All plans and specifications shall be prepared

under the supervision of a professional ENGINEER registered in the State of Arkansas. The ENGINEER's seal and signature shall be affixed to the plans before DEPARTMENT approval and for submittal to the ADH.

5.11 RECORD DRAWINGS

5.11.1 Upon completion of the project, two (2) complete sets of Record drawings shall be furnished to the DEPARTMENT for record purposes by the same ENGINEER who prepared and submitted the construction plans and specifications. Change of Engineering firm shall warrant re-submittal both to the DEPARTMENT and ADH. The size and scale of the drawings shall be as outlined in paragraph 5.4. The Record drawings shall show both, in plan and elevation profile (MSL), the exact locations, dimensions, size, lengths, depths, and type of pipes, valves, and appurtenances supplied of all facilities constructed. A digital set of complete and corrected Record drawings shall be provided to the MANAGER on CD. Acceptable digital formats are: AutoCAD DWG, latest version, DXF, DGN, or shape file. A PDF version shall also be provided. All files submitted shall be on Arkansas State Plane North coordinate system.

5.11.2 All service wyes and manhole stub-outs must be shown on the "As-Built" drawings. Each service line shall be referenced with the sewer main stations in lineal feet and dimensioned to at least one lot corner. The end of each service line shall be referenced by dimensioning two permanent objects or landmarks and measured at 90-degree angles. Measurements will be recorded on “As-Built” drawings. Projects will not be approved without measured references.

5.11.3 All meter boxes with an indication of whether it is single, or split service, and all valves or air relief valves must be shown on the "As Built" drawings. Meter service locations shall be marked on the curb prior to final acceptance inspection. Valves shall be referenced by dimensioning at least two permanent objects or landmarks and measured at 90-degree angles. Measurements will be recorded on “As-Built” drawings. Projects will not be approved without measured references.

SECTION 6 - INSPECTION

6.1 This section covers the requirements of inspection for the construction of water and sewer facilities.

6.2 The Responsible ENGINEER who prepared and submitted the construction plans and specifications shall be responsible for construction layout, general direction, resident inspection and final inspection as described in more detail in the following sections. Continuous project responsibility shall be an express condition of plan approval. The ENGINEER's responsibility shall extend through final inspection approval and submittal of "As-Built" drawings for acceptance of the project by the DEPARTMENT for maintenance.

6.3 All water and sewer facilities proposed shall be constructed by a licensed utility contractor and inspected by the responsible ENGINEER as defined under definitions. Inspection shall consist of, but not be limited to, periodic visits to the construction site to observe the progress and quality of the executed work to determine if the work is proceeding in accordance with the approved plans and specifications and with the standards set forth by the DEPARTMENT. Any defects, deficiencies or irregularities in the work found by the ENGINEER or reported by the resident inspector shall be reported to the CITY INSPECTOR. Such action, as deemed appropriate, and as approved by the MANAGER, shall be taken to correct such deficiencies. All work performed, shall at all times be subject to general inspection by the MANAGER or representative. The frequency of visits and the number of hours required for the DEPARTMENT personnel shall be governed by the quality of inspection being performed by the ENGINEER and resident inspector.

6.4 If deemed necessary by the MANAGER to insure conformance with the approved plans and specifications, full time resident inspection may be required during all or part of the project and shall be performed by qualified personnel under the direct supervision of the ENGINEER. The name and resume' of the resident inspector shall be furnished to the DEPARTMENT. It shall be the responsibility of the resident inspector to safeguard the DEPARTMENT'S interest by checking the construction work for compliance with the approved plans, specifications and other standards. The responsible ENGINEER shall provide an inspector for each location within a project that would use more than one pipe laying crew (e.g. two pipe laying crews on two different sites, two inspectors, one for each site). The CITY INSPECTOR or DEPARTMENT representative and the RESIDENT INSPECTOR shall witness all test procedures. The RESIDENT INSPECTOR shall provide a documented report of results, conditions, and time to the DEPARTMENT for its use and approval. If the CONTRACTOR intends to work outside of the normal work schedule or on a holiday, the RESIDENT INSPECTOR shall be required to be on the job site at all times. **See Section 2.**

6.5 Any defects, deficiencies or irregularities shall be reported to the ENGINEER. A job diary shall be kept, outlining all aspects of construction project and shall be made available to the DEPARTMENT upon request.

SECTION 7 - CONSTRUCTION LAYOUT

7.1 The layout and staking of the construction work shall be completed by trained and qualified survey personnel under the supervision of the ENGINEER. Construction layout shall consist of staking necessary to determine alignment and elevations to properly construct the proposed facilities. The use of a laser beam type grade light is required for gravity sewer construction. All depths shall be approved by the DEPARMENT during plan review.

SECTION 8 - FINAL INSPECTION PROCEDURES

8.1 Before acceptance of new construction involving water lines or sewer main extensions, a physical sight inspection will be made by the DEPARTMENT referred to as a “Final Inspection”.

8.2 All lot corners shall be in place and witnessed by a survey marker. Said marker shall bear the number of the respective lot it represents. If lot lines do not coordinate with newly constructed utilities, it shall be the DEVELOPER’S responsibility to make the appropriate adjustments. If said situation exists at time of final inspection, approval shall be withheld until lot lines and utility locations coordinate.

8.3 Water valve boxes will be to final ground elevation or paving grade centered directly over operator nut. Water valves and valve boxes shall be positioned in a manner to allow operability at all times. A continuous locator wire shall be present and operable in all valve boxes.

8.3.1 All water valve locations shall be verified by two reference measurements previously recorded by “As-Built” drawings. Water valve boxes shall be surrounded by a ground-level 24” square or circular pre-fabricated concrete valve pad. Pad thickness shall be 4” and the concrete shall be poured with 4,000-psi concrete mix. All concrete forms shall be removed prior to inspection. Pre-fabricated circular valve pads shall be grouted around valve box top section. All auxiliary fire hydrant valve boxes and valve pads shall have an 18-24” clearance from the top of the valve box to the fire hydrant cap and not interfere with cap removal when using a standard fire hydrant wrench.

8.4 Fire hydrants shall be set at bury line at finished grade. Hydrants shall be positioned 36” plus-or-minus 4” back from curb (measured from the steamer cap nut) or as directed by the DEPARTMENT during plan review or as directed by the Construction Inspector during construction. Under no conditions will Fire hydrants be allowed in the sidewalk.

8.4.1 All public fire hydrants shall be color coded according to NFPA 291, latest revision. Fire hydrant barrels are shall be chrome yellow. Fire hydrant tops and nozzle caps shall be painted, taped or banded with a capacity-indicating color. Hydrant classifications according to rated capacity shall be painted as follows:

Class AA – Flow capacity of 1500 GPM or greater – Light Blue
Class A – Flow capacity of 1000-1499 GPM - Green
Class B – Flow capacity of 500-999 GPM - Orange
Class C – Flow capacity of less than 500 GPM - Red

Hydrants shall be painted prior to inspection unless otherwise instructed by the DEPARTMENT.

8.4.2 All fire hydrant assemblies shall have an auxiliary gate valve installed at the point of connection serving the hydrant. Hydrant lead lines in excess of twenty (20)-feet shall

have an additional auxiliary gate valve installed at the fire hydrant or as designated by the DEPARTMENT during plan review.

8.5 Fire Department Connection (FDC) for each sprinkler or standpipe system shall be located not more than 100' from the nearest fire hydrant connected to an approved public water supply. Additional fire hydrants may need to be installed as required by the Fire Chief or his designated representative. With respect to hydrants, driveways, buildings and landscaping, fire department connections shall be so located that the fire apparatus and hose connected to supply the system will not obstruct access to the buildings for other fire apparatus. The location of the fire department connections and/or fire hydrants shall be approved by the Fire Chief or his designated representative. This fire hydrant will be solely used for the FDC.

8.5.1 Locations of FDC's must be located on address side of building and shall be approved by the Fire Department's Inspection Division prior to installation.

8.5.2 All FDC's must be supplied with a 5" Storz connection. This includes any retrofits and new construction.

8.5.3 Butterfly valves are not approved for use in fire suppression systems. Only approved gate valves shall be utilized and approved.

8.5.4 All facilities that have a fire suppression system will be required to have a secondary hydrant. Where hose racks are required by NFPA standards, the authority of the Tontitown Fire Department may eliminate them as long as 2½" NST hose connections are placed at every employee door and properly labeled on the exterior of the building.

8.6 Residential Meter boxes shall be set at 3" above proposed final grade or as directed by the DEPARTMENT during plan review. All meter setters inside the box shall not touch the sides of the box and shall be located where the turn-on and turn-off valves are easily accessible and operable by meter personnel. All meter sets shall have a minimum 3' stub-out service line for each service placed in such a manner to minimize disturbing meter box in the process of plumbing connection from pigtail to the customer's service line. All damage to meter boxes shall be the responsibility of the owner or builder after final acceptance has been completed. Meter personnel reserve the right to refuse placement of meters if setters and boxes are damaged, misaligned, or if finished grades have changed. All meter box lids shall be compatible with the current style of meter the department uses.

8.7 All meter vault plans and installations shall be approved by the DEPARTMENT during plan review.

8.8 All pipe and fittings shall meet the DEPARTMENT's specifications. All ductile iron pipe shall be cement lined and tar coated, all fittings be epoxy coated. Meter by-pass material shall be rigid copper or ductile iron pipe. Valves shall meet

specifications herein. Vault depth shall not exceed five (5') feet unless approved by the DEPARTMENT.

8.9 The vault cover shall be removable to allow full access to the vault. Four (4) recessed lifting points shall be provided. An access door shall be installed in the center of the vault. The lid shall have pre-drilled holes for meter touch-read capability. Approved doors shall be similar or equal to Bilco or Halliday and shall be a minimum of 36" x 36".

8.10 Water meters shall not be installed within buildings. Prior approval to install meters within buildings shall be approved by the MANAGER. If approved, meters inside buildings shall meet the following criteria, see 8.10.1 through 8.10.4, which shall be furnished and guaranteed by owner of future development prior to approval:

8.10.1 Meters must have remote read capability via outside of building and accessible to meter personnel, (no obstructions).

8.10.2 Owner shall be responsible for lead line to meter from operator valve on city main to physical meter connection.

8.10.3 Owner will provide a letter stating the DEPARTMENT shall not be liable for any repairs on lead line.

8.10.4 Operational valves up- and downstream from meter shall have hand wheels for internal use rather than 2" operator nuts.

8.11 Sewer stub-outs installed for a domestic sewer connection shall be marked and made visible by installing a metal tee post at the precise location above said sewer line end, at a height of 3' exposed above ground and buried a minimum of 3' below ground.

SECTION 9 - GENERAL REGULATIONS FOR CONSTRUCTION PURPOSES

9.1 This section outlines minimum construction procedures and standards for the installation of water and sewer extensions.

9.2 UNDERGROUND UTILITY NOTIFICATION

9.2.1 It is the CONTRACTORS responsibility to notify "Arkansas One-Call" (1-800-482-8998) two days in advance of any excavation. Location of utility requests for surveying purposes will be charged to the requesting party. A notice of at least 48 hours should be expected before locates are performed by the DEPARTMENT.

9.3 WATER OUTAGES

9.3.1 In the event that the CONTRACTOR must have a water main out of service in order to connect to the water system, the CONTRACTOR shall contact the

DEPARTMENT to notify customers of impending loss of service at least 24 hours in advance. All shutdowns shall be coordinated and scheduled by the DEPARTMENT. Notifying customers will be accomplished by means of approved door hanger notices supplied by the DEPARTMENT, however it is the CONTRACTORS responsibility to notify the customers.

9.4 TRENCH DEWATERING

9.4.1 The CONTRACTOR shall install dewatering systems as necessary that will be required to construct the proposed utilities in a manner that will prevent groundwater contamination.

9.5 LOCATION, ALIGNMENT AND GRADE

9.5.1 The pipe, fittings, valves, fire hydrants, meter boxes, manholes, and other appurtenances shall be constructed to conform to the location, lines and grades specified or as shown on the Plans.

9.5.2 Valves and fire hydrants shall be set with operating stem and nut plumb. There shall be no sharp and sudden breaks, requiring extra fittings and no joint shall be located underneath a sub-structure without the consent of the MANAGER.

Horizontal and vertical control points will be established along or adjacent to the construction area. It shall be the responsibility of the CONTRACTOR to make necessary measurements from these control points in order to maintain the proper alignment and grade of the structures. The CONTRACTOR shall preserve all stakes and markers established by the ENGINEER.

9.6 PUBLIC TRAVEL

9.6.1 The CONTRACTOR shall plan and execute the work to assure minimal interference with normal flow of traffic and pedestrians.

9.6.2 The CONTRACTOR shall be responsible 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 shall be satisfactory with the DEPARTMENT, State, County or local authority having jurisdiction within the area of work.

9.6.3 The CONTRACTOR shall notify applicable State, County or local authority before closing or obstructing any public highway, street or road. When state highways that are within the City of Tontitown are to be blocked or obstructed, the CONTRACTOR shall obtain an approved barricade plan from the authority having jurisdiction therefore, that traffic be maintained over any construction work in a public highway, street or road, and such traffic cannot be maintained on the alignment of the original roadbed or pavement, the CONTRACTOR shall, maintain a detour around the

construction area. Such detours shall be satisfactory with the DEPARTMENT, State, County or local authority.

9.6.4 The CONTRACTOR shall provide and maintain necessary barricades, signs, lights and markers around the construction area to avoid any property damage or personal injury. The CONTRACTOR shall also provide qualified flagmen to direct traffic while working upon a highway, street or road over which traffic must pass.

9.6.5 Excavated areas within the traffic lanes of highways, streets or roads and pedestrian walkways shall be backfilled and compacted with Aggregate Base Course, Class 7 (ABC CL7) immediately following pipe installation and the area opened to traffic.

9.6.6 The CONTRACTOR shall make the same provisions as described in section 9.6.2 for the passage of vehicular and pedestrian traffic between private property and public highways, streets and roads or other provisions that are satisfactory to the DEPARTMENT and the property owners involved.

9.7 SURFACE & SUBSURFACE STRUCTURES LOCATION AND PROTECTION

9.7.1 The DEPARTMENT does not guarantee the accuracy or correctness of locations of subsurface structures. It shall be the responsibility of the CONTRACTOR to satisfy himself as to the actual location and nature of subsurface structures.

9.7.2 The CONTRACTOR shall make necessary exploratory excavations to determine the location of underground structures such as pipes, drains, conduits, and other structures. The CONTRACTOR shall be responsible for contacting the respective utility of such structures before excavating in the vicinity of these structures and shall be guided by their instructions.

9.7.3 The CONTRACTOR shall provide adequate protection and support for all surfaces and subsurface structures or other facilities encountered during the progress of the work. Whenever such structures or facilities are in the same location as the proposed pipeline or appurtenances thereto, the CONTRACTOR shall relocate or reconstruct or cause to be relocated or reconstructed, the structure or facility to the satisfaction of the DEPARTMENT and utility facility owner. Whenever requested by the DEPARTMENT or utility owner, the CONTRACTOR shall provide drawings and other plans for supporting or otherwise safeguarding surface and subsurface structures or other facilities which, in the opinion of the DEPARTMENT, or utility or facility owner, may be damaged as a result of the CONTRACTORS work.

9.7.4 The CONTRACTOR shall not stop or impede the flow in any pipe, sewer, surface or subsurface drain without making provisions for diverting the flow to the satisfaction of the DEPARTMENT.

9.7.5 If any utility facility or structure is damaged during the progress of the work, the CONTRACTOR shall immediately notify the appropriate owner. Repairs shall not be

made by the CONTRACTOR without the prior approval of the utility facility or structure owner. The CONTRACTOR shall pay utility owners for the cost of repairing, relocating or replacing any facilities damaged by the CONTRACTOR. In addition, the CONTRACTOR shall provide all assistance available to the utility involved in making repairs under emergency conditions.

9.7.6 The CONTRACTOR shall not operate a control valve or fire hydrant in the existing water distribution system without the approval of the DEPARTMENT.

9.7.7 All existing water mains, services, appurtenances and bends shall be blocked or tied in such manner so as to prevent displacement before excavating behind these appurtenances.

9.8 PROTECTION OF VEGETATION

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

9.8.2 Unless otherwise specified in these specifications or in the plans, the CONTRACTOR shall replace all sod, shrubs, bushes, trees, and flowers disturbed or removed, that are located upon improved or landscaped public and private property. The CONTRACTOR shall replant vegetation and re-landscape or cause such to be performed throughout the work area as soon as possible after the water lines and appurtenances have been installed. All vegetation damaged during or after removal shall be replaced with healthy vegetation of the same kind or type. All plants shall be replanted in the original location. The CONTRACTOR shall maintain all such replanted vegetation by the application of water, fertilizers and topsoil. The vegetation shall be cultivated to prohibit the growth of foreign vegetation until a “well developed” root system has been established and transplanted vegetation has overcome the "shock" resulting from transplanting. If any vegetation dies or becomes unhealthy, all shall be replaced by the CONTRACTOR. The contour of the ground shall be left as near the original contour as possible.

9.8.3 In undeveloped areas that have not been landscaped, it is not necessary to replace vegetation unless otherwise specified in the project specifications or in the plans. However, the CONTRACTOR shall dispose of the vegetation removed to the satisfaction of the DEPARTMENT.

9.8.4 The CONTRACTOR shall stabilize all areas where ground surface has been disturbed by water and sewer construction activities and erosion is likely to occur. The DEPARTMENT shall approve the method of stabilization.

9.9 EXCAVATION AND PREPARATION OF TRENCH

9.9.1 The AUTHORITY and "Arkansas One-Call System" shall be contacted before excavation shall begin.

9.9.2 All trench excavation side walls greater than 5' in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by OSHA. Lateral travel distance to a ladder or steps shall not be greater than 25' in trenches 4' or deeper

9.9.3 The trench shall be excavated to the alignment and grade specified and only so far in advance of the pipe laying as the DEPARTMENT shall permit. Trenches along public streets or roads shall be limited to 300 feet or less, or as permitted by the governmental authority having jurisdiction. The DEPARTMENT may reduce this limit in congested areas.

9.9.4 All trenches shall be backfilled immediately after installation of the pipeline and appurtenances. It may be necessary to backfill only a portion of the trench in order to allow adequate curing of concrete.

9.9.5 The trench width may vary and depend upon the depth and the nature of the excavated material encountered. The trench shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of non-sheeted trench shall be at least one (1') foot greater than the nominal diameter of the pipe. Ledge rock, boulders, large stones, and other rock formation shall be removed to provide a clearance of at least six (6") inches on each side of pipeline and appurtenances up to and including 24-inches in diameter.

9.9.6 The bottom of the trench shall be prepared so as to provide a uniform and continuous bearing and support for the pipe on solid undisturbed or compacted soil. The trench shall be excavated to at least the depth specified as follows beyond the specified grade when the following described conditions exist:

9.9.7 When the bottom of the trench is at sub-grade and is found to be unstable or includes ashes, cinders, refuse, vegetable, other organic material, or large pieces of inorganic material, that, in the judgment of the DEPARTMENT, should be removed, the CONTRACTOR shall remove all such material to the extent required by the DEPARTMENT.

9.9.8 When the excavation is carried below or beyond that specified or required due to conditions described in Section 9.9.7, the CONTRACTOR shall backfill the trench to the proper grade with backfill approved by the DEPARTMENT, unless permitted by the DEPARTMENT to install the lines and appurtenances at the undercut grade. The backfill shall be accomplished in accordance with that specified by the DEPARTMENT or elsewhere herein.

9.9.9 The use of trench-digging machinery will be permitted except in places where operations of same will cause damage to trees, buildings, or other existing structures above or below the ground; in which case hand methods shall be employed.

9.9.10 Blasting for excavation will be permitted only after the CONTRACTOR secures the approval of the FIRE DEPARTMENT and DEPARTMENT and only when proper precautions are taken for the protection of persons and property. The FIRE DEPARTMENT will approve the hours of blasting. Any damage caused by blasting shall be repaired by the CONTRACTOR at their expense. The method of transporting, handling, and storage of explosives and blasting procedure shall conform to Federal Regulations, local and state laws, municipal ordinances and be approved by the FIRE DEPARTMENT in advance.

9.9.11 The CONTRACTOR shall comply with all federal, state and local laws or ordinances with respect to obtaining permits, the deposit of bonds and all other provisions of such laws and ordinances.

9.9.12 Whenever necessary to prevent caving, excavation in sand, gravel, sandy soil, or other unstable material shall be adequately sheeted and braced. Where sheeting and bracing is used, the trench width may be increased accordingly. Trench sheeting shall remain in place until the pipe has been laid and jointed. Where slides or cave-ins occur, the CONTRACTOR shall, at his expense, provide proper bedding and support for the pipe to maintain line and grade.

9.9.13 All excavated material stored on the job site shall be stockpiled in a manner to avoid blocking driveways, streets or sidewalks and will not endanger workers, pedestrians or travelers. Gutters shall be kept clear or other satisfactory provisions shall be made for street drainage. If local conditions permit their re-use, all surface materials suitable for re-use in restoring the surface shall be kept separate from the general excavation material. Excess material and debris shall be removed promptly.

9.9.14 The CONTRACTOR shall remove the minimum amount of street, driveway, sidewalk, parking lot, or other pavement required to permit installation of the lines or appurtenances as approved and scheduled with the DEPARTMENT. The City of Tontitown shall require a saw cut for all pavement surfaces in straight lines before removal by the CONTRACTOR.

9.9.15 The CONTRACTOR shall maintain all temporary surfaces in good condition until permanent repairs are complete.

9.10 BORING REGULATIONS AND PROCEDURES

9.10.1 The CONTRACTOR shall inspect the location where encasement structures are to be installed and become familiarized with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work. The omission of any details in the Plans and Specifications for the satisfactory

installation of the work in its entirety, which may not appear herein, shall not relieve the CONTRACTOR of full responsibility.

9.10.2 The CONTRACTOR shall satisfy themselves of soil conditions by means they deem necessary; i.e., exploratory boring or exploratory pit excavations at tunnel ends. All such exploratory work shall be done in such a manner as to not jeopardize highway or railroad fill, and shall be satisfactorily backfilled and restored.

9.10.3 The size of structure as shown on the Plans is considered as the "minimum acceptable size". If the CONTRACTOR deems that it would be to his advantage to install a larger structure, he may do so subject to the approval of the DEPARTMENT.

9.10.4 Encasement structures shall be installed at the grades and alignment shown on the Plans. Deviation shall be permitted only on approval of the DEPARTMENT.

9.10.5 When indicated by drawings and specifications, all street, road and highway crossings for water or sewer mains installed by the jacking and boring methods shall be in accordance with AHTD standards. All street crossings shall be bored with a steel encasement pipe using casing spacers to support the carrier pipe. This provision shall only be waived by the Department in the case of extenuating circumstances. Permits for all bores shall be obtained through the DEPARTMENT. Refer to permits and licenses Section 4.

9.10.6 Excavation of approach pits and trenches within right-of-way of street, road or highway shall be of sufficient distance from paving to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6" thick for entire length and depth of trench or pit. Compact backfill to 95% of maximum density obtained at optimum moisture as determined by AASHTO T 180-57, Method A. Mechanical tampers may be used after cover of 12-18" has been obtained over top of barrel of pipe.

9.10.7 All holes bored shall be a minimum of 16 inches in diameter or within 2" of same diameter as largest outside joint diameter of pipe installed and bored to proper alignment and grade. Deviation shall be permitted only on approval of the DEPARTMENT. All pipes shall be installed immediately after a bore has been completed. In no instance shall a bore hole be left open while unattended.

9.10.8 In the event subsurface operations or any other construction operation results in failure or damage to pavement or any other City of Tontitown utility appurtenance, the CONTRACTOR shall repair or replace disturbed or broken area or utility appurtenance at no cost to the City of Tontitown.

9.10.9 Steel casing welds shall be full penetration single butt-welds in accordance with AWWA C-205 and AWS D7-0-62.

9.10.10 Casing spacers shall be used in all situations; they shall be constructed of stainless steel with clamp portion consisting of Polymer Plastic Runners. Banded wood or sand fillings are strictly prohibited. Casing and utility pipes shall be sealed with synthetic rubber end seals. **See Detail GWS01**.

9.11 WORK PERFORMED BY DEPARTMENT

9.11.1 The intent of these specifications is for the CONTRACTOR to do all installation of new water and sewer infrastructure. All water and sewer taps to the existing Water Distribution or Wastewater Collection Systems shall be made by the DEPARTMENT as outlined in Section 11.8.

9.11.2 If damage occurs to the water or wastewater collection systems during construction, the DEPARTMENT, with its labor forces, will make all repairs to these systems. The CONTRACTOR may be requested to assist in the repairs to reduce charges for damages occurred.

9.11.3 If the DEPARTMENT assists the CONTRACTOR for any reason, the CONTRACTOR shall pay for the cost of this assistance, based on the cost of labor, equipment, materials and overhead.

9.12 CONFINED SPACES

9.12.1 The CONTRACTOR'S attention is called to the requirements for entry into confined spaces as defined by the Current Edition of the Occupational Safety and Health Administration Standard for Permit Required Confined Spaces, 29 CFR 1910, and Subpart J, which is specifically incorporated herein by reference.

9.12.2 CONTRACTOR'S responsibilities for entry into any Permit Required Confined Space are:

(a) CONTRACTOR shall obtain from DEPARTMENT any available information regarding any hazards of entry operations for a Permit Required Confined Space.

(b) When both DEPARTMENT and CONTRACTOR'S personnel are to work in or near a Permit Required Confined Space, CONTRACTOR shall coordinate such work with DEPARTMENT (as required in 29 CFR 1910, Subpart J).

(c) CONTRACTOR shall inform DEPARTMENT of type of Permit Required Space Program used by his employees.

(d) CONTRACTOR shall inform DEPARTMENT of any hazards confronted or created in a Permit Required Confined Space.

(e) CONTRACTOR is responsible for having knowledge of and complying with all requirements of 29 CFR 1910, Subpart J.

9.13 PUBLIC EMPLOYEES RIGHT TO KNOW ACT

9.13.1 The CONTRACTOR'S attention is called to the requirements of the Hazard Communication Standard adopted by OSHA in 29 CFR 1910.1200 and State of Arkansas Act 556 of 1991, Ark. Code Ann. Sec 8-7-1101 et. Seq.: Public Employees Chemical Right to Know Act.

9.13.2 The CONTRACTOR shall provide to the DEPARTMENT a list of all hazardous chemicals and a copy of appropriate Material Safety Data Sheet (MSDS) brought onto its property. This information shall be supplied to the DEPARTMENT prior to any work being started.

9.13.3 The DEPARTMENT will provide the CONTRACTOR a list of hazardous chemicals at any City of Tontitown facility where work is being performed. The location and MSDS information prior to work being started will be provided. The CONTRACTOR will be responsible for disseminating the information to its employees.

9.13.4 The CONTRACTOR is reminded that other obligations are imposed upon employers by the above Standard and Act.

9.14 CLEAN-UP OF JOB SITES

9.14.1 The CONTRACTOR shall remove all materials, equipment, tools, temporary structures, barricades, trees and other vegetation that have been cut or have died as a result of the work from both public and private property along the job site. There shall be no burning on the job site unless approved, in advance, by the FIRE DEPARTMENT.

SECTION 10 GENERAL INSTALLATION INFORMATION AND PROCEDURES

10.1.1 Before installation of pipe and appurtenances, the trench bottom shall be graded so uniform support of the pipe and appurtenances are provided. Shallow depressions shall be made in the trench bottom to accommodate bell ends. It is a requirement for bell or coupling holes to be excavated where no part of the load is supported by bells, couplings, or fittings.

10.2 HANDLING PIPELINE MATERIALS

10.2.1 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 in 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 CONTRACTORS expense.

10.2.2 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.

10.2.3 Pipeline materials, especially 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.

10.2.4 Proper implements, tools and facilities shall be provided and used by the CONTRACTOR for the safe and convenient execution of work.

10.2.5 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 pipeline.

10.2.6 Cutting of the pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or pipe lining. Torch cutting is not permitted. All pipes shall be cut at an angle of 90° to the pipe centerline. Cutting at other angles to provide greater deflections at the joints shall not be permitted. Field welding or welding except by the pipe manufacturer shall not be permitted.

10.2.7 Unless otherwise approved or directed by the DEPARTMENT, all pipe shall be laid with bell ends facing the direction of laying; and for lines on an appreciable slope, bells shall face upgrade.

10.2.8 No pipe shall be laid in water, or when the trench condition or the weather is unsuitable for such work, except by permission of the DEPARTMENT.

10.3 PIPE EMBEDMENT

10.3.1 This section covers materials used for embedment of water and sewer mains. Unless otherwise specified herein or shown on the plans, embedment materials shall be restricted to Class #67 type bedding. CONTRACTORS must provide proof of material to match required specifications.

10.4 COMPACTION

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

equivalent equipment. All trench backfill (except under paved areas) shall be compacted to 90% (minimum) standard proctor density of that of the adjacent undisturbed soil. In areas where the trench crosses a street, parking lot or driveway, the material shall be compacted as specified in section 10.4.2.

10.4.2 Aggregate Base Course, Class 7 (ABC CL7) crushed stone trench backfill shall be compacted to 95% modified proctor density (ASTM D1557-78). A minimum of one compaction test per crossing is required.

10.4.3 Ditch line compaction shall follow immediately after trench backfill. Topsoil shall be placed and shaped leaving the ditch line slightly rounded above existing grade.

10.5 JOINTING PVC & DUCTILE IRON PIPE AND FITTINGS

10.5.1 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, 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.

10.5.2 The clean rubber gasket shall be inserted in the bell and a thin film of lubricant shall be applied to the inside surface of the gasket. The cleaned plain end shall initially be entered in the bell straight.

10.5.3 The plain end shall be pushed inside the gasket and bell until it strikes the end of the interior of the bell, after which the end of the pipe shall be moved sideways or as specified by the manufacturer's requirements to move it slightly away from home to allow for expansion and to provide flexibility to the completed line. The pipe may then be deflected as prescribed by the manufacturer requirements, but not more than 5 degrees for 4-inch pipe, not more than 3 degrees for 12-inch pipe. Deviations for intermediate size pipes shall be in conformance with the stated maximum deviations.

10.5.4 Pipe lubricants specified by the pipe manufacturer shall be used. No substitutes shall be made.

10.5.5 When connecting the pipe or fittings according to manufacturer's requirements, care shall be exercised to avoid damage to where the pushing device or machine part 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 and/or fittings.

10.5.6 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.

10.6 JOINTING FLANGED PIPE & FITTINGS

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

10.6.2 Gaskets between flanges shall be AWWA approved of 1/16-inch minimum thickness.

10.6.3 Care shall be taken to prevent strain of the flanges. All bolts and nuts shall be cleaned and lubricated prior to tightening. Bolts on opposite sides shall be tightened alternately to the torque listed in paragraph 10.7.4 herein.

10.7 JOINTING MECHANICAL JOINT PIPE & FITTINGS

10.7.1 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, removing all foreign materials from the bells, especially the gasket seats.

10.7.2 The ductile iron follower rings shall be placed on the plain end of the pipe or fittings, followed by the rubber gasket, which has been thoroughly cleansed and lubricated with the soapy water.

10.7.3 The plain end of the pipe shall be placed in the bell, to which connection is to be made, and shouldered in back of the bell. The rubber gasket shall be advanced into the bell and seated in the gasket seat; the follower ring shall next be brought into contact with the rubber ring, and all bolts entered and nuts started. The pipe may then be given a maximum deflection as prescribed in accordance to the manufacturer's specifications.

10.7.4 Joints shall be made tight by advancing the nuts with a wrench 180° apart until a tight joint is made. The CONTRACTOR shall provide a "torque wrench" suitable for measuring tension on bolts for at least such a time as the workmen making the joints have gotten the "feel" of the required tension. At no time should handles longer than those supplied by the wrench manufacturer be permitted. The torque range shall be as follows or as directed by the manufacturer:

5/8" bolts	45 - 60 ft. lbs.
3/4" bolts	75 - 90 ft. lbs.
1" bolts	85 -100 ft. lbs.
1 1/4" bolts	105 -120 ft. lbs.

10.7.5 The rubber gasket and joint bolts of mechanical joint retainer glands shall be installed in accordance with above. Set screws shall be tightened evenly to approximately 75-foot pounds or as directed by the manufacturer.

10.7.5 The entire follower, retainer gland and all bolts shall be encased in polyethylene material in accordance with Section 13.10.

10.8 PIPE DEFLECTION

10.8.1 During the pipe laying operation, deflections at joints shall not exceed the amounts indicated by the manufacturer's recommendations.

SECTION 11 WATER DISTRIBUTION SYSTEM GENERAL INFORMATION

11.1 No water main shall be less than 8" in diameter unless prior approval is obtained in writing from the MANAGER. Variances will be considered, on a case-by-case basis for the reduction of water main sizes within cul-de-sacs.

11.1.1 The minimum cover over water mains 8" and less shall be 4' minimum. Mains larger than 8" shall have a minimum cover of 5' or as approved by the DEPARTMENT. The minimum cover over water services shall be twenty-four (24") inches or as approved by the DEPARTMENT. Minimum cover shall be measured from the ground surface or the surface of the permanent improvement to the top of the barrel of the pipe, whichever is greater. All depths of water and sewer mains shall be approved in advance by the DEPARTMENT.

11.1.2 Each component within a project, i.e. water valves, fire hydrants, pipe, etc. shall be homogenous throughout the project and by a single manufacturer.

11.2 Water line easements will be a minimum 20' in width, or two times the maximum depth to the pipe flow line, whichever is greater, or as approved by the DEPARTMENT. Easements shall be dedicated as utility easements unless required to dedicate for the exclusive use of the water mains. Water lines must be located within the center of the easement or as directed by the DEPARTMENT.

11.3 No PVC pipe sections will be allowed in lengths less than five (5') feet unless approved by the DEPARTMENT. If approved, lengths less than 5' shall be of ductile iron pipe.

11.4 Fire hydrants shall be installed so that no distance shall be greater than four-hundred (400') feet apart or as directed by the FIRE DEPARTMENT during plan review. Placement of fire hydrants in rural areas shall be installed so that no distance shall be greater than eight-hundred (800') feet apart or as directed by the DEPARTMENT. Densely constructed or industrial sites may need to meet criteria set forth by FIRE DEPARTMENT requirements. All considerations involving the physical locations of FDC connections shall be regulated by the FIRE DEPARTMENT. New construction of buildings must have a working fire hydrant before structure construction begins. Subject to approval from the FIRE DEPARTMENT. Fire hydrants shall not be installed on dead end water lines less than 8" in diameter. Maximum length for 6" fire hydrant lead is 20', if longer use 8" pipe. All Fire Hydrants shall have 6" Ductile Iron lead pipes.

11.5 End of main blow-off locations for main extensions shall be approved by the DEPARTMENT during plan review.

11.6 The hydraulic analysis, design flows, residual pressures and static pressure of the proposed mains shall be provided as requested by the DEPARTMENT. Additional design data may be required if, in the opinion of the MANAGER, it is necessary for review prior to approval of the plans.

11.7 Valves should be located not more than 500’ intervals within residential areas and 300' intervals within commercial areas or as required by the DEPARTMENT. Valves shall be provided at each quadrant of intersecting mains so as to enable two directions of flow throughout the designed system during times of maintenance or emergencies.

11.8 All taps on existing mains shall be performed by the DEPARTMENT. Request for taps to be performed by the DEPARTMENT shall be made at least forty-eight (48) hours in advance. CONTRACTOR shall provide material for all water taps greater than 2". CONTRACTOR shall be responsible for excavation, installation of valve and tapping sleeves, and shall provide a pressure test prior to the DEPARTMENT’S execution of tap. Pressure Test at 200 psig for 15 minutes shall be witnessed and recorded by the CITY INSPECTOR or DEPARTMENT representative.

11.9 In no case shall a residential building be allowed to connect to the same water service of a private building. In no case shall residential buildings be inter-connected with the plumbing system of another privately owned property. Water and sewer service lines shall be inspected by the Tontitown Water and Sewer Department.

11.10 All water meter boxes and services shall terminate as indicated on the approved plans or as directed by the DEPARTMENT. The developer will provide 1" water service piping to each lot with a minimum single meter set and box. All service lines shall be a minimum size of 1”.

11.11 All water services shall include a meter yoke, meter box, and lid. All meter sets shall have a minimum 3' service “pig-tail” on the customer’s side of the meter connection for each water service. The “pig-tail” shall be placed in such a manner to minimize disturbing meter box in the process of plumber connection.

11.12 For information related to cross-connection control and backflow prevention rules and regulations, refer to *City Code Section 51*.

SECTION 12 WATER DISTRIBUTION SYSTEM MATERIALS

12.1 These material specifications are intended to set a standard of quality and design for all materials used in the construction of water mains and appurtenances. Materials shall be of types listed in these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless prior approval is obtained in writing from the MANAGER.

12.2 Tontitown Water and Sewer Department must approve all material prior to installation. All materials shall meet AWWA specifications.

12.3 PIPE

12.3.1 All pipe furnished shall be designed for the distribution of potable water. Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart taste or odor to water. The lubricant container shall be labeled with the manufacturers' name. The DEPARTMENT will determine type and size of pipe to be installed within the water distribution system during plan review.

12.3.2 POLYVINYL CHLORIDE (PVC) WATER PIPE (4" – 12")(14" - 48")

12.3.2.1 PVC pipe in sizes 4" – 12" shall meet the requirements of AWWA C-900 DR-14 and comply with ASTM D1784 pressure classification rated class 200 only. Pipe joints shall be integrally molded bell ends in accordance with ASTM 3034 with factory supplied elastomeric gaskets and lubricant. Pipe to bear NFS-61 seal of approval for potable water. The pipe shall be approved by the Underwriter's Laboratories (UL) for use in underground fire protection service. The pipe shall be extruded from PVC meeting the requirements of cell classification 12454-B as defined in ASTM-D-1784, PVC compounds. The pipe shall be manufactured to cast iron size (C.I.) outside dimensions. Pipe shall bear identification markings that will remain legible during normal handling, storage and installation. Marking on pipe shall include the following and shall be applied at intervals of not more than 5'.

(a) Nominal size
(b) PVC
(c) Dimension ratio (for example DR-14)
(d) AWWA pressure class (for example PVC1120 or PC200).
(e) AWWA designation numbers (AWWA C-900).
(f) Manufacturer's name or trademark and production code.
(g) Seal (mark) of the testing agency that verified the suitability of the pipe Material for potable water service. (for example NSF-61 or ULFM).

12.3.2.2 PVC pipe in sizes 14" – 48" shall meet the requirements of AWWA C-905 DR-21 and comply with ASTM D 1784 pressure classification rated class 200 only.

12.3.3 POLYVINYL CHLORIDE (PVC) WATER PIPE 2-INCH

12.3.3.1 Polyvinyl Chloride Pipe shall be made from Type 1, Grade 1 or Grade 2, Polyvinyl Chloride Plastic conforming to ASTM D1784 and CS-256.

12.3.3.2 The pipe shall conform to ASTM D2241 as it applies to Type 1, Grade 1 or Grade 2, Polyvinyl Chloride Plastic, SDR 17 or SDR 21.

12.3.3.3 The joints shall be designed so that the pipe and fittings may be connected on the job without the use of glue or adhesive and any special equipment. The pipe and fittings shall have a push-on joint consisting of a single rubber gasket designed to be assembled by the positioning of a continuous molded rubber ring gasket in a recess in the pipe and fitting socket. Thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Gasket dimensions shall be in accordance with manufacturers' standard design dimensions and tolerances and shall be of such size and shape as to provide an adequate compressive force against the plain end and socket after assembly to effect a positive seal under all combinations of joint and gasket tolerances. Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. The joint shall be designed to withstand the same pressures as required for the pipe. The joint shall be designed so as to provide for the thermal expansion or contraction experienced with a temperature change of at least 75°F.
Plain pipe connected by a coupling provided with rubber gaskets and a center stop is acceptable. The bell wall thickness at any point shall conform to the dimension ratio of the pipe except in the annular gasket space where the wall shall be at least the minimum wall thickness of the pipe.

12.3.3.4 The pipe may be furnished in manufacturers' standard lengths of 18 to 20 feet.

12.3.3.5 The pipe shall conform to the specifications of the National Sanitation Foundation Testing Laboratories, Ann Arbor, Michigan.

12.3.3.6 As a minimum, the pipe shall have the following data applied to each piece:

Nominal Size
Type of Material
SDR-21
Manufacturer
NSF (National Sanitation Foundation seal of approval)

12.3.3.7 CONTRACTOR must be able to furnish a certificate from the manufacturer of the pipe that the manufacturer is fully competent and capable of manufacturing Polyvinyl Chloride pipe and fittings of uniform texture and strength that will fully comply with these specifications and have so manufactured this class of pipe in sufficient quantities to be certain that it will meet all normal field conditions of usage. The manufacturer must have adequate equipment and quality control facilities to be sure that each extrusion of pipe is uniform in texture, dimensions and strength.

12.3.3.8 Fittings shall be push-joint or mechanical joint Ductile Iron.

12.3.4 DUCTILE IRON PIPE

12.3.4.1 Ductile Iron pipe shall conform to ANSI/AWWA A21.51-96 and shall have a cement mortar lining and seal coat conforming to ANSI/AWWA C104 A21.4-95, and all ductile iron pipe shall be wrapped in polyethylene encasement. Joints shall conform to ANSI/AWWA C111/A21.11-00 and may be mechanical joint or push-on joint unless otherwise specified.

The following classes of ductile iron pipe shall be used:
4" – 12" : Pressure Class 350
16" – 24" : Pressure Class 250
24" and larger : Pressure Class 200 or as specified by the Engineer
Ductile Iron Pipe shall be American Cast Iron, US Foundry, Griffin Pipe or as approved by the Engineer.

12.3.5 POLYETHEYLENE PIPE (PE)

12.3.5.1 All Polyethylene pipe shall conform to ANSI/AWWA C901-96 with a MINIMUM pressure class rating of 200 psi and a DR rating of 9. All service line pipes will be 1" unless otherwise specified by the DEPARTMENT. Only Drisco Polyethylene Tubing will be acceptable.

12.3.6 COPPER PIPE

12.3.6.1 Copper service pipe shall be 1" Type "K", soft tempered, seamless, for underground installation, in accordance with ASTM B88 and Federal Specifications WW-T-799.

12.3.7 ENCASEMENT PIPE

12.3.7.1 Smooth Wall Steel Encasement Pipe - Pipe shall conform to ASTM A-139, ASTM A-21.11 or AWWA C200. The metal thickness shall be as shown in the Proposal or Plans.

12.3.7.2 Casing spacer systems shall be manufactured in two pieces, made from heavy gauge T-304 stainless steel with Polymer Plastic Runners (Teflon). Spacers shall be a Cascade Casing Spacer manufactured by Cascade Waterworks Manufacturing Company, Powerseal Power Chock Model 4810 SS, Advance SS with Adjustable Runners, or equal conforming to ASTM ratings, approved by AWWA and the DEPARTMENT. Casing and utility pipes shall be sealed with synthetic rubber end seals. **See Detail GWS01**.

12.3.8 WARNING TAPE

12.3.8.1 Warning tape shall be marker tape 3 inches wide with the words "BURIED WATER LINE BELOW" printed along the tape in 1-1/4 inch minimum letter height.

12.4 FITTINGS

12.4.1 DUCTILE IRON FITTINGS

12.4.1.1 Ductile iron fittings shall be designed for a minimum pressure rating of at least 350 psi, shall be ductile iron and shall conform to AWWA/ANSI C153/A21.53, Latest Revision for "Ductile Iron Compact Fittings". Joints may be mechanical joint conforming to ANSI A21.11. All fittings shall be furnished with gaskets and mechanical joint fittings shall be furnished with bolts, nuts and iron glands. All fittings shall be ANSI/AWWA C550 AND C116 6-8 mil Nominal Thickness Fusion Bonded Epoxy Coated. Fittings shall be manufactured by U.S. Pipe "TRIM TYTE" or American Ductile Iron Pipe "FASTITE", or may be manufactured by Tyler, Union Foundry, American Cast Iron or Star Pipe Products.

12.4.1.2 Mechanical Joint Retainer Glands for Ductile Iron shall be made from ductile iron and shall be designed for a working pressure of at least 200 psig. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to standard mechanical joint fittings (AWWA C111). The minimum number and minimum size set screws shall be as follows:

Size Gland	Size Set Screw	Number of Set Screws
4"	1/2"	4
6"	5/8"	6
8"	5/8"	9
10"	5/8"	16
12"	5/8"	16
16"	5/8"	24
20"	5/8"	28
24"	5/8"	32

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Gland Retainer (Series 1400)	18"	UFR1400-D18	Ford
Gland Retainer (Series 1400)	12"	UFR1400-D12	Ford
Gland Retainer (Series 1400)	8"	UFR1400-D8	Ford
Gland Retainer (Series 1400)	6"	UFR1400-D6	Ford
Gland Retainer (Series 1400)	4"	UFR1400-D4	Ford

12.4.1.3 Mechanical Joint Retainer Glands for PVC shall be made from ductile iron and shall be designed for a working pressure of at least 200 psi. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to standard mechanical joint fittings (AWWA C111). Glands may be EBAA, Ford or Stargrip Model 3000.

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER

Gland Rtnr.C900 Circle-Lock	18”	UFR1500-C-18	Ford
Gland Rtnr.C900 Circle-Lock	16”	UFR1500-C-15	Ford
Gland Rtnr.C900 Circle-Lock	12”	UFR1500-C-12	Ford
Gland Rtnr.C900 Circle-Lock	8”	UFR1500-C-8	Ford
Gland Rtnr.C900 Circle-Lock	6”	UFR1500-C-6	Ford
Gland Rtnr.C900 Circle-Lock	4”	UFR1500-C-4	Ford

12.4.1.4 Swivel hydrant Adapters and Tees shall be designed for a working pressure of at least 250 psig and to fit standard mechanical joint fittings (AWWA C550 & C116). One end of the swivel adapter and the branch of the tee shall be provided with a gland that may be rotated 360° on the fitting. Lengths of swivel adapter shall be as specified on plans and conform to standard manufactured lengths.

12.4.2 TAPPING SLEEVES (4" TAP & LARGER)

12.4.2.1 Tapping Sleeves shall be stainless steel. They shall be designed for a working pressure of at least 200 psi. Steel sleeves shall be stainless steel or coated with high build, Thermo-Set Epoxy. A test plug shall be furnished through the body for hydrostatic pressure testing. The outlets shall conform to ANSI B16.1, Class 125 flanges designed to accept tapping valves described herein. All bolts shall be of corrosion resistant alloy. Sleeves may be designed for a water tight seal by the use of mechanical followers or by the use of a gasket placed in a recess between the sleeve body and the pipe barrel. Only sleeves with mechanical followers or full circle gaskets may be used. If the known working pressure of the pipe to be tapped is greater than 200 psi the Department may require a MUELLER H-615 Series Tapping Sleeve.

The following tapping sleeves are acceptable by the DEPARTMENT
Ford – Fast SS Series
Smith Blair – S665 Series
Powerseal – P3490 Series (MJ or SR)

12.4.3 SLEEVES OR COUPLINGS

12.4.3.1 Sleeves shall be iron with mechanical joint followers. Couplings shall be steel or iron with gasketed ends. They shall be designed for a working pressure of at least 200 psig and sized to properly fit the type and class of pipe specified. All bolts shall be of corrosion resistance alloy. Steel couplings shall be coated internally and externally with high build, high strength, Thermo-Set epoxy coating. The Thermo-Set epoxy coating shall be 8 - 10 mils D.F.T. and free of voids.

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Transition Couplings:			
Comp Coup AC/CI	16” x 12”	442-19201780-400	Smith-Blair

Comp Coup AC/CI	12” x 12”	442-14401350-400	Smith-Blair
Comp Coup AC/CI	12” x 12”	442-14201350-400	Smith-Blair
Comp Coup AC/CI	8” x 12”	442-09850945-400	Smith-Blair
Comp Coup AC/CI	6” x 12”	442-07650722-400	Smith-Blair
3501 Series			Powerseal

Straight Couplings:

Comp Coup CI/PVC	12” x 12”	442-00001350-400	Smith-Blair
Comp Coup CI/PVC	10” x 12”	442-00001160-400	Smith-Blair
Comp Coup CI/PVC	8” x 12”	442-00000945-400	Smith-Blair
Comp Coup CI/PVC	6” x 12”	442-00000722-400	Smith-Blair
Comp Coup Sch-40	4” x 7”	441-00000450-900	Smith-Blair
Comp Coup Sch-40	3” x 7”	441-00000350-900	Smith-Blair

12.4.4 TAPPING SADDLES OR SLEEVES (F.I.P. OR C.C. OUTLET)

12.4.4.1 Tapping Saddles/Sleeves shall be made from iron, bronze steel or stainless steel and designed for a working pressure of at least 200 psig. Outlets shall be ANSI B16.1, Class 125 flanged tapping outlets, or as specified. Water tight seal shall be accompanied by the use of a gasket placed in a recess between the sleeve body and pipe barrel. The use of these Strap Saddle/Sleeves is restricted to taps where the branch is at least one size smaller than the run. Coatings on steel sleeves/saddles shall be as specified in Paragraph 12.4.3.1 above.

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Service Saddle, C.I., D.I., A.C.			
Saddle	24” x 2” IP Double Strap	F202-2650xIP7	Ford Meter
Saddle	18” x 2” IP Double Strap	F202-2050xIP7	Ford Meter
Saddle	16” x 2” IP Double Strap (CI)	F202-1840xIP7	Ford Meter
Saddle	16” x 2” IP Double Strap (AC)	F202-1925xIP7	Ford Meter
Saddle	12” x 2” IP Double Strap	F202-1438xIP7	Ford Meter
Saddle	8” x 2” IP Double Strap	F202-979xIP7	Ford Meter
Saddle	6” x 2” IP Double Strap	F202-760xIP7	Ford Meter
Saddle	4” x 2” IP Double Strap	F202-526xIP7	Ford Meter
Saddle	24” x 1” CC Double Strap	F202-2650xCC4	Ford Meter
Saddle	18” x 1” CC Double Strap	F202-2050xCC4	Ford Meter
Saddle	16” x 1” CC Double Strap (CI)	F202-1840xCC4	Ford Meter
Saddle	16” x 1” CC Double Strap (AC)	F202-1925xCC4	Ford Meter
Saddle	12” x 1” CC Double Strap	F202-1438xCC4	Ford Meter
Saddle	8” x 1” CC Double Strap	F202-979xCC4	Ford Meter
Saddle	6” x 1” CC Double Strap	F202-760xCC4	Ford Meter
Saddle	4” x 1” CC Double Strap	F202-526xCC4	Ford Meter
Saddle	3” x 1” CC Double Strap	F202-425xCC4	Ford Meter

Saddle	2” x 1” CC Double Strap	F202-250xCC4	Ford Meter
Mueller MDR2 Series Double Strap with Nylon SS Bands			Mueller

12.4.5 2-INCH PVC FITTINGS

12.4.5.1 Fittings shall have joints as described in PVC Pipe Specifications and shall be designed to withstand the same pressures as required for the pipe.

12.4.5.2 The double socket (bell) coupling shall be so designed that it may be used as an adapter for adapting to steel pipe. A center stop shall be provided.

12.4.6 SERVICE FITTINGS

12.4.6.1 Service clamps or saddles and duo-stops shall be those manufactured by the following companies or equal. The screws and/or nuts shall be of corrosion resistant alloy and shall be of Hex Head configuration.

12.4.6.2 Corporation and curb stops shall conform to AWWA C800 (curb stops shall have 360° rotation of Tee Head) and shall be those manufactured by the company specified, or equal, as follows:

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Corporation Stop Straight	1”	F1000	Ford
Valve Ball	1“	B-11-444	Ford
Valve Ball	2”	B-11-777W	Ford
Ball Corps		MB25008	Mueller
Curb Stops with Lock Wings		MB25170	Mueller

12.4.6.3 PE and Copper pipe fittings shall conform to AWWA C800 and shall be those manufactured by the Mueller Company, or equal, as follows:

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Adapter, Female	¾”	C-14-33	Ford
Adapter, Female	¾” x 1”	C-14-43	Ford
Adapter, Female	1”	H-15451	Mueller
Adapter, Female	1” x ¾”	C-14-34	Ford
Adapter, Male	¾”	H-15428	Mueller
Adapter, Male	1”	H-15428	Mueller
Adapter, Male	1” x ¾”	H-15428	Mueller
Coupling St.	¾” x 1”	C-44-34	Ford
Cplg. GALV/PVC	¾” x 1”	C-45-43	Ford
Cplg. GALV/PVC	¾”	C-45-33	Ford
Cplg. GALV/PVC	1”	C-45-44	Ford
Coupling 110 Comp	¾”	H-15403	Mueller

Coupling 110 Comp	1”	H-15403	Mueller
Ell Brass 110 Comp	¾”	H-15526	Mueller
Ell Brass 110 Comp	1”	H-15526	Mueller
Tee Pack Joint	1”	T444-444	Ford
Tee 110 Comp	¾”x3/4”x1”	H-15381	Mueller
Tee 110 Comp	¾”	H-15381	Mueller
U-Branch	1”x3/4”x7-1/2”	H-15363	Mueller

*Brass Nipples, Tees, Bell Reducers, Ells, Collars, etc. will be 150# SCH-40 Red Brass Domestic Fittings with Iron Pipe Threads.

12.4.6.4 The following meter setters and meter connection fittings shall conform to AWWA C800 and be those manufactured by the following companies, or equal:

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Meter Set w/o Dual Check (For Residential Service)	5/8” x ¾” x 7”	B-2404F	Mueller
Meter Set w/Dual Check (For Irrigation Service)	5/8” x ¾” x 7”	B-2404F-2A	Mueller
Meter Set w/o Dual Check (For Residential Service)	1” x 10”	B-2404F	Mueller
Meter Set w/Dual Check (For Irrigation Service)	1” x 10”	B-2404F-2A	Mueller

*All meter sets will be installed with Mueller End Connection # H-14222 and Mueller End Connection # H-14227. A Fiber Washer Mueller # H-48234 shall be set in each End Connection of the Meter Set.

12.5 GATE VALVES

12.5.1 GATE VALVES - 4" THROUGH 10" WITH RESILIENT SEAT

12.5.1.2 Resilient seat gate valves 4" through 10" shall be designed for a working pressure of 200 psig. Valves shall conform to AWWA C515 (Thin Wall or Lightweight Ductile Spec) with non-rising stem, O-ring stem seals and 2" square operating nut. Valves shall open when the operating nut is turned to the left (counterclockwise). Valve ends shall be as specified. The resilient seat may be bonded or mechanically attached to the gate. All interior metal surfaces shall be coated with a two-part thermosetting epoxy.

12.5.1.3 Epoxy Coating shall be 8-mils D.F.T. and free of voids.

12.5.1.4 Tapping valves shall have full size flow way accepting standard size shell cutter.

12.5.1.5 Valves conforming to these specifications will be accepted from the following manufacturers: Mueller Company, Clow Corporation, and Kennedy Valve, or equal.

12.5.2 GATE VALVES, 4" AND LARGER - DOUBLE DISC

12.5.2.1 Gate Valves, 4" through 12", shall be designed for a working pressure of 200 psig. Unless otherwise specified, valves 12" in diameter and larger shall be designed for horizontal installation with totally enclosed gear cases. Gate valves larger than 12" shall be designed for working pressure of 150 psig. Valves 16" in diameter and larger shall be equipped with rollers, tracks, and scrapers and a by-pass. The by-pass shall be the size specified in Section 23 of AWWA C500, and the by-pass valve shall conform to these specifications. Valves shall conform to AWWA C500, with iron bonnet (bronze mounted), non-rising stem double-disc (parallel seat type), O-ring stem seals and 2" x 2" square operating nut. Valves shall open when the operating nut is turned to the left (counter-clockwise). Valve ends shall be mechanical joint complete with accessories or as specified. Tapping valves shall conform to above specifications except that the connections shall be ANSI B16.1, Class 125 flange on one side (inlet) and mechanical joint on the other (outlet), or as specified. All non-resilient seat gate valves shall be approved by the DEPARTMENT prior to installation.

12.5.3 GATE VALVES - 2"

12.5.3.1 Gate valves shall be furnished with double disc non-rising stem, screw ends for standard 2" thread O-ring stem seals, and a 2" x 2” operating nut. Valves shall open when operating nut is turned to the left (counterclockwise).

12.6 BUTTERFLY VALVES

12.6.1 Butterfly valves shall conform to AWWA C504, having the following features:

12.6.2 Class 150B

12.6.3 Suitable for complete buried service. Exterior of valve shall be bituminous coated.

12.6.4 Disc may be made from any of the materials as specified in AWWA C-504. However, discs made from material other than bronze or stainless steel shall be coated with epoxy material in accordance with Section 12.6.9. All other interior surfaces which are not stainless steel or bronze shall also be coated with epoxy material.

12.6.5 Valve resilient seats shall be BUNA-N bonded into a self-retaining recess in the body or a natural rubber molded to an 18-8, Type 304 stainless steel retaining ring secured to the disc by self-setting screws. If the set is attached to the disc, the mating surface to the resilient seat shall be 304 or 316 stainless steel.

12.6.6 Stainless steel shafting. "O-Ring" or split-V shaft seals. Bronze, nylon or Teflon bearings and a “Manual Operator” totally enclosed for buried service shall include the following:

- 2" x 2" operating nut
- Open counter-clockwise
- Operators of the traveling nut type shall not have u-joints on the rods.
- On operators composed of worm gears; worm gears may be either bronze or ductile iron and the worms shall be composed of hardened steel.
- The operator shall satisfy the valve operating torque requirements for Class 150B valves and the operator input requirements of AWWA C-504.

12.6.7 Valve ends shall be as specified. If flange ends are specified, they shall conform to Class 125, ANSI B16.1.

12.6.8 Epoxy Coating for Valve Disc. Before application of coating material, all surfaces of the disc shall be thoroughly cleaned to remove dirt, grease, oil and any other substances; all sharp angles, protrusions or irregularities which would interfere with proper coating coverage shall be removed; and the entire surface grit blasted to white metal in accordance with SSPC Specification SP5 resulting in an anchor pattern of at least one (1) mil. Thermo-set epoxy material shall be applied to the sand-blasted surfaces before the white metal begins to oxidize (darken in color). The thermoset epoxy shall be approved for exposure to fluids for human consumption by the Federal Food and Drug Administration. The final film thickness shall be at least 8 mils D.F.T. and free of voids. The disc shall be post-cured for a sufficient period of time to assure full polymerization. Polymerization shall be checked by a direct impact test at 60-inch-lb. with no cracking or chipping of the coating. The film thickness shall be checked using an accurate magnetic film thickness gauge. The entire coated surface shall be checked for voids using a wet sponge type holiday detector. Any area where the film thickness is found to be less than eight (8) mils or where voids were detected shall be re-coated and re-checked. Valves shall be packed for shipment in such manner that the disc coating is protected from damage.

12.6.9 Butterfly valves shall be manufactured by Pratt, Val-Matic or M&H Valve Company.

12.7 AIR RELEASE VALVES

12.7.1 Air Release Valves shall be 1” APCO, ARI, Val-Matic or equal, or as required by the DEPARTMENT

12.8 VALVE BOXES, LID AND EXTENSIONS

12.8.1 Valve boxes shall be Tyler 6850 series with 5 ¼" shafts, screw type, 5 ¼" drop lid with "WATER" on lid. Length variable 10 ¼" O.D. bottom flange, 8" I.D. Bottom, 7

3/16" O.D. top, 6 ¾" I.D. top of 2 section valve box. The use of PVC pipe as valve box material is not approved. All valve box material shall be manufactured in the USA.

12.8.2 Extension shaft shall be required on any valve that exceeds four (4') feet in depth. Valve stem extensions shall be adequate to transmit full torque required to open valve, and shall be secured to the valve operating nut. The top of the extension shaft shall be a two (2") inch square AWWA nut. Extensions shall be provided to bring the operating nut to within four (4') feet of grade and have disc attached to hold operating nut in the center of valve box and shall be firmly attached to the valve.

12.9 METER BOXES, VAULTS AND LIDS

12.9.1 Water meters 5/8" and 1" shall be installed in 18"x13" Carson Model #1520 rectangular plastic meter boxes with locking lid Carson Model 1520-t plastic lid or as approved by the DEPARTMENT.

12.9.2.1 2" meters shall be installed in 32"x19" Carson Model #1730 rectangular meter boxes or as approved by department.

12.9.4 METER VAULTS (4" and larger)

12.9.4.1 All meter vaults shall be poured in place and shall have steel lids. All meter lids shall be able to accommodate the meter DEPARTMENT'S remote reading devices meter program. Meter boxes shall be approved by the DEPARTMENT prior to installation.

12.9.4.2 All meter vault plans and installations shall be approved by the DEPARTMENT prior to the start of construction. Meter vaults shall not be subject to flooding and shall be water tight to prevent intrusion of water and dirt or provided vault drains to daylight. The walls of the vault shall extend above the finished grade a minimum of 3" to prevent intrusion of water or dirt. **See Details W14 and W15.**

12.10 FIRE HYDRANTS

12.10.1 All fire hydrants furnished shall be dry barrel hydrants in conformance with AWWA C502, latest revision, for "Dry Barrel Fire Hydrants", and shall be designed for a 150 maximum working pressure. All fire hydrants shall be equipped with a safety stem coupling and flange, which are intended to fail upon vehicle impact without damage to the stem or main valve. All Fire Hydrants shall conform to AWWA C502, the following specifications, and shall be the Traffic Model Fire Hydrant:

Maximum Working Pressure	150 psig
Size of Valve Opening	Minimum 5 - 1/4"

Diameter of Inlet Connection	6"
Type of Inlet Connection	Mechanical Joint
Number & Size of Hose Connections	2 - 2 1/2", 1 - 4 1/2"
Nozzle Arrangement	All in same place
Nozzle Thread ASA	National Standard
Nozzle Cap Chains	Each cap
Nozzle Cap Washers	Rubber
Barrel	Ductile Iron Pipe
Operating Threads	Oil or Grease Lubricated Seals
Lubrication Chamber	Oil or Grease
Seat Rings	Bronze to Bronze
Direction to Turn to Open	Left (Counter-Clockwise)
Shape & Size of Operating & Nozzle Cap Nut	5-Sided, 1 1/2" from flat to point
Operating Nut	Bronze
Hydrant Shoe	Epoxy Coated
Color above ground - barrel and dome	Chrome Yellow
Color, Nozzle Caps & Top Nut, including shield	as specified by flow capacity*

*Flow Capacity Categories and corresponding colors:
Class AA – Flow capacity of 1500 GPM or greater – Light Blue
Class A – Flow capacity of 1000-1499 GPM - Green
Class B – Flow capacity of 500-999 GPM - Orange
Class C – Flow capacity of less than 500 GPM – Red

12.10.2 Seat must be removable, using a short, lightweight wrench that will fit all depths of bury.

12.10.3 The hydrant shall have a 6" mechanical joint inlet in conformance to the dimensions shown in ANSI/AWWA C110/A21.10, latest revision. The lead pipe from the valve to the fire hydrant shall be an approved Mechanical Joint Swivel Anchor Coupling 6”x13” Tyler 084150A CL 153 or equal for direct connections, or shall be ductile iron pipe with retainer glands as specified by type throughout these specifications. A fire hydrant anchor tee will be required for new main installation as indicated by the DEPARTMENT. All Fire Hydrants shall have 6" Ductile Iron lead pipes.

12.10.4 All fire hydrants shall be equipped with a two-piece barrel having a flange at the ground line. The above approved shall be installed by the CONTRACTOR as necessary to set the hydrants to the proper elevation required.

12.10.5 All fire hydrant installations shall have auxiliary 6” gate valves, valve boxes and valve box pads meeting all provisions specified elsewhere in these specifications.

12.10.6 All concrete used for fire hydrant blocking shall be in conformance with the concrete Section 12.13 of these specifications.

12.10.7 Fire hydrants conforming to these specifications will be accepted from the following manufacturers:

Mueller Super Centurion 250, Clow Medallion, AVK Series 2780 or AVK Series 2794 (Nostalgic Style Only)

12.10.8 All Fire hydrants shall be painted, taped or banded according to Section 8.4.1 of these specifications.

12.11 POLYETHYLENE TUBING MATERIAL FOR PIPE ENCASEMENT

12.11.1 Polyethylene material for the encasement of cast iron pipe (gray or ductile) shall have a minimum thickness of 8 mil and conform to ANSI A21.5 (AWWA C105).

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

12.12 TRACER WIRE

12.12.1 All water mains and sewer force mains, including ductile iron pipe, PE water services or other appurtenances installed shall have single #14 gauge type insulated copper tracer wire, on top of pipe and fastened securely with tape every 10' feet and buried with it. This locator wire shall be installed in conjunction with the main at the same depth as the water main or service.

12.12.2 Tracer wire shall not be connected in any way to main or any other underground metal (except other tracer wires). Installation of tracer wire shall be tested at the time of acceptance inspection. Failure of tracer wire is a non-bondable item for final acceptance.

12.12.3 Wire shall be accessible at valve boxes and meter boxes and shall extend three feet above the valve or meter box, at the main or service, connect all tracer wires together so that a continuous electrical path is ensured.

12.12.4 To connect tracer wires, the wires shall be spliced using a splint bolt connector (Blackburn 9H or Kearney KS90) or equal, then covered with electrical plastic tape (Type 3M Scotch 33) so that a waterproof joint is made.

12.13 CONCRETE MATERIAL SPECIFICATIONS

12.13.1 Concrete shall have a 28-day compressive strength of at least 3,500-psi and shall contain not more than six (6) gallons of water per sack of cement, including the water in the aggregates, and not less than five and one half (5.5) sacks of cement per cubic yard of concrete. Mix should contained 5% entrained air (plus or minus

2%). A copy of all tickets from concrete company shall be presented to the DEPARTMENT.

12.13.2 Portland cement conforming to ASTM C150, Type 1, shall be used unless the DEPARTMENT approves the use of other types.

12.13.3 Water used shall be clean and free from injurious amounts of oil, acids, alkalis, salt, organic matter, or other deleterious substances.

12.13.4 Fine aggregate shall consist of clean, sound, properly graded sand conforming to ASTM Standard C33 uniformly graded from 100% passing the 3/8-inch sieve to not more than 8% passing the Number 100 sieve.

12.13.5 Coarse aggregate shall consist of crushed stone, gravel, or other inert material of similar characteristics, having clean, hard, strong, durable, uncoated particles with not more than five (5) percent by weight of soft fragments, one-fourth (1/4) percent by weight of clay lumps, and one (1) percent by weight of material removed by decantation, except that when the material removed by decantation consists essentially of crushed dirt the maximum amount permitted may be increased to one and one-half (1 1/2) percent by weight. Aggregate shall conform to ASTM Standard D289. Coarse aggregate may be either of two sizes, 1 1/2-inch and smaller or 3/4-inch and smaller, and shall be graded within the following requirements.

12.13.6 PERCENT RETAINED BY WEIGHT

Maximum size mesh screen (sq. mesh)	0 - 3
Half-Maximum size mesh screen (sq. mesh)	30 - 65
No. 4 Sieve	94 - 100

12.13.7 In no case shall the maximum size aggregate exceed one-third (1/3) of the design thickness of any part of a structure. Coarse aggregate for exposed aggregate surfaces shall be as follows:

Total Retained on 1 1/2" Sieve	- 0 %
Total Retained on 3/4" Sieve	25 - 60%
Total Retained on 3/8" Sieve	70 - 90%
Total Retained on #4 Sieve	95 - 100%

12.14 CONCRETE PROPORTIONS AND CONSISTENCY

12.14.1 The proportions of the concrete shall produce a mixture that will work readily, with the placement method most used, into the corners and angles of the forms and around reinforcement. Segregation of materials in the mixture shall not be permitted nor the collection of excess free water on the surface.

12.14.2 The slump of the concrete shall be the minimum that is practicable. When vibrators are used to consolidate the concrete, the slump shall not exceed 4-inches; otherwise, the slump shall not exceed 6-inches.

12.14.3 The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked. Measurement of materials for ready-mixed concrete shall conform to Specifications for Ready-Mixed Concrete (ASTM C94).

12.14.4 Ready-mix concrete shall be required and shall conform to ASTM Standard C94 and to applicable portions of these specifications for on-site mixing. The concrete shall be delivered and placed within 1-hour after all materials, including mixing water, shall have been placed in the mixing drum. The CONTRACTOR shall obtain from the supplier of the ready-mixed concrete, the supplier's agreement to inspection by the DEPARTMENT, to the full extent deemed necessary by the DEPARTMENT.

12.15 CONCRETE TESTING

12.15.1 As the placement of concrete progresses, the DEPARTMENT may take samples of the concrete for testing. The CONTRACTOR shall provide whatever assistance required by the DEPARTMENT in collecting and preparing samples for testing. Sampling shall be in accordance with ASTM Standard C172.

12.15.2 An independent laboratory in accordance with ASTM Standard C143 shall conduct slump tests.

12.15.3 Compression test specimen shall be prepared and cured in accordance with ASTM Standard C31. Specimens shall be tested in accordance with ASTM Standard C39.

12.15.4 All reinforcing bars shall be "Billet-Steel Concrete Reinforcement Bars" conforming to ASTM Designation A15 or "Rail-Steel Concrete Reinforcement Bars" conforming to ASTM Designation A16. Billet-Steel bars shall be intermediate grade with minimum yield point of 60,000 psi

12.15.5 All reinforcing bars shall be deformed bars. Deformation shall comply with "Minimum Requirements of the Deformation of Deformed Steel Bars for Concrete Reinforcement - ASTM Designation A305".

12.15.6 When the volume of concrete required at the work site is less than one-third (1/3) cubic yard, mixing may be accomplished by hand tool methods. The concrete shall be mixed in a clean, watertight vessel to the extent necessary to assure that the cement; aggregate and water are thoroughly integrated. The mix shall be at least one (1) part Portland cement to two (2) parts coarse aggregate, as specified in Section 12.13.5 and two (2) parts sand, as specified in Section 12.13.4. Only

that amount of water required to provide a stiff, workable mix shall be used. The strength requirements specified in Section 12.13.1 herein, apply.

SECTION 13 INSTALLATION CRITERIA FOR WATER MAINS AND APPURTENANCES

13.1 CONNECTIONS TO WATER DISTRIBUTION SYSTEM

13.1.1 All connections to or any operations of appurtenances to the existing distribution system must be accomplished in the presence of the CITY INSPECTOR or DEPARTMENT representative.

13.1.2 In cases where completing the connection will disrupt service to customers, the CONTRACTOR shall notify the DEPARTMENT at least two (2) days in advance of the work. The customers whose service will be disrupted shall be notified by the CONTRACTOR. The CONTRACTOR shall plan the work so that disruption of service is held to a minimum. The schedule shall be approved by the DEPARTMENT.

13.1.3 After connections have been completed, the valves shall be tightly closed. All valve operation shall be performed by the CITY INSPECTOR or DEPARTMENT personnel. At no time shall the CONTRACTOR operate valves or fire hydrants within the water distribution system.

13.1.4 A minimum horizontal distance of 10’ should be maintained between water lines and sewer lines or other sources of contamination. Water lines and sewers shall not be laid in the same trench except on the written approval of the Arkansas Department of Health. Water mains necessarily in close proximity to sewers must be placed so that the bottom of the water line will be at least 18” above the top of the sewer line at its highest point. If this distance must unavoidably be reduced, the water line or the sewer line must be encased in watertight pipe with sealed watertight ends extending at least 10’ either side of the crossing. Any joint in the encasement pipe may be vented to the surface if carrying water or sewer under pressure. Where a water line must unavoidably pass beneath the sewer line, at least 18” of separation must be maintained between the outside of the two pipes in addition to the preceding encasement requirement. Exceptions to this must be approved in writing by the Arkansas Department of Health.

13.2 INSTALLATION OF VALVES

13.2.1 Valves shall be joined in accordance with the methods of jointing pipe as specified elsewhere herein. Valve stems shall be plumb and there shall not be any obstructions which will prohibit the installation of valve boxes directly over the stem. For dead-end lines, concrete anchor collars shall be provided around an adjoining length of pipe for all valves. Mechanical joint retainer glands shall be installed on all valves with mechanical joint ends. All valves shall be firmly supported on well

compacted approved bedding and completely wrapped in polyethylene tubing material as specified in Section 12.10.

13.2.2 Valve boxes shall be installed over the operating nut of each valve and be of adequate length to reach the finished grade. Boxes shall be firmly supported, plumb and centered over the valve operating nut. No part of the valve box shall rest on the valve. The box cover shall be flush with the final grade. Tracer wire shall be installed through the outside of the valve box bottom section then inserted through the inside of the top section of the valve box. A minimum of 6” of tracer wire is required to be extended beyond the top of the valve box.

13.2.3 When the distance between the valve operating nut and the finished surface exceeds four (4') feet, a valve stem extension shall be provided. The stem shall be round steel bar stock or steel pipe of the dimension shown below with a 2-inch square bar steel operating nut (except 2-inch valve) attached to the upper end. The stem extension shall be of adequate length to reach from the valve operating nut to a point within 12” to 18” of the final grade. A box wrench, 2 1/8" I.D. square, made from high grade steel 3/16-inches thick shall be welded* to the lower end of the stem extension which will fit over the valve operating nut. A round center guide made from 3/16-inch or 1/4-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. A bituminous coating shall be applied to all stem extension pieces.

*Note: Welds on stem extensions (top and bottom nut) shall be 1/8" - 3/16" fillet weld around full circumference, small - large valve stem extension.

13.2.4 Valve stem extensions shall be manufactured by Clow, or equal. Drawings of approved stem extensions are available by the DEPARTMENT. Shop drawings shall be submitted to the DEPARTMENT for approval prior to installing the stem extension pieces.

13.3 INSTALLATION OF TAPPING SLEEVES & TAPPING SADDLES

13.3.1 The pipe shall be free of dirt and other debris before attaching tapping sleeve or tapping saddle. That part of the pipe barrel, which will be in contact with the gasket of tapping saddles, shall be smooth.

13.3.2 Tapping saddles or 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 Section 12.4.1.2 herein. The strap bolts for tapping saddles shall be alternately tightened "snug" and then alternately tightened to a torque as required by manufacturer’s requirements.

13.3.3 The tapping valve shall be bolted securely to the tapping sleeve or tapping saddle outlet flange. The tapping valve shall be supported by concrete cap blocks to remove weight from the valve and sleeve or saddle.

13.3.4 After installation of the tapping sleeve or saddle and the tapping valve, the assembly shall be hydrostatically tested at 200 psi for 15 minutes by introducing water through the sleeve or saddle test tap.

13.3.5 All tapping sleeves shall have poured-in-place concrete thrust blocking installed after pressure testing. **See Detail GWS02**.

13.3.6 Polyethylene material shall be placed in accordance with Section 13.10 herein.

13.4 FIRE HYDRANT INSTALLATION

13.4.1 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.

13.4.2 Hydrants shall be located a safe distance from driveways, roadways and sidewalks and in a manner to provide complete accessibility. They shall stand plumb with nozzles at proper elevation and the steamer/pumper nozzle pointed perpendicular to traffic when hydrant is adjacent to a street, roadway or parking lot drive or toward the protected building unless otherwise directed by the DEPARTMENT**. See Detail W04**.

13.4.3 The large diameter nozzle shall be at right angles to the street or fire lane, with the nozzle cap 36” plus-or-minus 4” from back of the curb, unless otherwise directed by the DEPARTMENT.

13.4.4 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 DEPARTMENT.

13.4.5 The fire hydrant shoe shall be supported firmly on the bottom and shall be well braced against unexcavated earth with formed and poured concrete blocking on the backside, or other approved material as specified by the CITY INSPECTOR. If considered necessary by the DEPARTMENT, the hydrant shall be tied to the branch pipe with suitable rods or clamps. Rods or clamps are to be furnished by the CONTRACTOR without additional compensation.

13.4.6 All mechanical joint fittings shall be properly protected by polyethylene tubing as described in Section 12.10.

13.4.7 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 (6") inches above the weep hole drain outlet and shall consist of Class #67 gravel. Under no circumstances shall the waste outlet on the hydrant or the drainage bed be connected to sewer or storm drainage.

13.4.8 Backfilling and tamping around hydrant barrels shall be continuous in operation.

13.4.9 After installation, it is required that all fire hydrants shall be covered with a cloth or water resistant sack to indicate out-of-service. These may be removed after the CITY INSPECTOR or DEPARTMENT has placed the line in service.

13.5 CONCRETE PLACEMENT & FINISHING

13.5.1 All placement of concrete must be in the presence of the DEPARTMENT or his representative. The CONTRACTOR is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the DEPARTMENT or his representative.

13.5.2 Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of materials. All concrete in walls and columns shall be poured through tremies unless otherwise permitted by the DEPARTMENT. The free fall of concrete shall be 5-feet maximum.

13.5.3 Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. The placing of concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily into the spaces between the bars. Concrete that has been contaminated by foreign material shall not be used, nor shall re-tempered concrete be used.

13.5.4 When placing is once started, it shall be carried on as a continuous operation until placement of the panel or section is complete.

13.5.5 In placing concrete, care shall be taken that the freshly placed mass is so placed and vibrated that there is no tendency for the coarse aggregate to segregate from the mortar, that no rock pockets are left, that the concrete flows readily around the steel and into the extremities of the forms, and the whole freshly-placed mass becomes a plastic jelly-like mass but without free water in appreciable quantity on its surface. No concrete shall be poured without vibration with mechanical or magnetic internal vibrators.

13.5.6 Water shall be removed from place of deposit before concrete is placed unless otherwise permitted by the DEPARTMENT. Before depositing concrete on or against concrete which has taken its initial set, the surface of the hardened concrete shall be broken off down to coarse aggregate and wire brushed to remove

any loose aggregate and foreign matter. A layer of grout of the same cement-sand ratio as the concrete without coarse aggregate shall be placed to a thickness of one (1) to two (2) inches on the brushed surface after which the new concrete shall be placed immediately.

13.5.7 Concrete placed directly on the ground shall be placed in the forms on a compacted moist sub-grade and shall be tamped and spaded until mortar covers the entire surface. Tamping and spading shall be given special attention in order to prevent voids in the concrete.

13.5.8 Concrete after placement and finishing shall be protected from damage while curing. Provisions shall be made for maintaining concrete in moist condition for a period of at least ten (24) hours after placement.

13.5.9 After removal of forms and finishing, as specified elsewhere herein, backfill shall be placed around the structure and thoroughly compacted.

13.5.10 Forms shall be constructed before placement of any concrete* unless otherwise authorized by the DEPARTMENT.

* Concrete utilized for thrust blocking to be poured against undisturbed earth.

13.5.11 Forms shall conform to shapes, lines, and dimensions of the members as specified on the Plans, or as required to conform to the original shape and dimensions in the case of replacement structures, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain position and shape. They may be constructed of any material with sufficient strength, which will provide the finished work a satisfactory surface.

13.5.12 Forms shall be removed in such a manner as to insure the complete safety of the structure. When the structure is supported on shores, the removable floor forms, beams and girder sides, and column and similar vertical forms may be removed after 96 hours, providing the concrete will not be injured. In no case shall supporting forms or shoring be removed until members have acquired sufficient strength to support their weight and imposed loads safely.

13.5.13 Forms shall be coated with diesel fuel or oil before placement of reinforcing steel or concrete. Excessive coating material shall not be allowed to form or stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.

13.6 CONCRETE REINFORCEMENT

13.6.1 At the time concrete is placed, metal reinforcement shall be free from rust scale or other coatings that will destroy or reduce the bond. All bars shall be shop bent, unless otherwise permitted by the DEPARTMENT. No bars partially embedded in

concrete shall be field bent except as shown on Plans or as specifically permitted by the DEPARTMENT. Field bonding of rail steel bars will not be permitted.

13.6.2 Metal reinforcement shall be accurately placed according to the Plans or as specified herein and adequately secured in position by concrete, metal, or other approved chairs, spacers or ties.

13.6.3 No splices of reinforcement shall be made except as shown on the Plans, or as specified, or as authorized by the DEPARTMENT. All welding shall conform to the American Welding Society's Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction (AWS D12.1), unless otherwise authorized by the DEPARTMENT. All laps and splices shall be in accordance with ACI 318, using f'_c = 3000 psi and f_y = 60,000 psi unless otherwise shown on the Plans.

13.6.4 The reinforcement shall be protected by the thickness of concrete indicated in the Plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

(a) Where concrete is deposited against the ground without the use of forms not less than 3-inches, except wire mesh reinforcement for concrete slabs which may be within 1 ½-inches of the ground.

(b) Where concrete is to be exposed to the weather or to the ground but placed in forms--not less than 2-inches for bars larger than No. 5 and 1 ½-inches for No. 5 bars or smaller.

(c) In slabs and walls not exposed to the ground or to the weather--not less than 3/4-inch.

(d) In all cases--at least equal to the diameter of the bars.

13.7 CONCRETE COLD-WEATHER REQUIREMENTS

13.7.1 Concrete shall not be placed when the ambient temperature is 40°F and falling, but can be placed if the temperature is 35°F and rising, or when the concrete is not likely to be subjected to freezing temperatures before final set has occurred. Concrete footings or slabs shall not be placed over frozen ground. The temperatures of the concrete when placed shall not be less than 45°F. Heated materials shall be free of ice, snow and frozen lumps before entering the mixer. Methods and equipment for the heating of materials shall be subject to the DEPARTMENT'S approval. Suitable means shall be provided for maintaining the concrete at a temperature of at least 45°F for not less than 96 hours after placing.

13.7.2 Any and all concrete damaged by freezing shall be removed to the satisfaction of the DEPARTMENT, and replaced, all at the expense of the CONTRACTOR.

13.8 CONCRETE HOT-WEATHER REQUIREMENTS

13.8.1 In hot weather, suitable precautions shall be taken to avoid drying of the concrete prior to finishing operations. Use of windbreaks, sunshades, fog sprays, or other devices shall be provided as directed by the DEPARTMENT.

13.8.2 Concrete deposited in hot weather shall not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperatures shall be less than 90°F unless higher temperatures are permitted by the DEPARTMENT.

13.8.3 The use of curing compounds or other additives shall be prohibited unless written approval of its use has been secured, in advance, from the DEPARTMENT.

13.9 CONCRETE THRUST BLOCKS & ANCHOR COLLARS

13.9.1 Concrete thrust blocks and anchors shall be provided along the pipeline in accordance with the construction details, plan sheets, or as directed by the DEPARTMENT. The concrete mix shall be 3,000-psi 28-day strength, minimum.

13.9.2 Concrete for thrust blocks 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.

13.9.3 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 weep hole drain outlets shall not be restricted.

13.9.4 The top of the concrete thrust block or anchor collar shall be struck off with a wood straight edge or float.

13.9.5 Admixtures are not to be used without the approval of the DEPARTMENT.

13.9.6 All placement of concrete must be in the presence of the CITY INSPECTOR or DEPARTMENT representative. The CONTRACTOR is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the CITY INSPECTOR or DEPARTMENT representative.

13.9.7 Backfill over concrete thrust blocks or anchor collars shall not be placed before the concrete has attained initial set.

13.9.8 No thrust blocks shall be less than six (6") inches thick between the pipeline or appurtenances and undisturbed soil in the direction of thrust.

13.9.9 The excavation shall be free of water before concrete is placed. Steel reinforcement, as specified on the plans, shall be placed in accordance with Section 13.6 herein.

13.9.10 The pipe or appurtenances shall be cleaned before placing concrete when the concrete is to be in direct contact with the pipe or appurtenance. Polyethylene plastic shall cover all pipes or appurtenances subject to direct contact with concrete.

13.9.11 The area of contact of the thrust blocks and anchor collars shall be sufficient to resist the thrust. This area will vary depending on the safe bearing value of the soil. Suggested safe soil bearing values are as follows:

TYPE OF SOIL	**SUGGESTED SAFE BEARING VALUES (TONS\SQ.FT.)**
Solid Rock	25
Hard Slate	6
Medium Shale	4
Soft Shale	2
Dry Clay Gravel	4
Soft Clay	1.5
Dry Sand or Loam	2.5
Wet Clay	0.75

13.9.12 The above values are approximate and will vary considerably and are intended to be used only as a reference. The CONTRACTOR is responsible for determining the soil bearing value or taking other action to assure that the bearing area is adequate to restrain the pipe or appurtenances.

13.9.13 Where the soil is unstable or in the case of recent fill areas, the following procedures shall apply either individually or in a combination:

(a) Thrust blocks shall be of adequate size to restrain pipe or appurtenances by mass alone without depending on horizontal bearing of the soil.

(b) The excavation shall extend deep enough to contact firm soil and the block brought up to the pipe or appurtenances and constructed so that the block acts as a beam and will provide restraint required. Such block shall be reinforced with steel reinforcing bars. **See Detail GWS03**.

(c) Anchor blocks shall be constructed in a firm soil and tie rods extended to the pipe or appurtenances. **See Detail GWS03**.

13.9.14 Thrust blocks for vertical bends shall be adequate to resist the thrust by mass alone when the thrust is upward.

13.9.15 Thrust blocks and anchor collars shall be adequate to restrain the pipeline and appurtenances at the specified test pressure. The following table lists the resultant thrust at certain fittings at a pressure of 100 psi In order to determine the thrust at the test pressure these values are to be multiplied by a factor equal to the test pressure divided by 100.

TABLE 13.9.16
Reaction Backing Table

Pipe Diameter	Tees Sq. Ft.	90 Bend Sq. Ft.	45 Bend Sq. Ft.	22 1/2 Bend Sq. Ft.	11 1/4 Bend Sq.Ft.
4"	1.0	1.0	1.0	1.0	1.0
6"	1.5	2.0	1.0	1.0	1.0
8"	2.5	3.5	1.8	1.0	1.0
12"	6.0	8.0	4.0	2.0	1.5
16"	10.0	14.2	7.0	4.0	3.0
18"	21.0	21.0	12.0	6.0	4.0

13.9.17 Concrete thrust blocks or anchor collars that fail to restrain the pipe or appurtenances shall be replaced by the CONTRACTOR at his expense.

13.10 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

13.10.1 Polyethylene material ANSI A21.5 (AWWA C105), shall be in tubing form or in the form of flat sheet or rolls, as specified herein, shall be placed around all mechanical joints of pipe and fittings; all valves and fire hydrants with mechanical joint ends and all saddles, sleeves, and couplings, tapping saddles and any other appurtenances with exposed bolts.

13.10.2 Pipe-shaped appurtenances - bends, reducers, offsets and other pipe-shaped appurtenances shall be covered with polyethylene in the same manner as the pipe.

13.10.3 Odd-shaped appurtenances - valves, tees, crosses and other odd-shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Tape polyethylene securely in place at valve stem and other penetrations.

13.10.4 Where specified in the Plans, ductile iron 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.

13.10.5 Polyethylene tubing, when required, shall be applied to water lines by one of the following methods:

(a) Method "A" - Cut polyethylene tube to a length approximately two (2') feet longer than the length of the pipe section. Slip the tub around the pipe centering it to provide a one (1') foot overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure in place. Then slip the end of the polyethylene form the new pipe section of the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.

(b) Method "B" - Cut polyethylene tube to a length approximately one (1') foot shorter than the length of the pipe section. Slip the tube around the pipe, centering it to provide six (6") inches of bare pipe at each end. Make polyethylene snug, but not tight; secure ends. Before making up a joint, slip a three (3') foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the three (3') foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one (1') foot; make snug and secure each end.

13.10.6 Openings in Tubing Material - Openings for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making a x-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.

13.10.7 Junctions between Wrapped and Unwrapped Pipe - Where polyethylene wrapped pipe joins a pipe, which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least two (2') feet and secure the end.

13.10.8 The polyethylene material shall be secured around the pipe and appurtenances by at least three (3) circular wraps of tape. Tape for field application shall be Polyken #900,or Scotchrap #50, or equal, at least 2-inches wide.

13.10.9 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.

13.10.10 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.

13.10.11 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.

13.10.12 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.

13.11 METER CONNECTIONS

13.11.1 All meter sets shall be provided with approved washers at both ground union connections.

13.11.2 All fittings shall be sealed using approved pipe sealant or Teflon tape.

13.12 FILLING, FLUSHING, TESTING AND DISINFECTION OF WATER LINES

13.12.1 After the water lines and appurtenances have been installed, all concrete thrust blocking has cured adequately and upon approval of the CITY INSPECTOR or DEPARTMENT, the water lines shall be filled with water. The Contractor shall complete the Tontitown Water and Sewer Department form *"Flushing, Disinfection, Discharge and Sampling of Water"* and return to the Water Department for approval and scheduling of the testing three days prior to the flushing operation.

13.12.2 In order to prevent circulation of water through the new water lines back into the distribution system, only one valve shall be opened to allow water to flow into the new water lines. This valve will be tightly closed after the filling operation has been completed.

13.12.3 The valve operated to fill the water lines shall be operated slowly and shall not be fully opened. All water valve and fire hydrant operation shall be performed by the CITY INSPECTOR or DEPARTMENT representative.

13.12.4 All air shall be expelled from the pipeline by opening fire hydrants and/or other openings installed at the pipeline crests by the CONTRACTOR. The location and number of such openings shall be as shown on the Plans or as directed by the DEPARTMENT.

13.13 HYDROSTATIC PRESSURE AND LEAKAGE TESTS

13.13.1 All water lines and appurtenances shall be tested by a hydrostatic pressure test conducted at a minimum of 1.5 times the working pressure at the point of testing and not less than 1.25 times the working pressure at the highest point along the test section. **Air pressure testing of installed pressure pipe is expressly prohibited due to the catastrophic nature of failure should failure occur.**

13.13.2 After the water lines or isolated sections of the pipeline have been filled with water, the pressure shall be increased to the test pressure by means of a pump. The leakage test shall be in accordance with AWWA M23.

13.13.3 The CONTRACTOR shall furnish a pump, and all labor for conducting the tests.

13.13.4 The duration of the hydrostatic leakage test shall be two (2) hours or as specified by the CITY INSPECTOR or DEPARTMENT representative.

13.13.5 The source of water for the pump suction shall be potable water from the DEPARTMENT'S distribution system. The vessel used must be approved by the CITY INSPECTOR or DEPARTMENT representative.

13.13.6 All interior valves including valves on fire hydrants and other appurtenances shall be open during all tests.

13.13.7 The maximum leakage per hour for ductile iron and P.V.C. shall be as calculated from the following formula (All rubber gasket or 0-ring joints):

$$L = \frac{SD\sqrt{P}}{133200}$$

L = allowable leakage, (gallons per hour)
S = length of pipe tested (feet)
D = nominal diameter of pipe, (inches)
P = average test pressure during test, (psig)

13.13.8 After the specified test pressure has been applied the entire pipeline shall be checked in the presence of the CITY INSPECTOR or DEPARTMENT representative giving particular attention to that part of the pipeline and those appurtenances that are exposed.

13.13.9 After the CONTRACTOR has taken the necessary action to repair or replace any part of the pipeline or appurtenances where leaks were apparent or if no leaks were apparent, the water lines shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.

13.13.10 If any test of pipe laid discloses leakage greater than the allowable leakage as calculated from above formula or table, the CONTRACTOR shall, at his expense, locate the leak or leaks and perform whatever work and/or replace whatever

material that is required in order to remedy the defect and stop the leak. All corrective work must be approved by the DEPARTMENT.

13.13.11 Prior to the pressure test, the ENGINEER shall present an allowable leakage report to the CITY INSPECTOR.

13.14 DISINFECTING WATER LINES AND APPURTENANCES

13.14.1 Disinfection of water lines shall be performed in accordance with AWWA C-651, latest revision.

13.14.2 The CONTRACTOR shall construct blowoffs and sample points, as shown on the Plans or as directed by the CITY INSPECTOR or DEPARTMENT. Temporary blowoffs shall be utilized as sample points. Openings for sample points shall be 1" with polyethylene riser pipe that extends well above the surface, as shown on the **See Detail W01**. The lines shall not be considered acceptable until two (2) consecutive samples taken twenty-four (24) hours apart are negative of bacteria.

13.14.3 The continuous feed method is the only acceptable method for disinfection and sterilization. The MANAGER shall approve any method other than the continuous feed method. The continuous feed method using liquid chlorine or granulated minimum of 60% available chlorine calcium hypochlorite. Liquid chlorine shall be used only when the CONTRACTOR has suitable equipment available and employees who are familiar with the physiological, chemical and physical properties and who are properly trained and equipped to handle any emergency that may arise. If, in the opinion of the CITY INSPECTOR or DEPARTMENT, the equipment is inadequate or the personnel are not qualified, this method shall not be used.

13.14.4 When the continuous feed method is to be used, the pipelines and appurtenances shall be thoroughly flushed prior to disinfecting. The flushing plan shall be approved by the CITY INSPECTOR or DEPARTMENT. The DEPARTMENT may halt or reduce flushing when required.

13.14.5 The operation of valves or fire hydrants for this method shall be performed by the CITY INSPECTOR or DEPARTMENT representative.

13.14.6 The CONTRACTOR is reminded that chlorine is a powerful oxidant and reacts readily with foreign substances. All chlorine compounds shall be handled and stored in accordance with manufacturer's recommendations. Breathing of chlorine gas can be fatal. Hypochlorite solutions should not come into contact with skin or clothing. Containers used for mixing hypochlorite solution shall be clean and dry.

13.14.7 When the continuous flow method is used, the final concentration of chlorine inside the main shall be 50 parts per million and remain at this strength for a period not less than twenty-four (24) hours. Calcium hypochlorite shall contain minimum 60% available chlorine by weight in granular form.

13.14.8 During application of any chlorine solution, care shall be taken to assure that the solution does not flow back into the distribution system.

13.14.9 The procedure for disinfecting by the continuous flow method shall be as follows:

(a) The flow through the pipeline and the solution flow shall be regulated so that the required concentration of chlorine is attained. The flow through the main shall be measured by using a pitot gauge or meter.

(b) The introduction of the solution shall be continuous until the desired concentration is attained throughout the pipeline system. The concentration shall be checked by the Drop Dilution Method.

(c) After the required concentration has been attained all internal valves shall be operated in order to assure that the solution comes in contact with all appurtenances.

(d) The solution shall remain in the pipeline system for twenty-four (24) hours after which the pipelines shall be thoroughly flushed. The chlorine concentration shall be checked before flushing. If the concentration is less than 25 parts per million, the disinfecting procedure shall be repeated if directed by the CITY INSPECTOR or DEPARTMENT representative.

13.14.10 After the lines have been disinfected, they shall be thoroughly flushed until chlorine residual measurements show that the concentration in the water leaving the main is no higher than generally prevailing in the system or is acceptable for domestic use, usually 1 part per million. The CONTRACTOR shall obtain a Pipeline Hydrostatic Testing Discharge Permit, NPDES General Permit ARG670000. The CONTRACTOR shall make application and pay the fee to secure the permit. The CONTRACTOR shall discharge all test water in accordance with the requirements of the permit.

13.14.11 If any of the samples collected are positive of bacteria, the disinfecting procedures shall be repeated as directed by the DEPARTMENT until negative samples are collected and approved by the Arkansas Department of Health.

13.14.12 The cost of water for flushing, disinfection, discharge and sampling shall be charged to the CONTRACTOR by the DEPARTMENT..

SECTION 14 WASTEWATER COLLECTION SYSTEM GENERAL INFORMATION

14.1 No gravity sewer main conveying raw sewage shall be less than eight (8”) inches in diameter unless prior approval is obtained from the DEPARTMENT and the ADH.

14.2 Where the difference in invert elevation between two pipes entering a manhole is 2' or more, and no alternative exists, a drop connection shall be utilized as shown on the standard detail sheets. Internal drop connections may be utilized if top to invert elevation is greater than 15’ with the MANAGER’S approval.

14.3 The minimum earth cover for sanitary sewer mains shall not be less than 36” from final grade.

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

14.5 Location of main extensions to service parcels of property shall be planned so as to minimize the length of building sewer, which must be maintained by the property owner. If sewer stub-outs are provided for each lot in a new development, said stub-out shall be placed on the lowest elevation corner of property.

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

14.7 All gravity sewer main extensions without regard to length shall terminate in a standard manhole. Manholes are to be spaced no greater than 400' and shall occur at all changes in direction or grade.

14.8 Sewer easements will be a minimum 20' in width, or two times the maximum depth to the pipe flow line, whichever is greater, or as approved by the DEPARTMENT. Easements shall be dedicated as utility easements unless required to dedicate for the exclusive use of the sewer lines. Sewer lines must be located within the center of the easement or as directed by the DEPARTMENT. If water lines are to be located within the same easement, then the easement shall have a minimum width of 25’ and be of an adequate width to provide for 10 feet of separation between the water line and sewer line and two times the maximum depth of the sewer line. The water and sewer lines shall be located in the easement such that all necessary conditions are met.

14.9 Sewer services shall terminate beyond the edge of easement or right-of-way extending past other proposed utilities. Services shall be located from lot lines as directed by the DEPARTMENT. Placement of service stub-outs should be located on lowest elevation lot corner. Termination of all stub-outs shall be clearly marked 36” above ground with a 6’ T-Post driven in the ground at a minimum of 36”.

14.10 All efforts shall be made to design sewer systems that are accessible for future maintenance. Manholes should be located on or near streets in order to minimize difficulty of routine maintenance and all efforts should be made to eliminate manholes in ditches or drainage areas. Prior approval to locate manholes in surface runoff areas, such as drainage ditches, shall be approved by the DEPARTMENT prior to construction. All manholes located in drainage areas shall be equipped with watertight manhole rings and covers.

14.11 Access to sewer easements shall be reviewed on a case by case basis during plan review.

14.12 Sewer service lines from buildings to sewer mains shall be placed so as not to cross driveways, walks and proposed permanent objects over them. Services larger than 6" services must connect to a manhole.

14.13 The DEPARTMENT shall perform all taps on existing mains. There shall be no tapping into manholes unless prior approval has been obtained by the DEPARTMENT. All manhole intrusions are required to undergo vacuum testing at CONTRACTOR'S cost. A forty-eight (48) hour notice is required for sewer taps.

14.14 All manholes constructed shall be cast-in-place in accordance with the methods outlined in Section 17. The use of pre-cast manholes is expressly prohibited unless approved on a case-by-case basis by the DEPARTMENT.

14.15 A plug valve or resilient seat gate valves must be installed upstream of all air release valve assemblies on sewer force mains.

SECTION 15 WASTEWATER COLLECTION SYSTEM MATERIALS

15.1 All gravity or force sanitary sewer pipe shall be polyvinyl chloride (PVC). Epoxy coated ductile iron shall be approved by the DEPARTMENT. The minimum acceptable size of all gravity sewer mains is 8" diameter, unless prior approval is obtained from the DEPARTMENT and the ADH. All pipe installed shall be of the type, size, class and thickness as indicated in these specifications and on the design plans. The design strength of pipe used shall be based on standard Engineering design principles and manufacturer or trade association recommendations. Only pipe materials listed in this section shall be used for sanitary sewer mains and service lines unless specifically authorized by MANAGER.**15.2 POLYVINYL CHLORIDE (PVC)**

15.2.1 Pipe shall meet the requirement of SDR-26 Heavy Wall Sewer Pipe and comply with ASTM-3034 and Cell Classification 12454-B. Pipe joints shall be integrally molded bell ends per ASTM D-3034 Type PSM with factory supplied elastomeric gaskets and lubricant. Pipe shall be continually marked with the following:

(a) Nominal I.D.

(b) Dimension Ratio (for example SDR-26)
(c) Notation “Heavy Wall Sewer Pipe”
(d) Cell Classification: 12454-B
(e) SDR Rating ASTM-D3034
(f) Manufacturer’s name or trademark and production code
(g) Seal (mark) of the testing agency that verified the suitability of the pipe. (such as: “PSP”)

15.2.2 The DEPARTMENT prohibits all A2000 type or any “profile pipe” use.

15.2.3 Pipe joints shall be integrally molded bell ends per ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

15.3 DUCTILE IRON PIPE

15.3.1 Installation of ductile iron pipe shall only be installed under the direction of the DEPARTMENT. Ductile Iron pipe that meets ASTM 4746, extra heavy type, inside nominal diameter as specified on plans, bell and spigot end shall be used. Jointing devices ASNI A21.11, rubber gasket joint devices.

15.3.2 All ductile iron pipe and fittings for sewer service shall be lined with a high-build, multi-component Amine-cured Novalac epoxy lining. The lining system shall be Protecto 401 Ceramic Epoxy as manufactured by Vulcan Painters, Inc. The lining applicator shall have a successful history of applying linings to the interior of ductile iron pipe.

15.4 PIPE ACCESSORIES

15.4.1 Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

15.5 FITTINGS

15.5.1 Same material as pipe molded or formed to suit pipe size and end design, in required tee bands, elbows, cleanouts, reducers, traps and configurations required and shall be heavy wall SDR-26, or as approved by the DEPARTMENT.

15.6 CLEANOUTS

15.6.1 Cleanouts are strictly prohibited as a point of entry or maintenance for use in the municipal sewer system. Clean-outs shall be installed on private plumbing only. Entry into the sewer main shall be facilitated by the use of manholes only or as directed by the DEPARTMENT.

SECTION 16 DECENTRALIZED TREATMENT FACILITIES

16.1 This section covers the method of sewage collection acceptable to the Water and Sewer Department of the City of Tontitown, Arkansas, as well as establishes specifications pertaining to the design, construction, ownership, operation and maintenance of decentralized treatment and disposal facilities within the City of Tontitown service boundary.

16.2 The regulated area shall include all areas within the City of Tontitown service boundary, except for other incorporated areas within the service boundary that have adopted their regulations pertaining to sewage collection and decentralized treatment within their incorporated areas. Where the term "within the City of Tontitown service boundary" occurs, it shall be understood that the requirements do not pertain to those other incorporated areas.

16.3 All sewage collection within the City of Tontitown service boundary shall be by conventional gravity collection in conformance with the requirements of the City of Tontitown standard specifications for the construction of water and sewer facilities. No Decentralized treatment facility shall be constructed within the City of Tontitown service boundary when the property served by the facility is within 5,280 feet of a connection point to the central sewer system.

16.4 All potential sites for subsurface disposal shall be reviewed by the Arkansas Game and Fish Commission regarding the presence of endangered or threatened species in the area, and potential environmental effects.

16.5 No decentralized treatment facility within the City of Tontitown service boundary shall be constructed without the approval of the Tontitown Water and Sewer Department.

16.6 TREATMENT

16.6.1 Decentralized treatment and disposal facilities constructed within the City of Tontitown service boundary shall be owned, operated, and maintained by Tontitown Water Utilities.

16.6.2 Tontitown Water Utilities shall assess and collect a monthly fee from the users of decentralized treatment facilities to recover the costs of operation and maintenance, and to accrue funds for replacement of facilities as necessary. A present worth analysis comparison of installing and operating a Decentralized System versus a gravity sewer or a lift station with force main, or combination of by the Owner/Developer's consultant and submitted to the Tontitown Water Utilities for review.

16.6.3 Decentralized facilities shall be capable of accepting raw sanitary sewage and treating it to discharge limits specified herein, as minimum treatment requirements, or as required by the discharge permit issued by the Arkansas

Department of Environmental Quality, whichever requires the greater degree of treatment.

16.6.4 Allowable treatment processes shall include recirculating filter and fixed film reactor.

16.6.5 Treated effluent shall be disinfected by ultraviolet disinfection prior to disposal.

16.6.6 Flow equalization shall be provided ahead of treatment units. The volume shall conform with the recommendations and requirements of the equipment manufacturer, and Tontitown Water Utilities, but in no case less than three (3) times the average daily flow plus an allowance for Infiltration/Inflow.

16.6.7 Wastewater treated in decentralized treatment facilities shall be domestic wastewater only. No wastewater from restaurants, commercial or industrial sources shall be allowed.

16.6.8 SUBMITTALS

16.6.8.1 Construction drawings and specifications shall be submitted to Tontitown Water Utilities for review and approval sealed by a registered professional engineer licensed to practice in the State of Arkansas. These documents shall be accompanied by complete and detailed design computations. Drawings and specifications shall be in sufficient detail to assure compliance with the requirements of this document.

16.6.8.2 Along with the above submittals, a letter shall be submitted from the manufacturer of the equipment, signed by a registered professional engineer licensed to practice in the State of Arkansas, certifying that the manufacturer has reviewed the design requirements and that the equipment as proposed will produce an effluent meeting the required discharge limits.

16.6.8.3 Complete shop drawings of all material and equipment items shall be submitted to the Tontitown Water Utilities for review and approval prior to shipment.

16.6.9 OTHER REQUIREMENTS

16.6.9.1 All components such as tank walls, bottoms, supports, stairs, gratings, handrails, piping, electrical and control panels, hardware and other such items shall be made of non-corrosive materials such as stainless steel, fiberglass or PVC. Thickness and weight of materials shall be sufficient to assure long term service.

16.6.9.2 All components capable of being damaged by freezing shall be protected as required to provide assurance that freezing will not occur.

16.6.9.3 The facility shall have potable water service, protected by a reduced pressure backflow preventer.

16.6.9.4 One spare pump and one spare blower shall be provided for each type utilized in the treatment and disposal process.

16.6.9.5 The facility shall be equipped with emergency standby power generation capable of operating the entire facility.

16.6.9.6 The facility shall be equipped with complete radio telemetry compatible with Tontitown's SCADA system, as approved by the DEPARTMENT.

16.6.9.7 The facility shall have paved access.

16.6.9.8 No treatment facility shall be located within the 100-year floodplain boundary.

16.6.10 All equipment and materials shall have a 5-year warranty provided by the manufacturer for materials and workmanship. The warranty shall provide replacement in the event of failure to perform.

16.6.11 A sampling port shall be provided to allow sampling of the effluent below the UV disinfection.

16.7 EFFLUENT DISPOSAL

16.7.1 Effluent from decentralized treatment facilities shall be disposed of by means of a drip dispersal system(s). The system design and construction shall comply with the latest requirements of the Arkansas Department of Health. Where conflicts occur between these specifications and ADH requirements, the more stringent requirements shall govern.

16.7.2 Decentralized treatment facilities shall produce an effluent having the following discharge limits:

BOD5 – 20 mg/L
TSS – 20 mg/L
Fecal Coliform – less than 100 colonies / 100 mL

If effluent limits required by the Arkansas Department of Environmental Quality are more stringent than the above limits, the more stringent limits shall govern.

16.7.3 REQUIRED SUBMITTALS

16.7.3.1 Construction drawings and specifications shall be submitted to Tontitown Water Utilities for review and approval sealed by a registered professional engineer licensed to practice in the State of Arkansas. These documents shall be

accompanied by complete and detailed design computations. Drawings and specifications shall be in sufficient detail to assure compliance with the requirements of this document.

16.7.3.2 Along with the above submittals, a letter shall be submitted from the manufacturer of the equipment, signed by a registered professional engineer licensed to practice in the State of Arkansas, certifying that the manufacturer has reviewed the design requirements and that the equipment and materials as proposed are satisfactory for the intended application working conditions.

16.7.3.3 Complete shop drawings of all material and equipment items shall be submitted to the Tontitown Water Utilities for review and approval prior to shipment.

16.7.3.4 A complete report, prepared and signed by a registered soil classifier, detailing the methodology used to determine the application rate, shall be submitted.

16.7.4 SITE CONSIDERATIONS

16.7.4.1 No drip dispersal systems shall be constructed in areas known to be direct recharge areas of known endangered species.

16.7.4.2 No drip dispersal system shall be located within the 100-year flood plain boundary.

16.7.4.3 Diversion ditches shall be constructed outside of the drip dispersal field to channel surface runoff from adjacent areas around the dispersal field. Diversion ditches shall have side slopes of at least 3:1, and longitudinal slopes of at least 1 percent.

16.7.4.4 The minimum vertical separation between the ground surface and any rock substrata (consolidated or fractured) shall be four (4) feet.

16.7.4.5 The buffer area around the dispersal field shall be at least ten (10) feet wide.

16.7.4.6 The dispersal field shall have limited access. Fencing around the perimeter shall be provided, and permanent signs shall be posted at one hundred (100) foot intervals stating that the site is a “Sewage Disposal Area.”

SECTION 17 SEWER MANHOLE INFORMATION AND MATERIALS

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

17.2 CONCRETE CURING AND COMPOUNDS

17.2.1 Concrete used in the construction of manholes shall conform to the requirements in Section 12. Curing compounds or covers must be approved by the DEPARTMENT. It is the responsibility of the CONTRACTOR to protect the concrete to prevent cracking during the curing process and to protect the manhole during freezing temperatures. The ENGINEER or DEPARTMENT shall, at their discretion, prohibit pouring concrete during periods of extreme cold or inclement weather.

17.2.2 **Concrete for use in the construction of manholes, wet wells, and any other structure subject to direct exposure to wastewater shall be 4,000-psi and shall contain an antimicrobial additive as manufactured by Con-Shield or equal product.** The amount to be used shall be as recommended by the manufacturer of the antibacterial additive. This amount shall be included in the total water content of the concrete mix design. The ready-mix supplier shall submit a letter of certification to the project owner stating that the correct amount and correct mixing procedure were followed for all antimicrobial concrete.

17.3 CAST-IN-PLACE-MANHOLES

17.3.1 Cast-in-place manholes shall be constructed of 4000 psi concrete with the concrete base a minimum thickness of 8" below the invert and shall be poured on undisturbed earth. The base shall extend a minimum of 24” in all directions from the exterior of the manhole barrel. **See Detail SS01**.

17.3.2 Concrete shall be deposited evenly distributed in a continuous pour in maximum layers of 18", with each layer vibrated to bond it to the preceding layer.

17.4 DROP TYPE MANHOLES

17.4.1 Drop type manholes installations shall be approved during plan review. **See Detail SS02** for interior drop type manholes and see **Detail SS03** for exterior drop type manholes.

17.4.2 Internal drops may be constructed in existing manholes if top to invert elevation is 15’ or greater. All requests for internal drop construction shall be approved by the MANAGER. Point of intrusion shall be re-sealed with an approved water stop and grouted in place, the top section fitting shall be an all Hub SDR 26 double sanitary tee with direction of flow pointing downward. Vertical piping will be attached to concrete with 1 3/4 stainless steel bands by 5/8” X 3” stainless steel bolts with expansion anchors. Piping will terminate with a 90-degree long sweep bend resting on original invert base, fitting will be grouted in place on both sides to support assembly while forming new invert trough.

17.5 MANHOLE RINGS AND LIDS

17.5.1 All castings for manhole rings and lids must be of the best quality gray cast iron, free from cracks, holes, scale, shrinkage, distortion and other defects which might make them unfit for their intended use. They shall have a workmanlike finish, shall be non-rocking, shall have all bearing surfaces machined smooth and shall be of such quality that a blow from a hammer will produce an indentation on a rectangular edge of casting without flaking the metal. Manhole rings and lids shall have a minimum access diameter of 24". The manhole lids shall be of solid construction without any openings other than two (2) concealed pick holes which shall be located on direct opposite sides of the manhole lid. The concealed pick holes shall be of such design as not to allow infiltration into the manhole. Manhole lids shall have "SANITARY SEWER" or "CITY OF TONTITOWN SANITARY SEWER" cast on the lid. Standard manhole rings and lids shall beEast Jordan Ironworks 1348, or approved equal. The combined weight of the ring and lid shall equal 260 pounds or greater when installed outside of paved areas. Manhole lids located in paved areas shall equal 400 pounds or greater. All rings and lids shall be manufactured in the U.S.A. **See Detail SS04 and SS05**.

17.6 WATERTIGHT MANHOLE RINGS AND LIDS

17.6.1 Watertight manhole rings and lids where required on the plans, shall be East Jordan Ironworks V-2357, or approved equal manufactured in the USA. **See Detail SS05**.

17.7 MANHOLE STEPS

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

17.8 WATER STOPS

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

17.9 MANHOLE CONFIGURATIONS AND CONSTRUCTION

17.9.1 Manholes shall be of such construction so that the finished manhole will have an inside diameter of 4'0" plus or minus ½". Concrete used to pour the manhole shall be 4,000 psi with a slump of approximately 3". Wall thickness shall be a minimum of 6”. **See Detail SS01**.

17.9.2 Before the forms are set in place, any water that may have accumulated in the excavated area shall be pumped out and the concrete base thoroughly cleaned, if required, of dirt and debris.

17.9.3 The forms shall be removed after the initial set of the concrete so that holes may be cut in the manhole barrel for the installation of pipes which are to enter the manhole at points other than adjacent to the manhole base. The manhole shall not be backfilled less than 24 hours after the forms have been removed. Extra care shall be taken to compact all backfill to the top of the highest pipe entering the manhole. After these pipes have been put in place, the barrel shall be repaired using a grout mixture. If honeycombing of the barrel is found to be present after removal of the forms, they shall be repaired as directed by the ENGINEER, DEPARTMENT or CITY INSPECTOR.

17.10 MANHOLE SHAPE AND INSIDE DIMENSIONS

17.10.1 Manhole shapes shall be cylindrical and 48" diameter or as indicated on plans.

17.11 MANHOLE DESIGN DEPTH, HEIGHT AND PLACEMENT

17.11.1 Manhole depth shall be as indicated on plans. The DEPARTMENT requires accessibility to all manholes; the responsible ENGINEER shall design the sanitary sewer system in a manner so as to eliminate backyard placements between buildings, behind permanent structures, or other locations not accessible for normal street side maintenance.

17.11.2 Street side manhole rim elevations shall to be 4” above the proposed final grade and offsite or nonstreet side manhole top rim elevations shall be 6” above proposed final grade. All manhole rim elevations shall be shown as such on the sewer profile sheet and noted in the general construction notes. The DEPARTMENT during plan review will address finished manhole elevations and may require additional height elevations. In all cases, after sewer construction is complete, the vertical adjustment shall be no more than 12” plus the lid. Adjustments greater than 12” require the reconstruction of the manhole cone. All manholes constructed in ravines, drainage or runoff areas will require the installation of a watertight ring and lid.

17.12 MAIN AND SERVICE PIPES

17.12.1 All main and service pipes shall be neatly cut flush with inside of manhole or inlet where they enter structure walls, and correct irregularities and rough edges with non-shrinking grout.

17.12.2 TRACER WIRE

17.12.2.1 All sewer mains and sewer service lines or other appurtenances installed shall have a single #14 gauge type insulated copper tracer wire, on top of pipe and fastened securely with tape every 10' feet and buried with it. This locator wire shall be installed in conjunction with the main at the same depth as the sewer main or service.

17.12.2.2 Tracer wire shall not be connected in any way to main or any other underground metal (except other tracer wires). Installation of tracer wire shall be tested at the time of acceptance inspection. Failure of tracer wire is a non-bondable item for final acceptance.

17.12.2.3 Wire shall be accessible at manholes and cleanouts and shall be attached to the manhole, cleanout, or service; connect all tracer wires together so that a continuous electrical path is ensured. For all force mains, tracer wire shall accessible in a tracer wire terminal box. The tracer wire terminal boxes shall be placed at no more than 1,000 feet apart from one another or as specified on the drawings.

17.12.2.4 To connect tracer wires, the wires shall be spliced using a splint bolt connector (Blackburn 9H or Kearney KS90) or equal, then covered with electrical plastic tape (Type 3M Scotch 33) so that a waterproof joint is made. A revised drawing SS06 shows how the tracer wire on the service connection shall be placed on the service line and connected to the main sewer line. **See Detail SS06**.

17.12.3 GREASE TRAP INSPETION TANK

17.12.3.1 Each sewer service that disposes of grease in any form will be required to have a dual compartment inspection tank downstream of the grease trap inside of the building. This tank shall be accessible for inspection on an as needed basis by the Tontitown Water and Sewer Department to determine the extent of grease included in the wastewater flowing into the sewer system. Each individual or business that disposes of grease shall install the tank in an accessible area. **See Detail SS07.**
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17.12.4 INTERCEPTORS AND SEPARATORS

17.12.4.1 Each sewer service that utilizes an oil/water separator for disposal of wastewater containing oil-bearing, grease- bearing and/or flammable liquid wastes shall construct the separator in such a manner that the unit and its contents are easily accessible for inspection. The Tontitown Water and Sewer Department or their agents may inspect the separator on an as needed basis to determine the amount and nature of any deleterious substances entering the public sewer collection system.

Access to the oil/water separator tank shall be via hatches providing inspection of both chambers of the separator and allowing for sampling from the downstream chamber. **See Details SS08 and SS09**.

17.13 CONNECTIONS TO MANHOLES

17.13.1 To ensure that pipe will not break immediately adjacent to the manhole, care shall be taken that excavation for the manhole bottom is limited to the area to be filled with concrete. The CONTRACTOR shall support pipe entering the manhole all the way to solid bedding by placing approved backfill under the pipe and up to the mid spring-line with class B concrete.

17.14 INVERTS

17.14.1 The invert of the manhole shall be hand-placed and shaped using the same 4000-psi concrete mixture used to pour the base and walls of the manhole. The invert shall be shaped and smoothed so that the manhole will be self-cleaning and free of areas where solids may be deposited as sewage flows through the manhole and from service lines that enter the manhole base. Inverts shall be shaped, formed and brushed smooth from the concrete poured for the base prior to the initial set of the base. In all cases the diameter of each pipe entering the manhole barrel shall be cut smooth with the inside edge of the manhole barrel and the invert shaped throughout from all inlet pipes to the outside pipe. Shape inverts for smooth flow across structure floor as shown on drawings. Use concrete and mortar to obtain proper grade and contour and finish surface.

SECTION 18 SEWER SYSTEM GENERAL INSTALLATION INFORMATION

18.1 FIELD QUALITY CONTROL

18.1.1 Compaction testing will be performed in accordance with ANSI/ASTM D698, ASTM D2922, ASTM D3017 or ASTM D1557-78.

18.1.2 Test sanitary sewer pipe system installed below grade and outside building in accordance with the following procedures:

18.1.3 The CONTRACTOR shall perform the testing of manhole construction, pipe materials and/or other materials incorporated into the construction of the sanitary sewer system to determine leakage and water tightness. Testing to be supervised by design ENGINEER and inspected by the CITY INSPECTOR.

18.2 AIR TESTING OF GRAVITY SEWER LINES

18.2.1 All gravity sewer lines shall be tested in accordance with the following procedures:

(a) Plug all pipe outlets with suitable test plugs. Brace each plug securely.

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

(c) Add air slowly to the portion of pipe under test until the internal pressure of the line is raised to approximately 4 psig but less than 5 psig.

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

(e) When the pressure has been bled down to 3 1/2 psig and stabilized, start the test.

(f) If the pipe section does not drop below 3.0 psig in the allotted time the section passes the test.

18.3 GRAVITY SEWER AIR TESTING TIME REQUIREMENTS

Minimum Time Requirements for 0.5 PSIG
Pressure drop from 3.5 PSIG to 3.00 PSIG
(Not less than shown between manholes)

Pipe Size	Time
8"	5.0 minutes
10"	6.5 minutes
12"	7.5 minutes
15"	9.5 minutes
18”	11.5 minutes
24”	13.5 minutes

18.4 HYDROSTATIC PRESSURE AND LEAKAGE TEST OF FORCE MAINS

All sewer force mains and appurtenances shall be tested by a hydrostatic pressure test conducted at a minimum of 1.5 times the working pressure at the point of testing and not less than 1.25 times the working pressure at the highest point along the test section. **Air pressure testing of installed pressure pipe is expressly prohibited due to the catastrophic nature of failure should failure occur.**

18.4.1 After the sewer force mains have been filled with water, the pressure shall be increased to the test pressure by means of a pump. The leakage test shall be in accordance with AWWA M23.

18.4.2 The CONTRACTOR shall furnish a pump, and all labor for conducting the tests.

18.4.3 The duration of the hydrostatic leakage test shall be two (2) hours or as specified by the CITY INSPECTOR or DEPARTMENT representative.

18.4.4 The source of water for the pump suction shall be potable water from the DEPARTMENT'S distribution system. The vessel used must be approved by the CITY INSPECTOR or DEPARTMENT representative.

18.4.5 The maximum leakage per hour for ductile iron and P.V.C. shall be as calculated from the following formula (All rubber gasket or 0-ring joints):

$$L = \frac{SD\sqrt{P}}{133200}$$

L = allowable leakage, (gallons per hour)
S = length of pipe tested (feet)
D = nominal diameter of pipe, (inches)
P = average test pressure during test, (psig)

18.4.6 After the specified test pressure has been applied the entire pipeline shall be checked in the presence of the CITY INSPECTOR or DEPARTMENT representative giving particular attention to that part of the pipeline and those appurtenances that are exposed.

18.4.7 After the CONTRACTOR has taken the necessary action to repair or replace any part of the pipeline or appurtenances where leaks were apparent or if no leaks were apparent, the sewer force mains shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.

18.4.8 If any test of pipe laid discloses leakage greater than the allowable leakage as calculated from above formula or table, the CONTRACTOR shall, at his expense, locate the leak or leaks and perform whatever work and/or replace whatever material that is required in order to remedy the defect and stop the leak. All corrective work must be approved by the DEPARTMENT.

18.4.9 Prior to the pressure test, the ENGINEER shall present an allowable leakage report to the CITY INSPECTOR.

18.5 TESTING SAFETY PRECAUTIONS

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

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

18.5.3 Gauges, air piping manifolds and valves shall be located at the top of the ground. Install and brace all plugs securely.

18.6 GROUND WATER ELEVATION

18.6.1 If the pipeline to be tested is below the ground water level, the starting test pressure shall be increased by 0.433 psi for each foot the groundwater level is above the invert of the sewer pipe. In no case shall the starting test pressure exceed 9.0 psig.

18.7 TEST EQUIPMENT

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

18.7.2 The ENGINEER shall furnish one copy of gravity sewer and manhole test results to the DEPARTMENT upon completion of gravity sewer system approval by the CITY INSPECTOR.

18.8 MANDREL TEST

18.8.1 The mandrel (go/no-go) device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The contact length of the mandrel's arms shall equal or exceed the nominal inside diameter of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance of plus or minimum 0.01". The mandrel and all necessary equipment for the mandrel test shall be provided by the CONTRACTOR. No hand made mandrel devices shall be used for testing unless prior permission is given by the DEPARTMENT or the CITY INSPECTOR.

18.8.2 The mandrel shall be hand-pulled by the CONTRACTOR through all flexible pipe sewer lines no earlier than 30 days after the trench has been completely backfilled. Any sections of the sewer not passing the mandrel shall be uncovered and the CONTRACTOR shall re-bed, re-round or replace the sewer to the satisfaction of the DEPARTMENT. Any repaired section shall be re-tested.

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

NOMINAL DIAMETER (IN)	MANDREL O.D. (IN)
8"	7.12"

10" ..... 8.87”
12" . .....10.55 "
15" . .....12.98”
18" . .....16.12"

18.9 MANHOLE VACUUM TESTING

18.9.1 The manhole vacuum test shall be performed with suitable apparatus made for such purpose and shall draw a vacuum of 10" of mercury (Hg). The test shall pass if the vacuum remains at 10" of mercury (Hg) or drops to not less than 9" of mercury (Hg) in one minute. Vacuum test will be performed by construction CONTRACTOR. Test shall be witnessed and documented by resident inspector and CITY INSPECTOR. Responsible ENGINEER shall furnish test result information to the DEPARTMENT. If, after several attempts to perform a satisfactory vacuum test have failed, the CITY INSPECTOR may require that the manhole be removed and replaced.

18.10 ACCEPTANCE OF INSTALLATION

18.10.1 No gravity sewer or manhole will be accepted that does not comply with the minimum requirements of tests described within these specifications.

18.11 WARRANTY

18.11.1 The DEPARTMENT reserves the right to inspect by mandrel test or camera inspection any sewer line before acceptance, and also prior to expiration of the first year of operation. If a previously accepted line fails an inspection during the first year of operation, the defects must be corrected at the CONTRACTOR/DEVELOPERS expense.

SECTION 19 SEWER LIFT STATIONS

19.1 The MANAGER must approve all plans in writing.

19.2 As directed by the City of Tontitown, the CONTRACTOR will purchase an Industrial control system, or SCADA instrumentation and control system, with remote monitoring capabilities. The Industrial control system must be compatible with existing equipment and programming costs will be at the CONTRACTOR’s expense. The system integrated must be approved by the DEPARTMENT.

19.3 A spare pump must be furnished with each sewer lift station. The spare pump shall be equal in size and design capacity of the lift station unless multiple pumps are used to meet design capacity. In that case, the spare pump shall be equal to one of the two pumps required to provide the design capacity. The spare pump shall be delivered to the location directed by the Water and Sewer Department.

19.4 FINAL ACCEPTANCE

19.4.1 A final inspection will be done at the DEVELOPER'S request upon completion of construction. Upon final approval, the MANAGER will issue a letter of acceptance for the lift station.

19.5 CONTROL CENTER

19.5.1 The control center will be designed to provide automatic operation, while maintaining motor protection.

19.6 BASIC CONTROL PANEL SPECIFICATIONS

19.6.1 One combination circuit breaker/overload disconnect unit with magnetic trip elements sized for individual protection shall be provided for each pump. **See Detail LS01 and LS02.**

19.6.2 One across the line magnetic contactor shall be provided per pump. Sized in accordance with NEMA horsepower standards.

19.6.3 Control panels shall incorporate the following features as a minimum:

19.6.3.1 Alternator shall be provided for duplex controls. In the case there are more than two pumps, an alternator system shall be provided as directed by the MANAGER.

19.6.3.2 Individual selector switches to provide "hand-off-auto" control of each pump.

19.6.3.3 HAND POSITION - In this position, the pump controlled by the switch will run regardless of the wet well level. The pump will continue to run until the switch is turned to "off" or "auto" position.

19.6.3.4 AUTO POSITION - In this position, the operation of the pumps is controlled automatically by the level sensors in the wet well.

19.6.3.5 24 or 120 volt AC control transformer, protected on both the primary and secondary.

19.6.3.6 Terminals shall be provided for connection of the level sensors.

19.6.3.7 A removable dead-front panel is required.

19.6.3.8 All operator controls, toggle switches, circuit breakers, etc., shall be accessible without removing the dead-front panel.

19.6.3.9 NEMA 3 or NEMA 4 enclosure with draw pull catch and provisions for padlocking for indoor mounting. NEMA 4 or NEMA 4X shall be used for outdoor mounting.

19.6.3.10 Electrical connections in the wet well shall not be allowed.

19.6.3.11 Coordinate with the electric company prior to project start to determine type of electrical service. Three-phase power must be used when available. 240 and 480 volt power supplies.

19.6.3.12 Pump running pilot lights (green) mounted on operator's control plate.

19.6.3.13 Totalizer for each pump must be mounted on operator's control plate. Totalizer shall measure to the nearest one-tenth (0.1) hours.

19.6.3.14 Condensation protection; includes heater and adjustable thermostat.

19.6.3.15 Lightning arrester; 3 pole thyrite unit mounted in panel.

19.6.3.16 3-phase power monitor (230 or 460 V only). Stops pump for low voltage, single phasing and phase reversal.

19.6.3.17 Delayed start. Allows for 15-second delay in the lag pump circuit so that the pumps do not start simultaneously after a power failure.

19.6.3.18 The level control system sensors must be Flygt Floats ENH-10, multi-trode or equivalent.

19.7 FLOAT CONTROLS

19.7.1 Provide a switch control system incorporating a hermetically sealed liquid level indictor as a level sensing and signal control device for automatic control of lift station. The system shall monitor and control wet well level at each station as follows:

SWITCH 1 - All Stop
SWITCH 2 - Energize Lead Pump
SWITCH 3 - Energize Lag Pump
SWITCH 4 - High Level Alarm

19.7.2 Contingent upon wet well level, float system shall cause indicator/controller to energize appropriate control contacts.

19.7.3 A secondary backup level detection system shall be provided, which may be an ultrasonic sensor/transducer, or a pressure transducer, subject to Department approval.

19.8 EMERGENCY GENERATOR

19.8.1 The CONTRACTOR is responsible for providing a complete emergency power generating system, including all connections of the generator set to the lift station control panel. The CONTRACTOR is also responsible for making all arrangements with other utilities including natural gas or electricity.

19.8.2 Provide an automatic transfer switch that is recommended by the manufacturer of the generator set.

19.8.3 The system is required to be capable of performing automatic tests and have the ability to initiate manual transfer from alternate to normal source.

19.8.4 Provide adjustable time delay on transfer and re-transfer.

19.8.5 The CONTRACTOR is completely responsible for the connection to the natural gas system, if a natural gas fuel system if used. For diesel fuel systems, the above ground fuel storage tank shall provide volume sufficient for 24-hour consumption at full load.

19.8.6 All alarm conditions shall be made available for connection to control unit at the generator site for transmission to a central communication facility.

19.9 ACCESS ROAD

19.9.1 An access road will be provided from the curb to the lift station. Curbing must be cut and replaced to allow access.

19.9.2 The lift station access road shall be asphalt and a minimum of 12-feet wide and no greater than a 10% slope. A minimum of 6-inches of compacted base material is required. Base material and compaction shall be in accordance with the latest addition of AHTD Standard Specifications (Division 300). A minimum of 2-inches of asphalt is required. Paving materials and construction methods shall be in accordance with the latest edition of the AHTD Standard Specifications (Division 400). **See Detail LS03.**

19.10 LIFT STATION AND SITE

19.10.1 Minimum lot size shall be 50-feet by 50-feet.

19.10.2 Lift station lot shall be asphalt. A minimum of 6-inches of compacted base material is required. Base material and compaction shall be in accordance with the latest edition of the AHTD Standard Specification (Division 300). A minimum 2-inches of asphalt is required. Paving materials and construction methods shall be in accordance with the latest edition of the AHTD Standard Specifications (Division 400). **See Detail LS03.**

19.10.3 A 6-foot high chain link fence with poles inside the asphalt with a 12-foot roll back gate is required. The fence shall also be equipped with 45 degree standard barbed-wire supporting arms for three strands of barbed wire, one for each post, conforming to ASTM F626. Barbed wire shall be two-strand 12-1/2 gauge steel wire with 14 gauge 4-point barbs not more than 5 inches o.c.; metallic-coated finish to match fabric, with galvanized finish.

19.10.4 A high level alarm is required for duplex control centers. This level sensor is placed at a higher level in the wet pit than the pump controlling level sensors and is used to activate the alarm circuit. A red warning light shall also be installed on the station.

19.10.5 There shall be a fire hydrant or water faucet at each lift station.

19.10.6 There shall be a hoist or crane installed for pump removal. The length of chain provided shall be adequate to reach the bottom of the wet well.

19.11 STATION FREEBOARD

19.11.1 The top of the wet well shall not be less than 2-feet above the surrounding area. A 4-inch steel pipe with bird screen shall vent the wet well. Stations with 5-HP pumps may use a 2-inch vent.

19.11.2 All conduits leading out of the wet well shall have a junction box between the building and the wet well.

19.12 CONTROL PANEL

19.12.1 Shall be pedestal mounted on top of wet well or within 5-feet and shall be sealed to prevent fumes from rising into panel.

19.13 PUMP REQUIREMENTS

19.13.1 All lift stations require rail mounted submersible pumps as manufactured by Fairbanks-Morse, Flygt, Hydromatic or equivalent and interchangeable without alteration to the piping or electrical system. **See Detail LS04**.

19.13.2 Lift stations requiring less than 5-HP pumps must be grinder pumps. **See Detail LS05**.

19.13.3 All pumps will meet or exceed the minimum requirements required to pump the anticipated flow for the known number of houses, units, or number of persons. The pumps will meet or exceed required head values based on Engineer's design.

19.14 LIFT STATION PIPING

19.14.1 Will be constructed in such a manner that the force main velocity is never below 2-feet per second and never above 6-feet per second. All lift station piping and rails shall be stainless steel. All valves shall be ductile iron or stainless steel ball-cock type.

19.14.2 All lift station wet wells shall be concrete and all valve vaults shall be concrete with aluminum hatches to allow access to the valves.

19.14.3 This station must be constructed in such a manner to allow for growth or capacity above projected maximum flow for the area served.

19.14.4 The station will be constructed of concrete, either preformed or poured, with reinforcement material. All plumbing entering or leaving will be grouted to stop any infiltration. For concrete requirements, see Section 17.2.

19.14.5 Piping sized to flow needs.

19.14.6 Gate Valves and Check Valves are required on both discharging lines.

19.14.7 Chain hooked to pumps for removal.

19.14.8 All electrical connections shall be watertight.

19.14.9 Electrical services shall meet City and State Codes.

19.15 VALVE VAULTS FOR LIFT STATIONS

19.15.1 Vaults shall be of all concrete construction incorporating a single door aluminum access lid. Door shall open to 90 degrees, lock automatically in position, have closed position lock hasp and retractable grip for opening and closing with one hand. Lid shall support a minimum live load of 150 pounds per square foot, unless located in a traffic area, then it shall be rated for an H-20 loading. **See Details LS06 and LS07**.

19.15.2 Vaults shall be constructed on a minimum of 6 inches of Aggregate Base, Class 7 base material. Steps shall not be incorporated. Maximum vault depth shall be 5-feet from access hatch to base.

19.16 VALVES

19.16.1 Check valves shall be swing type with iron body and flanged ends mounted in the horizontal position only and shall be located in a valve vault not exposed to wastewater.

19.16.2 Gate valves 4-inch and larger shall be of the resilient seat type and meet the requirements of AWWA C-509 latest revision. Valves shall have non-rising stems and close right (clockwise). Valves shall have flanged ends and have a 2-inch operating nut. Valves smaller than 2-inch shall meet AWWA C-500. Acceptable manufacturers for all sizes include; American Darling, Clow, Kennedy, Mueller or equal. Gate valves shall be mounted horizontally in valve vault with no exposure to wastewater.

19.16.3 Plug valves are an acceptable means for isolation and shall be flanged Dezurik or Pratt equal.

19.17 GUARANTEE

19.17.1 The CONTACTOR shall guarantee for a period of at least one (1) year from the date station is placed into operation and accepted by the DEPARTMENT that the entire station and all equipment therein shall be free from defects in design, materials, and workmanship. In the event a component fails or is proven defective during the guarantee period, the manufacturer will provide a replacement part without cost, upon return of the defective part. Normal use items, such as grease, light bulbs, mechanical seals, packing, and belts are excluded.

SECTION 20 SCADA INSTRUMENTATION & CONTROL SYSTEM

20.1 DESCRIPTION

20.1.1 The Work to be included under this Section of the Specifications shall consist of furnishing all materials, labor, equipment, tools, supplies, and incidentals necessary for the installation of the lift station SCADA system. The Work shall include every item of construction necessary for a complete and acceptable installation as shown on the Plans and as hereinafter specified. Software programming of graphs, reports, alarms, and other items for the SCADA workstation shall be specified and approved by the DEPARTMENT. The CONTRACTOR shall be responsible for furnishing and installing all items of hardware, software, programming, and configuration for every input/output circuit described in these Specifications.

20.1.2 The CONTRACTOR shall subcontract with an authorized System Integrator approved by the DEPARTMENT as specified herein.

20.2 APPLICATION AND SOFTWARE DRIVER LICENSES

The PLC configurations, the HMI configurations, the database application, and any other support or driver software that is developed by the Contractor shall be licensed to and shall remain the property of the DEPARTMENT. The DEPARTMENT shall be granted an unlimited license to install the software on any number of computers, operate the software on any number of computers, modify

any configuration or application, or sell all or any part of the computer code that is written in the execution of this specific project.

20.3 MATERIALS

20.3.1 All meters, instruments, control units, and other components shall be the most recent field-proven models marketed by their respective manufacturers at the time of the submittal of the shop drawings, unless otherwise specified, to match existing equipment.

20.4 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

20.4.1 PLCs shall be made up of the list of components specified below and as shown on the Plans. PLCs shall be capable of receiving outside status, process indications and sending control signals to other equipment. PLCs shall be solid-state devices that have programmable memory to accomplish specific functions. PLCs shall be designed to operate in harsh industrial environments. The equipment shall be capable of operating in temperatures ranging from 0-55° C in 5-95% relative humidity without fans or cooling units. PLCs shall be Schneider Electric SCADAPACK Controllers, or equal as approved by the DEPARTMENT, to maintain the DEPARTMENT's system compatibility. Components of the PLC, shall consist of but are not limited to, necessary interface cables, communications cables, power cables, bus extension cables, and transient voltage surge suppression for the PLC unit communication ports.

20.5 REMOTE RADIO

20.5.1 The remote radio transceiver shall be a Dataradio HiPR 9000 Parallel Decode, transmitting frequency in the 902-928 MHz band. No substitutions shall be allowed to maintain the DEPARTMENT's system compatibility. MAC address filtering must be enabled and programmed on this device.

20.6 TRANSCEIVER POWER SUPPLY

20.6.1 The communications transceiver shall be furnished with a separate power supply. The power supply shall be rated 4.0 amperes, 120 VAC, 60 Hz input with a 12 VDC output. The power supply shall be UL/CUL and CE certified and manufactured by Schneider Electric, Inc.

20.7 UNINTERRUPTABLE POWER SUPPLY

20.7.1 Uninterruptible power supplies (UPS) shall be provided to support the SCADA system to ensure remote communication is uninterrupted. The UPS shall be easily replaced and self-testing. It should provide back-up power for the period of time specified in the contract documents at each PLC control panel

20.8 SERVICE

20.8.1 The incoming service for each panel shall be 120 volts, single-phase, 60 Hz, alternating current.

20.8.2 A surge arrestor shall be supplied and connected to each line of the incoming side of the power input terminals. The arrestor shall protect the control against damage from transient voltage surges caused by lightning interference, switching loads, and power line interference. A properly sized control power circuit breaker shall be provided and shall supply power to all control wiring within each control enclosure.

20.9 SIGNALS

20.9.1 Analog measurements and control signals shall be electrical and shall vary in direct linear proportion to the variable being measured. All analog signals, whether input or output control, shall be 4-20 milliamperes direct current, unless otherwise noted or specified by the DEPARTMENT. The analog input signals shall maintain loop integrity with the installation of a properly sized resistor across the input terminals.

20.10 ENCLOSURES

20.10.1 The CONTRACTOR shall utilize the appropriate SCADA enclosure, as specified below and determined by the project site conditions.

20.10.2 Enclosures that are to be housed inside a building out of the weather shall be single-door wall mounted type and rated NEMA 3R.

20.10.3 Enclosures that are to be housed outside in the weather shall be single-door wall mounted type and rated NEMA 4X and constructed from Type 304 stainless steel material.

20.11 CURRENT LOOP POWER SUPPLY

20.11.1 The instrument transmitters shall be furnished with a separate power supply to provide the loop power for these 2-wire instruments. The power supplies shall be rated 2.5 amperes, 120 VAC, 60 Hz input with a 24 VDC output. The power supplies shall be UL/CUL and CE certified and as manufactured by Schneider Electric.

20.12 POWER SURGE ARRESTER

20.12.1 The secondary surge arrester shall be a Square “D” catalog number TVS4EMA16A, or approved equal.

20.13 TERMINALS

20.13.1 Wire terminal blocks shall be installed at the bottom of the enclosure. Field wiring shall terminate at the terminal block. The terminal blocks shall be as manufactured by Phoenix Contact, Inc., or approved equal.

20.14 LEVEL TRANSMITTER

20.14.1 For tanks and wet wells, as specified in section 19.7, level transmitter(s) shall be provided with remote equipment and integrated into the SCADA system.

20.15 INSTALLATION

20.15.1 All of the elements, instruments, accessories, and assemblies shall be installed in accordance with the manufacturer's installation instructions and as detailed on the Plans. The CONTRACTOR shall subcontract with an authorized System Integrator approved by the DEPARTMENT. Approved authorized System Integrator shall be Multi-Craft Contractors, Inc. The CONTRACTOR shall coordinate with the Electrical Contractor and the approved System Integrator to insure that all of the items required are furnished, installed, wired, and configured as required by the Plans and the Specifications. The CONTRACTOR shall perform the site study to determine the feasibility of radio transmission, subject to DEPARTMENT supervision and approval.

20.15.2 The System Integrator shall provide the CONTRACTOR/DEVELOPER with quotations to provide and install the control panel, data radio, antenna, radio coax, UPS, and startup services. The System Integrator shall purchase end connections from others and install said connections. The CONTRACTOR/DEVELOPER shall purchase the radio tower components from TWU or others and install said components. Base section shall be installed in a concrete footing of sufficient depth and width to support the required tower sections. Provisions shall be included for electrical grounding.

20.15.3 Shielded instrumentation cables shall be used for all low-level signals from the instruments to the PLC panels. Separate conduits shall be used for instrument power and instrument signal lines.

20.15.4 The CONTRACTOR shall furnish and install the necessary enclosures, racks, power supplies, surge arrestors, communications modules, and I/O modules to the PLC unit. The CONTRACTOR shall install the necessary relays and wiring to connect the digital outputs from the PLC unit to the motor controls. The CONTRACTOR shall make the necessary power connections and signal connections with shielded instrumentation cable from the field devices (i.e., level transmitters, motor control, etc.) to the PLC unit.

20.15.5 The CONTRACTOR shall be required to perform the following items of work in building, developing, installing, and starting up the lift station SCADA system:

a. Assemble all hardware (i.e., PLC unit and communication components).
b. Integrate the software and develop the graphical user interface screens, database logging and reporting functions, PLC unit programming, control functions, etc.
c. Make interconnections to a network of all hardware components together at the factory test site to replicate the hardware architecture shown on the Plans as near as possible. Perform all necessary initial testing on the completed system.
d. After the DEPARTMENT is satisfied that the system is working as intended, the CONTRACTOR shall then be authorized to ship and install the system. The CONTRACTOR shall be available to answer any questions that the Electrical Subcontractor may have in the course of the installation.
e. After the installation of the system is complete, the CONTRACTOR shall check all field-wiring for proper placement into the system and startup the system at the facility. During the system checkout and startup, DEPARTMENT personnel shall be allowed to observe all of the procedures being performed on the system.

20.16 TESTING

20.16.1 Once the installation is complete, testing must be completed. During testing, the PLC shall be exercised (with simulated inputs, events, and conditions) in a manner that approximates an operational environment. No programming changes will be allowed to bypass failed modules during testing. The fiber shall be tested to determine that the installation was successful and include the manufacturer's maximum allowable dB loss. An addition, the System Integrator shall perform a complete, end-to-end checkout for every I/O point from the field wiring terminal strip.

20.16.2 The following tests shall be performed, as applicable:

a. Rigorous exercising of all devices both individually and collectively
b. Verification of proper scanning and data acquisition of all status and data points
c. Verification of proper Control Strategy up/down loading to the PLCs
d. Verification of all Control Strategies to ensure that they result in the correct sequence of operation for each site
e. Demonstration of all required device control functions
f. Demonstration of analog input, pulse input, and analog output accuracy
g. Demonstration of the functionality of the spare I/O of each panel.
h. Testing the user interface functions for all PLCs that have local operator interfaces
i. Create and process device failure conditions
j. Demonstration of all functions and components
k. Demonstration of recovery from power loss
l. Demonstration of UPS and battery backup functionality.
m. Demonstration of connecting the programmer's laptop to each type of PLC and establishing communications and running diagnostics

20.16.3 The following inspection checks shall be performed on all deliverable hardware items, as applicable:

a. I/O Subsystem physical layout
b. Power supply mounting
c. Power cable routing
d. Data cable routing
e. Wiring runs properly installed
f. Fans and blowers are unobstructed
g. Power supply and power conditioning equipment correctly installed
h. Wire numbering and color coding
i. Device labeling
j. Enclosure integrity

20.17 HMI SCREENS

20.17.1 The CONTRACTOR shall consult with the DEPARTMENT and the Engineer before creating and configuring the HMI screens for the lift station control application.

20.18 FINAL DOCUMENTATION

20.18.1 At the conclusion of the project and after all necessary changes have been completed to the system configuration, the CONTRACTOR shall fully document all of the PLC I/O lists using the HMI documentation program. The CONTRACTOR shall print copies of all commented control ladder diagrams as completed. The CONTRACTOR shall also print copies of all of the HMI display screens with the configuration of each display screen documented.

20.18.2 The DEPARTMENT shall be furnished with two (2) copies of the above listed documentation. The copies shall be bound in D-ring binders to facilitate updating the system documentation. Any necessary "AutoCAD" drawings required for documenting the SCADA control system shall be no larger than ledger size (11"x17") so the drawings can be easily folded into the D-ring binders.

20.18.3 The CONTRACTOR shall use the following list of software to document the SCADA control system.

a. All documentation drawings shall be furnished in PDF and DWG format.
b. All documentation text files shall be created and maintained in "Microsoft Word" format. At the completion of the project, the CONTRACTOR shall also furnish copies of all applications and the documentation specified above on CD-ROM or DVD to the DEPARTMENT.

20.18.4 The CONTRACTOR shall furnish the DEPARTMENT with O&M manuals for all of the components included in the lift station SCADA control system, as specified in

the Operations and Maintenance Manuals Section in the General Requirements Chapter of these Specifications.

20.19 TECHNICAL SUPPORT AND TRAINING

20.19.1 The CONTRACTOR shall include professional technical support for this system and for all of the hardware and software that is provided with the system. The technical support shall be provided for a period of twelve (12) months. The period shall commence at the date of final acceptance.

20.19.2 Technical support shall include the following at a minimum:
a. Voice telephone and/or remote computer access support for the supplied software applications.
b. Two (2) eight-hour days, during the twelve (12) months immediately following the project final acceptance, of on-site technical support to aid the DEPARTMENT in implementing new items into the system, including field point definitions, graphic displays, and PLC unit programming. This on-site support shall be provided at the discretion of the DEPARTMENT, but will be limited to the time frame specified herein. Travel time for the CONTRACTOR shall not be counted as part of the professional support days. All travel expenses shall be provided by the CONTRACTOR.

20.19.3 After the SCADA control system has been installed and accepted by the DEPARTMENT and the Engineer, the CONTRACTOR shall provide training sessions with the DEPARTMENT's personnel at the facility. The training sessions shall be of sufficient length to give the operations personnel a general understanding of the SCADA control system use, function, configuration, operation, and maintenance.

20.19.4 The training sessions shall be coordinated with the DEPARTMENT. The DEPARTMENT may at their discretion videotape any or all of the training sessions for future in-house use.

20.19.5 At the discretion of the DEPARTMENT, the CONTRACTOR shall provide training described as follows:
a. Eight (8) hours for conducting a system introduction and orientation.
b. Eight (8) hours of configuration training shall be provided with the instruction of one or two DEPARTMENT personnel showing the proper methods of designing screens and adding functions to both the process controllers and the operator workstation.