

Municipal-Regional Planning Commission

Meeting Agenda

Atoka Town Hall 334 Atoka-Munford Avenue Monday, February 12, 2024, 6:00 p.m.

I. Call to Order & Establishment of a Quorum

II. Approval of the Minutes

• Meeting Minutes – January 23, 2024

III. Reports

- Code Enforcement Monthly Activity Report
- **IV. Old Business**

V. Public Comment

VI. New Business

- 1. Recommendation to adopt the Atoka Standard Utility Specifications
- 2. Consideration of Sign Permit Application Summit Roofing

VII. Miscellaneous Items from the Planning Commission

VIII. Adjourn.



Municipal-Regional Planning Commission

Atoka Town Hall 334 Atoka-Munford Avenue Tuesday, January 23, 2024 6:00pm

Meeting – Minutes

The Atoka Municipal/Regional Planning Commission met with the following members present:

Barry L. Akin Paul Martin Matthew Peters

John Harber Stephen Shopher Vicki Shipley Tyra Faircloth

Absent:

Also attending: Amanda Faurbo, Assistant to the Town Administrator Marc Woerner, Town Administrator Jim Atkinson,, Planner *Attached Sign In sheet.

Chair Shopher called the meeting to order at 6:00pm and established a quorum.

Approval of Minutes

Approval of the December 18, 2023, Minutes – Commissioner Harber made a motion to approve the December 18, 2023, minutes as presented. Commissioner Shipley seconded the motion. No further discussion. All approved. Motion Carried.

Old Business - None

<u>**Reports** – Code Enforcement Monthly Report December 2023</u> —The report was presented and reviewed by the Planning Commission.

Public Comment – None

<u>New Business</u> – Approval of the Site Plan for Kroger's Expansion – Jim Atkinson, Planner presented the staff report. Marvin Brown, engineer for Kroger answered questions from commission. Commissioner Shipley made a motion to approve the Kroger expansion. Mayor Akin seconded the motion. Chair Shopher opened the floor for discussion. Commissioner Shipley amended her motion to approve the Kroger Site plan with conditions.

- 1. Submit building elevations that demonstrate a consistent architectural design as the existing building.
- 2. A required point of egress on Maple Road.

Mayor Akin seconded the motion. All approved. Motion carried.

Miscellaneous Items from the Planning Commission-

Commissioner Martin inquired about the construction at Summit Roofing new location. He wanted to verify that they received all the proper approvals. Staff advised that the permitting for the construction occurred prior to the new Building official. All permits were pulled for the construction. Commissioner Harber advised that a sign permit will be turned in for the signage, it will say Summit on the front of the building.

Commissioner Martin brought to the commission's attention that February's meeting falls on a Holiday. The Commission agreed to move the meeting to Monday, February 12, 2024 at 6:00pm.

Commissioner Shipley made a motion to adjourn the meeting at 6:23 pm. Commissioner Peters seconded.

Stephen Shopher, Chair

Amanda Faurbo, Clerk

Atoka Code Enforcement Fiscal Year 2024

PERMIT INFORMATION	JUL	AUG	SEP	ОСТ	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
Building Permit - Commercial	1	0	0	0	0	0	1						2
Building Permit - Industrial	0	0	0	0	0	0	0						0
Building Permit - Residential - Addition	2	1	0	2	1	1	1						8
Building Permit - Residential - New Build	1	4	0	2	0	0	4						11
Building Permit - Residential - Upstairs Finish	0	0	0	0	0	0	0						0
Misc Permit - Accessory Structure	5	3	3	6	6	0	1						24
Misc Permit - Detached Garage	0	0	0	0	0	0	0						0
Misc Permit - Fence Permit	17	5	3	2	2	3	2						34
Misc Permit - Pool Permit	1	1	1	1	3	1	0						8
Misc Permit - Mechanical	19	17	2	5	6	14	14						0
Misc Permit - Driveway/Sidewalk	0	3	2	2	0	0	0						0
Misc Permit - Fireworks	0	0	0	0	0	3	0						0
Misc Permit - Demolition	1	0	0	0	0	0	0						0
TOTAL PERMIT INFORMATION	47	34	11	20	18	22	23	0	0	0	0	0	87
CERTIFICATE OF OCCUPANCY	JUL	AUG	SEP	ОСТ	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
Certificate of Occupancy - Commercial	0	1	0	1	1	2	1						6
Certificate of Occupancy - Industrial	0	0	0	0	0	0	0						0
Certificate of Occupancy - Residential	1	7	2	6	4	3	3						26
TOTAL CERTIFICATE OF OCCUPANCIES	1	8	2	7	5	5	4	0	0	0	0	0	32
BUILDING INSPECTIONS	JUL	AUG	<u>S</u> EP	<u>о</u> ст	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	<u>TO</u> TAL
Form Board / Set Back Inspection	0	2	1	2	4	1	0						10
Footing Inspection	1	0	0	0	0	1	0						2
Plumbing Inspection	7	5	3	4	3	0	0						22
Sheathing Inspection	3	4	1	1	4	4	2						19
Brick Ties Inspection	5	1	4	1	3	3	2						19
Framing Inspection	10	9	5	7	5	6	2						44
Mechanical Inspection	11	17	10	7	4	9	18						76
Driveway/Side Inspection	0	2	1	2	0	0	0						5
Backwash Inspection	0	1	3	1	0	2	0						7
Insulation Inspection	6	6	2	4	2	4	6			ĺ			30
TOTAL BUILDING INSPECTIONS	43	47	30	29	25	30	30	0	0	0	0	0	234
							<u> </u>						
CODE ENFORCEMENT ACTIONS	JUL	AUG	SEP	_ ОСТ	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
Municipal Court Citations	1	0	0	2	1	2	0						6
Property Maintenance Complaints - Closed	9	9	8	5	2	0	4						37
Property Maintenance Complaints - Received	15	22	11	7	1	2	5						63
TOTAL CODE ENFORCEMENT ACTIONS	25	31	19	14	4	4	9	0	0	0	0	0	106
PERMIT FEES	JUL	AUG	<u>S</u> EP	<u>о</u> ст	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	<u>TO</u> TAL
Collected Fees	\$7,355	\$6,048	\$2,754	\$3,591	\$4,637	\$3,319	\$4,142						\$31,846
TOTAL PERMIT FEES													\$31,846
COMMENTS													
Temporary Permits: 1	1												
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TOWN OF ATOKA STANDARD UTILITY SPECIFICATIONS





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ARTICLE 1: POLICIES AND PROCEDURES

1.1 Purpose

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- (a) The purpose of this document is to assemble the Policies and Procedures that have been adopted by the Town of Atoka to protect the public health, safety, and welfare, and to promote uniformity in the development of Town of Atoka facilities.
- (b) These standards are subject to change, and interested parties are advised to check with the Town Administrator in the event there are any questions concerning the status of the published document. Updates to these standards are available at Atoka's Town Hall.

1.2 Definitions

1.2.1 Whenever the words, forms, or phrases defined or pronouns used in their stead occur in these Specifications, or any document or instrument herein contemplated or to which these specifications apply, the intent and meaning shall be construed and interpreted as follows:

1.2.2. Abbreviations: The following organizations are referred to in these specifications by abbreviations of their titles:

(a)	AASHTO	American Association of State Highway and
		Transportation Officials.
(b)	ACI	American Concrete Institute
(c)	AFBMA	Anti-Friction Bearing Manufacturer's Association
(d)	AGA	American Gas Association
(e)	AIEE	American Institute of Electrical Engineers
(f)	AISC	American Institute of Steel Construction
(g)	AISI	American Iron and Steel Institute
(h)	ANSI	American National Standards Institute
(i)	ARAP	Aquatic Resource Alteration Permit
(j)	ASA	American Standards Association
(k)	ASTM	American Society for Testing and Materials
(1)	AWS	American Welding Society
(m)	AWWA	American Water Works Association
(n)	COE	Corps of Engineers
(0)	CSI	Construction Specifications Institute
(p)	DIP	Ductile Iron Pipe
(q)	IEEE	Institute of Electrical and Electronic Engineers
(r)	EPA	U.S. Environmental Protection Agency
(s)	HDPE	High Density Polyethylene
(t)	NEC	National Electrical Code
(u)	NEMA	National Electrical Manufacturer's Association
(v)	NPDES	National Pollution Discharge Elimination System
(w)	NPT	National Pipe Thread
(x)	NSF	National Sanitation Foundation
(y)	OSHA	Occupational Safety and Health Administration
(z)	PVC	Polyvinyl Chloride
(aa)	ROW	Right-of-Way
(bb)	TDEC	Tennessee Department of Environment and
(cc)	TDOT	Tennessee Department of Transportation

- (dd) TVA Tennessee Valley Authority
- (ee) UL Underwriters Laboratories
- (ff) USGS United States Geologic Survey
- (gg) WEF Water Environment Federation
- 1. Authority: Town of Atoka, Tennessee.

- 2. Authority Engineer: The person or firm hired or contracted to be the Authority Engineer.
- 3. Authority Representative: An authorized representative of the Authority assigned to observe the construction of the work and advise the Authority of the Work's prosecution.
- 4. Town Administrator: Town Administrator of the Town.
- 5. County: The County of Tipton within the State of Tennessee.
- 6. Cul-De-Sac: A minor street with only one outlet and having an appropriate terminal for the safe and convenient reversal of traffic movement.
- 7. Dedication: The transfer of property from private to public ownership.
- 8. Design Engineer: Engineer of record performing detail design of Plans submitted to the Authority for approval of water, wastewater, roadway, drainage, electric and gas facilities.
- 9. Developer: the legal or beneficial owner or owners of all the land proposed to be included in a given development or the authorized agent thereof. In addition, the holder of an option or contract to purchase, a lessee having a remaining term of not less than thirty (30), or other person having an enforceable proprietary interest in such land shall be deemed to be a developer for the purpose of these Regulations.
- 10. Development: The act of combing raw land, roads, utilities, buildings, financing and promotion into a completed operating property with "permanent" improvements.
- 11. Development, Substantial Completion of: Completion and acceptance by the responsible agency of all streets, roads, alleys, curbs and gutter, surface drainage measures for prevention of soil erosion and private property, parks and open space and utilities (which shall be stubbed out to ownership tracts where appropriate): and certification indicating that all required improvements have been installed or that sufficient bon exist to cover all costs of completion of the improvements; and additional certificates and dedications necessary to insure adequate access for public protection and utilities as well as conformance to applicable plans and ordinance requirements.
- 12. Easement: A grant by the property owner of use, by the public, a corporation, or person(s) of a strip of land for specified reasons, or as created by operation of law.
- 13. Employee: Any person working on the project to which these Specifications apply and who is under the direction or control of and receives compensation from the Authority.
- 14. Engineer: Authority Engineer
- 15. Equipment: All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.
- 16. Floodplain: Those land areas in and adjacent to streams and watercourses subject to continuous or periodic inundation from 100-year flood frequency events. Floodplains shall include all areas of the County, which are designated as floodplain by the Federal Insurance Administration, by the United States Geological Survey or by the State of Tennessee. Areas designated as floodplains by the Federal Insurance Administration shall not have their bas flood elevations altered without prior approval from the Federal Insurance Administration.
- 17. Health Department: Shall mean the County Health Department of the appropriate jurisdiction.
- 18. Inspector: An authorized representative of the Engineer and/or Authority assigned to make all necessary inspections and/or tests of the work performed, or of the materials furnished or being furnished by the Contractor.
- 19. Laboratory: The official testing laboratories of the Authority or such other laboratories may be designated by the Authority.
- 20. Lot: A tract, plot, or portion of a subdivision or other parcel of land intended as a unit for the purpose, whether immediate or future, of transfer of ownership or for building development.
- 21. Materials: Any substance for use in the work and its appurtenances.

) ARTICLE 1 – POLICIES AND PROCEDURES

- 22. Nonresidential Subdivision: A subdivision whose intended use is other than residential, such as commercial or industrial.
- 23. Or Equal: Wherever a particular process, material, device, detail, or part is specified herein, follow by these words or by similar or equivalent expressions, such words or expressions shall be understood to mean and permit the use of another process, material, device, detail or part that the Engineer shall determine is fully equal in suitability, equality, durability, performance, and in all other respects, to the process, material, device, detail, or part herein specified for such use, and shall approve for such use in the work.
- 24. Owner: The term "Owner" shall mean any person, group or persons, firm or firms, corporation or corporations, or any other legal entity having legal title to or sufficient proprietary interest in the land sought to be subdivided or developed under these regulations.
- 25. Owner's Engineer: Shall mean the engineer or land surveyor registered and in good standing with the State Board of Registration of Tennessee who is the agent in his professional capacity of the owner of land which is proposed to be subdivided or developed or which is in the process of being subdivided.
- 26. Planned Residential Development: shall mean the use of land density of buildings and structures different from those which are allowed as of right within the zoning district in which the land is situated.
- 27. Plans: The official construction drawings or exact reproduction thereof which show and describe the work to be done.
- 28. Primary Circuits: Shall mean wiring methods from a distribution network to a secondary supply transformer.
- 29. Probate Judge: Shall me the County Judge of Probate for the appropriate competent jurisdiction.
- 30. Provide: Shall mean furnish, install and connect, and put in good working order.
- 31. Registered Engineer: An engineer properly licensed and registered in the State of Tennessee.
- 32. Resubdivision: A change in a map of an approved or recorded subdivision plat if such change affects any street layout on such map or area reserved thereon for the public use, or any lot line; or if it affects any map or plan legally recorded prior to the adoption or any regulations controlling subdivisions.
- 33. Sanitary Sewer: A sewer which carries wastewater.
- 34. Secondary Circuits: Shall mean wiring methods from a secondary supply transformer to a meter base.
- 35. Sketch Plat: A sketch preparatory to the preparation of the preliminary plat (or Final Plat in the case of a minor subdivision) to enable the applicant to save time and expense in reaching general agreement with the Authority as to the form of the play and the objective of these regulations.
- 36. Southwest Tennessee Electric: Hereafter referred to as SWTNE.
- 37. Special Conditions: Additions and revisions to the standard Specifications applicable to an individual project. The special conditions are intended to supplement, modify, or delete items covered in the standard Specifications. Special conditions shall prevail over General Conditions.
- 38. Specifications: A part of the documents containing the written directions, provisions, and requirements for completing work. Standards for specifying material or testing which are cited in the contract Specification by reference shall have the same force and effect as if included in the contract physically.
- 39. State: State of Tennessee
- 40. Station: A specific point on the centerline of a sewer or water main or on the survey baseline designating some specific distance from the point of origin. Stations are numbered in terms of one hundred linear feet measured horizontally.
- 41. Storm Sewer: A sewer which carries surface runoff and subsurface waters.
- 42. Structures: Facilities such as bridges, culverts, catch basins, inlets, retaining walls, cribbing, storm and sanitary sewer line, water lines, underdrains, electrical ducts, manholes, handholes, lighting fixtures and poles, transformers, flexible and rigid pavements, buildings, vaults, and other manmade features that may be encountered in the work and not otherwise classified herein.
- 43. Subdivider: Any person who (1) having an interest in land, cases it, directly or indirectly, to be divided into a subdivision or who (2), directly or indirectly sells, leases, or develops, or offers to sell, lease, or develop, advertises for sale, lease, or development, any interest, lot, parcel, site, unit, or plat in a subdivision, and who (3) is directly or indirectly controlled by, or under direct, or

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indirect common control with any of the foregoing.

- 44. Subdivision: Shall mean the division of a lot, tract, or parcel of land into two (2) or more lots, plats, or sites, or other division of land for the purpose, whether immediate or future, of sale or of building development. It includes re-subdivision and, when appropriate to the context, relates to the process of subdividing or to the land or territory being subdivided. It shall include all divisions of land involving the dedication of a new street or a change in existing streets.
- 45. Wiring: Shall mean wire and cable, installed in a raceway with all required boxes, fittings, connectors, etc. completely installed.
- 46. Work: The furnishing of all labor, materials, tools, equipment and incidental necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, Plans and Specifications.
- 47. Written Notice: Any notice to any party of the contract relative to any part of the contract in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address or delivered in person to said party or his authorized representative on the work.

1.3 Standard Reference Specifications

1.3.1 All standard Specifications referenced throughout these Specifications are to be taken as the latest version available.

1.3.2 The following is a nonexclusive list of national standard Specifications are to be taken as the latest version available.

ANSI	
A21.10	Standard for Gray-Iron Ductile-Iron Fittings, 2- ich Through 48-inch for water and other liquids
A21.11	Standard for Rubber Gasket Joints for Cast-Iron and Ductile-Iron pressure pipe and fittings
A21.15	Standard for Flanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges
A21.40	Standard for Cement-Mortar Lining for Cast- Iron and Ductile-Iron Pipe and Fittings for Water
A21.50	Standard for Thickness Design of Ductile-Iron Pipe
A21.51	Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined for Water or Other Liquids

AWWA

C105	Polyethylene Encasement for Gray and Ductile Cast Iron Piping for Water and Other Liquids
C115	Standard for Flanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges
C301	Standard for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and other Liquids
C302	Standard for Reinforced Concrete Pressure Pipe, Non-Cylinder Type, for Water and Other Liquids
C500	Standard for Gate Valves 3 in. Through 48 in. NPS for Water and Sewage Systems.
C502	Dry-Barrel Fire Hydrants
C504	Rubber-Seated Butterfly Valves
C509	Resilient-Seated Gate Valves, 3 in. through 12 in. NPS, for Water and Sewer Systems
C550	Protective Interior Coatings for Valves and Hydrants

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C600	Installation of Ductile-Iron Water Mains and their Appurtenances	
C601	Disinfecting Water Mains	

ASTM

A27	Mild to Medium Strength Carbon Steel Castings for General Application	C33	Concrete Aggregates
A44	Gray Iron Castings	C39	Comprehensive Strength of Cylindrical Concrete Specimens
A53	Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless	C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
A82	Cold-Drawn Steel Wire for Concrete Reinforcement	C62	Building Brick (Solid Masonry Units Made From Clay or Shale)
A123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip	C76	Reinforced Concrete, Culvert, Storm Drain and Sewer Pipe
A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware	C90	Hollow Load-Bearing Concrete Masonry Units
A167	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip	C94	Ready Mix Concrete
A184	Fabricated Deformed Steel Bars Mats for Concrete Reinforcement	C109	Compressive Strengths of Hydraulic Cement Mortars (Using 2 in. or 5MM Cube Specimens), Test Method for Portland Cement
A185	Welded Steel Wire Fabric for Concrete Reinforcement	C150	Portland Cement
A227	Steel Wire, Hard-Drawn for Mechanical Springs	C171	Sheet Materials for Curing Concrete
A283	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars	C172	Sampling Free Concrete
A307	Carbon Steel Externally Threaded Standard Fasteners	C309	Liquid Membrane-Forming Compounds for Curing Concrete
A449	Quenched and Tempered Steel Bolts and Studs	C425	Compression Joints for Vitrified Clay Pipe and Fittings
A496	Deformed Steel Wire for Concrete Reinforcement	C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
A497	Welded Deformed Steel Wire Fabric for Concrete Reinforcement	C478	Precast Reinforced Concrete Manhole Sections
A563	Carbon and Alloy Steel Nuts	C494	Chemical Admixtures for Concrete
A570	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality	C497	Determining Physical Properties of Concrete Pipe (D-Load Test)
A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement	C564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
A616	Rail-Steel Deformed and Plain Bars for Concrete Reinforcement	C828	Low-Pressure Air Test of Vitrified Clay Pipelines (4 to 12 in.)
A617	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement	D698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. Rammer and 12-inch. Drop
A648	Steel Wire, Hard Drawn for Prestressing Concrete Pipe, Spec	D968	Abrasion Resistance of Organic Coatings by the Falling Abrasive Tester
A746	Ductile Iron Gravity Sewer Pipe	D1238	Flow Rates of Thermoplastics by Extrusion Plastometer
B47	Copper trolley Wire	D1248	Polyethylene Plastics Molding and Extrusion Materials
B108	Aluminum-Alloy Permanent Mold Castings	D1505	Density of Plastics by the Density-Gradient Technique
B209	Aluminum-Alloy Sheet and Plate	D1693	Environmental Stress-Cracking of Ethylene Plastics
B211	Aluminum-Alloy Bar, Rod, and Wire	D2122	Dimensions of Thermoplastic Pipe and Fittings

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	Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and		
B221	Tubes	D2657	Heat Joining of Polyolefin Pipe and Fittings
B241	Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube	D2751	Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
	Aluminum-Alloy Standard Structural Shapes, Rolled or		Resistance of Organic Coatings to the Effects of Rapid
B308	Extruded	D2794	Deformation (Impact)
C31	Making and Curing Concrete Test Specimens in the Field		
C32	Sewer and Manhole Brick (Made from Clay or Shale)		

1.3.2.1 The following is a list of other publications referenced in the Specifications:

Tennessee Department of Transportation

- (a) Manual on Uniform Traffic Control Devices for Streets, and Highway
- (b) Standard Specifications for Highway Construction

1.3.2.2 Occupational Safety and Health Administration

(a) Safety and Health Regulations for Construction

1.3.2.3 Americans with Disabilities Act Guidelines

1.3.2.4 Architectural Barriers Act

1.4 Standards for Construction Plans

1.4.1 All Construction Plans Must have a Title Sheet with certain required signatures, including a Tennessee Professional Engineer's seal. The format for these signatures is illustrated below:

Construction Plan Certificates

Certificate of Accuracy of Engineering and Design

I, <u>(printed name of signer</u>), do hereby certify that I am a registered Professional Engineer and hereby certify that the plans, engineering and designs governing the construction of this subdivision are true and correct, and conform to the requirements set forth in the Subdivision Regulations and Technical Specifications of the Town of Atoka.

In witness where of, I <u>(printed name of signer)</u>, the said Professional Engineer, hereunto set out my hand and affix my seal this <u>day of</u>, 20___.

Professional Engineer State of Tennessee Certificate No.

(SEAL)_____

Certificate of a Adequate Storm Drainage

I, (<u>printed name of signer</u>), do hereby certify that I am a registered Professional Engineer and that I have designed all storm water drainage for the <u>(name of subdivision)</u> Subdivision to assure that neither said subdivision nor any adjoining properties will be damaged, or the character of land use affected by velocity and volume of water entering or leaving same. In witness where of, I <u>(printed name of signer)</u>, the said Professional Engineer, hereunto set out my hand and affix my seal this <u>day of</u>, 20___.

Professional Engineer State of Tennessee Certificate No.

Planning Commission Certificate of Approval of the Construction Plan

I. <u>(printed name of signer)</u>, do hereby certify that the Town of Atoka's Planning Commission has approved this as the Construction Plan. The signing of this certificate in no way indicates approval of or acceptance of the Final Plat.

Date

1

Secretary, Town of Atoka Planning Commission

1.4.2 The signatures of the Town of Atoka personnel indicate the following:

_____, 20

Review of Construction Plans for conformance with the Standard Construction Specification, a review of the Construction Plans for acceptable hydraulic, flowcarrying capacity and compatibility with long-term growth plans of the proposed water and sewer facilities.

1.4.3 The Title Sheet must contain a location map at a scale not smaller than 1"=1,000', the name of the project, and the name(s) of the Developer(s). The Title sheet must also contain an index to all sheets, and the following statement in the lower right-hand corner:

"Construction Specifications, latest edition as adopted by the Town of Atoka is hereby made a part of these Plans."

1.4.4 Street Plan containing the following:

- (a) Location of all proposed and existing streets or rights-of-way in or adjacent to the subdivision.
- (b) Width of existing and proposed rights-of-way
- (c) Street names
- (d) Plan of all streets, showing natural and finished grades drawn to a scale of not less that 1"=100'
- (e) Location of all required sidewalks and crosswalks

1.4.5 Storm Drainage Plan containing the following information:

- (a) Location of proposed drainageways, streams, and ponds in the subdivision
- (b) Topography at contour intervals not exceeding 2-feet
- (c) Location of easements and right-of-way for drainage ways and maintenance access thereof
- (d) Erosion/Sedimentation Control Plan: Shown on a site grading plan with existing and finished contours extending a minimum of 50' beyond the property line. Minimum erosion and sediment control measures as defined by the Tennessee Department of Environment and Conservation shall be indicated on the plan.

1.4.6 Sanitary Sewer Construction Plans shall contain the following information:

- (a) Plan and profile of proposed sewer system, drawn at 1" =50' horizontal and 1" =10 vertical scales, with grades (%) indicated and invert elevations shown at every manhole.
- (b) All pertinent planimetric features
- (c) Planimetric location of proposed sewers are related to existing or proposed: streets, alleys, highway, buildings, structures, other utilities, easements, and right-of-ways.
- (d) Location, size, and material of all existing and proposed sewers, with locations of connections to the other sewers and locations of service laterals.
- (e) Direction of flow in each sewer line
- (f) Horizontal location of all manholes and other system features, and deflection angles at manholes
- (g) Construction details of typical manholes, connections, service laterals, pipe bedding, trenches, road crossings (including encasement if required), stream or ditch crossings, and slope protection
- (h) North arrow on each Plan sheet
- (i) Tennessee Professional Engineer's seal on each Plan Sheet
- (j) Bench Mark location and elevation based on USGS datum
- (k) All topographic features, both existing and proposed
- (1) All property lines including subdivision block and lot numbers, right-of-way, and required or utilized easements
- (m) Off-site related right-of-way, as required
- (n) Indications of any modifications or revisions from previous drawings
- (o) References to applicable Standard Construction Specifications of the Authority with respect to the required for the construction of utility improvements proposed

1.4.7 Water Distribution Construction Plans shall contain the following information:

- (a) Plan of proposed water system, drawn at 1" =50', with all critical elevations
- (b) Location, size, and material of all existing and proposed water mains in the subdivision, (or outside of the subdivision if off-site connections are required), with locations of connections to other mains, service connections, valves, fire hydrants, and all other appurtenances indicated
- (c) Flow rate and pressure information, both residual and static, for the existing water system at or near the point of connection with the proposed water system
- (d) Construction details of typical pipe bedding, trenches, road crossings (including encasement if required), stream or ditch crossings, slope protection, service Standard Utility Specifications

connections, fire hydrants, and valves and other related appurtenances

- (e) North arrow of each Plan Sheet
- (f) Tennessee Professional Engineer's seal on each Plan Sheet
- (g) All topographic features, both existing and proposed
- (h) All property lines including subdivision block and lot numbers, right-of-way, and required or utilized easements
- (i) Off-site related right-of-way, as required
- (j) Indications of any modifications or revisions from previous drawings
- (k) References to applicable Standard Construction Specifications of the Authority with respect to the required for the construction of utility improvements proposed

1.4.8 Gas

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- (a) Plan of proposed gas system, drawn at 1"=50'
- (b) Location, size, and material of all existing and proposed gas lines in the subdivision, (or outside the subdivision if off-site connections are required), with locations of connections to other mains, service connections, valves, and all other appurtenances indicated
- (c) Construction details of typical pipe bedding, trenches, road crossings (including encasement if required), stream or ditch crossings, slope protection, service connections, valves, and other related appurtenances
- (d) Noth arrow on each Plan sheet
- (e) Tennessee Professional Engineer's seal on each Plan sheet
- (f) All topographic features, both existing and proposed
- (g) All property lines including subdivision block and lot numbers, right-of-way, and required or utilized easements
- (h) Off-site related right-of-way, as required
- (i) Indications of any modifications or revisions from previous drawing
- (j) References to applicable Standard Construction Specifications of the Authority with respect to the required for the construction of utility improvements proposed

1.4.9 Electrical

- (a) Plan of proposed electrical system, drawn at 1 = 50'
- (b) Location, sizes, and materials of all existing and proposed electrical work in the subdivision, (or outside the subdivision if off-site connections are required), with locations and all appurtenances indicated
- (c) Constructions details as necessary
- (d) North arrow on each Plan sheet
- (e) Tennessee Professional Engineer's seal on each Plan sheet
- (f) All property lines including subdivision block and lot numbers, right-of-way, and required or utilized easements
- (g) Off-site related right-of-way, as required
- (h) Indications of any modifications or revisions from previous drawings
- (i) References to applicable Standard Construction Specifications of the Authority with respect to the required for the construction of utility improvements proposed

1.4.10 For all subdivision subtending land which falls within 200 ft. of any gas transmission pipeline or Standard Utility Specifications

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fiberoptic trunk line, the developer shall send a certified letter to the appropriate utility owner (with a copy to the Authority) notifying them of the project. It shall be the responsibility of the applicant to provide the Authority with the letter of approval and with construction drawing (to accompany the preliminary plat), accompanied by the appropriate endorsements of the referenced departments or agencies, prior to the Authority's approval of the preliminary plat.

1.4.11 The Town of Atoka requires independent resident project observation on an as needed basis up to and including full-time, on-site observation, for any infrastructure related to construction. The costs associated with the resident project observation will be the responsibility of the developer and shall be paid in advance to the Town of Atoka prior to the developer receiving Planning Commission or City Council approval of the submitted subdivision plans. A preliminary opinion of the probable costs associated with resident project observation will be presented to the developer prior to final approval of the developer's subdivision plans. The funds will be escrowed in a non-interest-bearing account and neither the Town nor the developer will be eligible to collect interest from the escrowed funds. Any costs in excess of the preliminary opinion of probable costs will be billed to the developer and must be paid prior to issuance of any building permits. Any amount unused for resident project observation will be returned to the developer following final acceptance by the Town of Atoka of the infrastructure and receipt of a release of liens from the infrastructure contractor and/or developer.

1.5 Design Criteria

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1.5.1 Sanitary Sewers

- (a) All sanitary sewers shall be designed in accordance with these criteria, specification contained in other sections, and the standards of the Tennessee Department of Environment and Conservation (TDEC).
- (b) Sanitary sewers to be dedicated to the Authority shall be constructed within dedicated rights-of-way or utility and drainage easements.
- (c) Sewers shall be designed for a minimum velocity of 3.0 ft/second at design flow, a maximum velocity of 5.0 ft/second, and shall accommodate design flow at one-half full. Sewers shall have a minimum 8 inch diameter, and minimum slope for 8 inch sewers shall be 0.40% (0.40 ft/100 ft).
- (d) Design flow shall be based on a contribution of 100 gallon/person/day multiplied by a peak factor of 4.0. If the sewer serves other than residential developments, the design flow shall be calculated independently for each user based on their specific demand.
- (e) In general, sewers should be sufficiently deep to receive wastewater from basements and to prevent freezing. Insulation shall be provided for sewer that cannot be placed at a depth sufficient to prevent freezing.
- (f) Buoyancy of sewers shall be considered, and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.
- (g) All sewers shall be designed and constructed to give mean velocities, when flowing one-half, of not less than 2.0 feet per second (0.6 m/s), based on Manning's formula using an "n" value of 0.013. The following are the recommended minimum slopes which should be provided; however, slopes greater than these are desirable.

- -- -

- - -

	Minimum Slope in Feet
Nominal Sewer Size	per100Feet(m/100m)
8 inch (200 mm)	0.40
10 inch (250 mm)	0.28
12 inch (300 mm)	0.22
14 inch (350 mm)	0.17
15 inch (375 mm)	0.15
16 inch (400 mm)	0.14

18 inch (450 mm)	0.12
21 inch (525 mm)	0.10
24 inch (600 mm)	0.08

- (h) Sewers shall be laid with uniform slope between manholes.
- (i) All manholes shall be designed in accordance with the following guidelines:

1) Maximum distance between manholes shall be 400 ft

2) Maximum deflection angle at manholes shall be 90 degrees

3) For in/out invert elevations greater than 2.0 ft, a drop manhole shall be used. Drop manholes shall be avoided where practical.

4) Watertight frames and covers shall be required where the proposed manholes are subject to inundations.

5) A vent assembly shall be required on truck sewers at approximately 1500 ft intervals, and at the end manhole where practical.

(j) All sanitary sewers shall be constructed of the following types of pipe:

1) Sanitary sewers 21 inches in diameter and smaller shall be constructed of ductile iron sewer pipe or PVC sewer pipe unless specific needs demand otherwise, and only then pending the review and approval of the Engineer. PVC sewer pipe shall be allowed where the pipe slope is less than or equal to 12.00% or the cut is greater than 14ft, ductile iron sewer pipe shall be used. "Cut" is defined as the vertical distance from the finished ground, or surface, to the invert of the pipe.

2) Sanitary sewers with slopes in excess of 18% shall be constructed with concrete restraining collars designed at intervals to insure pipe stabilization.

3) Sanitary sewers 21 inches in diameter and larger shall be constructed of epoxy lines ductile iron sewer pipe or reinforced concrete sewer pipe with steel end ring joints, unless specific needs demand otherwise, and only then pending the review and approval of the Engineer.

4) Sanitary sewers crossing storm drains, creeks, or ditches shall be ductile iron pope and will be provided with concrete encasement.

5) Sanitary sewers with less than 4ft of cover shall be ductile iron pipes.

6) If areas which have been filled and the proposed sewer will be within the fill, ductile iron pipe must be specified. If the pipe trench through the filled area is to be undercut to natural ground and refilled to pipe grade with properly compacted crushed stone, PVC or concrete pipe may be approved by the Authority.

- (k) All sanitary sewers shall have a minimum of 30 inches of cover in a non-traffic area and 48 inches in paved areas subject to vehicular traffic.
- (1) Separations between sanitary sewers and water mains shall be 10 feet horizontal, and 18 inches vertical between the bottom of the water main and top of the sanitary sewer.
- (m) Permanent easements for sanitary sewers shall be a minimum width of 20 feet. Sanitary sewer depth will not exceed 12 feet.
- (n) Sewers shall be designed to serve every lot or parcel adjacent to the sewer, and manufactured, 90-degree "tees" shall be used for connection service line to the collector sewer.
- (o) In general, sewers 24 inches (600 mm) or less shall be laid with straight between manholes. Straight alignment shall be checked by either using a laser beam or

lamping.

- When a smaller sewer joins a large one, the invert of the larger sewer should be (p) lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation. Sewer extensions should be designed for projected flows even when the diameter of the receiving sewer is less than the diameter of the proposed extension at a manhole constructed with special consideration of an appropriate flow channel to minimize turbulence when there is a change in sewer size. The Authority may require a schedule for construction of future downstream sewer relief.
- All sanitary sewers or force main systems which discharge into the Authority's system (q) shall be designed according to these criteria.

1.5.2 Water Mains

- (a) All water mains shall be designed in accordance with these criteria, Specifications contained in other sections, and the standards of the Tennessee Department of Environment and Conservation (TDEC).
- (b) Water mains to be dedicated to the Authority shall be constructed within dedicated rights-of-way, or utility and drainage easements, at least 20 ft in width.
- (c) All potential customers shall be provided a minimum of 20 psi residual pressure, at the design domestic flow:

 $O=20 (c)^{\frac{1}{2}}$

Q = flow in gpm

C=total customers served, based on 2.5 persons/customer

- All development shall be provided a minimum of 500 gpm fire flows unless the (d) development requires a higher fire flow rate.
- Maximum designed velocity shall be 5.0 ft/sec. (e)
- (f) All water mains less than 12" in diameter shall be PVC Class 200, unless otherwise necessary for compliance with guidelines for pressure ratings. All water mains 12" and greater in diameter shall be ductile iron pipe, Pressure Class 350, unless otherwise necessary for compliance with guidelines for pressure ratings. All water mains shall be a minimum of 6" diameter.
- Water mains shall be designed for installation behind curbs where practical. Dead-end (g) mains shall extend to the last lot or parcel being served so that no service lines are installed in front of adjacent lots or parcels. Service meters shall be located adjacent to property lines and grouped in pairs where practical.
- All mains shall have a minimum of 30 inches of cover in non-traffic areas, and a (h) minimum of 36 inches of cover in paved areas subject to vehicular traffic.
- Water main shall have 10 ft horizontal and 18" vertical clearance from sanitary sewers (i) and shall have 3 ft horizontal and 12" vertical clearance from other underground structures.
- All service lines which cross under streets, highway, or any other paved roads must be (j) placed inside Schedule 40 PVC casing pipe, 2" minimum size, to 2ft behind the curb. The size of the casing will vary, depending on the size of the service line. All service lines greater than 50' in length shall be 1" diameter, minimum.
- A 3-way valve arrangement shall be required at every water main intersection, where (k) feasible. For connection to live mains, check with the Authority for details on allowable connection features.
- (1) Adequate thrust blocking shall be designed for the expected pressures, including the

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required test pressure, 200 psi minimum.

- (m) Fire hydrants shall be required at a maximum spacing of 500 ft, and no more than 300 feet from any structure. Fire hydrants shall not be permitted on lines smaller than 6" in diameter.
- (n) A fire hydrant, or flushing hydrant or blow-off assembly, shall be required at the dead end of any water main to allow for flushing the main at 2.5ft/sec minimum.
- (o) Pressure regulators for individual services are not required by the Authority except in areas of pressure exceeding 75 psi; however, they are recommended. They are not part of the Authority's system for operation and maintenance.
- (p) All water mains and appurtenances which connect to the Authority's system shall be designed according to these criteria.

1.5.3 Gas Lines

- (a) All gas lines shall be designed in accordance with these criteria, specifications contained in other sections, and the standards of the Tennessee Department of Environment and Conservation (TDEC).
- (b) Gas lines to be dedicated to the Authority shall be constructed within dedicated rightsof-way or utility and drainage easements.
- (c) The following information must be provided for the development:
 - 1) Ambient Temperature
 - 2) Specific Gravity of Gas
 - 3) Proposed Demand (ft^3 per 24 hour)
 - 4) Absolute Pressure at beginning point of line (tie-in to existing system)
 - 5) Absolute Pressure at ending point of line
- (d) Gas valve will be required at each point of the line where the tie-in to the existing system occurs.
- (e) A cathodic protection test station will be required for each new development.

1.5.4 Roadways

1.5.4.1 Street Classifications

- (a) Major Arterial Primary function is to accommodate regional through traffic. Major arterials emphasize mobility over land access. These facilities have relatively long trip lengths at moderate to high operating speeds with the highest traffic volumes.
- (b) Minor Arterial Primary function is to accommodate local/regional through traffic, to connect communities, and to provide access from regional roads to lower standard roads. These facilities generally interconnect with and augment major arterial routes at moderate operating speeds with less stringent access limitations.
- (c) Major Collector Primary function is to accommodate local traffic and to provide access to local streets and adjacent properties. These facilities collect and distribute moderate amounts of traffic between arterial streets and local roads at moderate to low operating speeds. Some major collectors have sufficient traffic volumes to support signalized intersections
- (d) Minor/Neighborhood Collection Primary function is to accommodate local traffic and to provide access to local streets and adjacent properties. These facilities collect and distribute moderate amounts of traffic between arterials, major collectors, and

local/ residential streets at relatively low operating speeds. These facilities provide easy movement within neighborhoods and channel neighborhood trips onto the arterial street system.

(e) Local/Residential Street - Primary function is to provide direct access to adjacent properties and connections to the higher order classified roadways within residential neighborhoods. These facilities have low traffic volumes, low operating speeds and short trip lengths.

1.5.4.2 Design Policy

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- (a) All roadway, traffic control and signalization plans submitted to the Town of Atoka shall be sealed by a Professional Engineer registered to practice in the State of Tennessee.
- (b) The project shall be designed in accordance with criteria set forth in the latest revision of the American Association of State Highway and Transportation Officials (AASHTO) publication "<u>A Policy on Geometric Design of Highways and Streets</u>", the latest revision of the Federal Highway Administration (FHWA) publication "Manual on Uniform Traffic Control Devices (MUTCD)" and criteria identified within this document and/or Tennessee Department of Transportation.

1.5.4.3 Design Speed

(a) Local/Residential

Design	Design
ADT (veh/day)	Speed (MPH)
<50	20
50-400	30
>400	40

(b) Collector

Design	Design
ADT (veh/day)	Speed (MPH)
<400	30
400-2,000	40
>2,000	50

(c) Arterial

Design
Speed (MPH)
40
50
60

1.5.4.4 Sight Distance

(a) Sight distance along streets and at intersections shall not be less than the minimum horizontal and vertical distances as specified in the current edition of "<u>A Policy on</u> <u>Geometric Design of Highways and Streets</u>", AASHTO, for the class of street under consideration.

1.5.4.5 Horizontal and Vertical Geometry

- (a) All horizontal and vertical design shall be in accordance with the current edition of "A Policy on Geometric Design of Highways and Streets", AASHTO.
- (b) The maximum grades (%) shall not exceed the following:

Local/Residential	11%
Collector	9%
Arterial	6%

(c) In setting the alignment and grades for streets, due consideration shall be given to storm drainage. In general, the depth of flow in gutters and the allowable spread of water shall be consistent with the functional classification of the street. Arterial streets shall be designed to remain virtually free of

water. Deeper flows and wider spreads may be tolerated on collector and land access streets. Street alignment and grades shall be designed so that, during severe rainfall events, the collector and land access streets can serve as open channels supplementary to the minor, normally piped, storm drainage system without flooding adjoining lots or building sites; therefore, mid-block sags in street grades are to be avoided and grades are to be set so as to generally parallel storm sewer gradients. During frequent normal rainfall events, appreciable runoff shall not be permitted to flow across intersections. The rate of flow for runoff contained on streets shall not normally exceed ten (10) feet per second.

- (d) Minimum grades on all roads shall be one-half of a percent (0.5%).
- (e) In general, the residential/neighborhood streets shall not have any superelevation.
- (f) The normal crown or cross-slope of all streets shall be 0.02 ft/ft.

1.5.4.6 Minimum Roadway Widths of Right-of-Way

Types of Minimum		Minimum	
Street	Pavement Width	Right-of-Way	
Local/Residential	23'	50'	
Collector	24'	60'	
Arterial	24'	60'	

1.5.4.7 Median

(a) The minimum width of a median shall be 14 feet.

1.5.4.8 Cul-de-sac or Turnarounds

- (a) Cul-de-sac and turnaround shall be designed to accommodate emergency and service vehicles.
- (b) Cul-de-sac or turnaround may not be required for streets shorter than 200', where emergency and service vehicles are able to back out.
- (c) The maximum length of streets leading to a cul-de-sac or turnaround shall be 1000'.
- (d) Minimum r a d i i f o r residential classifications shall be 30' and industrial classifications shall be 50'.

1.5.4.9 Intersections

(a) Intersecting streets should meet at a ninety (90) degree angle. Where this is

restrictive, due to obstacles, the intersecting streets may have a centerline angle of not less than seventy-five (75) degrees.

- (b) Intersection sight distance shall not be less than the distances specified or calculated according to the current edition of "<u>A Policy on Geometric Design of</u> <u>Highways and Streets</u>", AASHTO.
- (c) Offset T-Intersections: The centerline-to-centerline distance between offset T-type intersections shall be at least 150' along local streets and at least 300' along all other classified roadways.
- (d) All distances listed are minimum distances only. The actual required distance shall be determined by traffic analysis of the intersection locations and traffic volumes at each intersection.

1.5.4.10 Curbs, Gutters, Sidewalks, and Ramp

- (a) All curbs, g u t t e r s, sidewalks and ramps shall be designed in accordance with "A Policy on Geometric Design of Highways and Streets", AASHTO, "American with Disabilities Act Accessibility Guidelines", ADAAG, and "Architectural Barriers Act", ABA.
- (b) Sidewalks shall be a minimum of four (4) feet wide.

1.5.4.11 Guardrail

Guardrail shall be provided where warranted based on the current edition of "<u>Roadside Design</u> <u>Guide</u>", AASHTO.

1.5.4.12 Pavement Design

- (a) Pavement design shall be completed based on the design traffic volumes (ADT) for a specific facility.
- (b) For subgrade or base, a geotech engineer shall evaluate the necessity of a subgrade treatment and determine the appropriate method as identified in TDOT Standard Specifications. Any use of these alternative methods must meet TDOT Standards.
- (c) Typical paving sections are shown of the standard drawing contained in this document.

1.5.4.13 Drainage

- (a) All storm drainage shall be designed in accordance with these criteria, specifications contained in other sections, and detailed in the latest edition of the Tennessee Depart of Transportation (TDOT) Design Division Drainage Manual.
- (b) An adequate drainage system shall be provided and properly installed to provide adequate drainage of all surface water. This is applicable but is not limited to the following activities:

1) Altering, rerouting, deepening, widening, obstructing, or changing in any way an existing drainage system.

2) Development for: residential or other subdivisions; commercial, institutional, industrial, utility, or other activities.

- 3) Excavating, filling, grading, draining, or paving lots.
- 4) Commencing any other development which may: significantly increase or Standard Utility Specifications

decrease the rate and/or quantity of surface water runoff; or degrade the quality of water.

5) Other improvement, demolition, or construction activity that may create situations such as earth/mud slides, rock falls, slides, erosion/siltation, and/or the destabilization of karst terrain.

- (c) It is the responsibility of the developer or property owner to provide the Authority with a State approved Storm Water Pollution Prevention Plan (SWPPP) prior to any construction activities.
- (d) It is the responsibility of the developer or property owner to pick up or acceptably handle the stormwater runoff as it flows onto the property from the watershed above and conduct it to an adequate drainage outfall at the property line at the lower elevation. The outfall must be sufficient capacity to receive the runoff without deterioration of the downstream drainage way. All storm drainage systems shall:
 - 1) Account for both onsite and offsite stormwater.
 - 2) Maintain natural drainage divides.

3) Convey stormwater to a stream, channel, natural drainage way, or other existing facility at admissible velocities and existing location.

4) Ensure the design will not adversely affect adjacent or neighboring properties.

5) Utilize energy dispersion systems where flows will be of sufficient velocities to cause erosion or other damage.

- (e) Storm sewer systems shall be designed to prevent flooding of property of all classes by storm events having a specified return period.
- (f) A Professional Engineer registered to practice in the State of Tennessee is required to design the stormwater system. The plans shall contain, as a minimum the following items:
 - 1) Total land area.

2) Existing and proposed topography of existing land and impervious areas shown in a maximum of two (2) foot intervals.

3) Elevations of all existing and proposed streets, alleys, utilities, sanitary and stormwater sewers, and existing buildings and structures.

- 4) All existing and proposed impervious areas.
- 5) Natural or artificial watercourses.
- 6) Limits of flood plains (if applicable).
- 7) Existing and proposed slopes, terraces, or retaining walls
- 8) All existing and proposed stormwater drainage structures or features.

9) All stormwater structures and features immediately upstream and downstream of the site.

10) Erosion and siltation control plans.

11) Drainage calculations when required.

12) Drainage easements when required.

(g) The potential stormwater flows for the proposed development shall be determined by the Rational Method (for areas of <100 acres of development plus contributing watershed), the United States Department of Agriculture- Soil Conservation Service Technical Release 55 (TR-55) (for areas of >100 acres of development plus contributing watershed) or other acceptable method as detailed in the TDOT Design Division Drainage Manual.

- (h) The rainfall intensity (frequency/duration) curve to be used in calculating peak flow using the Rational Method is in Memphis, TN curve (Refer to end of this section).
- (i) The runoff coefficients used in the Rational Method shall be in the ranges of values show below:

	RUNOFF
VALUES OF RUNNOFF COEDDICIENTS (C)	COEFFICIENT
FOR USE IN THE RATIONAL METHOD	(C)
Rural Areas	
Concrete or sheet asphalt pavement	0.8 - 0.9
Asphalt macadam pavement	0.6 - 0.8
Gravel roadways or shoulders	0.4 - 0.6
Bare earth	0.2 - 0.9
Steep grassed areas (2:1)	0.5 - 0.7
Turf meadows	0.1 - 0.4
Forested areas	0.1 - 0.3
Cultivated fields	0.2 - 0.4
	RUNOFF
VALUES OF RUNNOFF COEDDICIENTS (C)	COEFFICIENT
FOR USE IN THE RATIONAL METHOD	(C)

Urban Areas

Flat residential, with about 30% of area impervious	0.40
Flat residential, with about 60% of area impervious	0.55
Moderately steep residential, with about 50% of area impervious	0.65
Moderately steep developed area, with about 70% of area impervious	0.80
Flat commercial/industrial, with about 90% of area impervious	0.80

<u>NOTES</u>: For flat slopes and/or permeable soil, use the lower values. For steep slopes and/or impermeable soils, use the higher values. For areas where there is a shallow bedrock surface, use the higher values.

Sources: Introduction to Highway Hydraulics Hydraulic Design Series Number 4. FHWA. April 1997 by James D. Schall and Everitt V. Richardson. Design of Roadside Channels – HDS 4. FHWA. May 1965 by James K. Searcy.

(j) Taken from TR-55, the 24-hour rainfall amounts for the different frequency storm events are listed below. These shall be used in the analysis and design of the stormwater systems.

	24-hour
<u>Frequency</u>	Rainfall Amount
2 year	3.9 inches
5 year	4.8 inches
10 year	5.5 inches
25 year	6.3 inches
50 year	7.0 inches

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100 year

1

7.7 inches

(k) The following table shows the design frequency storms to be used each drainage system component:

	Multilane Divided Arterial	Arterial	Collector	Local
Inlets	50-yr	10-yr	10-yr	10-yr
Storm Sewer	50-yr	10-yr	10-yr	10-yr
Culverts	50-yr check for 100-yr	50-yr check for 100-yr	50-yr check for 100-yr	50-yr check for 100-yr
Ditches	50-yr	10-yr	10-yr	10-yr

50-year design frequency storm shall be used in roadway sag sections.

- (1) The roadway freeboard shall be determined by a 50-year design frequency storm with the design high water elevation at or below the bottom of the roadway subgrade.
- (m) Stormwater detention facilities shall be designed to detain storm runoff in excess of the predevelopment runoff. The detained runoff shall be discharged at no greater than the 10-year frequency flow rate associated with the predevelopment conditions. Overflow or bypass capability shall be designed for a 100-year frequency storm event.
- (n) All driveway tile, laterals and cross drains are to be a minimum of 15-inch diameter pipe. The minimum size storm sewer pipe shall be 18 inches in diameter.
- (o) The depth of flow in the gutter or along any curb must not exceed the depth of the curb at any intersection or along the roadway.
- (p) When curb capacities are exceeded at a point, inlets shall be used intercept flow. In general, the greatest allowable spread on any facility is 8 feet, including gutter width, with the exception if the curb height is exceeded then the maximum spread shall be reduced as not to a depth greater than the curb height.
- (q) The maximum spacing between two adjacent catch basins should not be greater than 400 feet.
- (r) Cross drains and other pipe located under the pavement surface of any public street, alley, or public parking lot shall be made of reinforced concrete pipe (RCP) or Contech A-2000 pipe.
- (s) Longitudinal stormwater lines installed in the public right-of-way may be constructed of 14-gauge (minimum) corrugated metal pipe (CMP) or smooth interior high density polyethylene pipe (HDPE) or Contech A-2000 pipe providing they are installed a minimum of two (2) feet laterally from any public street pavement surface.
- (t) Stormwater pipe used under private driveways may be constructed of 14- gauge corrugated metal pipe (CMP), smooth interior high density polyethylene pipe (HDPE), Contech A-2000 pipe or reinforced concrete pipe (RCP). Each type of pipe shall conform to the minimum standards set forth in the TDOT Standard Specifications.
- (u) An approved concrete headwall shall be installed on all exposed ends of drainage pipe installed under public streets, commercial entrances and private driveways where required by the Town of Atoka.

- (v) Any run of pipe placed under the road or between lots with a length greater than 200 feet shall have junction boxes placed at a maximum of every 200 feet.
- (w) All pipe and drainage structures are to be installed to the manufacturer specification and as a minimum to the TDOT minimum design standards.
- (x) All manholes, castings, valves boxes, etc. which are located within the roadway, shall be finished to the elevation of the finished paving with any adjustments occurring prior to placing the final paving surface.
- (y) All junction and connection structure shall have an approved manhole access.
- (z) All storm drainage systems shall be designed to maintain a minimum velocity of flow of 3 ft/s and a maximum velocity of 15 ft/s when flowing full.
- (aa) All storm drainage pipes shall have a minimum cover of 12 inches.
- (ab) All storm drainage calculations shall be submitted as part of the approval process.

1.5.4.14 Electrical

- (a) The latest edition of all applicable building and safety codes shall be followed in the installation of the electrical underground distribution system. Included, but not limited to, are the:
 - 1) National Electric Code (NEC)
 - 2) National Electrical Safety Code (NESC)
 - 3) National Life Safety Code (NFPA 101)
 - Applicable Institute of Electrical and Electronic Engineers Codes (IEEE)
 - 5) U.S. Occupational Safety and Health Act of 1970 (OSHA)
 - 6) The American Concrete Institute (ACI)
 - 7) The American Society for Testing and Materials (ASTM)
 - 8) State of Tennessee Chapter 0780-2-1, Electrical Installations
- (b) The developer is to be held responsible for the full direction and supervision of all work being performed by his employees, agents, or developers. The developer shall also be responsible for the area at all times prior to acceptance, particularly in the prevention of damage to the electrical distribution system by the activities of other trades and utilities.
- (c) The developer is to replace at his expense any equipment damaged during installation or construction, or work not in compliance with the requirements in these specifications
- (d) Cleared and accessible areas shall be provided by the owner or developer for pad mounted transformers, switches, underground circuits and any and all other necessary electrical equipment to be installed by SWTNE. Easement requirements will be determined by the type and nature of the development.
- (e) Upon completion of any installation there under, the entire installation made by SWTNE and all equipment of every nature and description used in connection therewith, up to but not including the secondary service installed by the developer/customer, shall be and become a part of the electrical distribution system and a part of the operations of SWTNE. SWTNE shall have sole responsibility for Standard Utility Specifications

maintaining, repairing, and replacing said system. Maintaining, repairing and replacing of the customer installed secondary service with exception of metering equipment shall be the responsibility of the owner/developer/customer.

- (f) As a condition precedent to SWTNE agreeing to install and installing any electrical equipment upon any premises, the owner or developer must agree, for the benefits he will receive thereby, that SWTNE shall have a right of ingress and egress, for so long as any of its equipment remains upon said premises, for the purpose of entering thereon from time to time and uncovering, installing, repairing, maintaining, removing, and replacing such equipment or any other equipment used in connection therewith, and said right shall extend for a reasonable distance outside the boundary of the area actually occupied by any such equipment for such incidental uses and purposes as SWTNE may require. Upon exercise of the rights hereby created, SWTNE shall use reasonable care, under the conditions then existing, to minimize damage to the premises.
- (g) SWTNE will be responsible for restoring any unreasonable, unnecessary or willful damage to the premises. The owner of any premises upon which any equipment of SWTNE is placed hereunder will not use said premises in any way as to conflict with the rights of SWTNE or interfere with the proper use of SWTNE property located upon his premises.
- (h) If pad-mounted equipment, meterbases, and/or riser poles are more than fifteen feet (15') from a paved surface, SWTNE may require the developer to construct an all-weather road to provide accessibility to this equipment at the developer's expense.
- (i) Upon request of the owner, SWTNE will consider requests to relocate its equipment at the owner's expense if such relocation will not result in unreasonable interference with the electrical distribution system of SWTNE.
- (j) Care will be taken by SWTNE in placing equipment to avoid damage to existing trees and for aesthetics. Landscaping to improve the appearance of SWTNE equipment if desired is the prerogative of the owner or developer. Shrubs, screens or obstructions of any sort are not to be placed within six feet (6) of a door opening or three feet (3') to the other sides of a pad mounted transformer, switch or similar type equipment. (Measured from the edge of the concrete pad on which the equipment is located.) No overhead obstructions are permitted.
- (k) To offset part of the construction cost, the owner or developer shall provide materials and/or labor as indicated. Additional refundable and/or non-refundable investments may be required by SWTNE of the owner or developer as a condition precedent to any duty or obligation on the part of SWTNE relative to underground distribution, the amount of such additional investment depending on the cost of providing service.
- (1) All work done by the owner or developer shall be done according to standards and specifications prescribed by SWTNE. Work shall be supervised by SWTNE only for the purpose of insuring compliance with said standards and specifications, and the completed construction shall be inspected and approved by SWTNE, prior to such work being covered over by dirt or otherwise. If such construction is so covered prior to final inspection and approval by SWTNE, the customer or developer shall, at his own expense, uncover the same at the request of SWTNE. SWTNE will not supply electric service prior to final inspection by SWTNE. SWTNE does not hereby assume control over the individual actions of any persons not regular employees of SWTNE, does not hereby make such person's employees of SWTNE and hereby disclaims any responsibility or liability for damages, losses, or injuries resulting from any cause other than the sole negligence of the employees of SWTNE.
- (m) All changes made by the owner or developer in the project after the contract agreement are subject to SWTNE approval. The owner or developer may be required Standard Utility Specifications

to pay for changes that lead to extra investment by SWTNE.

- (n) 8' long, 5/8" diameter ground rods shall be driven at each pole and transformer location. Rods at transformer locations shall be buried to a minimum soil-contact depth of 7'8". Rods at pole locations shall be completely covered.
- (o) Trees and limbs shall be removed to provide adequate clearance for above ground installations.

1.5.4.15 Exterior Grease Traps

- (a) Grease traps shall be installed when required by the Authority.
- (b) Traps shall be designed with a minimum 60-minute detention period based on calculated peak flow through the trap.
- (c) Tank shall be designed in accordance with Rules of Tennessee State Board of Health, and International Building Code. The minimum tank size shall be 1,000 gallons.
- (d) Grease trap shall be shown on the Construction Plans and approved by the Authority.

1.5.4.16 Miscellaneous

- (a) All sanitary sewer, water, gas, electric and roadway facilities which connect to, or will be dedicated to, the Authority's existing infrastructure shall be designed in accordance with all criteria established herein. Also, all materials, construction, and testing of such facilities shall be in accordance with all Sections of this manual, regardless of whether such facilities will be dedicated to the Authority and therefor, shall be subject to inspection by the Authority as it deems necessary to insure the requirements contained herein are met.
- (b) If a proposed street, roadway, driveway, bike path, or sidewalk crosses an existing water main or sanitary sewer line, the trench backfill for that pipeline shall meet requirements of Section 3.09. That is, the trench shall be filled completely with properly compacted select earth material or with crushed stone. The method proposed by the Design Engineer or Developer will be reviewed by the Authority and approved according to the Authority's best interests.
- (c) Sanitary sewer lines and water mains shall be located as follows:

1) Trunk sewers shall be routed along natural drainage features, where practical, to provide a conduit at elevations low enough to serve the entire drainage basin within which the trunk is located, and to minimize impact on existing or proposed development.

2) Collector sewers shall be routed along existing or proposed street centerlines. In curved roadways, sewers shall be routed as close to center line as possible while maintaining a clearance of 5.0 feet, minimum, from faces of curbs, edges of pavement, or other drainage features.

3) Water mains shall be located a minimum of 3.0 feet behind curbs or from the edges of pavement. Mains shall be located consistently along the same side of the street within a project or development, and street crossings shall be minimized.

4) Gas lines shall be located a minimum of 7.0 feet behind curbs or from the edges of pavement. Lines shall be located consistently along the same side of the street within a project or development, and street crossings shall be minimized.

5) Electric lines shall be located a minimum of 10.0 feet behind curbs or from the edges of pavement. Lines shall be located consistently along the same side of the street within a project or development, and street crossing shall be minimized.
6) Deviations from the above, such as the routing of collectors' sewers along rear lot lines, shall be presented to the Authority and considered on a case-by-case basis. The Authority reserves the right to reject any particular layout or design of any water mains or sanitary sewers within its service areas.

(d) Any facilities not specifically covered herein shall be presented to the Authority for its approval. It is recommended the Authority be contacted prior to detailed design to discuss specific requirements.

1.6 **Review and Approval**

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1.6.1 Preliminary Play

- (a) STEP 1: The developer will consult early with Planning Staff, review the Major Road Plan, Subdivision Regulations, and Zoning Ordinance.
- (b) STEP 2: Fourteen days prior to the Planning Commission meeting at which the

plat will be reviewed:

1) The developer will submit four (4) copies of a preliminary plat to the City Administrator's Office, along with applications for any requested variances from subdivision regulations.

2) The developer will attend the Planning Commission workshop (2nd

Tuesday, 5:30 PM, Atoka Town Hall) to discuss the proposal.

- (c) STEP 3: Town Staff will review the preliminary plat for compliance with the Atoka Municipal Subdivision Regulations. A copy of these recommendations will be available at Town Hall seven days prior to the Planning Commission meeting.
- (d) STEP 4: The developer will attend the Planning Commission Meeting (3rd

Tuesday, 6:00 PM, Atoka Town Hall).

- 1) The Planning Commission will approve the plat,
- 2) Approve the plat contingent upon correction; or
- 3) Deny the plat. If denied, the reasons for disapproval will be stated in writing.
- (e) The developer will make necessary corrections or repeat Step 1) through Step 4) as necessary until approved or approved with contingencies. Submit approved (or corrected) plat to the City Administrator's Office. The City Administrator will obtain the necessary signatures.

1.6.2 Construction Plans

- (a) STEP 1: Twenty-one days prior to the Planning Commission meeting at which the development will be discussed, the developer will submit two (2) copies of signed and stamped Construction Plans to Town Hall. Construction plans will not be accepted prior to preliminary plat approval.
- (b) STEP 2: Town Engineer will review the construction plans for compliance with the standards set forth in the Town of Atoka Standard Utility Specifications.
- (c) STEP 3: The Town Engineer will return one (1) set of "mark-up" drawings and required corrections/revisions to the Design Engineer within fourteen (14) days.
- (d) STEP 4: The Design Engineer will make necessary corrections.
 - 1) As needed, the Design Engineer will contact the Town Engineer

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regarding corrections/revisions, data and measurements, etc.

2) The Design Engineer will return "mark-up" drawings and two (2) corrected sets of plans to the Town Administrator's Office.

(e) STEP 5: The Town Engineer will review the Construction Plans a second time.

Step 7 through Step 9 will be repeated as necessary until all corrections/revisions necessary for compliance have been made.

- (f) STEP 6: The Town Engineer will submit final proposed Construction Plans along with a memorandum certifying hydraulic analysis results, recommended fees or charges, and recommendation for acceptance of Construction Plans.
- (g) STEP 7: The Town Administrator's Office will notify the Design Engineer of the following by memorandum:
 - 1) Acceptance of Construction Plans
 - 2) Amount of fees
- (h) STEP 8: The Design Engineer will provide the following to the Town Administrator:
- 1) Original Title Sheet for Construction Plans, with necessary signature blocks
- 2) Payment, by check or letter of credit, for any fees or charges or a Letter of Request that submission of payment be delayed until or after other approvals, not to exceed 60 days.
- (i) STEP 9: The City Administrator will obtain the necessary signatures on the Construction Plans.
- (j) STEP 10: The Developer (or Design Engineer) will submit final Construction Plans to the Planning Commission for approval.
- (k) STEP 11: If approved, the Design Engineer will submit two (2) copies of the final Construction Plans to the Town Administrator, who will keep one approved set and forward another to the Town Engineer.
- (1) STEP 12: The Town Administrator will obtain the necessary signatures.

1.6.3 Final Plat

- (a) STEP 1: The developer will complete required improvements or provide an adequate surety instrument as detailed in the Atoka Municipal Subdivision Regulations.
- (b) STEP 2: Fourteen (14) days prior to the Planning Commission meeting at which the final plat will be reviewed:

1) The developer will submit ten (10) copies of the plat to the City Administrator's Office, along with applications for any requested variances from subdivision regulations.

2) The developer will attend the Planning Commission workshop (2nd Tuesday, 5:30 PM, Atoka Town Hall) to discuss the proposal.

- (c) STEP 3: Town Staff will review the final plat for compliance with the Atoka Municipal Subdivision Regulations. A copy of these recommendations will be available at Town Hall seven days prior to the Planning Commission meeting.
- (d) STEP 4: The developer will attend the Planning Commission Meeting (3rd Tuesday, 6:00 PM, Atoka Town Hall).

- 1) The Planning Commission will approve or disapprove the final plat.
- 2) If disapproved, the reasons for disapproval will be stated in writing along with necessary steps for approval.

1.7 Schedule

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- (a) After construction plan approval has been granted by the Authority and before any construction activity commences, a pre-construction meeting will be held at the Town of Atoka Town Hall. The participants of the meeting shall include the resident inspector, the Public Works director, representatives of all utility entities providing services to the proposed development, the property developer, and the construction foreman.
- (b) The developer will be required to submit a proposed construction schedule to the Authority at the preconstruction meeting.
- (c) The developer will be required to notify the Authority and the resident inspector a minimum of 48 hours before beginning any construction activities.

1.8 Bonds for Improvements

- (a) <u>Performance Bond for Water, Sewer, Gas, Drainage, Electric and/or Roadway Improvements</u>: See section 1.8 Submittals to Town under General Provision in the Atoka Subdivision Development Agreement and Regulations.
- (b) <u>Maintenance Bond for Improvements.</u> At the time of dedication and completion of subdivision improvements, the developer shall apply in writing (by letter) for acceptance of the improvements into the water distribution, sanitary sewer, roadway, drainage, electric and gas systems of the Authority. The letter must be accompanied by the following:

1) A statement signed by the developer and its consulting engineer, including a certification that the required improvements are complete, the total construction costs of said improvements, a certification that the improvements were constructed in accordance with standard specifications of the Authority and that they have successfully passed all testing required by the Authority and TDEC. The statement shall also include a certification that the developer and his engineer know of no defects from any cause in the improvements, and that the improvements are free and clear from any encumbrance or lien;

- 2) An agreement properly dedicating said improvements to the Authority.
- 3) Two (2) copies of as-built drawings of the improvement,
- 4) A Water, Sewer, Roadway, Drainage, Electric and/or Gas Improvements Maintenance Bond together with sufficient security deemed acceptable by the Authority's attorney.

The amount of this bond shall be fixed by the Authority's consulting engineer in an amount not less than 100% of the cost of the improvements. All costs to the Authority incurred in connection with review associated with fixing the amount of and approving maintenance bonds must be reimbursed to the Authority as a condition precedent to acceptance of the bond and the improvements.

The Maintenance Bond shall secure the Authority against defects or damage to the improvements arising out of defective or inferior materials or defective or negligent workmanship arising, occurring, or becoming apparent with one (1) year from the date of acceptance of the improvements. Inspection or acceptance of the water and sewer improvements by the Authority shall in no way affect the developer's obligation under the bond.

The application of acceptance should be filed with the City Administrator at least seven (7) days prior to

ARTICLE 1 – POLICIES AND PROCEDURES

the meeting of the Authority at which acceptance will be requested.

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ARTICLE 2: GENERAL CONSTRUCTION REQUIREMENTS

2.1 Construction Reference Standards

2

2.1.1 Requirements Included

- (a) Applicability of Reference Standard
- (b) Provision of Reference Standards at site

(c) Acronyms used in Policy Documents for Reference Standards. Source of Reference Standards

2.1.2 Quality Assurance

(a) For products or workmanship specified by association, trades, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

(b) The date of the Standard is in effect as the date of the approved construction plans.

2.1.3 Schedule of References

AASHTO American Association of State Highway and

Transportation Officials

444 North Capitol Street, N.W. Washington, DC 20001

ACI American Concrete Institute P. O. Box 19150 Reford Station Detroit, MI 48219

AGC Associated General Contractors of America 1957 E. Street, N.W. Washington, DC 20006

AI Asphalt Institute Asphalt Institute Building College Park, MD 20740

AISC American Institute of Steel Construction One East Wacker Drive Suite 700 Chicago, IL 60601

AITC American Institute of Timber Construction 400 North Michigan Avenue Eighth Floor Chicago, IL 60611

AISI American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036

ANSI American National Standards Institute 1430 Broadway New York, NY 10018

ASME American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017

ASPA American Sod Producers Association Association Building Ninth and Minnesota Hastings, NE 68901

ASTM American Society of Testing and Materials 1916 Race Street Philadelphia, PA 19103

AWWA American Water Works Association 6666 West Quincy Avenue Denver, CO 80235

CLFMI Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue, N.W. Washington, DC 20036

CRSI Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195

EJCDC Engineers' Joint Contract Documents Committee American Consulting Engineers Council 1050 15th Street, N.W. Washington, DC 20005

FM Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062

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FS Federal Specification
General Services Administration Specifications and Consumer Information Distribution Section (WFSIS)
Washington Navy Yard, Bldg. 197
Washington, DC 20407

MIL Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120

PCA Portland Cement Association5420 Old Orchard RoadSkokie, IL 60077

PCI Prestressed Concrete Institute 201 North Wacker Drive Chicago, IL 60606

PS Product Standard U. S. Department of Commerce Washington, DC 20203

SDI Steel Deck InstituteP. O. Box 3812St. Louis, MO 63122

SJI Steel Joist Institute 1703 Parham Road Suite 204Richmond, VA 23229

SSPC Steel Structures Painting Council 4400 Fifth Avenue Pittsburgh, PA 15213 TASTechnical Aid SeriesConstruction Specifications Institute601 North Madison StreetAlexandria, VA 22314

UL Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

2.2 General Project Requirements

2

Section Includes

General Requirements

2.2.1 General Requirements

- (a) Smoking and Fire Precautions: No smoking, fire, or use of any fire or explosion producing tools or equipment shall be permitted on the premises or at any locations where such may endanger said premises or the current operations thereon.
- (b) Manufacturers' Qualifications: The manufacturers of all materials and equipment used must be reputable and regularly engaged in the manufacture of the particular material or equipment for the use and service to which it will be subjected.
- (c) Contractor Shall Pay for All Laboratory Inspection Service: All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Contractor and approved by the Authority. Contractor to pay for all laboratory inspection services as a part of the Contract. Submit all material test reports to the Authority in triplicate.
- (d) Compliance With State and Local Laws: Comply with all applicable requirements of state and local laws and ordinances to the extent that such requirements do not conflict with federal laws or regulations.
- (e) Protection of Public and Private Property: Take special care in working areas to protect public and private property. The contractor shall replace or repair at his own expense any damaged water pipes, power and communication lines, or other public utilities, roads, curbs, gutters, sidewalks, drainpipes, ponds or pond structures, sewer drainage ditches, all properties and fixtures (both permanent and temporary) fences, and all plantings, including grass or sod on the site of the work. Leave the site in original or better condition after all cleanup work has been done.
- (f) Markers: Preserve all USGS, TVA, and State of Tennessee property markers and private markers. Do not remove or disturb any such markers without prior approval from the Owner. Any removal and replacement of such markers shall be at the expense of the Contractor.
- (g) Non-discrimination: The Contractor agrees to hire qualified persons without regard to race, creed, color, sex, or national origin for the performance of the work specified in this contract
- (h) Pavement Repair and/or Replacement: Whenever pipe trenches are cut across or along existing pavement or shoulders, backfill same and restore traffic over the cuts as quickly as possible by constructing a temporary surface with twelve (12) inches of Class A, grade D crushed stone. Add material and otherwise maintain such surface

until the permanent pavement is restored by the Contractor or until the entire project is accepted.

- (i) Department of Transportation Permits: The Owner shall secure any permits and provide bond as required by the Tennessee Department of Transportation or Tipton County, Tennessee for the installation of permanent facilities on highway rights-ofway. All such work shall be coordinated with and be subject to the approval of the Department of Transportation.
- (j) Approved Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either EPA or USDA. The use of all such chemicals and the disposal of residues shall be in strict conformance with instructions.
- (k) Catalogue Data for Authority: Provide duplicate complete, bound sets of a compilation of catalog data of each manufactured item of mechanical and electrical equipment used in the work and present this compilation to the Authority before final project close-out. Include descriptive data and printed installation, operating, and maintenance instruction (including a parts list for each item of equipment). Provide a complete double index as follows:
 - 1) Listing the products alphabetically by name.

2) Listing alphabetically the names of manufacturers whose products have been incorporated in the work, together with their addresses and the names and addresses of the local sales representative.

(1) Operation and Maintenance Instruction to Authority: Where the specifications for specific equipment require that a factory service representative provide operation and maintenance instruction to the Authority for that equipment, this service is to be performed by prior arrangement with the Authority after and in addition to the manufacturer's instructions to the Contractor for installation and start-up. The individual performing the instruction to the Authority shall be trained and/or certified by the manufacturer as its authorized operation, maintenance, and service specialist. If the said specialist is not a regular full-time employee of the manufacturer, the specialist's qualifications shall be submitted to the Authority for review and approval prior to scheduling the site visit for instructions to the Authority.

2.3 Field Engineering

2

2.3.1 Responsibilities

- (a) The Contractor shall be responsible for providing and paying for any surveying or engineering services required during the construction. The Contractor must retain qualified personnel as work may require.
- (b) The Authority shall be responsible only for inspections of all water, sanitary sewer, roadway, drainage, electric and gas facilities.
- (c) The Authority will not supply the Contractor with any survey control points.

2.3.2 Field Engineering

- (a) Contractor is responsible for providing and paying for engineering and surveying services required during construction.
- (b) Field engineering by the Contractor, such as structural design of form work, scaffolding, special earthwork, hydraulic groundwater control design, or other engineering work will be analyzed on a case-by-case basis, due to the specialized requirements of portions of the work.

ARTICLE 2 – GENERAL CONSTRUCTION REQUIREMENTS

- (c) Construction staking and cut sheets shall be performed and prepared by a registered land surveyor. Cut sheets for sanitary sewers shall include:
 - 1) Beginning and ending manholes
 - 2) Distance between manholes
 - 3) Pipe materials, size, and slope of line
 - 4) Centerline ground elevations and invert elevations
 - 5) Depth of cut at (minimum 50' intervals)

2.4 Shop Drawings, Product Data

2.4.1 Requirements included

Submit shop drawings and product data to the Authority for review and approval.

2.4.2 Shop Drawings

(a) Drawings shall be presented in a clear and thorough manner.

1) Details shall be identified by reference to sheet and detail, schedule or room numbers shown on the Construction Drawings.

2.4.3 Product Data

(a) Preparation

1) Clearly mark each copy to identify pertinent products or models.

- 2) Show performance characteristics and capacities.
- 3) Show dimensions and clearances required.
- 4) Show wiring or piping diagrams and controls.
- (b) Manufacturer's standard schematic Drawings and Diagrams

1) Modify drawings and diagrams to delete information which is not applicable to the work

2) Supplement standard information to provide that specifically applicable to the work.

2.4.4 Contractor Responsibilities

- (a) Review Shop Drawings, Product Data and Samples prior to submission.
- (b) Determine and verify:
 - 1) Field measurements.
 - 2) Field construction criteria.
 - 3) Catalog numbers and similar data.
 - 4) Conformance with specifications.
- (c) Coordinate each submittal with requirements of the work and of the Construction Plans.
- (d) Notify the Authority in writing, at the time of submission, of any deviations in the submittals.
- (e) Begin no fabrication or work which requires submittals until return of submittals with Authority stamp approval.

2.4.5 Submission

ARTICLE 2 – GENERAL CONSTRUCTION REQUIREMENTS

- (a) Make submittals promptly at the pre-construction conference.
- (b) Number of submittals required:
 - 1) Shop Drawings: Submit six (6) opaque reproductions.
- (c) Submittals shall contain:
 - 1) The date of submission and the dates of any previous submission.
 - 2.) The project title.
 - 3) The names of the Contractor, supplier and manufacturer.
 - 4) Identification of the product.
 - 5) Field dimensions clearly identified as such.
 - 6) Relation to adjacent or critical features of the work or materials.
 - 7) Applicable standards, such as ASTM or Federal Specification numbers.
 - 8) Identification of deviations from Contract Documents.
 - 9) Identification of revisions on submittals.
 - 10) A six (6) inch square blank space for Authority review stamps.

11) Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the work and of Contract Documents.

2.4.6 Resubmission Requirements

- (a) Make any corrections or changes in the submittals required by the Authority and resubmit until approved.
- (b) Shop Drawing and Product Data:
 - 1) Revise initial drawings or data and resubmit as specified for the initial submittal.

2) Indicate any changes which have been made other than those requested by the Authority.

2.4.7 Distribution

- (a) Distribute reproductions of Shop Drawings and copies of Product Data which carry the Authority's stamp of approval to:
 - 1) Job site file.
 - 2) Subcontractors
 - 3) Suppliers or fabricators

2.5 Temporary Controls

2.5.1 Requirements Included

Provide and maintain methods, equipment and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas u n d e r the Contractor's control; remove physical evidence of t e m p o r a r y facilities at completion of work.

2.5.2 Dust Control

Provide positive methods and apply dust control materials to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from dispersing into the atmosphere.

2.5.3 Water Control

2

(a) Provide methods to control surface water to prevent damage to the Project, the site or adjoining properties.

1) Control filling, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.

- (b) Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface water.
- (c) Dispose of drainage water in a manner to prevent flooding, erosion or other damage to any portion of the site or to adjoining areas, as required by local rules and regulations.

2.5.4 Debris Control

- (a) Maintain all areas under Contractor's control free of extraneous debris.
- (b) Initiate and maintain a specific program to prevent accumulation of debris at the construction site, storage, and parking areas, or along access roads and haul routes.
 - 1) Provide containers for deposit of debris.

2) Prohibit overloading of trucks to prevent spillage on access roads or haul routes.

- 3) Provide periodic inspection of traffic areas to enforce requirements.
- (c) Schedule periodic collection and disposal of debris. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

2.5.5 Pollution Control

- (a) Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharging of noxious substances from construction operations.
- (b) Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soils or liquids.

1) Excavate and dispose of any contaminated earth off-site and replace it with suitable compacted fill and topsoil.

(c) Take special measures to prevent harmful substances from entering public waters.

1) Prevent disposal of waste, effluents, chemicals, or other such substances adjacent to streams or in sanitary sewers.

- (d) Provide system for control of atmospheric pollutants.
 - 1) Prevent toxic concentrations of chemicals.
 - 2) Prevent harmful disposal of pollutants into the atmosphere.

2.5.6 Traffic Control

Contractor shall provide traffic control devices and signage as set forth by the latest edition of the Manual of Uniform Traffic Control Devices to protect the public where utility work is undertaken inside roadway areas.

2.6 Transportation and Handling

2.6.1 Packing and Transportation

- (a) Require supplier to package products in boxes or crates for protection during shipment, handling, and storage. Protect sensitive products against exposure to elements and moisture.
- (b) Protect sensitive equipment and finishes against impact, abrasion, and other damage.

2.6.2 Delivery

2

- (a) Arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation.
- (b) Coordinate to avoid conflict with work and conditions at the site. Specifically coordinate to determine:
 - 1) Work of the Authority
 - 2) Work of other contractors
 - 3) Availability of equipment and personnel for handling products
 - 4) Authority's use of premises
- (c) Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
- (d) Clearly mark partial deliveries of component parts of equipment to permit easy accumulation of parts and to facilitate and legible.
- (e) Immediately on delivery, inspect shipments to assure:
 - 1) Compliance with Construction Plans and approved submittals.
 - 2) Quantities are correct.
 - 3) Containers and packages are intact and that labels are legible.
 - 4) Products are properly protected and undamaged.

2.6.3 Product Handling

- (a) Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.
- (b) Provide additional protection during handling as necessary to prevent scraping, marring, or otherwise damaging products or surrounding spaces.
- (c) Handle products by using methods that will prevent bending or over stressing.
- (d) Lift heavy components only at designated lifting points.

2.7 Storage and Protection

2.7.1 Storage, General

- (a) Store products immediately on delivery in accordance with manufacturer's instructions with seals and labels intact. Protect until installed.
- (b) Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

2.7.2 Exterior Storage

ARTICLE 2 – GENERAL CONSTRUCTION REQUIREMENTS

- (a) Provide substantial platforms, blocking, or skids to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.
- (b) Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials to prevent mixing with foreign matter.
- (c) Provide surface drainage to prevent erosion and ponding of water.
- (d) All pipe and valves shall be stored with the ends capped to prevent debris from entering the materials.
- (e) All PVC pipe stored onsite longer than 30 days shall be covered by tarps to prevent degradation by ultraviolet light.

2.7.3 Maintenance of Storage

Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under the requirements of Contract Documents.

2.8 **Project Closeout**

2.8.1 Substantial Completion

- (a) When the work task is considered to be substantially complete, submit the following to Authority:
 - 1) Written notice that the specific work task is substantially complete.
 - 2) List of items remaining to be completed or corrected.
- (b) Within seven (7) working days, the Authority will inspect to determine status of completion and compile a punch list of items to be completed and corrected. If Authority determines that Work is not substantially complete, they will immediately notify Contractor in writing. Authority will generally point out his reasons, but he will not be obligated to give an exhaustive list of discrepancies.
- (c) Contractor's Duties: Remedy deficiencies and send Authority another written Notice of Substantial Completion.
- (d) Authority's Actions:
 - 1) Re-inspect the Work

2) When Authority considers Work substantially complete, they will issue the Certificate of Substantial Completion.

2.8.2 Authority Occupancy

- (a) Authority's Action: Occupy the Project, or designated portion of the Project, in accordance with provisions of the Certificate of Substantial Completion.
- (b) Contractor's Duties:

1) Make corrections listed on punch list attached to Certificate of Substantial Completion.

2) Perform final clean-up

2.8.3 Final Completion

(a) When this project is considered to be complete, Contractor shall submit certification in indication of the following:

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1) Contract Documents have been reviewed and Work has been inspected for compliance with those Documents.

- 2) Work has been completed in accordance with Contract Documents.
- 3) All punch list items have been corrected.

4) Equipment and systems have been tested in presence of Authority's Representative and are operational.

- 5) Work is complete and ready for final inspection.
- (b) Authority's Action during Final Inspection:
 - 1) Inspect to verify the status of completion within seven (7) working days.

2) If he considers Work incomplete or defective, he will promptly notify Contractor in writing, listing deficiencies.

- (c) Contractor's Duties: Take immediate action to correct deficiencies and send certification to Authority that Work is complete.
- (d) When Authority determines that Work is acceptable, he will request Contractor to make closeout submittals.

2.8.4 Reinspection Fees

Should status of completion of work require re-inspection by Authority due to failure of work to comply with Contractor's claims on initial inspection, Authority will deduct the amount of Authority compensation for re-inspection services from final payment to Contractor.

2.8.5 Contractor's Closeout Submittals Required

- (a) Project Record Documents: Comply with Section 2.09.
- (b) Evidence of Payment and Release of Liens: Contractor shall advertise in local paper for two (2) consecutive weeks of project closure and provide Authority with evidence of same.
- (c) Consent of Surety to Final Payment
- (d) Copies of all test results.
- (e) Documents required by State Licensure inspectors and other authorities having jurisdiction.

2.9 **Project Record Documents**

2.9.1 Section Includes

- (a) The Policy Manual requires the Contractor to maintain a record copy of the following for Authority's review:
 - 1) Drawings.
 - 2) Approved shop drawings, product data, and samples.
 - 3) Records of all changes made during construction.
- (b) In addition to the above, the Contractor shall maintain a record copy of the following where applicable:
 - 1) Field test results.
 - 2) Manufacturer's certificates.
 - 3) Fixed equipment manuals.

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2.9.2 Recording

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- (a) Record information concurrently with construction progress.
 - 1) Do not conceal work until required information has been recorded.
- (b) Contract Drawings: Legibly mark each item to record actual construction, including the following:

1) Measured horizontal and vertical locations of underground utilities, valves, etc. referenced to building exterior lines or other distinguishable permanent features such as power poles, inlets, etc. Show direction of flow of pipe and depth of piping underground

- 2) Field changes of dimensions and details.
- 3) Details not on original Contract Drawings.

2.9.3 Record Drawings

- (a) Record Drawings which are required for Authority records shall be recorded on reproducibles by the Contractor.
- (b) The Contractor shall transfer all changes recorded on construction drawings on the Record Drawing.
 - 1) All information shall be recorded neatly and legibly.
 - 2) Use separate colors for recording information about each major system.

2.9.4 Submittals

- (a) At Contract Closeout, deliver Record Drawings to Authority.
- (b) Submit Record Documents under cover of a transmittal letter containing:
 - 1) Date
 - 2) Project title
 - 3) Contractor's and subcontractor's names and addresses.
 - 4) Certification that each document submitted is complete and accurate.
 - 5) Signature of Contractor or his authorized representative.
- (c) Submit the following for record drawings:
 - 1) Two (2) mark-up copies of Record Drawings.
 - 2) An electronic copy of Record Drawings in .dwg format.

2.10 Cleaning

2.10.1 Cleaning

- (a) Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.
- (b) Keep streets clean from mud, dirt, debris, and other materials removed from the job site. Promptly remove mud and dirt tracked by vehicles from street surfaces.
- (c) At completion of work, r e m o v e waste materials, rubbish, tools, equipment, machinery, and surplus materials. Clean all sight-exposed surfaces. Leave project clean and ready for occupancy.
- (d) Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws.

ARTICLE 2 – GENERAL CONSTRUCTION REQUIREMENTS

1) Do not burn or bury rubbish and waste materials on the project site.

2) Do not dispose of volatile waste such as mineral spirits, oil and paint thinner in storm drains or sanitary sewers.

(e) Hazard Control:

1) Store volatile wastes in covered metal containers and remove from premises daily.

2) Prevent accumulation of waste which might cause hazardous conditions.

3) Provide adequate ventilation during use of volatile and noxious substances.

2.10.2 During Construction

- (a) Clean building, grounds and public properties and keep free from accumulations of waste materials and rubbish.
- (b) Wet down dry materials and rubbish to prevent dust.
- (c) At reasonable intervals during progress of Work, but in no case less than once a week, clean site and public properties and dispose of waste materials, debris and rubbish.
- (d) Provide on-site containers for collection of waste materials, debris, and rubbish.
- (e) No debris shall be permitted to accumulate on site except in a container designed for debris removal.

2.10.3 Final Cleaning

- (a) Remove waste, debris, and surplus materials from site. Clean grounds: remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.
- (b) Maintain cleaning until Final Completion.
- (c) Prior to Final Completion, or Authority occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

2.11 Buy American Policy

The Authority shall stipulate or cause to be stipulated a provision whereby the person, firm, or corporation undertaking the project agrees to use in the execution of the contract; materials, supplies, and products manufactured, mined, processed, or otherwise produced in the United States or its territories, if the same are available at reasonable and competitive prices.

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ARTICLE 3: CIVIL SITE

3.1 Clearing

3.1.1 Work Included

- (a) Clear site of trees, shrubs, plant life, grasses and debris.
- (b) Remove root system of trees and shrubs to be removed measuring three (3) inches and over at the diameter of the base.
- (c) Remove rocks, boulders, and other debris.

3.1.2 Related Work

- (a) Section 3.2: Structure Excavation and Backfill.
- (b) Section 3.4: Finish Grading.
- (c) Section 3.5: Seeding.

3.1.3 Protection

(a) Protect existing trees, shrubs, and lawn areas to receive planting, rock outcropping and other features remaining as part of final landscaping.

(b) Protect benchmarks and existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic.

(c) Maintain designated temporary roadways, walkways and detours for vehicular and pedestrian traffic.

3.1.4 Preparation

Maintain benchmarks, monuments and other reference points. Re-establish if disturbed or destroyed at no expense to the Owner.

3.1.5 Clearing

(a) Clear areas as required for access to the site excavation and performance of work.

(b) Cut down trees and shrubs within construction areas. Grub out stumps, roots, embedded rocks, and boulders.

- (c) Clear out undergrowth and deadwood, without disturbing subsoil.
- (d) Do not disturb trees or roots of trees which are to remain.
- (e) Remove any damaged branches on trees which are to remain.

3.1.6 Backfilling and Surface Preparation

(a) Backfill and compact all depressions resulting from clearing and grubbing with suitable materials in accordance with Section 3.9.

1) Backfill embankment areas to natural ground elevation.

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2) Backfill excavation areas below finished subgrade to finished subgrade.

(b) Perform backfilling a satisfactory time period ahead of construction operations.

(c) Prepare areas designated on the Drawings to receive erosion controls to smooth surfaces that have been shaped, in accordance with the Drawings.

3.1.7 Removal of Debris

(a) Promptly remove cleared debris from site. Burning or burying on site is not permitted.

(b) Obtain permission from applicable regulatory authority for disposal of debris at an approved waste disposal site.

3.2 Structure, Excavation & Backfill

3.2.1 Work Included

(a) Excavate for structures and stockpile soil on site for later use.

(b) Cap off and seal discontinued utility service and remove portions of lines within excavated areas.

- (c) Shore and brace excavations as required.
- (d) Place and compact fills to final elevations.
- (e) Dewater excavations as required.

3.2.2 Related Work

- (a) Section 3.1: Clearing.
- (b) Section 3.4: Finish Grading.
- (c) Section 3.9: Trenching, Backfilling and Compaction for Utilities.

3.2.3 Protection

- (a) Protect trees, shrubs and lawns, rock outcroppings and other features remaining as a part of the final landscaping.
- (b) Protect benchmarks, structures, fences, roads, sidewalks, and curbs against damage from equipment and vehicular traffic.
- (c) Protect excavations by shoring, bracing, sheet piling, underpinning or other methods, as required by OSHA regulations to prevent cave-ins or loose dirt from falling into excavations.
- (d) Underpin adjacent structures, which may be damaged by excavation work, including service line and pipe chases.
- (e) Notify Engineer of unexpected subsurface conditions and discontinue work in area until Engineer provides notifications to resume work.

- (f) Protect bottom of excavations and soil beneath and around foundations from frost.
- (g) Grade around excavations to prevent surface water runoff into excavated area. Keep excavation free of water at all times. Provide drainage and/or sump pumps as required.
- (h) All blasting shall conform to local codes and laws.

3.2.4 Fill Materials

- (a) Crushed stone backfill: Type A Aggregate, Grading D meeting the requirements of Section 903.05 in the Tennessee Department of Transportation "Standard Specifications for Road and Bridge Construction", latest edition.
- (b) Earth fill and backfill materials: Clean earth (free from organic material, cinders, ice and rocks over two (2) inches in longest dimension). When compacted, the earth fill and backfill material shall have a minimum dry density of 95 pounds per cubic foot.
- (c) Subsoil: Free from roots, rock larger than three (3) inches in size or building debris.
- (d) Fill under landscaped areas: Free from alkali, salt and petroleum products. Use subsoil excavated from site only if conforming to specified requirements.

3.2.5 Preparation and Layout

- (a) Establish extent of excavation by area and elevation; designate and identify datum elevations.
- (b) Maintain benchmarks, monuments, and other reference points. Re-establish if disturbed or destroyed, at no cost to the Owner.
- (c) Layout and verify grades. Prior to construction, gravity sewer must be staked and cut sheets prepared by a registered surveyor acceptable to the Engineer. If discrepancies exist between actual lines and elevations and those indicated on the Drawings, notify the Engineer.

3.2.6 Utilities

- (a) Before starting excavation, establish location and extent of underground utilities occurring within the work area.
- (b) Notify utility companies to remove and relocate lines that are in the way of excavation at least 72 hours prior to commencement of work in that area
- (c) Maintain, re-route, or extend as required existing utility lines to remain which pass through the work area. Any utilities designated to remain that are damaged by the contractor's activities shall be replaced or repaired at no cost to the Owner.
- (d) Pay cost for this work, except those covered by utility companies.
- (e) Protect utility services uncovered by excavation.
- (f) Remove abandoned utility service lines from areas of excavation; cap, plug or seal such lines and identify at grade.

(g) Accurately locate and record abandoned, and active utility lines rerouted or extended, on Project Record Documents.

3.2.7 Excavation

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- (a) Have the Engineer inspect and approve all foundation excavations prior to placement of concrete.
- (b) Excavate subsoil in accordance with lines and levels required for construction of the work, including space for forms, bracing and shoring, foundation drainage system, waterproofing and to permit inspection.
- (c) Perform additional excavation only by written authorization of the Engineer.
- (d) Machine slope banks.
- (e) Hand trim excavations and leave free from loose or organic matter.
- (f) When complete, verify soil bearing capacities, depths and dimensions.
- (g) Correct unauthorized excavation as directed, at no cost to the Owner.
- (h) Fill over-excavated areas under structure bearing surfaces with concrete as specified for foundations. Fill over-excavated areas under slabs on grade with No. 6 crushed stone.
- (i) Excavations are not to interfere with normal 45 degree bearing splay of any foundation.
- (j) Stockpile excavated sub-soil for re-use where directed. Remove unsuitable excavated subsoil from site. Remove excess excavated materials from site.
- (k) Where rock is encountered during excavation, remove as necessary to provide foundation system indicated. Dispose of excavated rock offsite.

3.2.8 Fill and Backfilling

- (a) Stockpile fill materials in areas designated by the Engineer.
- (b) Ensure areas to be backfilled are free from debris, snow, ice and water, and that ground surfaces are not in a frozen condition.
- (c) Do not backfill over existing subgrade surfaces which are porous, wet or spongy.
- (d) Cut out soft areas of existing subgrade. Backfill with compacted earth.
- (e) Fill and backfill to grades, contours, levels and elevations as indicated on the Drawings.
- (f) Maintain optimum moisture content of backfillmaterials to attain required compaction density.
- (g) Fills shall be shaped to provide natural drainage and shall be sealed at the end of each day's work or during precipitation.
- (h) Sealed fills shall be scarified before placing the next layer.

3.2.9 Surplus Material

- (a) Remove surplus materials from site.
- (b) Leave stockpile areas completely free of all excess fill materials.

3.3 Erosion Control

3.3.1 Description

- (a) This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding of plants and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction such as excavation work may be delayed until warmer weather or covered to prevent freezing.
- (b) The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to ensure economical, effective, and continuous erosion control throughout the construction and post-construction period.
- (c) Contractor shall be responsible for obtaining permits and adhering to the erosion control standards as set forth by the State of Tennessee.

3.3.2 Temporary Berms

- (a) A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills.
- (b) These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

3.3.3 Temporary Slope Drains

A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.

3.3.4 Sediment Structures

Sediment basins, ponds, and traps are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

3.3.5 Check Dams

Check dams are barriers composed of large stones, sandbags, or other non-corrodible materials placed across or partially crossing a natural or constructed drain way.

3.3.6 Temporary Seeding and Mulching

Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.

3.3.7 Baled Hay or Straw Checks

- (a) Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing five (5) cubic feet or more of material.
- (b) Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water runoff is a problem.

3.3.8 Temporary Silt Fences

Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth imposed or burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the runoff water.

3.3.9 Project Review

(a) Prior to the Preconstruction Conference the Contractor shall go over in detail the expected problem areas in regard to the erosion control work. It is the basic responsibility of the Contractor to develop an erosion control plan acceptable to the Authority and the State of Tennessee.

(b) The Contractor shall maintain a spill prevention plan. The contents of this spill prevention plan shall depend on what types of chemicals, lubricants and fuels will be used and if these will be stored on site. As a minimum, if fuel or lubricants or other chemicals are stored on site, either temporarily in vehicular tanks or in skid or trailer mounted tanks, a plan shall be supplied which directs all employees of the Contractor in the proper procedures to be followed should a spill occur. For more complex chemical storage requirements, a more complex plan will be required.

3.3.10 Preconstruction Conference

At the Preconstruction Conference, the Contractor shall submit for acceptance his schedule for accomplishment or temporary and permanent erosion control work, as are applicable for the utility construction.

3.3.11 Construction Requirements

(a) The Authority has the authority to limit the surface area of erodible earth material exposed by the utility construction, and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats seeding or other control devices or methods as necessary to control erosion. Cut and fill shall be seeded and mulched as the excavation proceeds.

(b) The Contractor shall be required to incorporate all permanent erosion control features

into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the preconstruction stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices but are not associated with permanent control features on the project.

(c) Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, erosion control measures may be required between successive construction stages. Under no conditions shall the erodible earth material exposed at one time by clearing and grubbing exceed 5,000 linear feet for linear utility work or twenty-five (25) acres for other clearing and grubbing operations (i.e. subdivisions).

(d) The Authority will limit the area of excavation in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

(e) In the event of conflict between these requirements and pollution control laws, rules, or regulations, or other Federal, State or Local agencies, the more restrictive laws, rules, or regulations shall apply.

3.3.12 Construction of Structures

(a) Temporary Berms

1) A temporary berm shall be constructed on compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches, with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with only minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately a ten (10) degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass o v er these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be constructed with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

- (b) Temporary Slope Drains
 - 1) Temporary slope drains shall consist of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.
 - 2) Fiber matting and plastic sheeting shall not be used on slopes steeper than 4:1 except for short distances of 20 feet or less.
 - 3) All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drains shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet end shall be properly constructed to channel Standard Utility Specifications

water into the temporary slope drain. Energy dissipater would be dumped rock or a small sediment basin which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

(c) Sediment Structures

(1) Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; and in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least four times as long as they are wide or at least have a flow path as long as possible.

(2) When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural and intended condition.

(d) Check Dams

1) Check dams shall be utilized to retard stream flow or restrict stream flow within the channel. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan.

- 2) All check dams shall be keyed into the sides and bottom of the channel.
- (e) Temporary Seeding and Mulching

Seeding and mulching shall be performed in accordance with Section 3.05 - Seeding. Seeding and mulching shall occur as soon as practical but no more than 14 calendar days after a phase of the grading has been completed.

(f) Baled Hay or Straw Erosion Checks

Hay or straw erosion checks shall be embedded in the ground four (4) to six (6) inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot or be removed after they have served their purpose. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris cleanout will be considered routine maintenance.

- (g) Temporary Silt Fences
- 1) Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are composed of woven geotextile fabric supported by steel or hardwood posts, buried at the bottom.
- 2) The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project. The silt accumulation at the fence should be removed when half the storage depth has been filled. The silt fence remains the property of the Contractor whenever the fence is removed.
- (h) Under no circumstances shall spent oil wastes be discharged on the site.

3.3.13 Maintenance

The t e m p o r a r y erosion c o n t r o l features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed

shall become the property of the Contractor.

3.3.14 Erosion Control Outside Project Area

Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads, and equipment storage sites.

3.4 Finish Grading

The work called for by this section shall include, but not necessarily be limited to, finish grading and the spreading and shaping of topsoil to the finished contour elevations indicated by the drawings.

3.4.1 Topsoil

(a) Use stripped topsoil that has been stockpiled. If the quantity of topsoil on the job is inadequate, furnish enough additional topsoil. Topsoil furnished shall be natural, fertile, friable soil possessing characteristics of representative productive solids in the vicinity. It shall be obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic substances that may be harmful to plant growth. Topsoil shall be without admixture of subsoil and shall be cleaned and reasonably free from clay, lumps, stones, stumps, roots, or similar substances 2" or more in diameter, debris, or other objects that are a hindrance to planting operations. Such material shall be subject to testing.

3.4.2 Grading

- (a) Do not begin work until the earth is dry enough to be tillable.
- (b) Inspect subgrades to see that they generally conform to the standards called for elsewhere in these specifications, particularly with regard to the approximate depths required for the work. After the work is completed, inspect it to ensure that all finish grading complies with design requirements.
- (c) Finish grade all areas to the depths required for the work as follows:
 - 1) Grade uniformly with rounded surfaces at the tops and bottom of abrupt changes of planes.
 - 2) Hand grade steep slopes and areas that are inaccessible for machine work.
 - 3) Protect graded areas from undue erosion, and repair and regrade areas where erosion does occur.
 - 4) Refill areas where noticeable settlement has occurred.
 - 5) Finish grade areas that are to receive topsoil up to 4" below the finished contour elevations called for by the drawings or, over rock, to 12" below these elevations.
- (d) Place topsoil uniformly over disturbed areas that do not receive other work as follows:
 - 1) Scarify subgrade to a depth of 3".
 - 2) Place the topsoil to a depth of 4" when lightly rolled or, on rock, to a depth of 12".
 - 3) Level the topsoil so that it slopes uniformly and has no water pockets.
 - 4) Carefully rake the topsoil by hand to remove all clods, roots, sticks, stones over 1" in diameter, and other foreign materials from the surface.

Dispose of excess excavated materials and debris away from the site.

3.5 Seeding

3.5.1 General

(e)

(a) This work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, sod, planting, etc., and shall include, but not necessarily be limited to, all seed bed preparation; the supplying and placing of soil additives, seed, and mulch and maintenance.

(b) Refer to other sections for items affecting seeding. Coordinate this work with that specified by other sections for timely execution.

3.5.2 Materials

- (a) GRASS SEED: Kentucky 31 Fescue (Festuca elatior) and/or annual rye meeting the requirements of the State Department of Agriculture and furnished in new bags or bags that are sound and not mended; no "below standard" seed will be accepted.
- (b) FERTILIZER: Commercially manufactured; Grade 10-10-10; furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.
- (c) AGRICULTURAL LIMESTONE: Containing a minimum of 85% calcium carbonate and magnesium carbonate combined, 85% of which passes a No. 10 mesh sieve.
- (d) MULCH: Stalks of rye, oats, wheat, or other approved grain crops properly cured prior to bailing, air dried, and reasonably free of noxious weeds and weed seeds or other material detrimental to plant growth.

3.5.3 Seeding

- (a) Perform all seeding and related work as a continuous operation. Sow seed as soon as the seed bed has been prepared and perform subsequent work in a continuous manner.
- (b) Before beginning seeding operations in any area, complete the placing of topsoil and final grading.
- (c) Scarify, disk, harrow, rake, or otherwise work each area to be seeded until the soil has been loosened and pulverized to a depth of not less than two (2) inches. Perform this work only when the soil is in a tillable and workable condition.
- (d) Apply fertilizer and agricultural limestone uniformly over the seed bed, and lightly harrow, rake, or otherwise incorporate them into the soil for a depth of approximately one (1) inch at the following rates:

Fertilizer: 40 pounds per 1,000 square feet

Agricultural Limestone: 80 pounds per 1,000 square feet

- (e) Sow seed uniformly with a rotary seeder, wheelbarrow seeder, hydraulic equipment or by other satisfactory means.
- (f) The seeding rate shall be five (5) pounds per 1,000 square feet for Kentucky 31 Fescue (Festuca elatior).
- (g) For temporary stabilization seeding rate shall be three (3) pounds per 1,000 square feet of annual rye grass.
- (h) Perform no seeding during windy weather or when the ground surface is frozen, wet, or otherwise untillable.

Standard Utility Specifications

- (i) When seeding with mulch is specified spread mulch material evenly over the seeded areas immediately following the seeding operation.
- (j) The mulch rate may be varied, depending on the texture and condition of the mulch material and the characteristics of the area seeded. Cover all portions of the seeded areas with a uniform layer of mulch so that approximately 25% of the ground is visible.
- (k) No equipment, material storage, construction traffic, etc., will be permitted on newly seeded ground.

3.5.4 Inspections

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The Authority shall inspect the seeding within 60 days after planting and determine if it is acceptable.

3.5.5 Guaranties

- (a) Secure an acceptable growth of grass in all areas designated for seeding.
- (b) An area is considered acceptable if it is represented by a minimum of 100 seedlings per square foot of the permanent species of grass representative of the seed mixture. If a n acceptable growth is not obtained on the first planting, reseeding, and remulching will be required.
- (c) If the planting is less than 50% successful, rework the ground, re-fertilize, reseed, and re-mulch.

3.6 Unclassified Excavation for Utilities

The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the Engineer, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

3.6.1 Quality Assurance

Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

3.6.2 Job Conditions

- (a) Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
- (b) Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
- (c) Do not interrupt existing utilities serving facilities occupied and used by Authority or others, during occupied hours, except when permitted in writing by Authority and then only after acceptable temporary utility services have been provided.

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- 1) Provide minimum of 48-hour notice to Authority before interrupting any utility.
- (d) Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
- (e) Preserve from damage surveying monuments, property pins, and similar items. If disturbed or damaged by construction operations, pay the cost of restoration by a registered surveyor.
- (f) Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, wash-out and other hazards created by earthwork operations.

3.6.3 Protection

- (a) Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation work.
- (b) Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- (c) Notify Authority and Engineer of Record of unexpected subsurface conditions and discontinue work in affected area until notification to resume work is issued.
- (d) Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- (e) Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.
- (f) Protect trees, shrubbery, fences, poles, and all other property and surface structures during construction operations. Fences, poles, or other man-made surface improvements which are moved or disturbed shall be restored to the original conditions after construction is completed. Trees, shrubbery, or other vegetation which are approved for removal in order to facilitate construction operations shall be removed completely, including stumps and main roots. Responsibility for damage or claims for damage caused by construction operations to shrubbery or other landscape improvements shall be assumed by the Contractor.

3.6.4 Safety

- (a) Barricades, Guards, and Safety Provisions: Place and maintain barricades, fences, construction signs, torches, flashing lights, lanterns, guards, and flagmen as required during the progress of the construction work and until it is safe for traffic to use the roads and streets. Material piles, equipment, and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The rules and regulations of OSHA and appropriate authorities respecting safety provisions shall be observed.
- (b) Structure Protection: Provide temporary support, protection, and maintenance of underground and surface drains, sewers, and other obstructions encountered during the progress of the work. Structures which may have been disturbed shall be restored upon completion of the work.

3.6.5 Deviation Occasioned by Structures or Utilities

- (a) Wherever obstructions are encountered during the progress of the work which occupies the space required for the pipeline, Authority shall have the ability to order a deviation from the line and grade.
- (b) Where gas, water, telephone, electrical, or other existing utilities directly interfere

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with the vertical or horizontal alignment of the pipeline, Authority will order a change in grade or alignment.

3.6.6 Maintenance of the Traffic and Closing of Streets

Carry on the work in a manner which will cause a minimum of interruption to traffic, and do not close to through travel more than two consecutive blocks, including the cross street intersected. Where traffic must cross open trenches, provide bridges at street intersections and driveways. Post signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic. Before closing any streets notify responsible municipal authorities.

3.6.7 Soil Materials

- (a) Satisfactory soil materials are defined as those complying with ASTM D2487unified soil classification system groups GW, GP, GM, SM, SW and SP.
- (b) Unsatisfactory soil materials are defined as those complying with ASTM D2487 unified soil classification system GC, SC, ML, MH, CL, CH, OL, OH and PT.
- (c) Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1-1/2" sieve and not more than 5% passing a No. 4 sieve.
- (d) Backfill and Fill Materials: Satisfactory soil material of clay, rock, or gravel not larger than 2" in any dimension, free of debris, waste, frozen materials, vegetable, and other deleterious matter.

3.6.8 Preparation of the Site

- (a) Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the Construction Documents specifically indicate are to be removed.
- (b) In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be specifically listed in the specifications, marked on the site, or identified by the Engineer. In no case damage or remove such growth without written permission from the Engineer.
- (c) If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area and remove all large roots to a depth of not less than 2' below the bottom of the proposed construction. Dispose of the growth removed. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.
- (d) Trees, cultivated shrubs, etc., that are situated within public rights-of way and/or construction e a s e m e n t through private p r o p e r t y but not directly w i t h i n the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely. Take special precautions to protect and preserve such growth throughout all stages of the construction.

3.6.9 Excavation

(a) Excavation is unclassified and includes excavation to subgrade elevations.
3.6.10 Unsuitable Materials

Whenever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with crushed stone up to the level of the line's grades, and/or cross sections shown on the drawings. The top 6" of the refill shall be No. 67 (TDOT) crushed stone for bedding.

3.6.11 Rocks and Boulders

- (a) Any material that is encountered within the limits of the required excavation that cannot be removed except by drilling and/or blasting, including rock, boulders, masonry, hard pan, chert, shale, street and sidewalk pavements, and/or similar materials, shall be considered as rock excavation. Rock material shall be considered where it cannot be removed by a track hoe by ripping the material.
- (b) Should rock be encountered in the excavation, remove it by blasting or otherwise. Where blasts are made, cover the excavation with enough excavation material and/or timber or steel matting to prevent danger to life and property. The Contractor shall secure, at his own expense, all permits required by law for blasting operations and the additional hazard insurance required. Observe all applicable laws and ordinances pertaining to blasting operations.
- (c) Excavate rock over the horizontal limits of excavation to a depth of not less than 6" below the bottom of pipe up to 30" in diameter and not less than 12" below the bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with No. 67 (TDOT) crushed stone, tamp to the proper grade, and make ready for construction.

3.6.12 Disposal of Materials

- (a) Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the Authority shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of by the Contractor as specified below.
- (b) Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workmanlike condition, as described below.

3.6.13 Sheeting, Shoring and Bracing

- (a) Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.
- (b) Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5' high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5' deep when examination of the ground indicates hazardous ground movement may be expected. Guard the wall and faces of all excavations in which employees are

exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.

- (c) Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional engineer licensed in the State of Tennessee. However, such approval does not relieve the Contractor of the sole responsibility for the safety of all employees, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.
- (d) Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Underpin adjacent structures wherever necessary.
- (e) Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the Owner, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and the cave-ins and slides are avoided.
- (f) Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.
- (g) The Contractor may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater that of an appropriate shoring system.
- (h) Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
- (i) Do not allow water to accumulate in excavations. Remove water to prevent softening of subgrade foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundation. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components to convey water away from excavations.
- (j) Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

3.6.14 Borrow Excavation

- (a) Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations, or whenever the backfill material from such excavations is unsuitable, obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the Authority.
- (b) Properly clear and grub borrow pits and remove all objectionable matter from the borrow pit materials before placing it in the backfill.

3.6.15 Backfilling

(a) Conduct backfilling around manholes, inlet, outfalls, and/or structures in the same manner as specified for water lines, gravity sewers and/or force mains except that even greater care is necessary to prevent damage to the utility structure.

(b) Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfilling is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary.

3.6.16 Maintenance

- (a) Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the Authority.
- (b) Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the Authority. Continue such maintenance until final acceptance of the project or until Authority issues a written release.

3.7 Demolition

- (a) Section Includes: Selective removal and subsequent disposal of utilities, pavements, portions of buildings, and other items indicated to be removed.
- (b) Extent of demolition work is indicated on Contract Drawings.

3.7.1 References

- (a) Code of Federal Regulations (CFR)
 - 1. 29 CFR Part 1910 Occupational Safety and Health Standards
 - 2. 29 CFR Part 1926 Safety and Health Regulations for Construction

3.7.2 Project/Site Conditions

- (a) Occupancy: Conduct demolition work in a manner that will minimize the need for disruption of normal operations for occupants of adjacent areas.
- (b) Explosives: Use of explosives is not permitted.

3.7.3 Examination

- (a) Verify existing conditions at the site and examine adjoining work that will affect the execution and scheduled completion of Work. If required, Contractor shall utilize detection system to locate existing underground interference.
- (b) Provide written pre-demolition survey to the Authority for review and approval.
- (c) Verify that utilities have been disconnected and capped.
- (d) If unanticipated elements conflicting with the intended function or design are encountered, investigate and measure the nature and extent of the conflict.

1) Promptly submit a written report to the Authority outlining the elements in conflict and extent of the conflict.

3.7.4 Utility Services

- (a) Maintain existing utilities indicated to remain in service and protect against damage during demolition operations.
- (b) Schedule any utility outages through the Authority. A minimum notice of 2 weeks is required.

3.7.5 Preparation

(a) Conduct demolition operations and remove debris in a manner to ensure minimum

interference with roads, streets, walks, and other adjacent occupied or used facilities.

(b) Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities designated to remain.

1) Provide temporary barricades and other forms of protection as required for safety and security.

2) Provide barriers and appropriate signs meeting requirements of 29 CFR 1910 for size and color where necessary to restrict pedestrians from wandering into construction areas.

(c) Provide and maintain interior and exterior shoring, bracing or structural support to preserve stability and prevent movement, settlement, or collapse of structures and adjacent facilities that are not part of demolition.

3.7.6 Demolition

(a) General: Perform demolition work in accordance with 29 CFR 1926.

1) Perform work in a safe and systematic manner.

2) Use such methods as required to complete work indicated on the Contract Drawings and to minimize disturbances to occupants of adjacent properties.

- (b) Demolish and remove existing construction only to extent required, and as indicated in the Contract documents.
- (c) Wear proper personal protective equipment at all times.
- (d) Protect adjacent properties from debris, dust, and excessive noise during the execution of the work of this Section. All work shall be wet down periodically to minimize dust.
- (e) Completely backfill below-grade areas and voids resulting from utility removal and other demolition work.
- (f) Abandonment of Utilities

1) Purge, clean, fill, or terminate utility pipelines that are to be abandoned in a manner conforming to the requirements of the nationally recognized code covering the specific utility; and as indicated on the drawings.

3.7.7 Repairs

- (a) Repair demolition performed in excess of that required.
- (b) Return structures, utilities, and surfaces not part of demolition to conditions existing prior to commencement of demolition work.

3.7.8 Disposal of Demolished Materials

- (a) All materials shall be disposed of in accordance with applicable laws and regulations of all agencies having jurisdiction. The contractor shall bear the cost of all fees.
- (b) If the Contractor encounters any materials during the removal that is suspected to be potentially hazardous, stop work immediately and notify the Authority.
- (c) Contractor is responsible for all removal of demolished materials to off-site disposal.
- (d) Burning debris and rubbish on the property will be permitted with the property Owner's and Authority's written approval. When permitted, burning shall strictly comply with applicable federal, state, and local regulations. The contractor will be responsible for all applicable permits.

3.7.9 Cleaning

- (a) Remove from the project site all materials, rubbish and other debris resulting from the demolition work. Leave the site clean and safe daily.
- (b) Remove tools, equipment and demolished materials from site upon completion of demolition work.

3.8 Trenching, Backfilling and Compaction for Utilities

Requirements included

- (a) Excavation for buried utility material.
- (b) Provide necessary sheeting, shoring and bracing.
- (c) Prepare trench bottom with appropriate materials.
- (d) De-water excavations as required.
- (e) Place and compact granular beds, as required, and backfill.

3.8.1 Related Work

- (a) Section 3.6: Unclassified Excavation for Utilities
- (b) Section 4.1: Manholes
- (c) Section 4.2: Sanitary Sewers (Gravity)
- (d) Section 4.3: Sewage Force Main
- (e) Section 5.1: Water Lines
- (f) Section 7.2: Asphaltic Pavement Repair.
- (g) Section 7.3: Portland Concrete Pavement Repair

3.8.2 Precautions

- (a) Contractor shall shore and brace all open cut trenches as required by State and Federal Laws and Local Ordinances; conform to recommendations set forth in AGC Manual of Accident Prevention in Construction; protect life, property, or work; and avoid excessively wide cuts in unstable material.
- (b) Notify utility companies when necessary to disturb existing facilities and abide by their requirements for repair and replacement.
- (c) Protect all vegetation and other features to remain.
- (d) Protect all benchmarks and survey points.

3.8.3 Preparation

- (a) Install barriers and other devices to protect areas adjacent to construction.
- (b) Protect and maintain all benchmarks and other survey points.

3.8.4 Excavation Trenches

- (a) Perform in such a manner as to form a suitable trench in which to place the pipe and so as to cause the least inconvenience to the public.
- (b) Maximum width at the crown of the pipe shall be 16 inches plus the nominal diameter of the pipe.

- (c) Cut pavement along neat, straight lines with either a pavement breaker or pavement saw.
- (d) Trench depth: To provide minimum cover as specified in Section 4.02, 5.01, 6.01, 8.01, or 9.01 over the top of the pipe.
- (e) Align trench as shown on the drawings unless a change is necessary to miss an unforeseen obstruction.
- (f) When unstable soil is encountered at the trench bottom, remove it to a depth required to assure support of the pipeline and backfill to the proper grade with coarse aggregate AASHTO M-43, Size No. 2 or 3.
- (g) Remove rock encountered in trench excavation to a depth of six (6) inches below the bottom of the pipe barrel, backfill with an approved material, and compact to uniformly support the pipe. In no case shall solid rock exist within six (6) inches of the finished pipeline.

3.8.5 Sheeting, Shoring and Bracing

- (a) When necessary, furnish, put in place, and maintain such sheeting, bracing, etc., as may be required to support the sides of the excavation and to prevent movement.
- (b) Take care to prevent voids outside the sheeting.
- (c) If voids are formed, immediately fill and compact to the satisfaction of the Engineer.
- (d) Unless adjacent facilities will be damaged, remove all sheeting, shoring, and bracing after backfill has been placed to a depth of 18 inches over the pipeline.
- (e) Cut shoring off at the top of the pipe and leave the lower section in the trench.

3.8.6 Use of Explosives

- (a) Conduct all blasting operations in accordance with prevailing municipal, state, or other agency regulations, codes, ordinances, or laws.
- (b) Exercise due caution when blasting adjacent to existing structures and pipelines.
- (c) Cover all shots with blasting mats to prevent flying material.

3.8.7 Disposal of Excavated Material

Satisfactorily dispose of all excess excavated material that cannot be used for or is not suitable for embankments.

3.8.8 Unauthorized Excavation

- (a) Unauthorized excavation is defined as all excavation outside or below the proposed lines and grades shown on the drawings.
- (b) Backfill areas of unauthorized excavation with the type material necessary (earth, rock or concrete) to insure the stability of the structure of construction involved.
- (c) Unauthorized excavation or backfill to replace same shall not be a pay item.

3.8.9 Removal of Water

- (a) Keep excavated areas free of water while work is in progress.
- (b) Well-pointing shall be performed if required.
- (c) Take precautions to prevent the displacement of structures or pipelines as a result of

accumulated water.

3.8.10 Obstructions

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- (a) Obstructions shown on the drawings are for information only and do not guarantee their exact locations nor that other obstructions are not present.
- (b) When utilities or obstructions are not shown on the drawings but are present off the roadway at the location of the proposed pipeline route, the Contractor should notify the appropriate utility owner prior to continuing with any installation.
- (c) Exercise due care in excavating adjacent to existing obstructions and do not disturb same unless absolutely necessary.
- (d) In the event obstructions are disturbed, repair or replace as quickly as possible to the condition existing prior to their disturbance.
- (e) Coordinate all obstruction relocation with the appropriate utility owner.

3.8.11 Initial Backfilling/Bedding

- (a) Do not begin backfilling before the Authority has inspected the grade and alignment of the pipe, the bedding of the pipe, and the joints between the pipe. If backfill material is placed over the pipe before an inspection is made, reopen the trench in order for an inspection to be made.
- (b) Perform backfilling by hand, together with tamping, until fill has progressed to 12 inches above the top of the pipe.

1) Deposit No. 67 stone material (where required) or loose soil free from lumps, clods, frozen material or stones no larger than 2 inches in layers approximately six (6) inches thick. Inside roadway or paved areas, all initial backfill shall be No. 67 stone

2) Compact by hand, or with manually operated machine tampers actuated by compressed air or other suitable means.

3) Use tamps and machines of a suitable type which do not crush or otherwise damage the pipe.

(c) If pipe is installed in a rock trench, install a 6" bedding of No. 67 (TDOT) crushed stone below the pipe. Then add additional No. 67 stone to a point 12" above the top of the pipe.

3.8.12 Final Backfilling

- (a) After the backfill has reached a point 12 inches or more above the top of the pipe, perform final backfilling depending upon the location of the work and danger from subsequent settlement. Where pipe is located inside roadway or paved areas, final backfilling shall be with No. 67 stone.
- (b) Backfilling in Unimproved Areas

1) Dispose of and replace all soft or yielding material which is unsuitable for trench backfill with suitable material.

2) Deposit backfill to the surface of the ground by dragline, bulldozer, or other suitable equipment in such a manner so as not to disturb the pipe.

3) Neatly round sufficient surplus excavated material over the trench to compensate for after settlement.

- 4) Dispose of all surplus excavated material.
- 5) Prior to final acceptance, remove all mounds to the elevation of the surrounding

terrain.

3.9 Boring and Casing for Utility Lines

Section Includes

- (a) The work to be performed hereunder shall consist of the installation of a casing pipe for the purpose of installing utility lines. It shall include the excavation of a boring pit, auger boring between the points as specified on the drawings, furnishing, and installing of the carrier pipe, and disposing of the excavated materials in the manner herein provided.
- (b) Water lines crossing beneath paved or concrete drives shall be bored and jacked. No casing pipe is required for drives. A water line shall be installed beneath the drive so that no bell or spigot is located beneath the drive.

3.9.1 Casing Pipe

(a) The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association "Specifications" for Pipelines for Carrying Flammable and Nonflammable Substances." The steel casing pipe shall have minimum yield strength of 35,000 PSI and shall have the minimum wall thickness shown in the following table:

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE FOR E72 LOADING

Carrier Pipe Diameter	Casing Pipe Diameter	Nominal Thickness		
4 inches	8 inches	0.250 inches		
6 inches	12 inches	0.250 inches		
8 inches	16 inches	0.312 inches		
10 inches	20 inches	0.312 inches		
12 inches	22 inches	0.312 inches		
14 inches	24 inches	0.344 inches		
16 inches	26 inches	0.375 inches		
18 inches	30 inches	0.406 inches		

- (b) When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inches greater than the thickness shown.
- 3.9.2 Carrier Pipe The carrier pipe shall be Class 350 DIP.
- **3.9.3** Casing Spacers Casing spacers shall be Model A, painted steel spacers by Pipeline Seal and Insulator Co. or approved equal.
- **3.9.4** End Seals Ends of casing pipe shall be closed by installing a 1/8" thick synthetic rubber end seal, Model C by Pipeline Seal and Insulator Co. or approved equal.
- **3.9.5** Boring The boring shall be accomplished by means of augering to the size, line, and the grade shown on the drawings.
- **3.9.6** Installation of Casing Pipe

- (a) Jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide watertight joints.
- (b) Do not remove unacceptable casing without prior approval from the Engineer. If the removal of casing pipe is permitted, make proper provisions to prevent caving in of the earth surrounding the casing. Void spaces shall be filled with grout or flowable fill. At a minimum, abandoned bore holes shall be pumped full of grout or flowable fill.

3.9.10 Installation of Carrier Pipe

- (a) The carrier pipe shall be furnished by the Contractor. Upon acceptance of the casing, install the carrier pipe in the casing by jacking it through the casing.
- (b) Casing spacers shall be used to provide alignment and support of the carrier pipe inside the casing. At a minimum carrier pipe shall be supported at the midpoint of pipe joint and at 1' from each end of pipe joint (3 per pipe segment).
- (c) No wood blocking of carrier pipe will be permitted.
- (d) Where sewer pipe is installed, restrained casing spacers shall be used in order to prevent flotation of carrier pipe which might impact vertical grade alignment.
- (e) Upon completion of installing carrier pipe in casing pipe, seal both ends with end seals.
- **3.9.11** Layout of Work The Contractor will provide all layouts required to keep the bore on grade and alignment.

3.10 Tunneling

Section Includes

- (a) This item shall include the furnishing and installation of a tunnel with steel liner plates and carrier pipe.
- (b) The Contractor shall conform to all requirements of the Tennessee Department of Transportation having jurisdiction over the tunnel operation and location.

3.10.1 Tunnel Liner Plate

- (a) The tunnel liner shall be constructed of 12 gage, bituminous coated, galvanized, or Type 2, aluminized two or four flanged steel plates bolted together, unless the Authority approves the use of an alternate material. The space between the liner and the edge of excavation shall be filled with grout placed under pressure.
- (b) The steel lining shall consist of plates which have a minimum tensile strength of 42,000 psi, minimum yield of 28,000 psi, elongation at 2 inches of 30% and do not exceed 18 inches wide. Each circumferential ring shall be composed of the number and length of plates to complete the required diameter. The Contractor shall submit details of the lining for approval.
- (c) All plates shall be punched for bolting on both longitudinal and circumferential seams and shall be so fabricated as to permit complete erection from the inside of the tunnel. The longitudinal seam shall be of the lap type with offset equal to gage of metal for full width of plates including flanges, and shall have staggered bolt construction, so fabricated as to allow the cross-section of the plate to be continuous through the seam. All plates shall be of uniform fabrication and those intended for one size tunnel shall be interchangeable.
- (d) The material used for the construction of these plates shall be new and unused Standard Utility Specifications

and suitable for the purpose intended. Plates shall be fabricated with material in accordance with ASTM A-819 and AASHTO M274.

- (e) After the plates are formed to shape and after all holes are punched, the plates shall be galvanized on all surfaces by the hot-dip process. A coating of prime western spelter, or equal, shall be applied at the rate of not less than 2 ounces per square foot of double exposed surface. If the average spelter coating as determined from the required samples is less than the amount specified above, or if any one specimen shows a deficiency of 0.2 ounce, the lot shall be rejected. Spelter coating shall be of first-class commercial quality free from injurious defects such as blisters, flux and uncoated spots.
- (f) All nuts and bolts shall be galvanized and shall be fabricated in accordance with

ASTM A-307, Grade A, B, C.

(g) Plates shall be fabricated with grout holes to facilitate grouting above and around the tunnel liner. These grout openings shall be 2" I.P.T. half couplings welded into a hold in the center corrugation of a plate and a galvanized C.I. plug shall be provided for each opening to permit tight closure after grout is pumped. All rings are to be provided with grout holes so that the spacing of holes with a maximum spacing of 18" centers at the top of the tunnel and at the top quarter points, staggered with the holes at the top.

3.10.2 Grout

The grout shall consist of Portland cement, water, sand and 2% approved additive (Bentonite, Septamine Seaex, Hydrocide liquid, etc.). One part Portland cement with additive shall be combined to four parts clean sand and sufficient water added to provide a grout having the consistency of thick cream when well mixed.

3.10.3 Carrier Pipe

The carrier pipe shall be CL350 DIP.

3.10.4 Excavation

- (a) Excavation shall be unclassified, and no distinction shall be made between rock and other materials excavated. Blasting is acceptable only with explicit written approval from the authority having jurisdiction over tunneled area.
- (b) Construction of the tunnel shall be carried on in such a manner that settlement of the ground surface above the tunnel shall be held to an absolute minimum. Where ground conditions are unstable, poling plates or poling boards shall be used to prevent caving of material above the tunnel before the liner plates can be installed. Steel liner plates shall be installed as soon after the excavation is removed as possible, and excavation shall not be removed more than 24" ahead of the installed liner plates. Excavation shall be carried on in such a manner that voids behind the liner plates will be held to a minimum. However, should any boulders larger than 1' in diameter be encountered, they shall be removed so that none are closer than 6" to the outer face of the liner plate. Where boulders are excavated below the invert of tunnel liner plates, the holes shall be backfilled with crushed stone (#57 or 67).

3.10.5 Liner Plate

(a) When installing liner plate by the tunneling method, the excavation shall be performed in such a manner that voids between the undisturbed earth and the liner plate shall be maintained at a minimum. Any void occurring shall be filled with

Portland cement and sand grout pumped under pressure through grouting openings in the liner plate.

(b) The minimum provision for grouting openings shall be one opening in a top plate of the tunnel at locations not to exceed 54" apart. Additional plates with grouting openings are to be installed at the top quarter points on each side between the top openings. The opening shall be staggered but shall not exceed 54" in any one line. Grout vent pipes will be required at a minimum of one per monolithic pour.

3.10.6 Grouting

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- (a) A pump shall be provided for placing the grout which shall be capable of exerting sufficient pressure to assure the filling of all voids between the liner plate and the undisturbed ground. Minimum acceptance pressure to fill voids will be five pounds per square inch.
- (b) Pumping of grout shall be done (1) at the completion of the installation of approximately each 9' of liner plate, (2) at more frequent intervals than 9' if conditions indicate the necessity, and (3) at the end of a work shift or for stopping work for any reason.

3.10.7 Carrier Pipe

- (a) Contractor shall jack the pipe by means of air bladders, blocks, or other suitable method. Once carrier pipe is established, Contractor shall pour lean concrete bedding for the carrier pipe.
- (b) The carrier pipe shall be adequately strapped to the tunnel flanges behind each bell with 2" x ¹/₄" stainless steel straps bolted to the liner plate flanges with ¹/₂" stainless steel bolts and nuts. Concrete bulkheads will be placed at each end of the tunnel; thickness and placement of which shall be subject to the Authority's approval.

3.10.8 Backfill

Sand, #57 crushed stone, or pea gravel shall be blown into the tunnel to fill the void between the inside wall of the tunnel and the outside edge of the carrier pipe to the top of the carrier pipe.

3.11 Horizontal Directional Drilling

Section Includes

- (a) This section covers the work necessary for the installation of HDPE line without casing installed beneath the creeks or wetland areas.
- (b) This method of installation shall only be used on a case-by-case basis and shall be pre-approved by the Authority.

3.11.1 Products

The Contractor shall provide all materials, equipment, and labor for completing the subaqueous crossing and for adequate protection of the work.

3.11.2 Scope of Work

- (a) Fabricate, Directionally Drill and Install HDPE pipe a minimum of three feet below the bottom of various creeks or wetlands.
- (b) Pressure test the pipeline creek section both before and after installation.

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- (c) Clean up all affected sites and restore all areas to pre-construction or better condition.
- (d) Provide complete as-built drawings for each pipeline crossing. As-builts shall include plan view and profile view.
- (e) Refer to Sections 4.03 and 5.01 for HDPE pipe requirements.

3.11.3 Submittals

- (a) The Contractor shall prepare a schedule for the work and submit it to the Authority for approval. The schedule shall include all major tasks to be performed including the following:
 - 1) Rig mobilization and setup.
 - 2) Pipe assembly.
 - 3) Pilot hole drilling.
 - 4) Pre-reaming.
 - 5) Pre-testing and pigging pipe before installation.
 - 6) Pipe pulling.
 - 7) Pre-testing and pigging pipe after installation.
 - 8) Restoration and demobilization.

3.11.4 Equipment and Materials to be Furnished by Contractor

- (a) The Contractor shall furnish all equipment and material required to complete the Scope of Work which shall include but not be limited to the following:
 - 1) Drilling equipment.

2) Water pumps, hoses, fittings, storage tanks, filters, hay bales, and silt fencing (as required).

3) Drilling fluids containment, collection, cleaning and disposal equipment, and material.

- 4) Fuel and lubricants.
- 5) Bentonite and related mixing equipment.
- 6) Carrier pipe.
- 7) All welding equipment and materials as required.
- 8) All hydrostatic and pneumatic testing equipment and materials.

9) Side-booms, cranes, backhoes, trucks, and other equipment and materials necessary to load and unload pipe and to support and smoothly transition the pipe while being pulled into the reamed hole.

10) All equipment and materials necessary to restore project areas to pre-existing condition or better.

3.11.5 Installation

(a) General: The Contractor shall install the Creek Crossing sections of the pipeline by the horizontally drilled, directionally controlled method of construction. This method shall consist of the drilling of a pilot hole within the designed tolerances for radius requirements, followed by enlargement of the hole to accommodate the product line.

- (b) Instrumentation: The Contractor will at all times provide and maintain instrumentation which will accurately locate the pilot hole position in the X, Y, and Z axis relative to ground surface. Drill fluid flow rate and pressure must also be monitored.
- (c) Tolerances:

1) A smoothly drilled pilot hole shall follow the design centerline of the pipe profile and alignment described on the Drawings. At no point during the bore will the combined radii in the Plan and Profile exceed the allowable minimum radius of the pipe material manufacture.

2) The course of the pilot hole must stay within the given right-of-way at all points along the drilled route. Contractor shall provide and use a separate steering system employing a ground survey grid system, such as "Tru- Tracker".

3) The Contractor shall have accurate working gages which register tensile force being used to pull the pipeline back through the reamed borehole. It is the Contractor's responsibility to prepare the reamed-out hole such that pulling aback operations do not exceed the tensile strength of the pipe. The Contractor shall provide estimated calculations for the pulling loads and allowable loads before pull back operations begin. If during the pipeline pulling process this force reaches 75 percent of the allowable load for the pipeline, the project inspector must be notified immediately. Logs must be kept intact referencing all forces exerted on the pipeline during pullback.

4) The Contractor shall provide adequate support along the stringing area to protect the pipe and allow free movement of the pipeline during pullback.

5) During pullback operations, Contractor shall monitor roller operation and use Side-booms if required to assist movement of the pipe. Situations which could cause damage to the pipe material shall be corrected immediately. Damaged pipe shall be repaired to the satisfaction of the Authority or replaced by the Contractor before pulling operations resume.

3.11.6 Drilling and Mud Cuttings

- (a) The Horizontal Directional Drilling operation is to be operated in a manner to eliminate the discharge of water, drilling mud and cuttings to the creek or land areas involved during the construction process. The contractor shall immediately contain and clean up any inadvertent returns. Contractor shall also provide equipment and procedure to maximize the recirculation of reuse of drilling mud to minimize waste disposal.
- (b) Disposal of drilling fluids shall be the responsibility of the Contractor and shall be conducted in compliance with all relative environmental regulations, easement and works pace agreements and permit requirements. All costs related to disposal shall be borne by the Contractor.
- (c) Water supply is the Contractor's responsibility, whether purchased locally, hauled in, or pumped from the creek. If pumped from the creek the Contractor must comply with the rules of the Tennessee Department of Environment and Conservation.
- (d) Drilling fluids must be free of all additives that will adversely affect the environment.

3.11.7 Additional Testing

After installation, the pipe shall be tested in accordance with requirements of Specification Section 4.3 and/or 5.1.

3.11.8 Ream and Pull Back

- (a) Pre-reaming: Pre-reaming operations shall be conducted at the discretion of the horizontal drilling Contractor. All provisions of this specification relating to simultaneous reaming and pulling back operations shall also pertain to pre-reaming operations.
- (b) Pulling Loads: Contractor shall be responsible for determining safe pulling loads required for proper installation. Such loads shall be minimized as required to prevent failure of the pipeline during installation.
- (c) Pull Section Support: The pull section shall be supported as it proceeds during pull back so that it moves freely, and the pipe material is not damaged.
- (d) Torsion Stress: A properly sized and fully operational swivel will be installed between the reaming assembly at the end of the drill pipe, and the pipeline to restrict torsion stress from being transmitted to the pipeline.

3.11.9 Cleanup, Repairs, and Restoration

- (a) The Contractor is responsible for leaving all areas affected by his construction activities in a condition equal to or better than the condition before construction.
- (b) The Contractor shall restore the area around entry and exit pits as soon as work is completed. Fill to previous existing ground elevation and grade any areas where settlement occurs due to subsidence.

3.12 Concrete for Utilities

Section includes

(a) Furnishing and installing concrete blocking, cradles, anchors, caps, pipe protection, and/or encasement at the locations directed by the Engineer.

3.12.1 Materials

(a) Concrete work shall conform to ACI 301 and ACI 318, latest revision, as modified by the supplemental requirements below:

1) Strength: The strength of concrete shall be 4,000 psi unless otherwise shown on the drawings.

2) Durability: All concrete exposed to weather shall be air entrained.

3)Slump: Concrete shall be proportional and produced to have a slump of three

(3) inches with a one (1) inch tolerance.

4) Admixtures: Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture (retarding, normal, or accelerating, depending on placing temperature), may be used if approved by the Owner.

5) Reinforcing Steel: Yield strength of reinforcing steel shall be 60,000 psi.

3.12.2 Installation

Perform concrete work in accordance with recommendations of ACI 301 and ACI 318.

3.13 Testing Laboratory Services

Section includes

- (a) Laboratory services required to perform the specified testing shall be performed by an independent testing laboratory employed by the Contractor.
 - 1. Services will be paid by Contractor.
- (b) The contractor shall cooperate with the laboratory to facilitate the execution of its required services.
- (c) Employment of the laboratory shall in no way relieve the Contractor's obligations to perform the Work of the Contract.

3.13.1 Qualification of Laboratory

- (a) Laboratory shall meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
- (b) Laboratory shall be authorized to operate in the State of Tennessee.

3.13.2 Reference Standards

- (a) ANSI/ASTM D3740 Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- (b) ANSI/ASTM E329 Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

3.13.3 Laboratory Responsibilities

- (a) Laboratory shall provide qualified personnel at site after due notice and cooperate with Engineer and Contractor in performance of services.
- (b) Laboratory shall perform specified inspection, sampling, and testing of products in accordance with specified standards.
- (c) Laboratory shall ascertain compliance of materials and mixes with requirements of Contract Documents.
- (d) Laboratory shall promptly notify Engineer and contractor of observed irregularities or non-conformance of Work or products.
- (e) Laboratory shall perform additional inspections and tests required by Engineer and authorized by Owner.
- (f) Laboratory shall attend preconstruction conferences.

3.13.4 Laboratory Reports

- (a) After each inspection and test, Laboratory shall promptly submit two copies of laboratory reports to Authority and two copies to Contractor.
- (b) Each report shall include:
 - 1) Date issued
 - 2) Project Title and number
 - 3) Testing laboratory name, address, and telephone number
 - 4) Name of laboratory inspector and job number
 - 5) Date and time of sampling or inspection
 - 6) Record of temperature and weather conditions

- 7) Date of test
- 8) Identification of specification section
- 9) Location of sample or test in the Project
- 10) Type of inspection or test
- 11) Results of tests and compliance with Contract Documents
- 12) Interpretation of test results

3.13.5 Limits on Testing Laboratory Authority

- (a) Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Document.
- (b) Laboratory may not approve or accept any portion of the Work.
- (c) Laboratory may not assume any duties of Contractor.
- (d) Laboratory has no authority to stop Work.

3.13.6 Contractor Responsibilities

- (a) Cooperate with laboratory personnel, and provide access to Work
- (b) Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- (c) Notify Engineer and laboratory 48 hours prior to expected time for operations requiring inspection and testing services.

1) When tests or inspections cannot be performed after such notice, Contractor shall notify the laboratory.

2) If Contractor does not notify the laboratory before laboratory personnel are scheduled for this work, Contractor shall reimburse the laboratory personnel for time and travel expenses

3.13.7 Payment for Testing

(a) Initial Service:

1) When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.

(b) Retesting:

1) When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be deducted by the Owner from the Contract Sum.

(c) Contractor's Convenience Testing:

1) Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

3.13.8 Code Compliance Testing

Inspections and tests required by codes or ordinances, or by a plan approval authority having jurisdiction over the project site, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

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ARTICLE 4: SANITARY SEWERS

4.1 Manholes

4.1.1 General

- (a) Manholes shall be precast or monolithic cast in place concrete with concentric cones unless otherwise approved by the Authority.
- (b) Shop drawings are required in accordance with Section 2.4 for castings, plastic gaskets, and precast manholes specified in this section.

4.1.2 Products

- (a) **CONCRETE MASONRY**: Reinforced or plain, meeting the applicable requirements of Section 3.12.
- (b) CLAY BRICK (FOR CASTING ADJUSTMENT): Clay brick shall be medium hard or better quality. Grade AM sewer brick conforming to the requirements of ASTM C32. Brick shall be solid and not cored brick.
- (c) **MORTAR**: Composed of one (1) part Portland cement and two (2) parts sand (volumetric measure) thoroughly mixed in a tight box, with water added gradually and mixed continually until mortar has attained the proper consistency for use in brick masonry; prepared only in such quantities as needed for immediate use; mortar mixed for more than 30 minutes, re-tempered, or previously set shall not be allowed.
- (d) GRAY IRON CASTINGS: Cast iron conforming to the requirements of Class 30, ASTM A48; made accurately to the required dimensions; sound, smooth, clean, and free from blisters and other defects; not plugged or otherwise treated to remedy defects; machined so that covers rest securely in the frames with no rocking and are in contact with frame flanges for the entire perimeter of the contact surfaces; thoroughly cleaned subsequent to machining and, before rusting begins, painted with a bituminous coating so as to present a smooth finish; tough and tenacious when cold, but not tacky and with no tendency to scale; and with the actual weight in pounds stenciled or printed by the manufacturer on each casting in white paint.
- (e) **PLASTIC GASKET FOR PRECAST MANHOLES**: Pre-formed plastic gasket shall meet or exceed all requirements of FS SS-S-00210, "Sealing Compound, Pre-formed Plastic for Pipe Joints," Type I rope form. The compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space when the pipes are laid. Use two (2) complete ropes at each joint. The sealing compound shall be protected by a suitable removable two (2) piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. The flexible plastic gasket shall also meet the requirements of the following table:

Composition	Test Method	Minimum	Maximum
Bitumen (Petroleum Plastic Content)	ASTM D4	50	70
Ash Inert Mineral Matter	AASHTO T111	30	50
Volatile Matter	ASTM D6		2.0

Property

Test Method

Minimum Maximum

Specific Gravity at 77 degrees F	ASTM D71	1.20	1.30
Ductility at 77 degrees F (cm)	ASTM D113	5.0	Softening Point
	ASTM D36	320 F	Penetration at 77
degrees F (150 gms) 5 sec.	ASTM D217	50	120

(f) STEEL TRAFFIC GRADE ADJUSTMENT RING (FOR CASTING ADJUSTMENT)

Adjustment rings shall conform to ASTM A48, Class 30, material specifications. The adjustment ring shall be of a traffic design and no more than 2-inches in height. The extension ring shall be No. 2500 as manufactured by John Bouchard & Son, Company, or equal. Reinforced concrete adjustment rings shall also be allowed.

(g) STANDARD FRAME AND COVER

- The standard frame and cover shall be traffic typed gray cast iron ASTM Designation A48

 Latest Revision, with 24-inch (minimum) diameter opening weighing not less than 410 pounds. The covers shall be the solid self-sealing type with no holes except watertight pick notches. The surface between the cover and frame shall fit smoothly without rocking and shall be thoroughly cleaned. The gray iron castings shall be painted with a bituminous coating.
- 2) Cover shall be of the solid indented type with the words "Sanitary Sewer" cast in raised letters thereon. Manhole frames and covers shall be Vulcan Foundary #V-1115 or approved equal.

(h) WATERTIGHT MANHOLES, FRAMES, AND COVERS

- 1) The manhole frames shall be set in the same manner prescribed for standard frames except special attention shall be paid to securing a watertight connection to the manhole barrel.
- 2) The watertight manhole frame and cover shall be a traffic type of grey cast iron ASTM A48-64 with a 24-inch diameter minimum clear opening weighing not less than 550 pounds and shall be of the two-cover design as shown on the Plans.
- 3) The surface cover shall be the solid type with no holes except watertight pick notches or a heavy lifting ring. The surface between this cover and frame shall fit without rocking. The inner cover shall be of the solid type with no holes, shall have not less than two lifting handles and shall have a neoprene sealing gasket at last 3/8-inch diameter cross-section. The inner cover shall be mechanically sealed by means of a removable metal bar located over the inner cover with a centrally located stainless steel tightening bolt. This bolt shall be fitted for a tee-handle or bent-handle for turning which shall be included with each cover. The bolt shall have Acme threads for durability. The inner cover shall have appropriate reinforcing ribs to prevent cracking or distortion when tightened. The inner cover shall have sufficient clearance to allow easy installation of the cover. Manhole frame and cover shall be Vulcan #V-2150-3 or approved equal.

(i) SHALLOW MANHOLE FRAMES AND COVERS

- 1) The manhole frames shall be set in the same manner prescribed for standard frames except special attention shall be paid to securing a watertight connection to the manhole barrel.
- 2) Shallow manholes shall be used where depth is five (5) feet or less.
- 3) The watertight manhole frame and cover shall be a traffic type of gray cast iron ASTM A48 with a 30-inch minimum clear opening as shown on the plans.
- 4) Cover shall be of the solid indented type with the words "Sanitary Sewer" cast in raised letters thereon. Shallow manhole frame and cover shall be John Bouchard #1312 or equal.

(j) MANHOLE JOINT WRAP

Joint wrap, at all joints between riser sections, shall be installed in accordance with ASTM C909. Joint wrap shall be 6-inch minimum width, and as manufactured by Press Seal Gasket Corporation of Fort Wayne, Indiana, or equal.

(k) MANHOLE STEPS

Manhole steps shall be made of copolymer polypropylene plastic meeting the latest revision of ASTM D2146-82, Type II, Grade 16906 and shall have a ¹/₂ inch diameter Grade 60 reinforcing rod meeting the latest revision of ASTM A615 through its center. Each step shall be [12 inches in width] and capable of carrying a load of 1,000 pounds in the center of the step when projected 6 inches from the wall. Each step shall be equipped with non-skid grooves.

(1) MANHOLE INVERTS

- 1) Manhole inverts shall be formed from 2,000 psi concrete. Inverts for "Straightthrough" manholes may be formed by laying the pipe straight through the manhole, pouring the concrete invert and then breaking out the top half of the pipe. Curved inverts shall be constructed of concrete and shall form a smooth even, half-pipe section as shown on the Plans. The inverts shall be constructed when the manhole is being built.
- 2) The bench or top portion of the invert shall slope to the flow line to prevent standing water.

(m) RESILIENT PIPE CONNECTIONS AT MANHOLES

- Resilient pipe connectors shall be manufactured in accordance with ASTM C923 and shall provide a positive watertight joint and minimum of 10 degrees deflection in any direction. There shall be no water leakage through the connector when the pipe is in its maximum deflected position. Connectors shall be manufactured of durable construction. Connectors shall be manufactured of durable rubber which offers superior resistance to water, sewage, oils, acid, ozone, weathering, and aging. Conical type flexible boot of the proper size to match the OD of the connection pipes shall be clamped securely to the cut out in the manhole wall and to the pipe by means of stainless-steel clamps or bands. The void area between the pipe and the connector shall be sealed with an approved flexible gasket material. The flexible boot shall meet ASTM C433. Connectors shall be as manufactured by the KOR-N-SEAL Company of Milford, New Hampshire, Press-Boot by Press-Seal Gasket Corporation of Fort Wayne, Indiana, or equal.
- Compression-type connectors cast integrally into the manhole wall shall be equivalent to the [A-Lok Manhole Pipe Connector as manufactured by A-Lok Products, Inc.] Compression-type connectors shall only be used when specifically called for on the drawings.

(n) PRE-CAST CONCRETE MANHOLES

- Precast manholes shall be constructed on a reinforced concrete foundation and shall be wet cast as modified herein. The bottom section of the manhole shall be precast integrally with the precast ring and shall be 4'-0" in diameter unless otherwise noted on plans. All concrete used in connection with the construction of manholes shall be 4,000 psi concrete. Wet cast precast manholes shall be Cloud or equal.
- 2) The precast manhole manufacturer shall use the additive Xypex concrete Admix C-2000/C-1000 at the rate of 2-3 percent by weight of cement in the concrete mix for all manholes. The Xypex Concentrate Admix must be added to the concrete at the time of batching as recommended by the manufacturer (Xypex Chemical Corporation, Richmond, British Columbia, Canada, local contact (615) 333-1000.)
- Precast concrete rings shall be constructed using standard forms and shall conform to Standard Utility Specifications

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ASTM C478 including steel reinforcement.

- 4) The precast sections shall be manufactured and installed in a manner so that there is no visible leakage in the manholes. The manhole section shall be manufactured in lengths such that a finished manhole will have the least possible number of joints. One section less than four feet in length will be allowed per manhole and that being the section required bringing the manhole to grade. The precast rings shall be of the tongue and groove design sealed watertight, and the joint shall be grouted smooth on the inside of the manhole so that no crack is visible. A resilient pipe connection shall be utilized in the sewer line to manhole connection.
- 5) The manhole sidewall shall be adjusted with either steel or concrete grade adjustment rings as required to bring the casting to grade.

(o) MATERIAL TESTING

All precast reinforced concrete manhole risers and tops specified herein shall be tested and inspected by a commercial testing laboratory prior to delivery to the site, and all materials that fail to conform to these specifications shall be rejected. After delivery to the site, any materials that have been damaged in transit or are otherwise unsuitable for use in the work shall be rejected and removed from the site. Supply certified copies in duplicate of the inspection and acceptance reports of the testing laboratory to the Authority before using the materials. The commercial testing laboratory shall be engaged and paid for by the Contractor. Submit a certificate from the manufacturer of the castings indicating they meet all applicable requirements of these specifications.

4.1.3 Manhole Installation

- (a) Dewater sufficiently to maintain the ground water level at or below the bottom of the manhole foundation prior to and during placement of the foundation.
- (b) Obtain an adequate foundation for all manhole structures by removing and replacing unsuitable material with well graded granular material, by tightening with coarse rock, or by such other means as provided for foundation preparation of the connected sewers or as directed by the Authority. Wherever water is encountered at the site, place all cast-inplace bases or monolithic structures on a one-piece waterproof membrane to prevent any movement of water into the fresh concrete.
- (c) When the foundation subgrade has been prepared and is approved by the Authority, carefully construct the concrete foundation for monolithic manholes to the line and grade required by the drawings. Construct the manholes after the concrete foundation has been allowed to set for a period of not less than 24 hours.
- (d) For precast manholes, carefully block the base section above the prepared surface so that it is fully and uniformly supported in true alignment; make sure that all entering pipe can be inserted at proper grade. A monolithic manhole bottom shall be used unless directed otherwise by the Authority.
- (e) Thoroughly wet and then completely fill all lift holes with mortar. Smooth and paint them both inside and outside to ensure water tightness.
- (f) Construct monolithic concrete manholes and bases of 4,000 psi concrete in accordance with the provisions of this section. The ladder bars shall be cast in place.
- (g) Carefully set the cast iron frame for the cover at the required elevation, and properly bond it to the masonry with cement grout, plastic manhole sealant and/or anchor bolts. Whenever manholes are constructed in paved areas, tilt the top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the existing adjacent pavement.
- (h) Manhole inverts shall be constructed of concrete or Portland cement mortared masonry fill and may, at the Contractor's option, be covered with cement mortar to the approximate cross section of the sewers connected to them. Make any necessary changes in cross sections

gradually from side to side of the manhole; make changes in direction of flow of the sewers to a true curve of as large a radius as is permitted by the size of the manhole.

- (i) Use flexible watertight manhole couplings on all pipe at connections to manholes.
- (j) Where the difference in the invert elevation of two or more lines intersecting in one manhole is 24 inches or more, construct a drop manhole. Drop manholes shall be similar in construction to standard manholes except that a drop connection of pipe and fittings of the proper sizes and materials shall be constructed outside the manhole and supported by 3,000 psi concrete as indicated by the standard drawings. Drops shall be 8 inches in size for pipe 12 inches and less in diameter. For pipes larger than 12 inches in diameter, drops shall be 10 inches.
- (k) Place backfill by hand around the manhole and to a distance of at least one (1) pipe length into each trench, and tamp with selected material up to an elevation of twelve (12) in ches a b o ve the crown of all entering pipes. Continue backfilling in accordance with the requirements for trench backfilling.
- (l) Flat-tops shall be used on manholes only when manhole depth is 5' or less.
- (m) Vacuum Testing of New Manholes:
 - 1) This test is only applicable to precast concrete manholes.
 - 2) All lifting holes shall be filled and pointed with an approved non-shrinking mortar.
 - 3) Manholes are to be tested immediately after assembly and before backfilling.
 - 4) No standing water shall be allowed in the manhole excavation which may affect the accuracy of the test.
 - 5) Installation and operation of vacuum equipment and indicating devices shall be in accordance with equipment specifications and instructions provided by the manufacturer.
 - 6) The test head shall be placed to include the manhole casting (frame).
 - A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches of mercury shall be recorded.
 - Acceptance for 4-foot diameter manholes shall be defined as when the time to drop to 9 inches of mercury conforms to the table below. Authority representative shall witness all manhole tests.

Manholes Depth	Diameter	<u>Time to Drop 1 Inch Hg</u>
10 feet or less	4 feet	60 seconds
10.1 feet to 15 feet	4 feet	75 seconds
15.1 feet to 25 feet	4 feet	90 seconds

- 9) For manholes 5 feet in diameter, add an additional 15 seconds and for manholes 6 feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes.
- 10) If the manhole fails to test, necessary repairs shall be made, and vacuum test repeated until the manhole passes the test.
- 11) If the manhole joint mastic or gasket is displaced during the vacuum test, the manhole shall be disassembled, and the seal replaced.
- (n) Casting adjustment may be accomplished with either manhole brick or precast concrete grade rings. Maximum grade adjustment shall not exceed 12 inches.
- (o) After the manhole has been adjusted to the proper grade, the manhole shall be visually inspected by the Contractor in the presence of the Authority's Representative. Any defects

noted shall be corrected by the Contractor until the work is found satisfactory to the Authority.

4.2 Sanitary Sewers (Gravity)

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Section includes

- (a) Pipe material for sewer lines shall be DIP or PVC.
- (b) Shop drawings and manufacturer certification are required for all products specified in this section.
- (c) Refer to other sections for items affecting gravity sewers. Coordinate this work with that specified by other sections for timely execution.
- (d) Each type of gravity pipe and fittings (DIP, PVC, etc.) supplied under this section shall be provided by the same manufacturer.

4.2.1 Pipe

- (a) Polyvinyl Chloride (PVC): to meet and/or exceed the requirements of ASTM D3034, SDR 35; suitable for use as a gravity sewer conduit with provisions for contraction and expansion at each joint; with a rubber ring and standard lengths of 20' and 12.5' plus or minus one (1) inch; designed to pass all tests at 73 degrees F (plus or minus 3 degrees F); six (6) inches long sections of pipe to be subjected to impact from a free falling top (20 pounds, Type A) in accordance with ASTM D2444 with no evident splitting or shattering (denting not considered a failure); and with a minimum envelope of eight (8) inches of granular material around the pipe and to a depth of twelve (12) inches above the pipe, but with all other bedding and backfilling requirements remaining the same as for other pipe material.
- (b) Contech A -2000: to meet and/or exceed the requirements of ASTM F949; manufactured from 12454 cell class material per ASTM D1784; minimum pipe stiffness of 46 lbs./in./in. when tested in accordance with ASTM D2412; with diameters approved of twelve (12) inches and larger; and all bedding and backfilling requirements meeting the requirements of SDR-35 pipe.
- (c) Contech A-2026: to meet and/or exceed the requirements of ASTM F949; manufactured from 12454 cell class per ASTM D1784; with a minimum pipe stiffness of 115 psi; with gaskets meeting the requirements of ASTM F477; and all bedding and backfilling requirements meeting the requirements of SDR-35 pipe.
- (d) Large Diameter PVC: to meet and/or exceed the requirements of ASTM F679, specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings; suitable for use as a gravity sewer conduit. Pipe shall be subjected to the ASTM D2444 Impact Resistance Test as described in 2.01.A. The minimum wall thickness shall meet the requirements of ASTM D2122 (0.711 in. for 24", 0.903 in. for 30").
 - 1) Pipe shall be clearly marked at 5-foot intervals with the following:
 - (aa) Manufactures name or trademark and code
 - (bb) Nominal pipe size
 - (cc) PVC minimum cell classification
 - (dd) PS 46 PVC Sewer Pipe (Pipe stiffness designation)
 - (ee) ASTM F679
 - 2) Minimum envelope of six (6) inches granular material shall be placed for pipe bedding below the pipe and initial backfill granular material to a point twelve (12) inches above the pipe. Other bedding and backfill requirements shall be the same as for other pipe material.
- (e) Large Diameter PVC (Alternative): to meet or exceed the requirement of ASTM F1803, Standard Specification for Poly (Vinyl Chloride) (PVC) Closed Profile Gravity Pipe. Impact Standard Utility Specifications

resistance shall be in accordance with ASTM D2444 with a free-falling tap (30 pounds, Type B with flat-plate holder) Type B to a level of 220 foot-pounds with no evidence of splitting or cracking. Minimum pipe stiffness shall be 46 psi when tested in accordance of ASTM D2412. The contractor shall follow the bedding and backfill requirements as previously described for PVC pipe.

Other PVC pipe products designed per ASTM D794, sometimes referred to as "open profile", shall not be considered equal to the products specified for this project and shall not be considered for quotation.

- (f) Ductile Iron: With push-on joints conforming to ASTM A746, Class 350 unless otherwise shown on the drawings.
- (g) Lateral Branches: To be tees of the same material as the main sewer and have a 6" inside diameter unless otherwise specified or noted; able to withstand all test pressures involved without leakage.

4.2.2 Joints and Jointing Materials

- (a) Polyvinyl Chloride (PVC) Pipe Joints: Joints for sewer plastic pipe shall meet all requirements of ASTM D3212 standard specifications. Joint design shall be tested and certified to result in no leakage under prescribed laboratory test conditions of joint alignment, load conditions, pressure and vacuum, and deflection. Pipe and fittings shall have integral bell with elastomeric seal joint.
- (b) Ductile Iron Pipe Joints: gasket type joints for bell and spigot ductile iron pipe designed to meet the infiltration requirements of these specifications; jointing to comply with the applicable provisions of ANSI A21.11.

4.2.3 Compression Couplings

When dissimilar pipe materials like PVC and concrete pipe are joined, use compression couplings that are resistant to the corrosive action of soils and sewage and that will provide a permanent watertight joint. The compression couplings shall be of natural or synthetic rubber or rubber-like material and shall comply with the requirements and test methods specified in Table 2 of ASTM C425. The coupling shall meet the leak requirements specified in ASTM C425, and the bands for attaching the couplings to the dissimilar pipes shall be of stainless-steel meeting ASTM A167 or A240. Each coupling shall bear the manufacturer's identifying mark and an indication of its size.

4.2.4 Pipe Laying

- (a) Lay no pipe except in the presence of an observer representing the Authority.
- (b) Before placing sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting as provided in Section 3.06, Unclassified Excavation for Utilities.
- (c) Wherever necessary to provide satisfactory bearing surface, place concrete cradles as shown on the drawings or as directed by the Authority. Cradles shall be of concrete and conform to the dimensions shown on the drawings. Concrete placed outside the dimensions shown shall be at the Contractor's expense.
- (d) No sewer lines shall be installed without approved cut sheets having been approved by the Authority.
- (e) Tightly stretch a mason's line or wire above ground level, parallel to and directly above the axis of the pipe to be installed, supporting this line at intervals of no more than 50 feet for sewers being laid on a grade of two percent (2%) or more and of no more than 25 feet for grades of less than two percent (2%). Determine the exact line and grade for each section of

pipe by measuring down from this line to the invert of the pipe in place, and accurately place each pipe to the exact line and grade called for on the drawings. Furnish all labor and materials necessary for erecting batter boards.

- (f) Lasers may be used. When lasers are used, set reference points for both line and grade at each manhole. Where grades are 0.6% or less, check the elevation of the beam each 100 feet with an offset point or engineer's level.
- (g) Do not allow water to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to de-water. Open pipe ends shall remain temporarily plugged at all times.
- (h) Correct trench bottoms found to be unsuitable for foundations after pipe laying operations have started, bringing them to exact line and grade with crushed stone as necessary.
- (i) Carefully inspect each piece of pipe and special fitting before it is placed and lay no defective pipe in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.
- (j) Bell holes shall be large enough to allow ample room for the pipe joints to be properly made. Cut out bell holes no more than two (2) joints ahead of the pipe laying. Carefully grade the bottom of the trench between bell holes so that each pipe barrel rests on a solid foundation for its entire length. Lay each pipe joint so as to form a close concentric joint with adjoining pipe and to avoid sudden offsets or inequalities in the flow line.
- (k) Before c o n s t r u c t i n g or placing any joints, demonstrate to the inspector, by completing at least one (1) sample joint, that the methods to be used conform to the specifications and will provide a watertight joint and further that the workmen to be involved in this phase of work are thoroughly familiar and experienced with the type of joint proposed.
- (1) Install tee branches in sewer lines to serve properly each lot facing or abutting on the street or alley in which sewer is being laid and at such other locations as may be designated. If tee branches are not to be used immediately, close them with approved stoppers that are held in place to prevent infiltration and withstand all test requirements.
- (m) For all tees that are plugged and laid in rock, blast a minimum of six (6) linear feet of ditch line in the direction and to the approximate grade of the future lateral, but do not excavate the material. Furnish the Authority with a record of the exact location of each tee installed.
- (n) If the work consists of constructing a new sewer to replace an existing one, connect existing service lines to the new line.
- (o) New service laterals shall conform to the standard drawings.
- (p) As the work progresses, thoroughly clean the interior of the pipe in place. After each line of pipe has been laid, carefully inspect it, and remove all earth, trash, rags, and other foreign matter from its interior.
- (q) After the joints have been completed, they shall be inspected, tested, and accepted by the Authority before being covered. The pipe shall meet the test requirements for water tightness; immediately repair any leak or defect discovered at any time after completion of the work. Any pipe that has been disturbed after joints were formed shall be taken up, the joints cleaned and remade, and the pipe re-laid at the Contractor's expense. Carefully protect all pipe in-place from damage until backfilling operations are completed.
- (r) Do not begin the backfilling of trenches until the pipe in place has been inspected and approved by the Authority.
- (s) Lay sewers at least ten (10) feet horizontally from any existing or proposed water main. If this is not practical, the sewer may be laid closer than ten (10) feet to a water main provided it is laid in a separate trench and the elevation of the top of the sewer is at least 18 inches below the bottom of the water main.

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- (t) Where a sewer crosses under water mains, the top of the sewer shall be at least 18 inches below the bottom of the water main. If the elevation of the sewer cannot be varied to meet the above requirements, relocate the water main to provide this separation, or else reconstruct it with mechanical joint ductile iron pipe for a distance of ten (10) feet on each side of the sewer with a full joint of the water main centered over the sewer.
- (u) If it is impossible to obtain proper horizontal and vertical separation as stipulated above, construct both the water main and the sewer of mechanical joint ductile iron pipe, and pressure test each.
- (v) Perform boring by means of auguring to the size, line, and grade shown on the drawings. Jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide a watertight joint.
- (w) Make connections to all existing sewer lines as shown on the drawings. Make connections either by removing a section of the sewer from the existing line and inserting a wye or tee branch of the proper size or by constructing a manhole, junction box, regulator chamber, or other structure as shown on the drawings.
- (x) Make connections to existing manholes or inlets by cutting a hole in the wall of the existing structure and insert a watertight flexible manhole pipe connector into the cored opening. Shape or reshape the bottom of the manholes as necessary to fit the invert of the sewer pipe.
- (y) Joint dissimilar pipe by using suitable compression couplings. Compression couplings will not be allowed on new installations.
- (z) Provide concrete protection or concrete cap as shown on the drawings for pipe sewers that, when completed, have less than 2.5 feet of cover in non-traffic areas and four (4) feet of cover in traffic areas. If such protection is not shown on the drawings, place it in accordance with the typical section shown.
- (aa)Carefully protect from damage all existing sewers, water lines, gas lines, sidewalks, curbs, gutters, pavements, electrical lines, and other utilities or structures in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility or structure in order to complete the work properly, do so in compliance with the provisions set forth in other section of these specifications.
- (bb) For PVC and ductile iron pipe, furnish a certificate from the pipe manufacturer indicating that the pipe meets all applicable requirements of these specifications.
- (cc) The minimum pipe stiffness for PVC pipe at five percent (5%) deflection shall be 46 for all sizes when tested in accordance with ASTM D2412; external loading properties of plastic pipe shall be by parallel plate loading.
- (dd) A specimen of PVC pipe six (6) inches long shall be flattened between parallel plates in a suitable press until the distance between the plates is 40% of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is complete in two (2) to five (5) minutes.
- (ee) After being immersed for two (2) hours in a sealed container of anhydrous acetone (99.5% pure), a sample ring of PVC pipe shall show no visible spalling or cracking when tested in accordance with ASTM D2152 (swelling or softening is not considered a failure).

4.2.5 Testing Gravity Sewers

- (a) Visual Tests
 - 1) Upon completion of the construction or earlier if the Authority deems advisable, the Authority shall make a visual observation of the sewer and construction site. Immediately repair all leaks and defects found by such observation.
 - 2) In addition to general cleanup and leakage, the following standards shall be used to determine failure or defects of this project.

3) Sewers shall be built so as to remain true to line and grade. The inclining grade of the bottom of the sewer after completion shall be such that, after flooding, the flood water drains off so that no remaining puddle of water is deeper than 1/2 inch on pipe 36 inches internal diameter or smaller and 3/4 inch on pipe larger than 36 inches internal diameter. Any section of pipe that does not comply with the specifications at any time previous to final acceptance of the work shall be replaced or re-laid at the Contractor's expense.

- 4) The Contractor shall be held strictly responsible that all parts of the work bear the load of the backfill. If cracks 0.01 inch develop in the pipe within one (1) year from the date of final acceptance of the work, the Contractor shall be required to replace, at his expense, all such cracked pipe. To this end, the Contractor is advised to purchase pipe under a guarantee from the manufacturer, guaranteeing proper service of sewer pipe under conditions established by the drawings, specifications, and local conditioning at the site of the work.
- (b) Air Testing for Sewers
 - 1) Perform low pressure air testing as follows:
 - (a) Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the Authority.
 - (b) Make the air test after all services have been installed and backfilling has been completed and compacted.
 - (c) Perform the first series of air tests after 2,000 linear feet but before 4,000 linear feet of sewer has been laid. The purpose of this first series of tests is to assure both the Contractor and the Authority that the materials and methods of installation meet the intent of these specifications. Conduct the remainder of the tests after approximately each 10,000 linear feet has been laid. All air tests shall be conducted in the presence of an Authority representative.
 - (d) Plug all tees and ends of sewer services with flexible joint plugs or caps securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.
 - (e) Prior to testing, check the pipe to see that it is clean. If not, clean it by passing a full gauge squeegee through the pipe. It shall be the Contractor's responsibility to have the pipe cleaned.
 - (f) Immediately following this check or cleaning, test the pipe installation with low pressure air. Supply the air slowly to the plugged pipe installation until the internal air pressure reaches 4.0 psi more than the average back pressure of any ground water that may submerge the pipe. Allow at least two (2) minutes for temperature stabilization.
 - (g) The pipeline shall be considered acceptable when tested at an average pressure of 3.0 psi more than the average back pressure of any ground water that may submerge the pipe, if the section under test does not lose air at a rate greater than 0.0015 cfm per square foot of internal pipe surface area. Calculate the pressure drop as the number of seconds for the air pressure to drop from a stabilized pressure of 3.5 to 3.0 psi more than the average back pressure of any ground water that may submerge the pipe. Calculate time as described in ASTM C828.
 - (h) The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 3.0 psi more than the average back pressure of any ground water that may submerge the pipe is not less than that shown in Table 1 attached at the end of this section.
 - (i) If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage and repair or replace Standard Utility Specifications

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all defective materials or workmanship. The completed pipe installation shall meet the requirements of this test before being considered acceptable.

- 2) The recommended procedures for conducting acceptance tests are as follows:
 - (a) Clean pipe that is to be tested.
 - (b) Plug all pipe outlets with suitable test plugs and brace each plug securely.
 - (c) Increase gauge pressure in the test by the amount of ground water pressure at the crown of the pipe.
 - (d) Add air slowly to the portion of the pipe installation being tested until the internal air pressure is raised to 4.0 psi more than the average back pressure above the crown of the pipe.
 - (e) After the above internal pressure is obtained, allow at least two (2) minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
 - (f) After two (2) minutes, disconnect the air supply.
 - (g) When pressure decreases to 3.5 psig, either by leaking down or by bleeding down with a release valve, start the stopwatch, and determine the time in seconds that is required for the internal air pressure to reach 3.0 psig.
 - (h) Compare this time interval as calculated above. If the time is more than that calculated, the test shall be assumed to be acceptable.
- 3) Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of a plug, which can become a high velocity projectile. Locate gauges, air piping manifolds, and valves at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Four (4) pounds per square inch air pressure (gauge) develops a force against the plug in a 12-inch pipe of approximately 450 pounds. Provide a safety release device set to release at ten (10) psi between the air supply and the sewer under test.
- 4) Regardless of the outcome of the tests, repair any noticeable leak.
- (c) Infiltration Testing
 - Ground water above the pipe will reduce air loss. If the section of line under test shows significant infiltration, the Contractor, shall furnish, install and maintain a V-notch sharp crested weir in a wood frame tightly secured at the low end of each sewer lateral and at locations on the main sewers directed by the Authority. Maximum allowable infiltration shall be 25 gallons per mile per inch of diameter of sewer per 24-hour day at any time. The joints shall be tight, and visible leakage in the joints or leakage in excess of that specified above shall be repaired at the Contractor's expense by any means found to be necessary.
 - 2) When infiltration is demonstrated to be within the allowable limits, the Contractor shall remove such weirs.
 - 3) Infiltration tests may be required for the complete line or any portion thereof. Failure of any part of the line to pass an infiltration test shall be sufficient reason.
- (d) Repairs
 - 1) Regardless of the outcome of any tests, repair any noticeable leak.

4.2.6 Copper Wire for Detection

All buried sewer lines shall be installed with a 12-gauge, blue coated copper wire, installed 12" to 18" below finished grade directly above the pipe.

4.2.7 Visual Inspection of Miscellaneous Materials

All material used on this project shall be visually observed by the Authority at the site for conformance to the required specifications. When reasonable doubt exists that said material meets the specifications, the Authority may require certified mill tests, samples, and/or tests by an independent laboratory or other suitable form of verification that the material meets the required specifications.

4.2.8 Deflection Testing for PVC Pipe

Test deflection of the pipe by passing a nine (9) arm pin go / no-go mandrel sized to 95% of the pipe diameter of the actual pipe used with the pipe in place and covered. Make this acceptance test after backfill consolidation has occurred. Contractor shall provide the mandrel. Test to be performed in the presence of the Authority.

4.2.9 Clean Up

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After completing each section of the sewer line, remove all debris, construction materials, and equipment from the site of the work, grade and smooth over the surface on both sides of the line, and leave the entire area in a clean, neat, and serviceable condition.

TABLE 1											
	MINIMUM SPECIFIED TIME REQUIRED FOR A 0.5PSIG PRESSURE DROP										
		FOI	R SIZE AND) LENGTH	OF PIPE	INDICATI	ED FOR Q	0 = 0.0015			
		3			Sp	ecification '	Time for Le	ength (L) Sl	hown (min:	sec)	
1	2	Length	4					-		·	
Pipe	Minimu m Timo	for	Time for								
(in.)	(min:sec)	Time	Length								
()	()	(ft.)	(sec.)								
				100 #	150 #	200 ft	250 ft	200 f t	250 ft	400 f t	450 f t
				100 It	150 ft	200 II	230 ft	300 ft	550 ft	400 II	450 ft
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L 2.671 I	5:40	5:40	5:42 8:54	/:08	8:55	9:58	11:24	12:50
13	8:30	133	2.071 L 3 846 I	8.30	9.37	12.49	16:01	19.21	22.26	25.38	20.02
21	9.55	114	5 235 L	9.55	13.05	17.27	21.49	26.11	30.32	34.54	39.16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23
42	19:45	57	20.942 L	34:54	52:21	69:49	87:15	104:42	122:10	139:37	157:04
48	22:47	50	27.352 L	45:35	68:23	91:11	113:58	136:46	159:33	182:21	205:09
54	25:41	44	34.618 L	57:42	86:33	115:24	144:15	173:05	201:56	230:47	259:38
60	28:20	40	42.738 L	71:14	106:51	142:28	178:05	213:41	249:18	284:55	320:32

4.3 Sewage Force Main

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- (a) Wherever reaction blocking is necessary, it shall be considered an integral part of the force main work.
- (b) Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections.
- (c) All buried sewer lines shall be installed with a 12-gauge, blue coated copper wire, installed 12" to 18" below finished grade directly above the pipe.

4.3.1 Ductile Iron Pipe and Fittings

- (a) Ductile cast iron pipe shall be made of good quality ductile iron that meets the requirements for modular iron castings of ASTM E8. It shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be specified by ANSI A21.50/AWWA C150, Pressure Class 350.
- (b) Ductile iron pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to the specifications of ANSI A21.51/AWWA C151. It shall be made and tested in accordance with ASTM A339 and shall be subjected to and able to withstand a hydrostatic pressure of 500 psi. The maximum depth of pits shall be half that allowed in the AWWA specifications.
- (c) The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
- (d) The push-on, single gasket joints shall be either Fastite (manufactured by American Cast Iron Pipe Company), Tyton (U. S. Pipe and Foundry Company), Super Bell-Tite (Clow Corporation), or other joints of similar type and equal quality. They shall be able to withstand 200 psi of operating pressure.
- (e) The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- (f) The gasket shall be of high-quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- (g) Enough lubricant shall be furnished with each order to provide a thin coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste of smell or odor, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.
- (h) Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.53/AWWA C153.
- (i) Pipe and fittings shall be lined with enameline or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately one (1) mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- (j) Fitting laying lengths shall conform to ANSI A21.53/AWWA C153.

- (k) Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.
- (1) The pipe manufacturer shall furnish the Authority a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with ANSI A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the serial number of each piece of pipe making up the shipment. In addition, the weight of each individual piece of pipe making up the shipments to be listed opposite the serial number of each pipe length and attached to the certificate of inspection.

4.3.2 PVC Pipe

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- (a) All plastic pipe shall be made from Class 12454-B polyvinyl chloride plastic (PVC 1120) as defined by ASTM D1784.
- (b) VC pipe used to transport sewage shall be green in color.
- (c) All Class 200, 250, or 315 pipe shall have NSF approval and be manufactured in accordance with ASTM D2241. The following tests shall be run for each size and type of piping being produced, as specified below:

1) Flattening Test: Once per shift in accordance with ASTM D2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.

2) Acetone Test (Extrusion Quality Test): Once per shift in accordance with ASTM D2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the test.

3) Quick Burst Test: once per 24 hours in accordance with ASTM D1599.

<u>SDR</u>	Pressure Rating	Minimum Bursting Pressure, psi
13.5	315	1,200
17	250	1,000
21	200	800

4) Impact Tests: For six (6) inches and larger, once per shift in accordance with ASTM D2444; for four (4) inches and smaller, once each two (2) hours in accordance with ASTM D2444.

5) Wall Thickness and Outside Dimensions Tests: once per hour in accordance with ASTM D2122.

6) Bell Dimension Test: once per hour in accordance with ASTM D3139.

- (d) If any specimen fails to meet any of the above-mentioned tests, all pipe of that size and type manufactured between the test periods must be scrapped and a full set of tests rerun.
- (e) Furnish a certificate from the pipe manufacturer stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimension, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these specifications.

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- (f) All pipe shall be manufactured in the United States of America. All pipe for any one project shall be made by the same manufacturer.
- (g) All four (4) inches and six (6) inches pipe may be furnished in the manufacturer's standard laying lengths of 20 feet, 38 feet, or 40 feet. Pipe eight (8) inches and larger shall be furnished in 20 feet lengths. The Contractor's methods of storing and handling the pipe shall be approved by the Engineer. All pipe shall be supported within five (5) feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed routes shall not be allowed in advance of more than one (1) day.
- (h) Certain information shall be applied to each piece of pipe. At the least, this shall consist of:
 - 1) Nominal size
 - 2) Type of material
 - 3) SDR or class
 - 4) Manufacturer
 - 5) NSF Seal of Approval
 - 6) Color of pipe shall be green
- (i) Pipe that fails to comply with the requirements set forth in these specifications shall be rejected.
- (j) The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaim rubber will be allowed. Gasket materials shall meet the requirements of ASTM F477. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radically compressed to the pipe and locked in place against displacement, thus forming a positive seal.
- (k) The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F.
- (1) Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell to the water, have no harmful effect on the gasket or pipe material, and support or promote any bacterial growth. The lubricant containers shall be labeled with the manufacturer's name.
- (m) Joints shall be manufactured in accordance with ASTM D3139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be e i t h e r integral bell and ring joints with rubber compression gaskets as manufactured by the Clow Corporation, Johns-Manville, or Vulcan Plastic Corporation; twin gasket couplings as manufactured by the Certain-Teed Products Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.
- (n) Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C153. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe. Standard Utility Specifications

- (o) Fittings shall be lined with enameline or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately one (1) mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- (p) Fitting laying lengths shall conform to ANSI A21.53/AWWA C153.
- (q) Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.

4.3.3 Installation of Force Main

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- (a) Lay the force main to and maintain it at the lines and grades required by the drawings. All fittings shall be at the required locations and the spigots centered in the bells.
- (b) Unless otherwise indicated by the drawings, all force mains shall have at least 36 inches of cover. No departure from this policy shall be made except with the approval of the Authority.
- (c) For detection purposes, a 14-gauge solid strand copper tracing wire (shielded) shall be installed either below the plastic force main pipe. Connections between wires shall be soldered or connected with wire nut fasteners and wrapped and sealed to be watertight.
- (d) Any pipes strung out along the route of the proposed lines before the actual installation of those lines is due to take place shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. PVC pipe shall be strung out a maximum of one (1) day ahead of pipe laying. Remove all unnecessary material from the bell and spigot end of each pipe. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell and leave dry and oil-free.
- (e) Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- (f) After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and insert to the depth specified by the manufacturer and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.
- (g) Bell holes shall be large enough for ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so each pipe barrel rests on a solid foundation for its entire length.
- (h) Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug. If the joints of any pipe in the trench cannot be completed until a later time, caulk them with packing in order to make them as watertight as possible; this shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.
- (i) Cut pipe so that valves, fittings, or closure pieces can be inserted in a neat workmanlike manner without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- (j) Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the Authority.
- (k) Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary Standard Utility Specifications
for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer.

- (1) Lay no pipe in water or when trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, its use is considered incidental to the project, and no separate payment will be made for its use.
- (m) Joint all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials.
- (n) Install a sewage air release valve and / or an air and vacuum valve at all relative high points.

4.3.4 Hydrostatic Tests

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(a) Pressure Test

1) After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All services are to be laid prior to testing the main and tested as part of the test of the main

2) The duration of each pressure test shall at least be one (1) hour.

3) Slowly fill each valved section of pipe with water and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the Authority. Furnish the pump, pipe, connections, gauges, and all necessary apparatus.

4) Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.

5) Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the Authority.

(b) Leakage Test

1) Conduct the leakage test after the pressure test has been satisfactorily completed. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.

2) The duration of each leakage test shall be two (2) hours; during the test, subject the main to a pressure of 150 psi.

3) Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

4) No pipe installation shall be accepted until the leakage is less than the number of gallons per two (2) hour period listed below:

<u>Pipe Sizes</u>	Gallons per 1,000 Feet of Pipe
2 inches – 2 $\frac{1}{4}$ inches	0.2
<u>PipeSizes</u>	Gallons per 1,000 Feet of Pipe
3 inches	0.5
4 inches	0.6
6 inches	0.9

8 inches	1.2
10 inches	1.5
12 inches	1.9
14 inches	2.2
16 inches	2.6
18 inches	2.9
20 inches	3.2
24 inches	3.8

5) Should any section of pipe laid display leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

4.3.5 Clean Up

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After completing each section of force main, remove all debris and all construction materials from the work site. Then grade and smooth over the surface of both sides of the line. Leave the entire area clean and in a condition satisfactory to the Authority.

4.4 Effluent Pump Stations

- (a) General Description: The manufacturer shall furnish complete Effluent Pump Station(s), consisting of a effluent pump, a tank constructed of concrete, NEMA 6P electrical quick disconnect, pump removal system, discharge piping assembly with shut-off valve, anti-siphon valve, check valve, electrical alarm panel, and all necessary internal wiring and controls. All components and materials shall be in accordance with Section 2.0 of this Product Specification. For ease of serviceability, all pump motor units shall be of like type and horsepower throughout the system.
- (b) Shop Drawings: After receipt of notice to proceed, the manufacturer shall furnish a minimum of six (6) sets of shop drawings detailing the equipment to be furnished, including dimensional data and materials of construction. The engineer shall promptly review this data, and return two (2) copies as accepted, or with requested modifications. Upon the engineer's acceptance of the shop drawings and the manufacturer's receipt of notice to proceed, the manufacturer shall begin fabrication of the equipment.
- (c) All buried sewer lines shall be installed with a 12-gauge, blue coated copper wire, installed 12" to 18" below finished grade directly above the pipe.

4.4.1 Manufacturer

- (a) Effluent pump stations, complete with all appurtenances, form an integral system, and as such, shall be supplied by one effluent pump station manufacturer. The contractor shall be responsible for the satisfactory operation of the entire system. The equipment specified shall be a product of a company experienced in the design and manufacture of effluent pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and are responsible for maintaining a continuing inventory of effluent pump replacement parts. The manufacturer shall provide a reference and contact list from ten of its largest contiguous effluent pump installations of the type of effluent pumps described within this specification.
- (b) The manufacturer of the effluent pump station shall be Orenco.
- (c) Attention is directed to the fact that the drawings and overall system design are based on a Standard Utility Specifications

particular piece of equipment from a particular manufacturer. These specifications are intended to provide guidelines for standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

4.4.2 Operating Conditions

The pump(s) shall be capable of delivering 15 GPM against a total dynamic head of 0 feet (0 PSIG) and 10 GPM against a total dynamic head of 138 feet (60 PSIG) at a maximum of 8.0 amps. The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

4.4.3 Warranty

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The effluent pump manufacturer shall provide a part(s) and labor warranty on the complete station, accessories and control panel for a period of twelve (12) months from the date of installation, or fifteen (15) months from the date of shipment, whichever comes first. Any manufacturing defects found during the warranty period will be reported to the manufacturer by the AUTHORITY.

4.4.4 Warranty Performance Certification

As a bid certification requirement, each bidder shall provide with their bid schedule a Warranty Performance Certification statement executed by the most senior executive officer of the effluent pump manufacturer, which certifies a minimum of a twelve (12) month warranty. They must further detail any exclusion from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees, and certify that the manufacturer will bear all costs to correct any original equipment deficiency for the effective period of the warranty. All preventive maintenance type requirements shall be included in this form as exclusions. These requirements include, but are not limited to, unplugging of lines, periodic motor maintenance, and periodic cleaning of liquid level controls. Should the contractor (supplier) elect to submit a performance bond in lieu of the experience clause outlined above, this Warranty Performance Certification shall also be used as a criterion to evaluate the contractor's (supplier's) performance over the warranty period. A Warranty Performance Certification form is included with the bid schedule and must be completed and submitted as part of the bid package. Bids with incomplete forms or missing forms will be considered non-responsive.

4.4.5 Pump

The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. The rotor shall be constructed of stainless steel. Plating on the rotor will not be acceptable due to its tendency to delaminate. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service. Pumps shall be Orenco model PF10011-50.

4.4.6 Electric Motor

As a maximum, the motor shall be a 1/2 HP, 115 Volt, 60 Hertz, 1 Phase, capacitor start, ball bearing, aircooled induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4-foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. To reduce the potential of Standard Utility Specifications

environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oilfilled motors will not be accepted.

4.4.7 Mechanical Seal

The pump shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless-steel spring.

4.4.8 Tank

- (a) Tanks shall be 1,000-gallon precast concrete tanks and shall be designed by a licensed engineer registered in the State of Tennessee and approved by local regulatory agencies. The manufacturer shall provide the structural design and certification to the Town of Atoka for review and approval. The design shall be in accordance with accepted engineering practice.
- (b) The tanks shall be designed for the following loading conditions:
 - 1) Top: 300 psf
 - 2) Lateral Loads: 62.4 pcf
 - 3) Cold weather installations requiring deep burial will need special consideration
- (c) All tanks shall be guaranteed in writing by the tank manufacturer for a period of 2 years from the date of delivery to the project. The manufacturer's signed guarantee shall accompany bids.
- (d) Tanks shall be manufactured and furnished with access openings 24 inches in diameter and of the configuration shown on the standard drawings. Modification of completed tasks shall not be permitted.
- (e) Inlet plumbing shall penetrate 18 inches into the liquid from the inlet flow line.
- (f) Tanks shall be substantially water-tight capable of successfully withstanding an aboveground static hydraulic test in accordance with ACI 350.1. All tanks shall be individually tested.
- (g) All tanks shall be installed in strict accordance with the manufacturer's recommended installation instructions.
- (h) Walls, bottom, and top of reinforced concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank crosssection as a continuous fixed frame.
- (i) The walls and bottom of the slab shall be poured monolithically.
- (j) Reinforcing steel shall be ASTM A615 Grade 60 deformed bar. Details and placement shall be in accordance with ACI 315 and ACI 318.
- (k) Concrete shall be ready-mix with cement conforming to ASTM C150, type II. Concrete shall have a cement content of not less than 6 sacks per cubic yard and a maximum aggregate size of ³/₄ inch. Water/cement ratio shall be kept to 0.335, and concrete shall achieve a minimum compressive strength of 5,000 psi at 28 days.
- (1) Tanks shall be protected by applying Xypex as an admixture at the concrete plant where the tanks are manufactured.
- (m) From release used on tank molds shall be Nox-Crete, or equal. Diesel or other

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petroleum products are not acceptable.

- (n) Tanks shall not be moved from the manufacturing site to the job site until the tank has cured for 7 days or has reached 2/3 of the design strength.
- (o) Tanks shall have a ½ inch wide by ½ inch deep groove, 21 inches, 24 inches, or 30 inches in diameter, as required, surrounding the access opening. The groove shall be formed in the top of the tank at the time of manufacture to facilitate the installation of the riser.

4.4.9 Check Valve

- (a) The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless-steel discharge piping. The check valve will provide a full-ported passageway when open and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to ensure seating even at a very low backpressure. The valve body shall be an injection molded part made of glass filled PVC. Ball type check valves are unacceptable due to their limited sealing capacity in slurry applications.
- (b) Each effluent pump installation shall also include one separate check valve of the type detailed above for installation in the 1-1/4" service lateral between the effluent pump station and the sewer main, preferably next to the curb stop. The separate check valve shall be provided as a separate line item in the bid schedule.

4.4.10 Anti-Siphon Valve

- (a) The pump discharge shall be equipped with a factory-installed, gravity operated, flapper-type integral anti-siphon valve built into the stainless-steel discharge piping.
- (b) Moving parts will be made of [300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength]. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices, due to their tendency to clog from the solids in the slurry being pumped.

4.4.11 Core Unit

The Effluent Pump Station shall have an easily removable core assembly consisting of the pump, motor, all motor controls, check valve, anti-siphon valve, EQD and wiring. The watertight integrity of the core unit shall be established by 100 percent factory test at a minimum of 5 PSIG.

4.4.12 Controls

(a) All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and High-level alarm functions shall not be controlled by the same switch.

- (b) To assure reliable operation of the differential pressure switches each core shall be equipped with a pressure equalization chamber. The equalization chamber shall continuously calibrate the level sensing pressure switches to fluctuations in barometric pressure & prevent fluid from entering the control compartment during high water level conditions. The equalization chamber shall be constructed from EPDM, High Impact Polystyrene and stainless steel and measure 12" in diameter by 6" high. The chamber shall be assembled by the core manufacturer and factory tested at the point of assembly to verify proper operation. The effluent pump will be furnished with a 6 conductors, 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY INSTALLED NEMA 6P EQD half attached to it.
- (c) Pump control panels shall be Orenco model ORD 544917 and the tracer wire will extend to the control panel box.

4.4.13 Alarm Panel

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- (a) Each Effluent Pump Station shall include a NEMA 3R, Alarm Panel suitable for wall or pole mounting. The NEMA 3R enclosure shall be manufactured of corrosion resistant thermoplastic and be furnished with a hinged cover and padlock.
- (b) For each core, the panel shall contain one (1) 15 amp, double pole circuit breaker for the power circuit and one (1) 15 amp single pole circuit breaker for the alarm circuit. The Alarm Panel shall include a visual high-level alarm indicator. The visual alarm lamp shall be inside a red fluted lens mounted to the top of the enclosure in such a manner as to maintain NEMA 3R rating. The alarm sequence is to be as follows:

1) When liquid level in the tank rises above the alarm level, the contacts on the alarm pressure switch will close and the visual alarm will illuminate on the control panel.

2) The visual alarm will remain illuminated until the sewage level in the tank drops below the "off" setting of the alarm pressure switch.

4.4.14 Serviceability

The effluent pump core unit shall be furnished with polypropylene lifting harness connected to the pump body to facilitate easy removal when necessary. All mechanical and electrical connections must provide easy disconnect accessibility for core unit removal and installation. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

4.4.15 Safety

The Effluent Pump Station shall be free from objectionable noise, odor, or health hazards, in its capability to perform as specified in either individual or low-pressure sewer system applications.

4.4.16 Factory Test

Each effluent pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as the anti-siphon valve, check valve, level sensors and each unit's dedicated controls. All factory tests shall incorporate each of the above-listed items. Certified test results shall be available upon request showing the operation of each effluent pump at two (2) different points on its curve, with the maximum discharge pressure no less than 60 psi. The Engineer reserves the right to inspect such testing procedures with representatives of the Authority, at the effluent pump manufacturer's facility.

4.4.17 Installation

(a) Earth excavation and backfill are specified under Section 3.02, but are also to be done as a part of the work under this section, including any necessary sheeting and bracing. The Contractor shall be responsible for handling ground water to provide a firm, dry

subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

- (b) The Effluent Pump Stations shall not be set into the excavation until the installation procedures and excavation have been approved by the Engineer.
- (c) Remove packing material: Users instructions MUST be given to the Authority. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4" inlet grommet (4.50" OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason. Installation shall be accomplished so that 1" to 4" of access way, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor. A 6-inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit. A concrete anti-flotation collar, as detailed in the drawings, and sized according to the manufacturer's instructions, shall be required and shall be pre-cast to the effluent pump or poured in place. Each Effluent Pump Station with its pre-cast anti-flotation collar shall have a minimum of three (3) lifting eyes for loading and unloading purposes. If the concrete is poured in place, the unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured. The Contractor will provide and install a four (4) foot piece of 4-inch SCH 40 PVC pipe with watertight cap, to stub-out the inlet for the property owners' installation contractor, as depicted on the contract drawings.
- (d) The electrical enclosure shall be furnished, installed and wired to the Effluent Pump Station by the Contractor. An alarm device is required on every installation, there shall be NO EXCEPTIONS. It will be the responsibility of the Contractor to coordinate with the individual property owner(s) to determine the optimum location for the Alarm Panel. The Contractor shall mount the alarm device in a conspicuous location, as per national and local codes. The Alarm Panel will be connected to the Effluent Pump Station by a length of six (6) conductor 12-gauge type TC cable. The power and alarm circuits must be on separate power circuits. The effluent pump stations will be provided with a minimum of 32' (25' of usable electrical supply cable outside the station) to connect to the alarm panel. This cable shall be supplied with a factory installed EQD half to connect to the mating EQD half on the core.

4.4.18 Backfill Requirements

- (a) Proper backfill is essential to the long-term reliability of any underground structure. Several methods of backfill are available to produce favorable results with different native soil conditions. The most highly recommended method of backfilling is to surround the unit to grade using Class I or Class II backfill material as defined in ASTM 2321. Class 1A and Class 1B are recommended where frost heave is a concern, Class 1B is a better choice when the native soil is sand or if a high, fluctuating water table is expected. Class 1, angular rushed stone offers an added benefit in that it does not need to be compacted.
- (b) Class II, naturally rounded stone, may require more compactive effort, or tamping, to achieve the proper density. If the native soil condition consists of clean compactible soil, with less than 12 percent fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85 percent and 90 percent. Heavy, non-compactable clays and silts are not suitable backfill for this or any underground structure such as inlet or discharge lines. If you are unsure of the consistency of the

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native soil, it is recommended that a geotechnical evaluation of the material be obtained before specifying backfill.

- (c) Another option is the use of a flowable fill (i.e., low slump concrete). This is particularly attractive when installing effluent pump stations in augured holes where tight clearances make it difficult to assure proper backfilling and compaction with dry materials. Flowable fills should not be dropped more than four feet from the discharge to the bottom of the hole to avoid separation of the constituent materials.
- (d) Backfill of clean native earth, free of rocks, roots, and foreign objects shall be thoroughly compacted in lifts not exceeding 12" to a final Proctor Density of not less than 85 percent. Improper backfilling may result in damaged access ways. The effluent pump station shall be installed at a minimum depth from grade to the top of the 1-1/4" discharge line to assure maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid; final grade shall slope away from the effluent pump station.
- (e) All restoration will be the responsibility of the Contractor. The properties shall be restored to their original condition in all respects, including, but not limited to, curb and sidewalk replacement, landscaping, loaming and seeding, and restoration of the traveled ways, as directed by the engineer.

4.4.19 Start-Up and Field Testing

- (a) The manufacturer shall provide the services of qualified factory-trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the Authority's personnel in the operation and maintenance of the equipment before the stations are accepted by the Authority. All equipment and materials necessary to perform testing shall be the responsibility of the installing Contractor. This will include, as a minimum, a portable generator (if temporary power is required) and water in each basin. The services of a trained factory-authorized technician shall be provided at a rate of one (1) four (4) day week for each 100 effluent pump stations supplied. Each day shall be ten (10) person hours in duration.
- (b) Upon completion of the installation, the authorized factory technicians will perform the following test on each station:

1) Make certain the discharge shut-off valve is fully open. This valve must not be closed when the pump is operating. In some installations, there may be a valve(s) at the street main that must also be open.

2) Turn ON the alarm power circuit.

3) Fill the tank with water to a depth sufficient to verify the high-level alarm is operating. Shut off water.

4) Close the pump power circuit breaker. The pump should immediately turn ON. Within one (1) minute the alarm light will turn OFF. Within three (3) minutes the pump will turn OFF.

(c) Upon completion of the start-up and testing, the manufacturer shall submit to the Authority the start-up authorization form describing the results of the tests performed for each Effluent Pump Station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and all installation deficiencies have been corrected.

4.4.20 Operation and Maintenance

(a) SPARE CORE: The manufacturer will supply one (1) spare effluent pump core for up to every 50 effluent pump stations installed, complete with all operating controls level

sensors, check valve, antisiphon valve, and pump/motor unit.

(b) MANUALS: The manufacturer shall supply four (4) copies of Operation and Maintenance Manuals to the Authority, and one (1) copy to the Engineer.

4.5 Grinder Pump Stations

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Grinder Pumps are no longer accepted as of March 1, 2024.

4.6 Classic Wet Well Mounted Pump Station with Duplex Non-Clog Pumps

- (a) The contractor shall furnish and install one factory-built, automatic pumping station as manufactured by Smith & Loveless, Inc. or approved equal, complete with all needed equipment, factory-installed on a welded steel base with fiberglass cover.
- (b) The principal items of equipment shall include vertical, close-coupled, motor driven, vacuum primed, non-clog pumps; valves; internal piping; central control panel with circuit b r e a k e r s; motor starters and automatic pumping level controls; heater; ventilating blower; priming pumps and appurtenances; and all internal wiring.
- (c) All buried sewer lines shall be installed with a 12-gauge, blue coated copper wire, installed 12" to 18" below finished grade directly above the pipe.

4.6.1 Operating Conditions

(a) Each station shall be equipped with pumps capable of delivering the following flows of wastewater against the total dynamic heads indicated and at the efficiencies specified.

1) Operating Design Point will be developed for each specific application. Hydraulic calculations will be required to demonstrate the methods used to determine the design point.

- (b) All openings and passages shall be large enough to permit the passage of a sphere 3" in diameter and the pump shall have a flanged suction and discharge connection no smaller than 4".
- (c) The pump motors shall not be overloaded beyond their nameplate rating at the design conditions nor at any head in the operating range.

4.6.2 Manufactured Equipment Evaluation

- (a) The specifications and drawings detail Smith & Loveless equipment and represent the minimum standard of quality for both equipment and materials of construction.
- (b) Substitution of other makes may be considered if the equipment proposed for substitution is superior or equal in quality and efficiency to the standards of quality named in the specifications and is demonstrated to the satisfaction of the engineer.
- (c) Contractors wishing to substitute equipment shall include the following submittal information with their proposal. This submittal shall include all necessary information for the proper determination of the acceptability of the proposed substitution and shall not necessarily be limited to the following:

1) Complete description of the equipment, system, process or function, including a list of system components and features, drawings, catalog information and cuts, manufacturer's specifications, including materials descriptions.

- 2) Performance data and curves, and horsepower requirements.
- 3) Outside utility requirements, such as water, power, air, etc.

4) Functional description of any internal instrumentation and controls supplied including list of parameters monitored, controlled or alarmed.

5) Addresses and phone numbers of nearest service centers and a listing of the manufacturer's or representative's services available at these locations, including addresses and phone numbers of the nearest parts warehouses capable of providing full parts replacement and/or repair services.

6) A list of five installations in the states where similar equipment by the manufacturer is currently in similar service; include contact name, telephone number, mailing address of the municipality or installation; engineer, owner, and installing contractor. If five installations do not exist, the list shall include all that do exist, if any.

7) Detailed information on site, architectural, structural, mechanical, plumbing, electrical and control, and all other changes or modifications to the design and construction work necessary to adapt the equipment or systems to the arrangement shown and/or functions described on the drawings and in the technical specifications. This shall include plan view and section sketches illustrating any additional space requirements necessary to provide the minimum adequate clear space within and around the equipment for operation and maintenance, as shown on the drawings and specified.

8) All differences between the specifications and the proposed substitute equipment shall be clearly stated in writing under a heading of "differences".

9) Other specific submittal requirements listed in the detailed equipment and material specifications.

(d) Approval of the substitution as an alternate shall in no way relieve the contractor from submitting the specified shop drawings for approval or complying fully with all provisions of the specifications and drawings. If substituted equipment is accepted, the contractor shall, at his own expense, make any changes in the structures, piping, electrical, etc. necessary to accommodate the equipment. If engineering is required due to the substitution of alternate equipment, the contractor shall pay for all engineering changes. To receive final consideration, copies of the manufacturer's quotations for the equipment may be required to document the savings to the satisfaction of the engineer. It is the intent that the owner shall receive the full benefit of the savings in cost of the savings. In all technical and other evaluations, the decision of the engineer is final.

4.6.3 Guarantee

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- (a) The manufacturer of the pump station shall have a minimum of five years experience in the design and manufacture of vacuum priming type factory-built automatic pump stations and shall guarantee the structure and all equipment to be free from defects in materials and workmanship for a period up to one year from the date of start-up, not to exceed 18 months from the date of shipment.
- (b) Warranties and guarantees of suppliers of various components in lieu of a single source responsibility by the pump station manufacturer will not be accepted. The pump station manufacturer shall be solely responsible for the guarantee of the station and all components.

In the event a component fails to perform as specified or is proven defective in service during the guarantee period, the pump station manufacturer shall provide a replacement part without cost to the owner. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as pumps, pump motors and sewage piping manifold.

(d) It is not intended that the pump station manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting form defects in design, material, workmanship or delays in delivery, replacement or otherwise.

4.6.4 **Product Liability Insurance**

The pump station manufacturer shall furnish product and comprehensive liability insurance from an insurance company with a rating of A+ (superior) IV, according to the Best's Key Reporting Guide, in an amount

equal to \$5,000,000.00. The policy shall also include SUDDEN AND ACCIDENTAL POLLUTION COVERAGE. The insurance certificate must be included with the manufacturer's submittal.

4.6.5 Station

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The station shall be constructed in one complete, factory-built assembly. It shall be sized to rest on the top of the wet well as detailed in the construction drawings. The supporting floor plate shall be minimum 3/8" thick steel with reinforcing, as required, to prevent deflection and ensure an absolutely rigid support. Steel plate shall meet or exceed ASTM A-36 specifications.

4.6.6 Fiberglass Cover

- (a) The pump station shall be enclosed by a hinged fiberglass cover made of molded reinforced orthopthlalic polyester resins with a minimum of 30% glass fibers with a minimum average length of 1 ¹/₄". The outside of the enclosure shall be coated with a polyester protective in-mold coating for superior resistance to weathering, ultra-violet radiation, yellowing and chalking. The completed fiberglass enclosure shall be resistant to mold, mildew, fungus and corrosive liquids and gases normally found in pump station environments. The cover shall have a suitable drip-lip around the edge and shall be provided with a hasp and staple connection to the floor plate to allow the pump chamber to be locked with a padlock.
- (b) The cover shall be attached with a multi segment stainless steel hinge, constructed of 7-gauge (minimum) type 304 stainless steel with a 3/8" diameter stainless steel pin and supporting at least 75% of the width of one end. Stainless steel bolts with tamperproof heads and a full width 3/8" thick anodized aluminum backing plate shall anchor the hinge to the fiberglass cover.
- (c) Dual high pressure gas struts shall be provided to counteract the dead weight of the cover assembly and limit the maximum lifting force required for opening to less than 20 pounds. The cover shall be self-latching upon opening, with a manually operated release for closing. Duplex heavy gauge safety chains shall be provided to prevent over-extension. All hardware and components of the cover assembly which are exposed to the weather shall be constructed of corrosion resistant materials.
- (d) Heavy extruded aluminum, adjustable ventilating louvers shall be provided on each end of the fiberglass cover, which are capable of being closed during cold weather operation.

4.6.7 Lifting Arm

- (a) To allow on-site maintenance of the pumps, a stanchion with lifting arm shall be provided to lift each pump. The stanchion requirement will apply to both vertical and horizontal pumps, whichever is supplied by the installing contractor. The lifting arm shall have a hook over the center of the motor to support a hoist for removal of the motors, impellers and pumps from the station.
- (b) The pump casings and discharge piping shall be mounted in relation to the floor plate as detailed in the construction drawings. The suction and discharge connections, where they pass through the floor shall be sealed by gaskets, rather than being welded, to allow adjustment and replacement.

4.6.8 Manway

(a) An aluminum manway cover fabricated of ¼" treadplate, located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. The manway shall be an integral part of the station floor plate and provide access to the wet well. The minimum open area of the manway access into the wet well shall be at least

4.2 square feet.

(b) The manway cover shall have a three color 7" x 10" (minimum) corrosion resistant sign permanently affixed to it, reading "DANGER – Before Entering, Test for Explosive Gasses. Test For Oxygen Deficiency. Supply Fresh Air to Work Area".

4.6.9 Welding

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All steel structural members shall be joined by electric arc welding with welds of adequate section for the joint involved.

4.6.10 Corrosion Protection

After welding, all inside and outside surfaces of the structure shall be blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld splatter and surface roughness shall be removed by grinding. Immediately following the cleaning, a single heavy inert coating shall be factory applied to all inside and outside surfaces prior to shipment. This coating shall be Versapox epoxy resin specially formulated for abrasion and corrosion resistance. The dry coating shall contain a minimum of 86% epoxy resin with the balance being pigments and thixotropic agents.

4.6.11 Main Pumps

- (a) The pumps shall be vertical, non-clog type of heavy cast iron construction, especially designed for the use of mechanical seals and vacuum priming. In order to minimize seal wear caused by linear movement of the shaft, the shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing.
- (b) To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump, the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 1-7/8" for motor sizes 1.5 HP through 15 HP; 2-1/8" for motor sizes 20 HP through 30 HP; and 3" for motor sizes 40 HP and larger]. The dimension from the lowest bearing to the top of the impeller shall not exceed 6".
- (c) The bearing nearest the impeller shall be designed for the combined thrust and radial load. The upper bearing shall be free to move in a linear direction with the thermal expansion of the shaft and shall carry only radial loads.
- (d) The shaft shall be solid stainless steel through the mechanical seal to eliminate corrosion and abrasive rust particles. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter.

4.6.12 Impeller

- (a) The pump impeller shall be of the enclosed type made of close-grained cast iron and shall be balanced. The impeller shall be keyed with a stainless-steel key and secured to the motor shaft by a stainless steel cap screw equipped with a Nylock or other suitable self-locking device.
- (b) The impeller shall not be screwed or pinned to the motor pump shaft and shall be readily removable without the use of special tools. To prevent the buildup of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shrouds. The shrouds shall remain full diameter so that close minimum clearance from shrouds to volute is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft. The pump shall have an adapter providing a large water reservoir above the impeller to provide for positive exclusion of air from the impeller. The seal shall be inside this area to assure lubrication. Pumps which do not use hollow priming adapters for positive lubrication of the seal will not be acceptable.

- (c) The pump shall be constructed so as to permit priming from the lower pressure area behind the impeller. Priming from high pressure connections, which tends to cause solids to enter and clog the priming system, will not be acceptable. The priming bowl shall be transparent, enabling the operator to monitor the priming level.
- (d) The pump shall be arranged so that the rotating element can easily be removed from the casing without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal, so that any foreign object may be removed from the pump or suction line.
- (e) The pump shaft shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water, which lubricates the mechanical seal, shall be automatically drained from around the seal if the pump loses prime in order to allow the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in sub-freezing temperatures.
- (f) The seal shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless-steel spring. The entire seal assembly shall be held in place by a bronze seal housing to prevent excessive heat build-up. Use of cast iron or other ferrous material for the seal housing which will rust and damage the seal, shortening its life, will not be acceptable.
- (g) The pump volute shall be furnished with mounting lugs and bolted to the station floor plate, forming a gas-tight seal.

4.6.13 Motors

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- (a) The pump motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction type.
- (b) Motors shall have Class F insulation suitable for temperatures up to 105 degrees C. Insulation temperature shall, however, be maintained below 80 degrees C.
- (c) The motors shall have normal starting torque and low-starting current, as specified by NEMA Design B characteristics.
- (e) They shall be open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall be uniformly spaced around the motor frame. Leads shall be terminated in a cast connection box and shall be clearly identified.
- (f) The motors shall have 1.15 service factor. The service factor shall be reserved for the owner's protection. The motors shall not be overloaded beyond their nameplate rating, at the design conditions, nor at any head in the operating range as specified under Operating Conditions.
- (g) The motor-pump shaft shall be centered, in relation to the motor base, within 0.005". The shaft runout shall not exceed 0.003".
- (h) The motor shaft shall equal or exceed the diameter specified under Main Pumps at all points from immediately below the top bearing to the top of the impeller hub.
- A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.
- (i) The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.

4.6.14 Controls

- (a)
- The control equipment shall be mounted in a NEMA Type 1 steel enclosure with a Standard Utility Specifications 117

removable access cover. The circuit breakers, starter reset buttons, and control switches shall be operable without removing the access cover.

- (b) A grounding type convenience outlet shall be provided on the side of the cabinet for operation of 120-volt AC devices. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits.
- (c) Magnetic across-the-line starters with under-voltage release and overload coils for each phase shall be provided for each pump motor to give positive protection. Each single-phase auxiliary motor shall be equipped with an over-current protection device in addition to the branch circuit breaker or shall be impedance protected. All switches shall be labeled, and a coded wiring diagram shall be provided.
- (d) To control the operation of the pumps with variations of liquid level in the wet well, a minimum of displacement switches shall be provided. A 30' cord shall be provided with each switch. The cord shall have a corrosion-resistant vinyl jacket and be multi-stranded in order to prevent fatigue.
- (e) An automatic alternator with manual switch shall be provided to change the sequence of operation of the pumps every cycle. The manual switch shall allow either pump to be selected as a base pump or for automatic operation.
- (f) Provisions shall also be made for the pumps to operate in parallel should the level in the wet well continue to rise above the starting level for the low level "Lead" pump.

4.6.15 Accessories

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(a) High Water Alarm

1) An adjustable displacement switch shall be provided to sense a high-water level condition. The switch shall hang into the wet well and shall activate a contact to indicate the high-water condition.

(b) High Water Alarm Light

1) A vapor-proof light fixture with a 120 VAC 50 watt lamp, red globe and guard shall be furnished for outdoor mounting to signal the alarm condition.

(c) Running Time Meters

1) A running time meter shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture-proof molded plastic case. The flush mounted dial shall register in hours and tenths of hours up to 99,999.9 hours before repeating. The meter shall be suitable for operation on 120 VAC supply.

(d) Transformer

1) A 2 or 3 KVA insulating type transformer shall be provided to supply power lights, controls and auxiliary devices. The transformer shall have 240/460-volt primary, 120/240 volt secondary, Class F insulation, with temperature rise not to exceed 115 degrees C above a 40 degree C ambient. The core and coil shall be protected by a metal housing to prevent damage.

(e) Phase Failure Protection

1) A relay with double pole double throw contacts to monitor and protect against phase loss (single phase), under voltage (brown outs) and phase reversal (improper sequence) shall be provided in the control system. The relay shall activate the high-water alarm light in the event of a failure. The relay shall automatically reset whenever three phase service returns to normal.

4.6.16 Vacuum-Priming System

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- (a) A separate and independent priming system shall be furnished for each pump, providing complete standby operation. Each priming system shall include a separate vacuum pump. Vacuum pumps shall have corrosion-resistant internal components.
- (b) The vacuum priming system shall be complete with large port vacuum control solenoid valves, vapor filters to protect the solenoid valves, prime level sensor, float-operated check valves to protect the vacuum pumps, and all necessary shut-off valves. The float-operated check valves shall have a transparent body for visual inspection of the liquid level and shall have an automatic drain check valve. All hoses and tubing used in the priming system shall be at least 3/8" nominal diameter.
- (c) The solenoid valves used in the vacuum priming system shall be of the high flow, direct acting brass body type, with threaded ports, NBR seals and 300 Series stainless steel plunger, rod, plate and springs. The minimum orifice diameter shall be 5/16". The solenoid valves shall be UL Listed, with Class F coil rating and of suitable voltage and thermal capacity for the application.
- (d) Each solenoid valve shall be protected by a vapor filter, installed in the vacuum line between the valve and the priming dome. The vapor filter shall be constructed of corrosion resistant materials and be suitable for operation from 25" Hg to 100 PSI. They shall be readily replaceable without the use of special tools.
- (e) Liquid level in the pump priming chamber shall be monitored by a resonant frequency liquid level sensor with piezoelectric drive and sensitive circuits to detect frequency shifts when the sensor is covered by liquid. This type of system shall be used rather than an electrode system or mechanical means such as a float, to avoid electrical or moving parts inside the chamber, which may accumulate debris, short out, bind or fail. Only a resonant frequency level sensor with no electrical components or floats in the priming chamber shall be used.
- (f) The priming system shall automatically provide positive lubrication of the mechanical seal each time a main pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which the pumped liquid must pass shall be smaller than the equivalent of a 2 ¹/₂" opening.

4.6.17 Environmental Equipment

- (a) A ventilating blower capable of delivering 250 CFM at 0.1" static water pressure shall be provided in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a preset thermostat.
- (b) A heavy extruded aluminum louvered grille with adjustable openings shall cover the discharge of the blower. A similar grille shall be provided in the other end of the station enclosure for air intake.
- (c) A 500-watt electric heater controlled by a preset thermostat shall be furnished. The heater shall be rigidly mounted in the station to prevent removal.

4.6.18 Main Piping

- (a) The pump suction shall be drilled and tapped for a 125 pound American Standard flange for easy connection of the suction riser.
- (b) The discharge line from each pump shall be fitted with a clapper-type check valve and eccentric plug valve. Size, location and quantity of check valves and plug valves shall be as shown on the construction drawing.
- (c) The check valve shall be of the spring-loaded type with external lever arm and an easily

replaced resilient seat for added assurance against vacuum leaks. Check valves shall have stainless steel shaft with replaceable bronze shaft bushings and shall be sealed through the bearings with o-rings. Ball-type check valves are specifically unacceptable for this application.

- (d) An operating wrench shall be provided for the plug valves.
- (e) Protrusions through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well. Bolted and sealed joints shall be provided at the pump casings or suction pipes in order to prevent corrosive, noxious fumes from entering the station. The pump station manufacturer shall extend the suction and discharge connections below the floor plate at the factory so that field connections can be made without disturbing the gas-tight seals.
- (f) The manufacturer of the pump station shall provide a compression-type sleeve coupling for installation in the common discharge pipe. Provisions shall be made for securing the coupling to the station floor plate.

4.6.19 Factory Tests

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- (a) All components of the pump station shall be given an operational test at the pump station manufacturer's facility to check for excessive vibration or leaks in the piping or seals, and to correct operation of the automatic control and vacuum priming systems and all auxiliary equipment. Installed pumps shall take suction from a deep wet well, simulating actual service conditions. The control panel shall undergo both a dry logic test and a full operational test with all systems operating.
- (b) Factory test instrumentation must include flow measuring with indicator; compound suction gauge; bourdon tube type discharge pressure gauge; electrical meters to measure amperes, volts, kilowatts and power factor; speed indicator; and a vibrometer capable of measuring both amplitude and frequency.

4.6.20 Installation and Operating Instructions

- (a) Installation of the pump chamber shall be done in accordance with the written instructions provided by the manufacturer.
- (b) The Manufacturer shall supply three (3) copies of Operation and Maintenance manuals shall be furnished which will include parts lists of components and complete service procedures and troubleshooting guide.

4.6.21 Start-Up

The pump station manufacturer shall provide complete start-up services. The pump station manufacturer representative or factory service technician will inspect the completed installation to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally and otherwise acceptable; the station installation is safe and in optimum working condition; and conforms to the specified operating conditions. The start-up technician shall instruct the Owner's personnel in the proper operation and maintenance procedures.

4.6.22 Spare Parts

A complete replacement pump shaft seal assembly shall be furnished with each pump station. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare casing gasket and seal gasket shall be provided.

4.7 Sewage Valves

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Section Includes:

- (a) Installation of valves as specified below.
- (b) Refer to other sections for work related to that specified under this heading.

4.7.1 Oil Cushioned Swing Check Valve

- (a) The check valve shall be a counterweighted, rubber seated swing check valve with external oil cushion chamber. The valve shall permit flow in one direction only and shall close tightly without slamming when the discharge pressure exceeds the inlet pressure. The cushioned swing check valve shall be installed with the flow direction either horizontally or vertically up and shall function to prevent reverse flow. The valve shall provide a full equivalent pipe area when open fully.
- (b) The valve body shall be a one-piece cast-iron casting with integral flanges. The valve body shall conform to ASTM A126 Class B and shall have a minimum working pressure rating of 250 psi. The flanges shall be faced and drilled in accordance with ANSI B16.1 Class 125 or Class 250 as shown in the valve schedule or as shown on the Contract Drawings.
- (c) The hinge shaft shall be located completely above the waterway and shall be constructed of stainless steel with the disc arm and counterweight arm keyed there on. The hinge shaft shall be one piece and shall extend through both sides of the valve body.
- (d) The body seat shall be bronze or aluminum bronze conforming to ASTM B62 or ASTM A148, and the disc shall be cast iron conforming to ASTM A126 Class B. The seat ring shall be a resilient field replaceable ring that can be replaced without the use of special tools.
- (e) The oil cushion chamber shall be attached to the outside of the valve body externally and shall be constructed with a piston operating in the chamber to effectively permit the valve to be operated without hammering action. The shock absorption shall be by oil and the valve closure shall occur in multiple stages. The speed at which each stage of closure occurs shall be field adjustable.
- (f) The valve shall be an APCO Series 610 or approved equal.

4.7.2 Air Cushioned Swing Check Valve

- (a) The check valve body shall be cast iron per AWWA C508 with integral flanges. The valve body shall conform to ASTM A126 GR.B.
- (b) The seat shall be cast bronze with an O-ring seal and be locked in place with stainless steel lock screws. It shall be field replaceable without the use of special tools.
- (c) The cushion cylinder assembly shall be externally attached to the valve body and will permit adjustability to cushion the closure of the valve. It shall be constructed to effectively permit the valve to be operated without hammering action.
- (d) The shaft shall be single and continuous stainless steel, extending both sides of the body with a lever and weight, using an air cushion cylinder side mounted.
- (e) The disc shall be cast iron connected to a ductile iron disc arm. F.

The valve shall be an APCO Series 6000 or approved equal.

4.7.3 Sewage Surge Relief Valve

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- (a) The Sewage Surge Relief Valve shall function to prevent high pressure surges in the pipeline. When the pipeline is under normal operating pressure, the valve shall be closed tightly. If the pipeline pressure rises above the setpoint of the relief valve, the valve shall open quickly to dissipate the overpressure. Once the overpressure condition has been dissipated, the relief valve shall close at a controlled rate of speed.
- (b) The valve shall be of a long radius elbow or "WYE" body configuration. The valve disc shall be held in the closed position due to the action of externally mounted springs when the pipeline is under normal working pressure. If the pipeline pressure, acting on the valve disc, overcomes the spring force the valve will open. The pipeline pressure at which the valve opens (i.e. relief setpoint) shall be adjustable by varying the spring tension. The valve shall remain open as long as the line pressure exceeds the relief setpoint. When pipeline pressure drops below the relief setpoint, the spring force shall close the valve. The rate of closure shall be adjustable by the action of an oil-hydraulic cylinder and flow control valve.
- (c) The main valve body, cover and disc shall be constructed of cast iron conforming to ASTM A126 Class B ad shall very nearly resemble a long radius elbow. The center to face dimensions shall be equal to a standard long radius elbow fitting.
- (d) The valve body shall contain a bronze seat ring. The valve disc shall contain a resilient, replaceable seat ring of Thiokol treated leather or nylon held in place by a bronze follower ring. The disc shall be attached to a stainless-steel stem guided by bronze bearing through a length not less than the valve diameter. A rod wiper shall be included for removal of solids adhering to the stem as the stem enters the bearings.
- (e) The stem shall be attached to externally mounted springs. The relief setting shall be factory set. Springs enclosed in steel enclosures shall be provided with spring position indicators.
- (f) A hydraulic cylinder assembly shall be attached to the stem. An oil reservoir and flow control valve shall be provided with the valve.
- (g) The valve shall be as manufactured by APCO Willamette Valve and Primer Corporation, GA Industries Golden Anderson Valve Division, or approved equal.

4.7.3 Plug Valves

- (a) All plug valves shall be eccentric plug valves with 100% full port unless otherwise specified.
- (b) Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with mechanical joint end connections.
- (c) Valve bodies shall be of ASTM A126 Class B cast iron. Bodies in 4" and larger valves shall be furnished with a 1/8" welded overlay seat of not less than 90% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.
- (d) Plugs shall be of ASTM A126 Class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset fro the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.
- (e) Valves shall have sleeve type metal bearings and shall be of sintered, oil Standard Utility Specifications

impregnated permanently lubricated Type 316 ASTM A743 Grade CF-8M or AISI Type 317L stainless steel. Non-metallic bearings shall not be acceptable.

- (f) Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
- (g) Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.
- (h) Non-buried manual valves shall have handwheel gear actuators. Buried valves shall be provided with tee wrenches and extension stems. All valves 6" and smaller may be equipped with gear actuators. All manual actuators shall be rated for the full pressure rating of the valve. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts and washers shall be zinc plated.
- Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washer shall be stainless steel.
- (j) All valves shall be as manufactured by DeZURIK or approved equal.

4.7.4 Sewage Air/ Vacuum Valve

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- (a) The valve shall automatically exhaust air and gases from the pipeline while the pipeline is being filled and allow air to re-enter the pipeline when a negative pressure exists in the pipeline.
- (b) The valve shall incorporate a lower float and an upper float or disc. The lower float shall be connected directly to the upper float or disc by a stainless steel rod or assembly. The lower float shall be manufactured from 304 stainless steel. The stem guide shall be constructed from stainless steel. The seat shall be Buna-M. The stem/float assembly shall be of sufficient length to prevent contact between the seat and incoming wastewater during normal modes of operation.
- (c) The valve body and cover shall be manufactured from ASTM A126 Grade B iron. At a minimum, the valve body shall have openings for a "backflushing" attachment, a blow-off valve, and an inlet valve. The cover shall be a ¹/₂ inch NPT opening. Valves 4 inches or larger shall have flanged inlets.
- (d) In addition to the air/vacuum valve, a backflushing assembly, a blow-off valve, and an inlet valve shall be provided.
- (e) All internals shall be removable through the top of the valve without removing the valve from the line that it serves.
- (f) Acceptable manufacturers include APCO Williamette Valve and Promer Corporation, GA Industries. Or an approved equal.

4.7.5 Valve Boxes

Valve boxes shall be cast iron sectional type. The lower section shall have a minimum diameter of

five inches, enlarged to fit around the bonnet of the valve if a 2-section box is used, or to fit a circular or oval base section if a 3-section box is used. The upper section shall slide or screw down over the adjoining lower section and shall be full diameter throughout. Valve boxes shall have cast iron lids or covers. The boxes shall be long enough to permit the top to be set flush with the established ground surface grade.

4.7.6 Copper Wire for Detection

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All buried sewer lines shall be installed with a 12-gauge, blue coated copper wire, installed 12" to 18" below finished grade directly above the pipe.

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ARTICLE 5: Water Lines

Section Includes

- (a) Contractor shall be responsible for safely storing materials needed for work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.
- (b) Trenching includes excavating, backfilling, compacting, disposing of surplus material, and all other work incidental to the construction of trenches for utilities and buried appurtenances, including additional excavation which may be required for structures forming a part of the pipeline.
- (c) Excavation i n c l u d e s removal of quicksand, hardpan, boulders, clay, rubbish, unforeseen obstacles, underground conduits, pipe, drain tile, trees, root, timber or masonry structures, pavements, sidewalks, and all other obstacles encountered. No claim for additional payment will be accepted because of the character of the ground in which the excavation is made.
- (d) Refer to 3.09 Trenching, Backfilling, and Compaction and Section 3.06 Unclassified Excavation for Utilities for additional requirements.
- (e) Wherever reaction blocking is necessary, it shall be considered an integral part of the water line work.

5.1 Water Lines

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5.1.1 Materials

- (a) Bedding and backfill material shall be size No. 67 in accordance with the Tennessee Department of Transportation's Standard Specifications for Road and Bridge Construction or satisfactory soil materials of clay, rock or gravel, free of debris, waste, frozen materials, vegetable and other deleterious matter that has a size of no more than 2" as specified herein and/or as shown on the plans.
- (b) Portland cement, ASTM C150, Type I.
- (c) Steel bar reinforcing, ASTM A615, Grade 60.
- (d) Concrete aggregate, ASTM C33.

5.1.2 **Ductile Iron Pipe and Fittings**

- (a) Ductile cast iron pipe shall be made of good quality ductile iron that meets the requirements for modular iron castings of ASTM E8. It shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be specified by ANSI A21.50/AWWA C150, except that all pipe with a diameter of 12" or less shall have a wall thickness of class 350. Pipe larger than 12" diameter shall be pressure class 250.
- (b) Ductile iron pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to the specifications of ANSI A21.51/AWWA C151. It shall be made and tested in accordance with ASTM A339 and shall be subjected to and able to withstand a hydrostatic pressure of 500 psi. The maximum depth of pits shall be half that allowed in the AWWA specifications.
- (c) The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
- (d) The push-on, single gasket joints shall be either Fastite (manufactured by American Cast Iron Pipe Company), Tyton (U. S. Pipe and Foundry Company), Super Bell-Tite

(Clow Corporation), or other joints of similar type and equal quality. They shall be able to withstand 200 psi of operating pressure.

- (e) The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- (f) The gasket shall be of high-quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- (g) Enough lubricant shall be furnished with each order to provide a thin coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell to the water, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.
- (h) Standard and special fittings for ductile iron pipe shall be ductile iron. Use compact mechanical joint fittings (4"–12"). All fittings shall conform to the specifications of either ANSI A21.53/AWWA C153.
- (i) Pipe and fitting shall be lined with enameline or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately one (1) mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- (j) The pipe manufacturer shall furnish the Owner a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with ANSI A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the serial number of each piece of pipe making up the shipment. In addition, the weight of each individual piece of pipe making up the shipments to be listed opposite the serial number of each pipe length and attached to the certificate of inspection.
- (k) Pipe shall be furnished in standard 18- or 20-feet lengths.

5.1.2 PVC Pipe

- (a) All plastic pipe shall be made from Class 12454-B polyvinyl chloride (PVC 1120) as defined by ASTM D1784.
- (b) SDR pipe all Class 200 or 250 pipe shall have NSF approval and be manufactured in accordance with ASTM D2241. The following tests shall be run for each size and type of piping being produced, as specified below:

1) Flattening Test: Once per shift in accordance with ASTM D2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.

2) Acetone Test (Extrusion Quality Test): Once per shift in accordance with ASTM D2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the test.

3) Quick Burst Test: once per 24 hours in accordance with ASTM D1599.

		Minimum Bursting
<u>SDR</u>	Pressure Rating	Pressure, psi
17	250	1,000
21	200	800

4) Impact Tests: For six (6) inches and larger, once per shift in accordance with ASTM D2444; for four (4) inches and smaller, once each two (2) hours in accordance with ASTM D2444.

5) Wall Thickness and Outside Dimensions Tests: once per hour in accordance with ASTM D2122.

- 6) Bell Dimension Test: once per hour in accordance with ASTM D3139.
- (c) If any specimen fails to meet any of the above-mentioned tests, all pipe of that size and type manufactured between the test periods must be scrapped and a full set of tests rerun.
- (d) Furnish a certificate from the pipe manufacturer stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimension, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these specifications.
- (e) All pipe shall be manufactured in the United States of America. All pipe for any one project shall be made by the same manufacturer.
- (f) All four (4) inch and six (6) inch pipe may be furnished in the manufacturer's standard laying lengths of 20 feet, 38 feet, or 40 feet. Pipe eight (8) inches and larger shall be furnished in 20 feet lengths. The Contractor's methods of storing and handling the pipe shall be approved by the Engineer. All pipe shall be supported within five (5) feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight.
- (g) Certain information shall be applied to each piece of pipe. At the least, this shall consist of:
 - 1) Nominal size
 - 2) Type of material
 - 3) SDR/DR or class
 - 4) Manufacturer
 - 5) NSF Seal of Approval
 - 6) Pressure Class
 - 7) Color shall be white or blue
- (h) Pipe that fails to comply with the requirements set forth in these specifications shall be rejected.
- (i) The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaimed rubber will be allowed. Gasket materials shall meet the requirements of ASTM F477. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal Standard Utility Specifications

under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radially compressed to the pipe and locked in place against displacement, thus forming a positive seal.

- (j) The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F
- (k) Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell to the water, have no harmful effect on the gasket or pipe material, and support or promote any bacterial growth. The lubricant containers shall be labeled with the manufacturer's name.
- (1) Joints shall be manufactured in accordance with ASTM D3139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be either integral bell or ring joints with rubber compression gaskets as manufactured by the Vulcan Plastic Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.
- (m) Standard and special fittings for PVC pipe shall be gray iron or ductile iron. Use compact mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.53/AWWA C153. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe.
- (n) Fittings shall be lined with enameline or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately one (1) mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- (o) Fittings shall be in accordance with the compact mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.

5.1.3 **PE Pipe**

(a) PE PIPE: AWWA C906, ductile iron pipe size, DR Number 11 with PE compound number required to give working pressure rating not less than 160 psi.

1) PE, AWWA Fittings: AWWA C906, socket or butt-fusion type, with DR number matching pipe and PE compound number required to give working pressure rating not less than 160 psi

2) PE pipe only to be used for special applications such as directional bores of creeks or wetlands and as approved by the Authority.

5.1.4 Mechanical Joint Restraining Devices

- (a) Mechanical Joint Restraining Devices:
 - 1) Available Manufacturers: Ebba Iron Sales, Inc.
 - 2) Suitable for use with PVC or ductile iron pipe.

3) Glands manufactured of ductile iron and sized to fit standard mechanical joint, ANSI/AWWA C153/A21.53 fittings. Twist off nuts shall be used to insure proper activation of the restraining device.

4) Use where noted on plans or approved by the Authority.

5.1.5 Copper Wire for Detection

All buried water lines shall be installed with a 12-gauge, blue coated copper wire, installed 12" to 18" below finished grade directly above the pipe.

5.1.6 Excavation for Pipeline Trenches

- (a) Excavation for pipelines shall consist of the excavation necessary for the construction of water lines and their appurtenances (including valves, fittings, collars, concrete saddles, and pipe protection) that are called for by the drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials, all of which shall conform to the applicable provision set forth elsewhere in these specifications.
- (b) The Contractor may, if he chooses, use a motor-powered trenching machine. If he does, however, he shall be fully responsible for the preservation or repair of existing utility service connections.
- (c) Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings make excavation for pipelines in open cut and true to the lines and grades shown on the drawings. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed but shall be a minimum of 4 inches on each side of pipe.
- (d) For all pipe in non-rock trenches, shape the bottom of all trenches to provide uniform bearing for the bottom of the pipe barrel.
- (e) Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than 2 joints ahead of pipe laying.
- (f) Do not excavate pipe trenches more than 200' ahead of the pipe laying, and not more than 200' of open ditch shall be left behind the pipe laying and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where necessary to maintain vehicular or pedestrian traffic.
- (g) In all cases where materials are deposited along open trenches, place them so that in the event of rain no damage will result to the work and/or to adjacent property.
- (h) Refer to Section 3.06, Unclassified Excavation for Utilities, for sheeting, shoring and bracing requirements.

5.1.7 Installation of Water Lines

- (a) Lay water lines to and maintain at the lines and grades required by the drawings. All fittings, valves, and hydrants shall be at the required locations, the spigots centered in the bells, and all valves and hydrant stems plumb.
- (b) Unless otherwise indicated by the drawings, all water pipes shall have at least 36 inches of cover when located outside the roadway and at least 48 inches of cover when located inside the roadway. No departure from this policy shall be made except with the approval of the Authority.
- (c) Provide and use tools and facilities that are satisfactory to the Authority and that will allow work to be done in a safe and convenient manner. All pipe, fittings, valves, and hydrants are to be unloaded from the trucks using suitable tools and equipment.

Use a derrick, ropes, or other suitable tools or equipment to lower all pipe, fittings, valves, and hydrants into the trench one (1) piece at a time. Lower each piece carefully so that neither it nor any protective coating or lining it may have shall be damaged. Under no circumstances drop or dump water line materials into the trench.

- (d) Any pipes strung out along the route of the proposed lines before the actual installation of those lines is due to take place shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. PVC pipe shall be strung out a maximum of one (1) day ahead of pipe laying. Remove all unnecessary material from the bell and spigot end of each pipe. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell and leave dry and oil-free.
- (e) Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside, then place a heavy, tightly woven canvas bag or plug of suitable size over each end of the pipe and leave in place until it is time to connect that pipe to the adjacent pipe.
- (f) Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- (g) After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and insert to the depth specified by the manufacturer and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.
- (h) Bell holes shall be large enough so that there is ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so each pipe barrel rests on a solid foundation for its entire length.
- (i) Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug or by other means approved by the Authority. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.
- (j) Cut pipe so that valves, fittings, or closure pieces can be inserted in a neat workmanlike manner without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- (k) Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the Authority.
- (1) Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the p i p e manufacturer, and shall be approved by the Authority.
- (m) Lay no pipe in water or when it is the opinion of the Authority that trench conditions are unsuitable.
- (n) Where a water line crosses over a sanitary sewer, use a full joint of pipe with a standard mechanical joint, and center over the sewer. Where a water line is to be parallel to a sanitary or storm sewer, lay it at least ten (10) feet from the sewer. If it is not practical for the water and sewer lines to be separated as described above, then lay the water line at least 18 inches above the top of the sewer.
- (o) Joint all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials.
- (p) As an attempt to verify quality of the PVC water pipe prior to installation of all pipe, the following procedure will be required. After the Contractor has laid between 2,000 to 3,000 feet of pipe, said pipe shall be pressure tested in accordance with

these specifications. Only upon satisfactory completion of the testing will the Contractor be allowed to continue laying pipe. If the quality of the pipe becomes suspect at any other point in the project, testing will be required prior to continuation of the pipe laying.

(q) Connecting to Existing Lines

1) Connections of new lines to existing lines shall be as shown on the Plans and/or directed by the Authority.

2) The Contractor shall be completely responsible for determining existing pipeline materials, ordering proper fittings for the connection, and making the connection in an approved manner.

5.1.8 Backfilling

- (a) Begin backfilling after the line construction is completed and then inspected and approved by the Owner. On each side of the line, from the bottom of barrel to 1 foot above the top of the pipe, the backfill material shall be select backfill consisting of fine, loose earth like sandy soil or loam or of granular material that is free from clods, vegetable matter, debris, stone, and/or other objectionable materials and that has a size of no more than 2". Place this backfill simultaneously on either side of the pipe in even layers, which before compaction are no more than 6" deep. Thoroughly and completely tamp each layer into place before placing additional layers. Backfill shall, at locations beneath or closely adjacent to pavement, consist of No. 67 (TDOT) crushed stone.
- (b) If pipe is installed in a rock trench, install a 6" bedding of No. 67 (TDOT) crushed stone. Then add additional No. 67 stone backfill up to 1' above the top of the pipe as shown on the standard details.
- (c) From 1' above the pipe upward the backfill material may contain broken stones that make up approximately 3/4 of the backfills total volume. However, if this type of backfill is used, there must be enough spalls and earth materials to fill all voids completely. The maximum dimension of individual stones in such backfill shall not exceed 6", and the backfill material shall be placed and spread in even layers not more than 12" deep. At locations beneath or closely adjacent to pavement or at location of improvements subject to damage by displacement the backfill shall be entirely No. 67 stone. Tamp and thoroughly compact the backfill in layers that, before compaction, are 6" deep. In other areas, the backfill for the upper portion of the trenches may be placed without tamping but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.
- (d) Copper Wire for Detection: The Contractor shall furnish and install a 12-gauge blue coated copper wire over the non-metallic pipe. The copper wire shall be between12" to 18" below the ground surface to assist in future pipe location. Where two sections of wire connect a 12-inch minimum twisted overlap is required with adequate bare wire connection for continuity. The bare wire connection shall extend up into all valve boxes, so it is accessible for connection to locating equipment. At uncased road crossings the Contractor shall install the copper wire onto the top of the plastic pipe.
- (e) If earth material for backfill is, in the opinion of the Authority, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material the Authority considers too wet or otherwise unsuitable.
- (f) Wherever excavation has been made within easements across private property, the top 1' of backfill material shall consist of fine loose earth free from large clods, Standard Utility Specifications

vegetable matter, debris, stone, and/or other objectionable materials.

- (g) Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing Class A, Grade D, crushed stone as the top 12" of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Authority.
- (h) Wherever pipes have diameter of 15" or less, do not use power operated tampers to tamp that portion of backfill around the pipe within 1' above the pipe.
- (i) Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary.
- (j) Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the Engineer's requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.

5.1.9 Pressure Tests

- (a) After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All pipe shall be tested within two (2) weeks of installation in the presence of a representative of the Authority.
- (b) Conduct a pressure test for at least two (2) hours on uncovered pipe and six (6) hours on covered pipe.
- (c) Slowly fill each valved section of pipe with water and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the Authority. Furnish the pump, pipe, connections, gauges, and all necessary apparatus.
- (d) Before applying the specified test pressure, expel all air from pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and close taps after the test has been completed.
- (e) Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the Authority.
- (f) Prepare reports of all pressure test activities. Pressure tests shall be conducted utilizing a recording device and paper circular pressure chart. A copy of the pressure chart shall be provided to the Authority upon completion of satisfactory testing.

5.1.10 Leakage Test

- (a) Conduct the leakage test after the pressure test has been satisfactorily completed. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.
- (b) The duration of each leakage test shall be two (2) hours; during the test, subject the main to a pressure of 150 psi and performed in the presence of a representative of the Authority.
- (c) Should any test of pipe laid disclose leakage greater than that specified the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

ARTICLE 5 – WATER LINES

(d)

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- Leakage defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof in order to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
- (e) Allowable Leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

Ductile Iron Pipe: $L = \underline{SD\sqrt{P}}$ 133,200

Where: L = allowable leakage, in gallons per day.

S =length of pipe tested, in feet.

D = nominal diameter of the pipe, in inches.

P = average test pressure during the leakage tests, in per square inch (gauge).

Table 1 – Allowable leakage per 1000 ft of pipeline* - gph (Ductile Iron Pipe)										
Avg.		Nominal Pipe Diameter - Inches								
Test Pressure	3	4	6	8	10	12	16			
250	0.36	0.47	0.71	0.95	1.19	1.42	1.90			
225	0.34	0.45	0.68	0.90	1.13	1.35	1.80			
200	0.32	0.43	0.64	0.85	1.06	1.28	1.70			
175	0.30	0.40	0.59	0.80	0.99	1.19	1.59			
150	0.28	0.37	0.55	0.74	0.92	1.10	1.47			
125	0.25	0.34	0.50	0.67	0.84	1.01	1.34			
100	0.23	0.30	0.45	0.60	0.75	0.90	1.20			

* If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

2. PVC Pipe:
$$L = \underline{ND}\sqrt{P}$$

7,400

Where:

L = allowable leakage, in gallons per hour N = number of joints in the length of pipeline tested

D = nominal diameter of the pipe, in inches

P = average test pressure during the leakage tests, in pounds per square inch (gauge)

Table 2 – Allowable leakage per 50 joints of PVC pipeline* - gph								
Avg. Test	4	6	8	10	12	16		
Pressure 250	0.43	0.64	0.85	1.07	1 28	1 71		
225	0.41	0.61	0.81	1.01	1.20	1.62		
200	0.38	0.57	0.76	0.96	1.15	1.53		
175	0.36	0.54	0.72	0.89	1.07	1.43		
150	0.33	0.50	0.66	0.83	0.99	1.32		
125	0.30	0.45	0.60	0.76	0.91	1.21		
100	0.27	0.41	0.54	0.68	0.81	1.08		

* If pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

When testing against closed metal-seated valves, an additional leakage enclosed valve of 0.0078 gal/h/in of nominal valve size shall be allowed. When hydrants are in the test section, the

test shall be made against the closed main valve in the hydrant. All visible leaks are to be repaired regardless of the amount of leakage.

5.1.11 Disinfection

- (a) During construction, take precautions to protect pipe interiors, fittings, and valves against contamination. When pipe laying is not in progress (e.g., at the end of the day's work), place watertight plugs in the ends of all pipe already in the trench; if water accumulates in the trench, leave the plugs in place until the trench is dry. Complete the joints of all pipe in the trench before stopping work for any reason.
- (b) Prior to placing the installed water line in service, the new pipe and all exposed sections and appurtenances of existing pipelines shall be cleaned and disinfected in accordance with ANSI/AWWA C651-92, unless otherwise specified. Pipelines shall be flushed following completion of disinfecting procedures. Disposal or neutralization of disinfection water shall comply with applicable regulations.
- (c) Make water flow from the existing distribution system or some other source approved by the Authority into the newly laid pipeline and add chlorine to it. Feed water into the pipe, and chlorine into the water, at constant, measured rates so proportioned that the chlorine concentration in the water in the pipe is kept at a minimum of 50 mg/l available chlorine.
- (d) Table 3 shows how much chlorine is needed for each 100 feet of line for pipes of various diameters. A 1% chlorine solution may be prepared either with one (1) pound of calcium hypochlorite for each 8.5 gallons of water or with sodium hypochlorite.

TABLE 3 CHLORINE REQUIRED TO PRODUCE A 50 MG/L CONCENTRATION IN 100 FEET OF PIPE, BY DIAMETER						
Pipe Size	100%	1% Chlorine				
(inches)	Chlorine	Solutions				
4	0.027	0.33				
6	0.061	0.73				
8	0.108	1.30				
10	0.170	2.04				
12	0.240	2.88				
16	0320	3.96				

- (e) While the chlorine is being applied, manipulate valves so that the treatment dosage will not flow back into the line that is supplying the water. Continue the application of chlorine until the entire line being treated is filled with the chlorine solution. Then retain the chlorinated water in the line for at least 24 hours, during which time all valves and hydrants in the line being treated so that appurtenances can also be disinfected. After 24 hours, the treated water shall have a chlorine concentration of at least 25 mg/L throughout the line.
- (f) Final flushing shall be conducted in accordance with AWWA C651. After applicable retention period, flush heavily chlorinated water from line until chlorine concentration in water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/L. Perform such flushing only at approved sites. If no approved point of discharge is available, neutralizing chemicals must be applied to the water in order to neutralize the chlorine residual. The amount of chemicals required to neutralize various residual chlorine concentrations in 100,000 gallons of water are shown in Table 4.

TABLE 4									
Amounts of Chemicals Required to Neutralize Various Residual Chlorine Concentration in									
100,000									
				Chemical 1	Required				
Residual	S	ulfur	Sc	odium	S	odium	So	dium	
Chlorine	Di	Dioxide Bisulifite Sufate Thiosufate							
Concentration	(5	(SO2) (NaHSO3) (Na 2HSO3) (Na2S2O35H2							
mg/L	lb.	(kg)	lb.	(kg)	lb	(kg)	1	(kg)	
1	0.8	(.36)	1.2	(.54)	1.	(.64)	1	(.54)	
2	1.7	(.77)	2.5	(1.13)	2.	(1.32)	2	(1.09)	
10	8.3	(3.76)	12.5	(5.67)	14.6	(6.62)	12	(5.44)	
50	41.7	(18.91)	62.6	(28.39)	73.0	(33.11)	60	(27.22)	

(g) The velocity of the water used to flush a line shall be at least 2.5 fps. The flow rates required to produce this velocity in various sizes of pipe are shown in the following Table 5:

TABLE 5										
REQUIRED OPENINGS TO FLUSH										
	PIPEL	INES (40 PSI RI	ESIDUAL PRES	SURE)						
Pipe Size	Flow	No. of Taps	Size of Tap	Hyd	rant					
(inches)	Required	on		Out	let					
, , ,	to Produce	Pipe		Noz	zles					
	2.5 fps									
4	100	1	1"	1	2-1/2					
6	220	1	1-1/2"	1	2-1/2					
8	390	3	2 @ 1-1/2" 1 @ 2"	1	2-1/2					
10	610	5	3 @ 1-1/2" 2 @ 2"	1	2-1/2					
12	880	2	2"	1	2-1/2					
16	1,565	3	2"	2	2-1/2					

- (h) Once a line has been flushed, test to make certain that the residual chlorine in the water is within acceptable limits.
- (i) It must be noted that flushing is no substitute for taking preventative measures before and during the laying of water lines. Certain contaminants -- especially those in caked deposits-- are difficult or even impossible to remove by flushing, no matter how high the velocity. Furthermore, in pipes with diameters of 16 inches or more, it can be difficult to achieve even the minimum recommended flushing velocity of 2.5 fps.

5.1.12 Bacteriological Tests

- (a) After a water line has undergone final flushing but before it is placed into service, collect a sample for bacteriological testing from the end of that line. In the case of extremely long lines, take additional samples if the Authority so directs. A bacteriological sample shall be taken from each dead-end line or at least 1,200 feet whichever is less. Tests shall be in accordance with AWWA C651.
- (b) Collect these samples in sterile bottles treated with sodium thiosulfate. Do not use a hose or fire hydrant to collect samples. One suggested sampling method is to install a standard corporation cock in the line with a copper tube gooseneck assembly; after the samples have been taken, the gooseneck assembly can be removed and retained for later use.

- (c) Take the samples collected to an approved laboratory to be tested for bacteriological quality in order to determine if they contain any coliform organisms. If the initial disinfection fails to produce satisfactory samples, repeat disinfection until satisfactory samples are obtained.
- (d) When the samples tested are found to be satisfactory, the water line may be placed in service.

5.1.13 Disinfection Procedure After Cutting Into or Repairing Existing Lines

- (a) The procedures outlined above apply primarily to cases in which the lines are wholly or partially dewatered.
- (b) However, leaks or breaks that are repaired with clamping devices while the lines remain full of water under pressure present little danger of contamination and require no disinfection.
- (c) When an existing line is opened, whether by accident or design, the excavated area could be wet and contaminated because of the presence of sewers nearby. The danger of contamination from such pollution can be lessened if liberal quantities of hypochlorite are applied to the open trenches. It is better to use tablets for disinfection in such cases because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation site.
- Where practical, treat the lines by the slug method in accordance with AWWA C651.
 E. The following disinfection procedure is considered the minimum that may be used

1) Swab the interior of all pipes and fittings (particularly couplings and tapping sleeves) that are to be used in repairing an existing line with a solution of 5% hypochlorite before installing them.

2) The most practical means of removing contamination introduced into a line during repairs is to give the line a thorough flushing. If the locations of valves and hydrants make it possible, flushing in both directions is recommended. Start flushing as soon as repairs are completed and continue until all discolored water is eliminated.

5.1.14 Final Water Line Acceptance

- (a) After completing each section of water line, remove all debris and all construction materials from the work site. Then grade and smooth over the surface of both sides of the line. Leave the entire area clean and in a condition satisfactory to the Authority.
- (b) At least 2 copy/copies of final test charts and laboratory results shall be provided to the Authority.

5.2 Water Meters and Service Assemblies

Section Includes

Service assembly requirements for 3/4 inch and 1 inch service connections. Size of service shall be directed by the Authority. The same products shall apply for service reconnections.

5.2.1 Materials

- (a) The service assembly shall include a corporation cock, copper service pipe gooseneck, meter yoke, meter, meter box, and tapping saddle as required.
- (b) CORPORATION COCK: The corporation cock shall be of solid bronze suitable for a compression flange on the service pipe and for tapping into the water main at a
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vertical angle. This cock shall be similar to Ford F-1000, or equal. The threads on the corporation cock shall be Ford.

- (c) SERVICE PIPE: Service pipe shall be 3/4 inch or 1 inch copper service line. Goosenecks shall be a minimum of 3 feet long.
- (d) METER SETTERS: Meter setters shall be Mueller H1404 or Ford Series 70. Meter setters shall include a check valve. All 2" meters and smaller require a meter setter.
- (e) WATER METERS: All meters shall be frost-proof, sealed register, displacement type with bronze cast. Meters shall be Master Meter. Meters shall be straight reading in gallons.
- (f) METER BOXES: Meter boxes shall be Brooks precast concrete with cast iron reading lid. The box shall be installed with one course of brick as base.
- (g) TAPPING SADDLES: Tapping saddles shall be used for tapping all PVC pipe and shall be Ford S70 series and shall be threaded to accept the corporation cock specified above. Tapping saddle body and strap shall be made of brass alloy and shall be joined together with stainless steel pin. No taps larger than 1 inch shall be made in any size pipe without approval by the Authority.
- (h) PRESSURE REDUCING VALVE: 3/4-inch pressure reducing valve shall be Watts or approved equal. Valve shall be preset for 50 psi. Pressure reducing valves shall be installed in a separate meter box located immediately behind the water meter box.

5.2.2 Installation

- (a) No couplings shall be used on the new service line.
- (b) In general, install the meter box as near the property lines as possible in the street right-of-way. Set plumb approximately 1 inch above the existing or proposed grade and so that surface drainage will not enter it. Fill from the existing or proposed grade to the top of the meter box at a slope of 1 inch in 12 inches. When the cut or fill slopes on streets extend beyond the street right-of-way, install the meter box at the top or toe of slope, as applicable, or as directed by the Engineer.
- (c) The service main shall not be taut from stop to cock. D.
- (d) Set the yoke plumb and level.
- (e) Pressure reducing valves shall be installed in a separate meter box located immediately behind the meter box.

5.3 Valves, Hydrants and Appurtenances

Section Includes

- (a) Installation of fire hydrants, valves, blow-offs and related accessories as specified below.
- (b) Refer to other sections for work related to that specified under this heading.

5.3.1 Gate Valves

- (a) Valves on water lines 12 inches and smaller shall be of the resilient seat, iron body, bronze mounted type designed to work equally well with pressure on either side of the gate. All gate valves shall be in accordance with or exceed AWWA C509. Working pressure shall be 200 psi.
- (b) Valves shall be supplied with O-ring seal stuffing boxes and shall open to the left. Valves shall be Mueller, America Darling, Clow, or equal, with mechanical joints.

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5.3.2 Butterfly Valves

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- (a) Valves on water lines 16 inches and larger shall be of the butterfly style.
- (b) AWWA, cast-iron butterfly valves complying with AWWA C504, Class 150B, buried service with mechanical joint end connections, stainless steel shaft, cast iron valve disc, BUNA-N valve seat, stainless steel disc seat, removable shaft seals without removing valve shaft, sleeve type corrosion resistant, valve bearings, self-lubricating thrust bearings on shaft outboard, totally enclosed actuator gears, open/close stops in the valve actuator, epoxy coated interior, in accordance with AWWA C550, asphaltic coated exterior. Minimum Working Pressure of 150 psi.

5.3.3 Valve Boxes

All valve box castings shall be made accurately to the required dimensions, and shall be sound, smooth, clean and free from blisters and other defects. Defective castings which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces of frames and covers shall be machined so that the covers rest securely in the frames with no rocking and with the cover in contact with the frames for the entire perimeter of the contact surface. All castings shall be thoroughly cleaned s u b s e q u e n t to machining and before r u s t i n g begins, painted with a bituminous coating so as to present a smooth finish, tough and tenacious when cold, but not tacky with no tendency to scale. Install valve boxes on each proposed valve in accordance with the details shown on the standard drawings.

5.3.4 Blowoff Hydrants

Blowoff hydrants shall be flush type standard fire hydrants, Mueller, or equal, with

2-1/8 inch valve opening and one 2 1/2 inch hose nozzle, 36 inch bury with 3 inch mechanical joint shoe. Hose nozzle treads, operating nut, and cap shall conform to local government standards. Install a 3 inch gate valve ahead of each blowoff hydrant.

5.3.5 Fire Hydrants

- (a) Fire hydrants shall comply in all respects with AWWA C502 and shall be of the compression type, with the main valve opening against the pressure and closing with the pressure. The main valve opening shall be not less than 5-1/4 inches in diameter. The main valve facing of the hydrant shall be made of balata or similar material especially suited and proven for the services intended. The bottom stem threads of the main valve rod shall be fitted with an acorn nut or suitable means for sealing the threads away from the water. Hydrants shall be connected to the main by a 6 inch mechanical joint shoe, unless otherwise shown on the drawings. Two 2 1/2 inch hoses and one 4 1/2 inch steamer nipple shall be threaded and screwed into the nozzle section and then pinned to prevent turning.
- (b) Operating nut shall be provided with convenient means to afford lubrication to ensure ease of operation and the prevention of wear and corrosion.
- (c) Hydrant shall be the dry barrel type, and hydrant shoe shall have two positive acting noncorrodible drain valves that drain the hydrant completely by opening as soon as the main valve is closed and by closing tightly when the main valve is open. Drain valves operated by springs or gravity will not be acceptable.
- (d) The packing gland located in the bonnet shall be solid bronze, and gland bolts shall seal with bronze nuts. A double O-ring seal may be used in lieu of conventional stuffing box.
- (e) The hydrant shall open by being turned to the left and be so marked on the bonnet in cast letters with an arrow.
- (f) Threads on hose and steamer nipples, operating nut, and cap nuts shall conform to

Authority standards.

- (g) Bury shall be 36 inches, with the depth being measured from grade line to top of trench or connecting pipe when outside roadway and 48 inches when water line is located inside roadway.
- (h) Hydrants shall be Mueller "Centurion".

5.3.6 Air Release Valves

Air release valves shall be manual type and as set forth in the Standard Details.

5.3.7 Blow-off Assemblies

Blow-off assemblies shall be complete assembly and as set forth in the Standard Details.

5.3.8 Setting Valves and Fittings

- (a) General: Set valves, fittings, plugs, and caps and joint to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.
- (b) Location of Valves: Valves in water mains shall, where possible, be located on the street property lines extended unless otherwise shown on the drawings.
- (c) Valve Boxes and Valve Pits: Provide a valve box for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as directed by the Authority. A concrete collar shall be installed around each valve box located outside the roadway area.

5.3.9 Setting Hydrants

- (a) Location: Locate hydrants as shown on the drawings or as directed by the Engineer and in a manner that will provide complete accessibility and also minimize the possibility of damage from vehicles or injury to pedestrians.
- (b) Position: All hydrants shall stand plumb. Set hydrants to the established grade, with nozzles at least 12 inches above the ground, as shown on the drawings or as directed by the Authority. If the hydrant is required to adjust height to 12 inches, this adjustment device shall be supplied by the contractor.
- (c) Connection to Main: Connect each hydrant to the main with a ductile iron mechanical joint tee, or hydrant anchor tee and 6 inch gate valve.
- (d) Hydrant Drainage: Provide drainage at the base of the hydrant by placing coarse gravel or crushed stone from the bottom of the trench to at least 6 inches above the waste opening in the hydrant to a distance of 1 foot around the elbow. Connect no drainage system to sewer.
- (e) Concrete blocking of hydrants shall not be permitted. All newly installed hydrants shall be restrained to the valve and the valve restrained to the main line using Grip-Rings. If rods are used in conjunction with restraint, the rods shall be plain or continuous threaded, and shall be rated 50.000 psi tensile strength. Bolts shall meet the requirements of ASTM A325, Type 3D. Rods shall be galvanized or otherwise rustproof treated.

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ARTICLE 6: Gas Systems

6.1 Job Conditions

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- (a) If existing gas or water pipes, buried electrical, telephone, and telegraph ducts, conduits, sewers, drains, or poles are blocked or interfered with by the excavation required on this project, maintain them in continuous operation, and restore them to their original condition if damaged.
- (b) Preserve from damage surveying monuments, property pins, and similar items. If disturbed or damaged by construction operations, pay the cost of restoration by a registered surveyor.
- (c) Locating, maintaining, and protecting existing facilities shall be the responsibility of the Contractor.
- (d) The Contractor shall be responsible for safely storing materials needed for the work until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

6.1.1 Safety

Refer to Section 3.13

6.1.2 Protection

- (a) Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- (b) Underpin adjacent structures that may be damaged by excavation work, including service utilities and pipe chases.
- (c) Notify Engineer of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- (d) Protect bottom of excavations and soil adjacent to and beneath foundation from frost.
- (e) Grade excavation top perimeter to prevent surface water run-off into excavation.
- (f) Protect excavation bottoms against freezing when atmosphere temperature is less than 35°F.
- (g) Protect trees, shrubbery, fences, poles, and all other property and surface structures during construction operations unless their removal for purposes of construction is authorized by the Engineer. Fences, poles, or other manmade surface improvements that are moved or disturbed shall be restored to the original conditions after construction is completed. Trees, shrubbery, or other vegetation which are approved for r e m o v a l in order to facilitate c o n s t r u c t i o n operations shall be removed completely, including stumps and main roots. Responsibility for damage or claims for damage caused by construction operations to shrubbery or other landscape improvements which were not authorized for removal by the Engineer shall be assumed by the Contractor.

6.1.3 Deviations Occasioned by Structures or Utilities

- (a) Wherever obstructions are encountered during the progress of the work which occupies the space required for the pipeline, the Engineer shall have the authority to change the drawings and order a deviation from the line and grade or arrange with the Owners of the structures for the removal, relocation, or reconstruction of the obstructions.
- (b) Where gas, water, telephone, electrical, or other existing utilities directly interfere with the vertical or horizontal alignment of the pipeline, the Engineer will order a change in grade or alignment or will arrange with the Owners of the utilities for their removal.

6.1.4 Pipe

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Polyethylene pipe will be Driscoplex 6500, which is a medium-density polyethylene pipe (MDPE), which has a plastic pipe material designation of PE 2406. Pipe shall be manufactured and tested in accordance with the latest published edition of ASTM D2513.

6.1.5 Fittings

- (a) Polyethylene heat fusion fittings shall be manufactured and tested by the pipe manufacturer in accordance with the latest published edition of ASTM D2513 and TDOT requirements.
- (b) The same manufacturer shall supply polyethylene pipe and butt heat fusion fittings.

6.1.6 Joining Polyethylene Pipe

- (a) All polyethylene pipe shall be joined by the butt fusion method. Heat fusion joints and joining equipment shall be made in accordance with all applicable sections of Part 192 of the Minimum Federal Safety Standards.
- (b) All joints made by butt fusion on PE pipe shall be made by personnel qualified in accordance with Part 192, section 192.285 of the Minimum Federal Safety Standards. Contractor shall supply Owner/Engineer with a copy of PE Fusion certificates for all personnel who will be fusing proposed PE pipe.
- (c) Refer to pipe manufacturer's recommended procedure for butt fusion.

6.1.7 Burial Depth

All mains shall have a minimum cover of thirty inches (30"); in consolidated rock, twenty-four inches (24") is allowable.

6.1.8 Foundation and Bedding

Polyethylene Pipe shall be laid on grade and on a stable foundation. Unstable trench bottom soils shall be removed, and a 6" foundation or bedding of compacted Class I material shall be installed to pipe bottom grade. A trench cut in rock or stony soil shall be excavated to 6" below pipe bottom grade and brought back to grade with compacted Class I bedding. All rock, boulders and large stones shall be removed.

6.1.9 Pipe Handling

Pipe shall be handled in a safe manner that avoids damage to the product. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope or chain shall not be used.

6.1.10 Backfilling

- (a) Embedment material soil type and particle size shall be in accordance with ASTM D2774. Embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids.
- (b) Final backfill shall be placed and compacted to finished grade. Native soils may be used provided the soil is free of debris, stones, boulders, clumps, frozen clods or the like larger than 8" in their largest dimension.

6.1.11 Protection from Shear and Bending Loads

In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

6.1.12 Testing

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- (a) Fusion Quality: The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Authority, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.
- (b) Polyethylene gas distribution systems that are subject to TDOT Safety Regulations shall be tested in accordance with CFR 49, Part 192, Section 192.509, 192.511, or 192.513 as applicable.
- (c) The Contractor shall furnish all necessary labor, equipment, compressors, and any other supplies required to complete the pressure testing of the pipeline.
- (d) The Contractor shall give the Engineer and the Authority ample advance notice (minimum of 2 working days) of all proposed tests and conduct all pressure tests in the presence of the Engineer and/or Authority.
- (e) The test pressure during the tests shall be measured on an accurate recording type pressure gauge with 24-hour chart, furnished by the Contractor and installed by the Contractor. The recording pressure gauge shall be calibrated before the beginning of the test with a dead weight tester, furnished by the Contractor. Additional calibrations with a dead weight tester will be required as instructed by the Authority and/or the Engineer.
- (f) Factors for testing:
 - 1) All plastic pipelines will be pressure tested to a minimum of 100 PSIG, for an MAOP of 60 PSIG.
- (g) Test medium for these specifications is air. Other test mediums may be substituted, such as inert gases, if approved by the Authority. Should a different medium be approved, the line pressures and the frames herein stated shall still apply. The intent of the testing procedures shall not be altered by the selection of a test medium
- (h) The Contractor shall fill the test sections with air; measure the test pressure with an accurate recording type pressure gauge with 24- h o u r chart. The test gauge shall show no drop in pressure for a minimum of 8 hours after the source of test pressure has been disconnected from the pipeline section involved in the test and the temperature of the test medium has been allowed to equalize. The Contractor shall locate and repair all leaks which may be disclosed by the tests, and repeat the tests as required for approval.
- (i) All charts used in the tests shall be identified with the test date, section of pipeline involved, test pressure, and the Contractor's signature. The Contractor shall deliver to the Owner, two (2) Photostatic or Xerox copies of these charts. All test charts shall be twelve-inch (12"), twenty-four (24) hours, recording charts. All test gauges shall be a minimum of four and one-half inches (4 ¹/₂") in diameter or bigger depending on the accuracy required from the test.
- (j) All tests shall have a gauge at the point where the air is being put into the line, and the Standard Utility Specifications

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point furthest from the recording chart and one at the point where the recording chart is located.

- (k) Piping shall, in no case, show any drop in pressure during the test except what may occur due to temperature changes. It is strongly recommended that once the pipe has been pressurized to the proper pressure that it sits for a period of time to allow pressure and temperature to stabilize. The pipeline should stand the test pressure without leakage for a minimum of eight (8) consecutive hours. The Authority shall approve or reject the test.
- (1) Compressors, used in pumping the lineup, shall in no way, inject any type of lubricant, or any foreign matter into the line
- (m) The Contractor shall take all precautions to eliminate hazards to persons near lines being tested. Pipes being tested shall be supervised at all times.

6.1.13 Roadway Crossings

- (a) The Contractor shall install a pipeline at all highway and street crossings in strict accordance with the specifications required by state highway engineers, or any other authority having proper jurisdiction over such installations.
- (b) If casings are required, they shall be installed by the Contractor. Casing spacers and end seals shall be installed with the insulators spaced at proper intervals on the pipe between the pipe and casing. Vents are to be installed at required locations. All casing installations must pass electric resistance tests.
- (c) All necessary barricades, safety signs, lights, etc. required by federal, state, city, county, or other governmental authority shall be furnished and maintained by the Contractor.
- (d) The pipe at all road crossings shall be buried to a depth to ensure that the top of the pipe or casing shall be at least thirty-six inches (36") below the lowest point in the bottom of the drainage ditch. However, on roads other than federal or state highways, when in consolidated rock, less cover may be acceptable, at the option of the Authority, but in no case will less than twenty-four inches (24") of cover in drainage ditches be acceptable.
- (e) The Contractor shall install "Notice", "Danger", and "Warning" signs at road and railroad crossings and at other locations along the pipeline as designated in the plans. The Contractor shall furnish all signs and materials.

6.1.14 Water Crossings

- (a) At water crossings, creeks, or streams, the Contractor may use dikes, cofferdams, culverts, or pilings to separate the work area from the flowing stream. The minimum depth of the pipe below the existing stream shall be three feet (3'). However, at the option of the Authority, two feet (2') may be acceptable in consolidated rock. The spoil shall be deposited on either side of the water crossing. After the pipe has been placed in the ditch, all spoil banks shall be placed back over the line in the stream. The banks of the crossing shall be restored to their original condition and to prevent erosion, rip-rap material may be required. All excavation work shall conform to the terms of federal, state, and local permits and Right-Of-Way easements.
- (b) Weights shall be installed, if required. The Contractor shall either furnish weights or weight material.

6.1.15 Pipeline Tie-ins

(a) The Contractor shall make a tie-in to the existing piping as shown on the plans. However, should the underground piping be discovered to be different than shown on the plans, the Contractor will make a tie-in at the direction of the Engineer. All tie-ins to the existing

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system will be made by the contractor while the hot-tap will be made by the Munford City Hall Gas Service.

- (b) Connecting new lines to existing mains shall be accomplished without interrupting normal gas service. Connections shall be in accordance with the American Standard Code for pressure piping.
- (c) Where new lines are fifty percent (50%) or less of the nominal diameter of the existing mains, connections shall be accomplished with a hot tapping tee.
- (d) Where new lines are more than fifty percent (50%) of the existing mains, the connection shall be accomplished by removing a section of the existing main and inserting a standard tee. Isolation of the section of main to be removed shall be accomplished with line stopper fitting that will accommodate a bypass line.
- (e) Ties to existing main shall be made only during the time specified by the Authority.
- (f) Should, for any reason, gas service be discontinued during the tie-in operation, it shall be the responsibility of the Contractor to close each existing gas service affected. When gas service is returned, it shall be the Authority who will reopen all gas services and ignite all pilots for all gas-operated appliances. The Contractor will be responsible for all costs incurred by the Authority for such work.

6.1.16 Purging

- (a) New Lines: Before placing in service, purge all new lines with gas to remove all air and explosive mixtures, using proper safety precautions. Purging gas will be furnished by the Authority. The Contractor shall not waste gas unnecessarily.
- (b) Existing Piping: Before temporarily or permanently taking existing piping out of service, purge all pipes with air to remove all gas and explosive mixtures, using proper safety precautions.

6.1.17 Clean Up

- (a) Clean up the work areas as the work progresses.
- (b) After all the work is complete; make a final clean-up of all areas where work has been done. These areas should be left, at a minimum, as clean as the condition of the area before construction. Clean up of the work areas shall be completed within 45 days after the gas mains have been installed, but no earlier than 30 days after installation. All work shall be completed to the satisfaction of the Authority and the Engineer.

6.1.18 Fire Protection

- (a) At all times during the work under this contract, maintain suitable approved fire extinguishing equipment near the locations where work is in progress and especially in the vicinity of "hot connections" and purging operations. Use every possible safety precaution to prevent fire and explosions, and comply with all applicable safety and fire prevention codes.
- (b) Portable fire extinguishing equipment shall conform to National Fire Protection Associations Standard Section 10.
- (c) The storage and use of flammable and explosive liquids, solids, and devices shall be in accordance with the applicable section of the National Fire Protection Associations Codes, Standards, and Recommended Practices.
- (d) Section 1 of the NFPA Standards shall be abided by at all times.

6.1.19 Static Electricity

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Static electricity charges can build up when plastic pipelines are purged. Static electric charges are caused by particle matter in the gas contacting the pipes inside wall and fittings of high flow rates. This static electric charge will "flow" down the pipe wall with the gas and collect on metal fittings or at the end of the pipe. The static electric charge must be conducted to the ground to remove any potential danger. The grounding method used shall be to wrap a water/soap-saturated cloth around the pipe and in contact with wet earth or ground rod. If squeeze-off tools are necessary, all units and metal fittings shall also be grounded.

6.2 Gas Valves and Appurtenances

Refer to other sections or detail sheet of plans for work related to that specified under this heading.

6.2.1 Valves

- (a) Valves on gas lines shall be Orbit type or approved equal ANSI 600 pressure class with butt weld ends to match designated pipe wall thickness. The body and core shall be ASTM A-216 cast steel with nickel face overlay on core.
- (b) Valves shall be supplied with Teflon packing rings with braided flexible graphite top and equipped with injectable packing port and lower lube fitting.
- (c) All valves installed by the Contractor shall be installed with one insulating gasket set at locations shown on the plans. Installation of valves and appurtenances shall be done as detailed on the construction drawings or as described in other sections of these specifications. All above ground piping and appurtenances shall be primed and painted by the Contractor using methods and materials outlined in the Plans, Specification or as approved by the Authority and/or Engineer.

6.2.2 Valve Boxes

- (a) Location of valves: Valves in gas mains shall be located as shown on the construction plans or as detailed by the Engineer in the field.
- (b) Valve Boxes: The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve with the box cover flush with the surface of the finished pavement or such other level as directed by the Engineer and/or the Authority.
- (c) Valve boxes shall be two (2) piece telescopic ductile iron. The diameter of valve shall not be less than 5-1/4 inches.
- (d) Valve boxes shall be of sufficient length, if possible, so that no extensions are needed on the valve boxes.
 - 1) Should a case arise that requires an extension to be used on a valve box, PVC Schedule 40 water pipe shall be used, and
 - 2) The extension (PCC Sch. 40 pipe) shall be placed on the bottom of the valve box.
- (e) Valve boxes shall be installed plumb and extending above finished grade so that no water can accumulate around the valve box top.
- (f) Valve boxes shall have two (2) feet by two (2) feet by six (6) inches concrete collar poured around the top of the box after the backfill has had time to settle.
- (g) Contractor will insure that valve box is square and straight over valve operation and will take all necessary precautions during backfilling and forming/pouring concrete collar that a valve wrench is easily inserted and fitted on the valve operator.

6.2.3 Flange Insulation

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The Contractor shall install full-face flange insulation kits on each flange as shown on the plans. These insulation kits shall be F.H. Maloney, as supplied by Harco, and shall include Type E Gasket, polyethylene sleeves and washers. Gasket shall be medium-weave fabric based phenolic with neoprene coating. Kits shall match the pressure rating of flanges.

6.2.4 Miscellaneous Fittings

- (a) Welded Fittings:
 - 1) All welded sitting for steel piping shall be Tube Turn, Midwest, or as approved standard strength (Sch. 40) fittings, confronting to ANSI/ASME 16.9 ANSI/ASME 16.9a, ANSI/ASME 1625, MSS-SP-25, and manufactured in the United States of America.
- (b) Stainless Steel Fittings:
 - 1) All stainless- s t e e l tubing shall be joined by means of compression type connectors except where threaded adaptors are required.
 - 2) All stainless-steel tubing fittings shall be manufactured by Parker or as approved.
 - 3) All fittings shall conform to MSS-SP-25.
- (c) Mechanical Fittings:
 - 1) All compression type fittings used on steel piping shall be manufactured by Dresser Industries.
 - 2) All compression type fittings and bolt-on tapping tees used on plastic pipe shall be manufactured by Continental Industries or as approved.
 - 3) All mechanical tapping tees used on steel line shall be manufactured by Mueller or approved equal.
 - 4) All fittings shall conform to MSS-SP-25.
- (d) Threaded Fitting:
 - 1) All threaded fittings shall be as manufactured by Grinnell or as approved. Black malleable iron conforming to ANSI/ASME B16.3, MSS-SO-25 and manufactured in the United States of America.
 - 2) All threaded fittings shall have national pipe tapered threads (NPT) and conform to ANSI/ASME B2.1.
 - 3) All unions shall be of the insulating type and conform to ASNI/ASME B16.39.
 - 4) All plugs, bushing and locknuts shall conform to ANSI/ASME B16.14.
 - 5) Threaded pipe shall conform to API 5B.
- (e) Control Piping, Tubing, and Hose Fittings (1/2 inch or smaller):
 - 1) All threaded fittings shall be as described in "Stainless Steel Fittings" in this subsection.
 - 2) All threaded control piping fitting including valves shall be forged steel with a minimum working pressure rating of 2,000 psi. All nipples shall be extra heavy.
 - 3) Only when authorized and under special conditions shall flare-nut type fittings are used.
 - 4) Brass fittings may be used only when there is not stainless steel or steel fittings available and must be approved by the Authority and Engineer.
 - 5) Under no conditions may aluminum, nylon, polyethylene, PVC, or Teflon tubing or hose fittings be used.

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- 6) All hose clamps shall be stainless steel worm drive.
- 7) All hose fittings, unless otherwise noted, shall be Parker Parflex Series 50 fittings.
- 8) All threaded fittings shall conform to API 5B, ANSI/ASME 2.1, and ANSI/ASME 16.11.
- 9) All fittings shall conform to MSS-SP-25.
- (f) Line Stopper Fittings:
 - 1) All line stopper fittings shall be of the welding type.
 - 2) Line stoppers shall be capable of totally stopping the flow of gas in the line.
 - 3) Line stops and fitting shall be manufactured by T.D. Williams or approved equal and shall be compatible with the Munford City Hall Gas Service's line stopper equipment.
- (g) Bolts and Studs:
 - 1) All bolts shall be threaded to within $\frac{1}{2}$ -inch of the bolt head.
 - 2) All studs shall be threaded the entire length.
 - 3) All bolts and studs shall be UNC male cut threads.
 - 4) All bolts shall have regular hex heads.
 - 5) All bolts and studs shall be grade 7 steel.
 - 6) All bolts and studs shall be manufactured in the United States and of steel manufactured in the United States
 - All above ground flanged regulators, filters, relief valves, strainers, etc. except valves shall have stud type bolts of the proper diameter and length.
 - 8) All bolts shall have at least $\frac{1}{4}$ to $\frac{1}{2}$ inch exposed at end of nuts.
 - 9) All bolts, screws and nuts shall conform to ASME 18.2.1, and ASME 18.2.2.
 - 10) All studs shall conform to ANSI/ASME A687.
- (h) Nuts:
 - 1) All nuts shall be UNC female cut threads.
 - 2) All nuts shall be regular hex
 - 3) All nuts shall be grade 7 steel.
 - 4) All nuts shall be made in the United States and of steel made in the United States.
 - 5) All nuts shall conform to ASME B18.2.2 and ANSI/ASME B1.1.
- (i) Washers:
 - 1) All washers shall be circular flat washers of the appropriate size and manufactured from grade 7 steel.
 - 2) All washers shall be made in the United States and of steel manufactured in the United States
 - 3) All washers shall conform to B18.21.1 or 18.21.2.
- (j) Weldolets and Threadolets:
 - 1) Weldolets shall be as manufactured by the Boney Forge Company or approved equal.
 - 2) Threadolets shall be as manufactured by the Bobey Forge Company or approved equal.
 - 3) Threadolets and weldolets shall conform to ANSI/ASME B16.11 and MSS-SP-25.

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6.2.5 Cathodic Test Stations

Cathodic protection test station shall be located as indicated on the drawings and as detailed in the detail page of the drawing.

6.2.6 Casing Spacer and End Seals

- (a) Upon completion of the installation of the steel pipe encasement, the contractor shall furnish and install non-metallic casing spacers and end seals.
- (b) Casing spacers shall be spaced a maximum of eight (8) feet apart along the length of the carrier pipe with one casing spacer within two (2) feet of each end of the pipe joint and the rest evenly spaced.
- (c) Casing spacers shall be all non-metallic (polypropylene), molded in segments for field assembly without any special tools. Spacer segments shall be secured around carrier pipe by insertion of a Slide-Lock. The casing spacer polymer shall contain ultraviolet inhibitors and shall have a minimum compressive strength of 1.5 ft-lbs/ inch. Each casing spacer shall have full length, integrally molded extending beyond the bell or mechanical joint of the carrier pipe.
- (d) Spacers shall be at least 5.12" wide.
- (e) The casing spacers shall be PSI Ranger II Midi Model, Casing Spacers and manufactured by Pipeline Seal and Insulator, Inc., or approved equal.

6.2.7 End Deals, insulators, and Vent Pipe Service Saddle

- (a) All insulators shall be PSI Products, Inc. Model A8G-1, centered, non-restrained, or approved equal. Insulators shall be spaced within six (6) inches of each end of the casing and at a spacing of approximately twelve (12) feet along the length of the carrier pipe.
- (b) End Seals shall be "Link Seal" assemblies, 400 Series, No. 48, Size LS-475 or approved equal.
- (c) Connection of vent pipe to the existing eight (8) inch D.I. pipe shall be made by means of "Ford" Iron Service Saddle Style F202-871 X CC7 or approved equal.

6.2.8 Vent Pipe

- (a) Vent pipes shall be installed in the manner and locations as specified herein and as shown on the construction drawings, exact location of the vent pipes, will be determined the Engineer and/or Authority.
- (b) Vent pipes shall be two inch (2") nominal diameter, 0.154-inch wall thickness with one end threaded to fit tapping saddle specified.
- (c) Vent pipes shall have 180-degree screened return elbow welded three (3) to four (4) feet above finished grade.
- (d) The elbow shall have a screen attached to one end by hose clamps.

6.2.9 Setting Valves and Appurtenances

- (a) General: Set valves, fittings, plugs, caps, and joint to pipe and other appurtenances in the manner heretofore specified for handling, laying, and jointing pipe.
- (b) Coating material for the pipe connections shall be cold applied tar enamel, Bitumastic #50 or approved equal.

6.2.10 Cathodic Test Stations

- (a) Test stations shall be located as shown on the drawings and as determined in the field by the Authority and/or Engineer. Care should be taken to place the test stations away from areas of possible damage by activity.
- (b) Connections of wire to pipe shall be made using Cadweld #15 Type cartridges for steel piping. Proper sleeves shall be used on the wires in accordance with the manufacturer's recommendations.
- (c) Coating material for the pipe connections shall be cold applied tar enamel, Bitumastic #50 or an approved equal. Allow 24-hours for curing before backfilling.
- (d) Contractor to install 24" concrete pad around the Test Station. Lid shall be flush with the top of the concrete pad.

6.3 Gas Services

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Section includes

- (a) This section addresses the installation of service taps, service lines and service meters.
- (b) The service assembly shall include tap tee, service riser, valve cock, and primary regulator. All service lines shall be installed according to the following sections of the Department of Transportation Federal Standards: 192.357, 192.361, 192.363, 192.365, and 192.367.

6.3.1 Materials

- (a) Tap Tee: All tap tees used shall be Mueller H-17501, or equal, welding inlet, steel cap, 1440 psi rating, 3/4" x 3/4", and 1/4" tap.
- (b) Service Riser: The service riser shall be fabricated from ³/₄", Schedule 40, 1.050" O.D., 0.113" Wall, API 5L, A-25, CW pipe. If pipe is bent, the maximum difference between minimum and maximum diameters in the bend shall not exceed 0.01875". The maximum radius of bend is 12" and the minimum radius of bend is 6.5". Pipe shall extend approximately 6" above ground level and pipe coating shall extend approximately 3" above ground level.
- (c) Valve Cock: All service valves shall be Mueller H-11185, or equal, black finish, lock wing, 500# test, and 3/4" in size.
- (d) Primary Regulator: The first stage regulator shall be a Fisher 627R regulator, with built-in full capacity relief, or equal, 3/4" x 3/4", 1/8" orifice, 35-80 psi spring, spring number 10B3078X012, spring color blue, and set at 40 psig. Provide a temporary cap on the outlet to prevent entrance of water and/or debris.
- (e) Service Line: The service line shall be Driscoplex 6500, which is a medium density polyethylene pipe (MDPE) with a plastic pipe material designation of PE 2406, meeting the test requirements of ASTM D2513.
- (f) Secondary Regulator: The second stage regulator shall be an American Meter Series 1813C regulator, with built-in capacity relief, or equal, 3/4" x 3/4", 1/8" x 3/16" orifice, 5.5 8.5 in. w.c. spring, spring number 70017P044, color yellow, set at 7" w.c.
- (g) Meter: The meter shall be an American Meter AI-250 or equivalent

6.3.2 Preparation

- (a) Make no taps on dry lines without approval from Engineer.
- (b) The service line shall have a minimum of 18" cover.

6.3.3 Installation

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(a) All service lines to be installed under paved county or state roads will be bored and jacked.

(b) All service installations shall be coordinated with TDOT and Munford City Hall Gas Service prior to installation of services.

6.3.4 Meter Installation

Meters, if required, shall be set by the Munford City Hall Gas Service.

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ARTICLE 7: ROADWAY

7.1 Work Included

- (a) This work shall consist of the construction and preparation of part or all of the roadbed to receive the immediate construction of a base or pavement thereon.
- (b) This work shall consist of furnishing and placing one or more courses of aggregates, and additives if required, on a prepared subgrade in accordance with these specifications and in reasonably close conformity with the lines, grades, thickness and typical sections shown on the Plans.

7.1.1 Related Work

- (a) Section 3.1 Clearing
- (b) Section 3.2 Excavating
- (c) Section 3.4 Finish Grading
- (d) Section 7.2 Asphaltic Concrete Pavement
- (e) Section 7.3 Portland Cement Concrete Pavement

7.1.2 Applicable Specifications

"Standard Specifications for Road and Bridge Construction"

Latest Revision, Tennessee Department of Transportation (TDOT).

7.1.3 Applicable References

"American Association of State Highway and Transportation Officials" (AASHTO).

"American Society for Testing and Materials" (ASTM)

7.1.4 General Requirements for Mineral Aggregate Base Materials

- (a) Mineral Aggregate shall meet the general requirements of TDOT Standard Specifications Section 303 and Subsection 903.05 for Class A or Class B aggregates depending upon whether type A or type B is required in the construction. Type A base will require the use of Class A aggregate grading D. Either Class A or Class B aggregate may be used for type B base.
 - 1) When the stationary plant method for mixing is used the aggregate will be accepted for gradation immediately following mixing or immediately prior to mixing based on periodic samples taken from the pugmill output or from the belt feeding the pugmill.
 - 2) When two (2) or more materials are blended on the road by means or mechanical mixers the aggregate will be accepted for gradation after mixing and before compaction based on samples taken from each layer of base material. Aggregate that does not require blending will be accepted for gradation at the aggregate production plant based on samples taken from stockpiles of plant production immediately prior to delivery to the road.
- (b) Calcium chloride shall meet the requirements in TDOT Standard Specifications Subsection 918.02 for type 1, type 2, or calcium chloride liquor.
- (c) Sodium chloride shall meet the requirements in TDOT Standard Specifications. Standard Utility Specifications

7.1.5 Soil-Cement Base

- (a) Soil-cement base shall meet all requirements of TDOT Standard Specifications Section 304 and related material specifications in Subsections 901.01, 904.02,904.03, and 918.13.
- (b) Engineer shall determine the specified thickness and cement ratio based on the in- place soil or other selected soil

7.1.6 Portland Cement Concrete Base

- (a) Portland Cement Concrete Base shall meet all requirements of TDOT Standard Specifications Section 306 and related materials specifications in Subsections 901.01, 903.01, 903.03, 907, 913, 918.01, 918.09.
- (b) The Engineer shall determine the specified thickness of the base materials and the proportions of materials that will produce a workable concrete with maximum design slump of $1 \frac{1}{2}$ " per AASHTO T-119.

7.1.7 Bituminous Plant Mix Base (Hot Mix)

This base mix shall conform to the TDOT Standard Specifications Section 307 and Section 7.01 subsection 2.05 and 3.03 of these specifications.

7.1.8 Aggregate-Cement Base

- (a) Aggregate-cement base shall meet all requirements of TDOT Standard Specifications Section 3.09 and related materials specifications in subsections 3.02.03 (b), 901.01, 903.05, 903.15, 904.02, 904.03
- (b) The Engineer shall determine specified thickness, cement ratio and aggregate to be used for base.

7.1.9 Aggregate-Lime-Fly Ash Base

Aggregate-lime-fly ash stabilized base course shall meet all requirements of TDOT Standard Specifications Section 312 and related material specifications in Subsections 903.05, 904.02, 904.03, 918.01, and 918.04.

7.1.10 Treated Permeable Base

Treated permeable base composed of a mixture of aggregate, Portland cement and water or a mixture of aggregate with asphalt binder shall meet all requirements of TDOT Standard Specifications Section 313 and related material specifications in subsections 901.01, 903.03, 903.06, 904.01, 918.01.

7.1.11 Subgrade (Lime) Treatment

- (a) Subgrade (lime) treatment shall meet all requirements of TDOT Standard Specifications Section 302 and related material specifications in subsection 904.02, 904.03, and 918.04.
- (b) This work shall consist of preparing the existing subgrade, distributing the specified percentage of lime, initial mixing, mellowing, final mixing, compacting, finishing and curing.

7.1.12 Subgrade

- (a) Prepare subgrade in reasonably close conformity with the lines and grades as shown of the Plans.
- (b) Grade subgrade in a manner as to provide ready drainage of water from subgrade and maintain ditches and drains during construction.
- (c) Compact the finished subgrade to not less than 100% of the maximum required density.
- (d) If lime treatment is deemed necessary, the subgrade shall be prepared and constructed in accordance with TDOT Standard Specifications Subsections 302.05 through 302.13.

7.1.13 Base

- (a) Place one or more courses of aggregates, and additives if required, on a prepared subgrade in reasonably close conformity with the lines, grades, thickness, and typical cross sections shown on the Plans.
- (b) Spread all base material while at optimum moisture content in layers of specified thickness and cross section.
- (c) For compaction testing purposes, each completed layer will be divided into lots of not more than 10,000 square yards. If the construction area yields fewer than 3 sample lots, then the lot size shall be reduced to obtain 3 lots of approximately equal size.
- (d) Five (5) density tests shall be performed on each lot.

7.2 Asphaltic Concrete Pavement

This work shall consist of mixing, spreading, compacting, and finishing of bituminous pavements for base, leveling, and surface courses on roads in accordance with TDOT Standard Specifications and in conformity with the lines, grades, and cross sections shown on the plans.

7.2.1 Related Work

- (a) Section 3.1: Clearing
- (b) Section 3.2: Excavation
- (c) Section 3.4: Finish Grading
- (d) Section 7.1: Base and Subgrade Treatment.

7.2.2 Applicable Specifications

"<u>Standard Specifications for Road and Bridge Construction</u>", latest revision, Tennessee Department of Transportation (TDOT).

7.2.3 Applicable References

- (a) "American Association of State Highway and Transportation Officials," (AASHTO).
- (b) "American Society for Testing and Materials (ASTM)."

7.2.4 General Requirements for All Mixes

- (a) The Engineer may require samples of aggregate, bituminous materials, or the plant mixed material for testing in an independent laboratory.
- (b) All methods of sampling and testing will be in accordance with current AASHTO methods for use on highway materials.

7.2.5 General Requirements for Mineral Aggregate Base

- (a) Mineral Aggregate shall meet the general requirements of Section 7.01, additional requirements specified for each type and TDOT Standard Specifications Subsection 903.05 for Class A or Class B aggregates depending upon whether type A or type B is required in the construction. Type A base will require the use of Class A aggregate grading D. Either Class A or Class B aggregate may be used for type B base.
 - 1) When the stationary plant method for mixing is used the aggregate will be accepted for gradation immediately following mixing or immediately prior to mixing based on periodic samples taken from the pugmill output or from the belt feeding the pugmill.
 - 2) When two (2) or more materials are blended on the road by means of mechanical mixers the aggregate will be accepted for gradation after mixing and before compaction based on samples taken from each layer of base material. Aggregate that does not require blending will be accepted for gradation at the aggregate production plant based on samples taken from stockpiles of plant production immediately prior to delivery to the road.
- (b) Calcium chloride shall meet the requirements in TDOT Standard Specifications Subsection 918.02 for type 1, type 2, or calcium chloride liquor.
- (c) Sodium chloride shall meet the requirements in TDOT Standard Specifications.

7.2.6 General Requirements for Bituminous Mixing Plants

- (a) Bituminous mixing plants, either batch or continuous, sufficiently equipped and coordinated to provide paving mixes in an amount necessary for orderly prosecution of the work and to:
 - 1) Produce a uniform mixture having complete and uniform coating of all aggregate and a uniform distribution of the bituminous material in the mix.
 - 2) A canvas cover, or cover of suitable material, to protect the mix during transit.
 - 3) Insulation, if required, so that the mix can be delivered to the paving machine at the specified temperature or not more than 250 F, less than the discharge temperature at the plant.

7.2.7 General Requirements for Bituminous Plant Mix Pavements

- (a) Do not produce bituminous mixed material when the surface on which the material to be placed is wet or otherwise unsuitable; the air temperature is below 40 degrees F.; or when other conditions would prevent the proper placing and compacting of the mix.
- (b) Aggregates shall meet the applicable requirements in TDOT Standard Specifications Section 903.
- (c) Mineral filler shall meet the requirements in TDOT Standard Specifications Subsection 903.16.
- (d) Bituminous materials shall meet the applicable requirements in TDOT Standard Specifications Section 904.
- (e) Chemical additives shall meet the requirements in TDOT Standard Specifications Subsection 918.09.
- (f) The aggregate shall be separated into coarse and fine aggregate stockpiles. When coarse aggregate is stockpiled by means causing segregation it shall be separated into coarse and medium coarse stockpiles.
- (g) Each size and type of aggregate shall be stocked in a separate pile, bin, or stall. The storage

yard shall be maintained in an orderly condition with a walkway between stockpiles that are not separated by partitions. The stockpiles shall be readily accessible for sampling.

- (h) The mineral aggregate will be conditionally accepted for quality in the stockpile at the producer's site. The bituminous material may be conditionally accepted at the asphalt terminal. Acceptance of the aggregate gradation and asphalt cement content shall be determined from hot bin samples or sample(s) taken from the completed mix at the asphalt plant after it has been loaded onto the trucks for transport to the project as specified herein.
- (i) Where anti-stripping additive other than hydrated lime as described in TDOT Standard Specifications Subsection 918.09 (B) and this Section is required it shall be added by approved on line blending equipment at the Contractor's mixing plant.

7.2.8 Hot Mix Bituminous Plant Mix Base

- (a) The material used in this construction shall conform to the requirements in TDOT Standard Specifications Subsections 903.06, 918.09, 904.01.
- (b) The specific grading of aggregate to be used will be specified in the plans. Mineral aggregate, bituminous material and the plant mix will be accepted as provided for in TDOT Standard Specifications Subsection 407.02.
- (c) The graduations of the coarse and fine fractions of aggregate shall be such that when combined in proper proportions the resultant mixture will meet one of the following grading(s), as specified:

HOT PLANT MIX BASE COURSE MIXTURE DESIGN RANGE OF GRADATIONS

Sieve	Grading	Grading	Grading	Grading
Size	A	A-S	A-CRL	В
50 mm	100	100	100	100
(2")	100	100	100	100
37.5 mm	81-100	75-100	80-93	95-100
(1-1/2")				
19 mm	50-71	55-80	60-75	70-85
(3/4")				
9.5 mm	35-50	-	-	49-72
(3/8")				., ,_
4.75 mm	24-36	7-11	12-16	34-51
(No. 4)	2150	/ 11	12 10	5151
2.36 mm	12 27			22 42
(No. 8)	13-27	-	-	23-42
600 µm	- 1-			11.00
(No. 30)	/-1//	-	-	11-22
300 µm				0.14
(No. 50)	-	-	-	9-14
150 µm				
(No. 100)	0-10	0-6	0-4	4-10
75 μm				
(No. 200)	0-4.5	0-4.5	0-3.5	2.5-6.5

Total Percent Passing, by Weight

HOT PLANT MIX LEVELING COURSE MIXTURE DESIGN RANGE OF GRADATIONS

Total Percent Passing, by Weight

Sieve Size	Grading B-M	Grading C	Grading C-W	Grading C-S
25 mm (1")	100	-	-	-
19 mm	85-100	100	100	-
(3/4")				
9.5 mm (3/8")	59-79	70-90	75-100	100
4.75 mm	42-61	39-66	-	89-94
(No. 4)				
2.36 mm	29-47	23-47	43-67	53-77
(No. 8)				
600 μm	13-27	10-27	23-47	23-42
(No. 30)				
$300 \mu\text{m}$	7-20	8-15	-	-
(No. 30) 150 μm (No. 100)	4-10	4-8	4-10	9-18
75 μm (No. 200)	0-6.5	2.5-6.5	2.5-6.5	6-13.5

7.2.9 Prime Coat

- (a) Materials shall meet the requirements in TDOT Standard Specifications Subsections 903.13, 904.02, 904.03.
- (b) Emulsified Asphalt, Grade AE-P shall meet the following requirements:

		Minimum	Maximum
Viscosity, Saybolt Furol at	77° F.	10	50
Settlement at 5 days			5%
Sieve Test			0.10%
Distillation to 500° F.			
Distillate, by weight			55%
Oil Portion of Distillate			12%
Test on Residue			
Float Test, 140° F., sec	20		
Soluble in Trichloroethylene	97.5%		

The settlement test shall be waived if the emulsion is used in less than 5 days. The emulsion shall be tested in accordance with AASHTO T-59, except:

1) Stone coating test: AASHTO T-59, except that the mixture of stone and emulsified asphalt shall be mixed vigorously for five minutes and then immediately drenched with approximately twice its own volume of tap water at room temperature.

- 2) Solubility in Trichloroethylene, AASHTO T-44
- 3)Float test, AASHTO T-50, except delete section 3.2 and substitute section 8.7 of AASHTO T-59 for preparation of test specimen.
- (c) Cut-Black Asphalt: Grade RC-70 or RC-250 meeting the requirements of AASHTO M-81 or M-82 for the type and grade specified or selected.
- (d) Application temperature for the bituminous material: RC-

70	80 ⁰	- 150 ⁰	F
RC-250	100 ⁰	- 175 ⁰	F
AE - P	60 ⁰	- 140 ⁰	F

7.2.10 Tack Coat

- (a) Bituminous materials shall conform to the requirements in TDOT Standard Specifications Subsections 904.01 through 904.03 and 918.09(B).
- (b) Emulsified Asphalt:
 - 1) Amionic Emulsified Asphalts shall conform to all the requirements of AASHTO M-140 for the type and grade specified.
 - 2) Grade AE-3 shall meet the following requirements:

	Minimum	Maximum
Viscosity, Saybolt Furol at 122° F.	50+	50 & pumpable
Settlement at 5 days		5%
Sieve Test		0.10%
Stone Coating	90%	
Distillation to 500° F.		
Distillate, by weight		30%
Oil Portion of Distillate		6%
Tests on Residue		
Float Test, 140° F., sec.	200	
Ductility, 77° F., cm.	40	
Soluble in Trichloroethylene	97.5%	
Ash by ignition		

- (c) Cut-Back Asphalt: Grade RC-70 or RC-250 meeting the requirements of AASHTO M-81 or M-82 for the type and grade specified or selected.
- (d) Application temperature for the bituminous materials:

RC-70	80° F -150° F
RC-250	100° F $- 175^\circ$ F
SS-1	60° F $- 140^\circ$ F
AE-3	60° F $- 140^\circ$ F

7.2.11 Double Bituminous Surface Treatment

- (a) Double Bituminous Surface Treatment shall conform to TDOT Standard Specification Section 404.
- (b) Materials used in this construction shall meet the requirements in TDOT Standard Specifications Subsections 903.14, 904.02, 904.03.
- (c) The ranges of application temperature in degrees Fahrenheit shall be as shown in TDOT Standard Specifications Subsection 404.02.

RC-800	175°-250°F
RC-3000	200°-275°F
RS-2	125°-185°F

(d) Bituminous material shall be applied only when the designated surface is dry, firm and properly cured; only between April 15th and October 1, and when the ambient temperature in the in the shade and away from artificial heat is 700 F or above.

7.2.12 Bituminous Seal Coat

- (a) Materials used in this construction shall meet the requirements in TDOT Standard Specifications Subsections 903.13 and 904.01 through 904.03.
- (b) Application temperatures for bituminous materials in degrees Fahrenheit shall be shown in TDOT Standard Specifications Subsection 405.02.

7.2.13 Asphaltic Concrete Surface (Hot Mix)

- (a) Materials used in this construction shall meet the requirements in TDOT Standard Specifications Subsections 903.11, 903.16, 904.01, 918.09 (B).
- (b) The mineral aggregate, bituminous material and plant mix will be accepted as provided for in TDOT Standard Specifications Subsection 407.02.

7.2.14 General Requirements

- (a) Obtain approval of Engineer for the mix and surface to be treated prior to placing any materials.
- (b) Protect all adjacent trees, surfaces, and structures from the bituminous material during construction.
- (c) Prepare all receiving surfaces in reasonably close conformity with the lines, grades, and cross sections shown on the drawings.

7.2.15 Mineral Aggregate Base

Mineral aggregate base shall conform in general construction requirements, mixing, spreading, shaping and compaction, maintenance, thickness requirements, and surface requirements to the requirements in TDOT Standard Specifications Subsections 303.06 through 303.12.

7.2.16 Bituminous Plant Mix Base (Hot Mix)

Bituminous plant mix base (hot mix) shall conform in composition of mixtures, general construction requirements, preparation of subgrade, sub-base, or surface, and thickness and surface requirement to the requirements in TDOT Standard Specifications Subsections 307. 03 and 307.05 through 307.07.

7.2.17 Prime Coat

Prime coat shall conform in limitations, preparation of surface, application of prime, application of cover material, and maintenance and protection to the requirements in TDOT Standard Specifications Subsections 402.04 through 402.08.

7.2.18 Tack Coat

Tack coat shall conform in preparation of surface and application of bituminous material to the requirements in TDOT Standard Specifications Subsections 403.04 and 403.05.

7.2.19 Double Bituminous Surface Treatment

Double bituminous surface treatment shall conform in limitations, preparing designated surface,

applications of bituminous material and mineral aggregate, rolling and curing, shoulders, and maintenance and protection to the requirements in TDOT Standard Specifications Subsections 404.04 through 404.09.

7.2.20 Bituminous Seal Coat

Bituminous seal coat shall conform in limitations, preparing the designated surface, application of bituminous material, spreading and rolling aggregate, shoulders, and maintenance and protection to the requirements in TDOT Standard Specifications Subsections 405.04 through 405.09.

7.2.21 Bituminous Plant Mix Pavement (General)

Bituminous plant mix base (hot mix) shall conform in composition of mixtures (includes Contractor's quality control system), weather limitations, conditioning of existing surface, preparation of bituminous material, preparation of aggregates, mixing, spreading and samples, and surface requirements to the requirements in TDOT Standard Specifications Subsections 407.03 and 407.09 through 497.18.

7.2.22 Asphaltic Concrete Surface (Hot Mix)

Asphaltic concrete surface (hot mix) shall conform in composition of mixtures, general construction requirements, preparing the designated surface, mixing and surface requirements to the requirements in TDOT Standard Specifications Subsections 411.03 and 411.05 and 415.08.

7.2.23 Cold Planning of Bituminous Plant Mix Pavements

Cold planning of bituminous plant mix pavements shall conform in general requirements and surface requirements to the requirements in TDOT Standard Specifications Subsections 415.03 and 415.04.

7.2.24 Pavement Repair

Where trenches have been opened in any roadway or street that is a part of the State highway system surfaces shall be restored in accordance with the requirements of the Tennessee Department of Transportation. All other restoration shall be done in accordance with this Section and Standard details.

- (a) Excavation in the pavement area shall require that pavement surfaces be cut and brought to a neat line by use of an air hammer, saw, or other suitable equipment.
- (b) Upon completion of installation of utility backfill fill the trench with mineral aggregate type A, grading D (crusher run stone) and temporary asphalt patch with two (2) inches of cold mix or hot bituminous seal coat until such time that the permanent pavement patch is constructed.
- (c) Complete the pavement restoration for the various types of roadway typical sections in conformance with Standard details and this Section.
- (d) Concrete curb or combined curb and gutter, driveways, median pavement, and sidewalks shall be restored as required to match existing construction. Replace damaged sections with complete new sections or squares. Patching of damaged sections will not be permitted.
- (e) Maintain restored sections and surfaces for a period of one (1) year following the date of final acceptance.
- (f) The minimum width to be trimmed on each side of the trench line as seen in the section may be waived or amended upon approval of the Inspector however a minimum width of replacement shall be four (4) feet to allow for a roller.
- (g) All excavations made within public right-of-way will require excavation and street closure permits from the Town of Atoka prior to commencing Work.
- (h) Flowable fill shall meet the requirements in TDOT Standard Specifications Section 204
- (i) When a manhole top or other utility casting requires adjustment to an elevation one
 (1) inch or more above the existing pavement grade and is exposed to traffic before
 Standard Utility Specifications

final paving is completed a temporary ramp shall be constructed by feathering bituminous concrete for three hundred sixty (360) degrees around the manhole or utility casting. A taper slope of not less than two (2) feet per one (1) inch shall be used. During the paving operation but prior to the placement of the topping course the bituminous concrete taper shall be removed from around the manhole to a minimum depth of one (1) inch below the top of the manhole.

7.3 Portland Cement Concrete Pavement

This work shall consist of constructing a pavement or Portland cement concrete with reinforcement as specified on a prepared surface in accordance with the TDOT Standard Specifications and in conformity with the lines, grades and cross section show on the plans.

7.3.1 Related Work

- (a) Section 3.1: Clearing.
- (b) Section 3.2: Excavation.
- (c) Section 3.4: Finish Grading.
- (d) Section 7.1: Base and Subgrade Treatment.

7.3.2 Applicable Specifications

"<u>Standard Specifications</u> for Road and Bridge Construction", latest revision, Tennessee Department of Transportation (TDOT).

- 7.3.3 Applicable References
 - (a) "American Association of State Highways and Transportation Officials" (AASHTO).
 - (b) "American Society for Testing and Materials" (ASTM).

7.3.4 Products

- (a) All concrete used shall be in accordance with TDOT Standard Specifications Section 501.
 - Minimum compressive strength shall be 3,000 psi when tested according to AASHTO T-22.
 - 2) Minimum flexural strength shall be 550 psi when tested according to AASHTO T-97 or 650 psi when tested according to AASHTO T-177.
 - 3) Slump shall be between 1/2" and 2"..
- (b) All steel dowels shall be epoxy coated and of size and length indicated on the Plans and in accordance with TDOT Standard Specifications and Standard Drawings.

7.3.5 Preparation of Base

- (a) Construct or correct the base to such grade tolerances as will insure the concrete pavement thickness required in accordance with TDOT Standard Specifications Part 2 Base and Subgrade Treatments.
- (b) Complete base work not less than 500 linear feet in advance of paving.
- (c) The base grading machine and slip-form paver shall be equipped with automatic line guidance and grade control.

7.3.6 Formwork

All formwork shall conform in base support, form setting, grade and alignment with TDOT Standard Specifications Subsection 501.07.

7.3.7 Retempering

The retempering of concrete which has partially hardened by the addition of any ingredient will not be permitted; however, a portion of the mixing water may be withheld from transit mixers and added at the work site

7.3.8 Concrete Paving

The placing of concrete shall conform in unloading, spreading, consolidating, and requirements of slip-form method as detailed in TDOT Standard Specifications Subsection 501.12.

7.3.9 Joints

Joints shall be constructed of the type and dimensions and at the location required by the Plans and in accordance with the provisions of TDOT Standard Specification Subsection 501.15.

7.3.10 Curing

Curing shall be performed in accordance with TDOT Standard Specification Subsection 501.18.

7.3.11 Final Strike-Off, Consolidation and Finishing

Final strike-off, consolidation and finishing shall conform with TDOT Standard Specification Subsection 501.16.

7.3.12 Testing

All placed concrete shall be tested in accordance with TDOT Standard Specification Section 501.

7.3.13 Defective Installation

- (a) Where surface deviations exceed ½ inch in 12 feet, remove and replace the pavement.
- (b) When it is necessary to remove pavement, remove and replace any remaining portion of the slab adjacent to the joints that is less than 10 feet in any length.

7.4 Highway Signing

- (a) Highway signing shall consist of the construction of foundations and supports, fabricating, furnishing, assembling, and erecting traffic signs on the supports, including delineators when specified, for a section of highway, its interchanges, frontage roads and roads or streets affording immediate access to the highway.
- (b) Highway signs and devices shall be constructed and erected in accordance with these Specifications and the <u>Manual on Uniform Traffic Control Devices</u> (MUTCD), FHWA latest edition, at the locations and within reasonably close conformity to the lines and grades indicated on the Plans or as otherwise directed by the Engineer.
- (c) This work shall be in accordance with TDOT Standard Specifications Section 713 and 916.

7.4.1 Applicable Specifications

- (a) "<u>Standard Specifications for Road and Bridge Construction</u>, "Latest Edition, Tennessee Department of Transportation (TDOT).
- (b) "<u>Standard Specifications for Structural Supports for Highway signs, Luminaires and Traffic Signals</u>," Current Edition, American Association of State Highway and Transportation Officials (AASHTO).

7.4.2 Applicable References

- (a) "<u>Manual on Uniform Traffic Control Devices for Streets and Highways</u>," (MUTCD) Current Edition, Federal Highway Administration (FHWA).
- (b) "Standard Highway Signs," Current Edition, Federal Highway Administration (FHWA).
- (c) "<u>Roadside Design Guide</u>," Current Edition, American Association of State Highway and Transportation Officials (AASHTO).

7.4.3 Aluminum

(a) Aluminum signs shall conform to TDOT Standard Specifications Section 713 and

subsection 916.02

- (b) The aluminum sign blanks shall be flat and shall contain no visible lateral bow.
- (c) The size of signs shall be shown on the Plans or conform to standard sizes as identified in the MUTCD.

7.4.4 Steel

Steel signs shall conform to TDOT Standard Specifications Section 713 and Subsection 916.03.

7.4.5 Stainless Steel

Stainless steel signs shall conform to TDOT Standard Specifications Subsection 916.04.

7.4.6 Reflective Sheeting

- (a) Reflective sheeting shall conform to TDOT Standard Specification Subsection 916.06 and meet all requirements of AASHTO M268.
- (b) All sign colors shall conform to the current edition of the MUTCO.

7.4.7 Fabrication

- (a) Fabrication of all signs and supports shall be in accordance with the details shown on the Plans and in conformance with TDOT Standard Specifications Subsection 916.05.
- (b) All signs shall conform to the current edition of the MUTCD, and other referenced documents cited by the MUTCD.

7.4.8 Sign Supports

- (a) Type, length and size of post shall be shown on the Plans.
- (b) All posts for ground mounted signs shall conform to AASHTO Standard Specifications.
- (c) All posts shall be driven into the ground or bolted to a stub in the concrete foundation.
- (d) Posts shall be plumb, aligned, and oriented as shown on the Plans.
- (e) In driving posts, a method shall be used which will not damage or deface the top of the post.
- (f) Post shall be one of the following (refer to TDOT Standard Drawing T-S-19):
 - 1) Perforated/Knockout Tube: ASTM A446 (Grade A) or A570.
 - 2) U-Post: ASTM A499
 - 3) Ribbed U-Post: ASTM A499

7.4.9 Erection

- (a) Construct highway signs and devices in accordance with the "Manual on Uniform Traffic Control Devices," (MUTCD), FHWA, Current Edition.
- (b) Construct signs at the locations and within reasonably close conformity to the lines and grades indicated on the Plans or otherwise directed by the Engineer.

7.5 **Pavement Markings**

- (a) This work shall consist of furnishing and supplying pavement markings in accordance with these specifications, the latest revision of the "Manual on Uniform Traffic Control Devices," (MUTCD) published by the FHWA, and in reasonably close conformity to the lines, dimensions, patterns, locations, and details shown on the Plans or established by the Engineer.
- (b) This work shall be in accordance with TDOT Standard Specifications Section 716.

7.5.1 Applicable Specifications

"Standard Specifications for Road and Bridge Construction," Latest Revision, Tennessee Department of Transportation (TDOT).

7.5.2 Applicable References

"Manual on Uniform Traffic Control Devices," (MUTCD) Current Edition, Federal Highway Administration (FHWA).

7.5.3 Thermoplastic Pavement Marking

- (a) Thermoplastic pavement markings shall conform to all requirements set forth by TDOT Standard Specifications Subsections 716.03 and 918.23.
- (b) The pavement temperature shall be a minimum of 50° F and rising before application begins.

7.5.4 Preformed Plastic Pavement Markings

- (a) Preformed plastic pavement marking shall conform to all requirements set forth by TDOT Standard Specifications Subsection 716.05 and 918.08.
- (b) The pavement temperature shall be a minimum of 60° F or over before application begins.

7.5.5 Paint

- (a) Paint shall be applied in conformance with all requirements set forth by TDOT Standard Specifications Subsections 716.06, 910.01, and 910.02.
- (b) When reflectorized paint is required for temporary or final marking, the paint shall be installed to permanent standards at the end of each day's work.

7.5.6 Raised Reflective Pavement Markers

- (a) Markers shall conform to all the requirements set forth by TDOT Standard Specifications Subsections 716.04, 918.20, and 918.26.
- (b) The markers shall be installed when the pavement is dry, and the pavement temperature is no less than 50° F.

7.5.7 Execution

- (a) All pavement markings shall be in accordance with the "Manual on Uniform Traffic Control Devices," (MUTCD), published by FHWA.
- (b) All pavement markings shall be in close conformity to the lines, dimensions, patterns, locations, and details shown on the Plans.

7.6 Guardrail

- (a) This work shall consist of furnishing and erecting guardrail, and the construction of anchor blocks and approach ends, of the specified kind and dimensions, in accordance with these Specification, and in reasonably close conformity with the lines, grades and locations shown on the Plans, or as directed by the Engineer.
- (b) Guardrail shall include appurtenant materials and work in making connections with other guardrail or structures, as may be required to complete the construction as indicated on the Plans.
- (c) This work shall be in accordance with TDOT Standard Specifications Section 705 and 909.

7.6.1 Applicable Specifications

"<u>Standard Specifications for Road and Bridge Construction</u>," Latest Revision, Tennessee Department of Transportation (TDOT).

7.6.2 Applicable References

- (a) "<u>Roadside Design Guide</u>," Current Edition, American Association of State Highway and Transportation Officials (AASHTO).
- (b) "American Society for Testing and Materials (ASTM)". Standard Utility Specifications

7.6.3 Metal Beam Guardrail

- (a) Corrugated sheet steel beams shall conform to the current requirements of AASHTO M180, Class A, Type 2. Rail material shall have a yield strength of 50 KIPS per square inch and a tensile strength of 70 KIPS per square inch.
- (b) Rub rails and rub rail splice plates shall conform to ASTM A36 and shall be galvanized in accordance with ASTM A123.
- (c) Where guardrail is to be placed on a curve with a radius less than 150 feet, the rail section shall be shop-formed to the required radius.

7.6.4 Guardrail Posts and Block-Outs

- (a) Posts and block-outs shall be of timber with a stress grade of 1,200 psi or more. Posts will have nominal size of 6" x 8". Block-outs will have nominal size of 6" x 8" (typical size 5.5" x 7.5"). Testing shall be in accordance with West Coast Lumber Inspection Bureau, Southern Pine Inspection Bureau, or other appropriate timber associations. Timber for posts shall be rough sawn (unplanned) with nominal dimensions indicated. Timber for block-outs shall be S4S with the typical dimensions indicated
- (b) All wood posts and block-outs shall be treated with timber preservative as required by subsection 911.02 (A) of the TDOT Standard Specifications.
- (c) Wood posts and block-outs shall be furnished with holes for future rail adjustment in accordance with details shown on TDOT Standard Drawings S-GR-13.
- (d) Materials and specifications not shown in the "S-GR" series of TDOT Standard Drawings shall be in accordance with standard provisions regarding section 705.
- (e) The contractor may have optional choice of either the steel W6 x 8.5 or W6 x 9.0 hot rolled or welded steel shape, or the wood posts with their companion block-outs as shown above, within the following stipulations:
 - 1) The mixing of any of the above post types on a given project will be avoided if possible.
 - 2) Should it become necessary to change the type of posts on a given project, the posts shall not be mixed on any given run of guardrail. (Exception, wood posts on guardrail terminals.)
- (f) On existing structures not having a vertical face for the attachment of two rail elements, use of the W6 x 15.0 posts is required on the semi-rigid to rigid barrier transition details, see TDOT Standard Drawings S-GR-16 and S-GR-20. The bolt holes will be oriented to the center line of the flange of the steel post and will be the same size and dimension as those shown on TDOT Standard Drawings S-GR-13.
- (g) Metal posts and all block-outs shall be furnished with holes for future rail adjustment in accordance with details shown on TDOT Standard Drawings S-GR-13 and S-GR-13A.
- (h) W6 x 9.0 or W6 x 8.5 post shall be used for installations on bridges as shown on TDOT Standard Drawing S-GR-22.
- (i) Welded steel posts may be used as alternates to the hot rolled steel shape. They must conform to ASTM A769 and be galvanized according to ASTM A123.

7.6.5 Guardrail Hardware

- (a) Bolts shall conform to the requirements of ASTM A307 and nuts to the requirements of ASTM A563M, Grade "A" or better.
- (b) All steel fittings, bolts, washers and other accessories shall be galvanized in accordance with the requirements of AASHTO M 111 or ASTM A153, whichever may apply. All galvanizing shall be done after fabrication.

7.6.6 Terminals

Type and installation of terminals shall conform to TDOT Standard Specifications and Standard Standard Utility Specifications

Drawings.

7.6.7 Dimensions

All dimensions shall be in accordance with TDOT Standard Drawings.

All work shall be completed in accordance with TDOT Standard Specifications Subsection 705.04 through 705.08 and applicable Standard Drawings.

7.7 Concrete Curbs, Gutters, Sidewalks, and Driveways

This work shall consist of curb, gutter, combined curb and gutter, and sidewalk construction of Portland cement concrete in accordance with TDOT Standard Specification Section 701 and 702 and this document and in reasonably close conformity with the lines, grades, typical cross sections, and dimensions shown in the plans.

Related Work

- (a) Section 3.1: Clearing
- (b) Section 3.2: Excavation
- (c) Section 3.4: Finish Grading
- (d) Section 7.1: Base and Subgrade Treatment
- (e) Section 7.2: Asphaltic Concrete Pavement
- (f) Section 7.3: Portland Cement Concrete Pavement

Applicable Specifications

"Standard Specifications for RoadandBridgeConstruction", Latest Revision, Tennessee Department of Transportation (TDOT).

Applicable References

"American Association of State Highway and Transportation Officials" (AASHTO).

"American Society for Testing and Materials" (ASTM).

"American Concrete Institute" (ACI).

"Americans with Disabilities Act" (ADA).

"Americans with Disabilities Act Accessibility Guidelines" (ADAAG).

"Architectural Barriers Act" (ABA).

7.7.1 General Requirements

Materials shall meet the applicable requirements in TDOT Standard Specifications Sections 604 and 913 together with the conditions and requirements set forth in this Section.

7.7.2 Preformed Joint Filler

Preformed joint filler shall conform to the requirements in TDOT Standard Specifications Subsection 905.01. Joint filler for brick sidewalk shall be Portland cement with prepared color added conforming to ASTM C 150. Sand shall conform to ASTM C 144.

7.7.3 Drain Pipe

(a) This pipe shall conform to AASHTO M 178 or AASHTO M 179 for the specified material and diameters. Unless otherwise specified the pipe shall be of standard quality class. When specified the pipe spigot shall have integral spacer lugs to provide for an annular opening and self-centering feature. (b) Drain pipe shall conform to the requirements in TDOT Standard Specifications Subsection 914.04.

7.7.4 Concrete

Concrete for sidewalks, driveways, and median pavement shall be Class A concrete meeting all the requirements prescribed in TDOT Standard Specifications Section 604.

(a) When the use of a curb machine is authorized the Contractor may request a concrete design based on the following:

Water	Cement	Combined Coarse and Fine Aggregate
4 gallons (maximum)	94 lbs.	505 lbs.
coarse aggregate		size nos. 7, 57, 67, 78
fine aggregate		45% to 60%

- (b) Entrained air will not be required in curb concrete made with the above combination.
- (c) The water and percentages of fine and coarse aggregate may be adjusted within the above limits to permit satisfactory placement.
- (d) Compressive test specimens may be made by the vibratory method in accordance with AASHTO T-23 or other approved methods.

7.7.5 Brick

Brick when made from clay or shale shall conform to ASTM 902 including BX for dimensional tolerance. When made of concrete they shall conform to ASTM C 55. The kind and grade shall be as specified in the plans. Brick shall be full depth two and one- quarter (2 1/4) inches thick and shall be four inches by eight inches (4" x 8") in area unless otherwise shown in the plans or directed by the Engineer. Contractor shall submit sample for approval.

7.7.6 Asphalt

Setting bed for brick sidewalk shall be a three-quarter (3/4) nominal inch deep binder mix and binder base shall be a four (4) inch deep binder mix both conforming to the applicable requirements in TDOT Standard Specifications Sections 307 and 407. Contractor shall determine the exact proportions to produce the best possible mixture for construction of the bituminous setting bed and binder base to meet construction requirements and shall submit design mix to the Engineer for approval.

7.7.7 Neoprene Modified Asphalt Adhesive

Neoprene modified asphalt adhesive under brick shall conform to the following specifications "or equal":

mastic (asphalt adhesive)	
solids (base)	$75\% \pm 1\%$
pounds/gallon	8 lbs. – 8.5 lbs.
solvent mineral spirits (over 100 ⁰ Fahrenheit flash)	
base (2% neoprene, 10% asbestos-free fibers, 88% asphalt)	
melting point – ASTM D 36	150° Fahrenheit mix penetration – 77°
Fahrenheit 100-gram load 5 sec.	23-27
ductility – ASTM D 113-44 at 77 ^{o Fahrenheit}	
2 inches/min.	39-49 inches/min.
7.7.8 Mortar

7

Cement and sand used for preparation of mortar shall conform to the requirements in TDOT Standard Specifications Section 607.

7.7.9 General

Curbs, gutter, combined curb and gutter, sidewalks, and ramps shall meet all applicable requirements of the ADA, ADAAG and ABA.

7.7.10 Preliminary Work

Clearing and grubbing, removal of structures and obstructions, excavation and undercutting, and embankment construction shall be performed in accordance with the provisions in TDOT Standard Specifications Sections 201, 202, 203, and 205 and in Section 3.1: Clearing, Section 3.2: Excavation and Section 3.4: Finish Grading.

7.7.11 Subgrade Preparation

Subgrade preparation for sidewalks, driveways, and median pavement shall be made to the required depth and to a width that will permit the installation and bracing of the forms. The subgrade shall be shaped and compacted to a firm even surface in reasonably close conformity with the grade and cross section shown in the plans. All soft and yielding material shall be removed and replaced with acceptable material which shall then be compacted as directed.

7.7.12 Expansion Joints

- (a) Expansion joints for curb, gutter, or curb and gutter shall be formed at the intervals and locations shown in the plans using preformed filler three-quarters (3/4) inch thick unless otherwise specified. They shall be placed in line with corresponding expansion joints in adjoining pavement or other construction. Joint filler shall be cut to the full cross section of the curb, gutter, or curb and gutter.
- (b) For sidewalks and driveways, unless otherwise indicated in the plans premolded expansion joint filler one-half (1/2) inch in thickness shall be paced at locations and in line with expansion joints in the adjoining pavement, gutter, or curb. All premolded expansion joint filler shall be cut to full width or length of the proposed construction and shall extend to within one-half (1/2) inch of the top or finished surface. All longitudinal expansion joints shall be placed as indicated in the plans. All expansion joints shall be true, even, and present a satisfactory appearance.
- (c) Construction joints shall be formed around all appurtenances such as manholes, utility poles, etc., extending into and through the sidewalk or median area. Premolded expansion joint filler one-half (1/2) inch thick shall be installed in these joints. Expansion joint filler of the thickness indicated shall be installed between concrete sidewalks and any fixed structure such as building or bridge. One-half (1/2) inch thick expansion joint filler shall be installed between concrete curb and median pavement and unless otherwise specified between concrete curb and sidewalk. This expansion joint material shall extend for the full depth of the walk or median pavement.

7.7.13 Limitations of Mixing

Limitations on the mixing of concrete shall be as prescribed in TDOT Standard Specifications Subsections 501.11.

7.7.14 Mixing Concrete

Concrete shall be mixed in accordance with the provisions in TDOT Standard Specifications Subsection 604.14.

7.7.15 Placing Concrete

(a) Placing concrete shall be performed as provided for in TDOT Standard Specifications Subsection 501.12 except that mechanical spreaders will not be required. Immediately before placing the concrete, the subgrade shall be thoroughly wetted, and the forms given a coating of light oil. The forms shall be thoroughly cleaned and oiled each time before using.

- (b) The concrete shall be placed immediately after mixing. The edges, sides, or faces shall be thoroughly spaded and vibrated sufficiently to consolidate the concrete thoroughly and bring the mortar to the surface after which the surface shall be finished smooth and even by means of a wooden float.
- (c) Concrete curb, gutter, and combined curb and gutter shall be constructed reasonably true to line, grade, and cross section and unless otherwise specified in the plans in sections having uniform lengths of ten (10) feet. The length of these sections may be reduced where necessary for closures, but no section less than six (6) feet will be permitted. The templates shall be set carefully before the placing of the concrete and allowed to remain in place until the concrete has set sufficiently to hold its shape but shall be removed while the forms are still in place. The forms on the face of all curbs shall be removed as soon as the concrete will hold its shape and the surface then floated with a wooden float to a smooth and even finish. No plastering will be permitted. Unless otherwise specified the top edges of the curb and the edge of the gutter shall be rounded to a radius as shown on the standard drawings and the edges on each side of templates and expansion joint material shall be finished with an edging tool with a radius of not over one-quarter (1/4) inch and then all lines or marks shall be removed with a wet brush. The back of curbs shall be finished not less than three (3) inches below the top of backfill against the curb. Any exposed surface or surfaces against which some rigid type of construction is to be made shall be left smooth and uniform so as to permit free movement of the curb, gutter, or combined curb and gutter.
- (d) Sidewalks shall be constructed with materials which produce one of the following results:
 - 1) Standard Portland cement concrete (white concrete) with a coarse broomed finish.
 - 2) Portland cement concrete containing river gravel to produce an exposed aggregate finish.
 - 3) Brick sidewalk.
- (e) Joints shall be constructed at intervals of twenty-five (25) feet to thirty (30) feet except for closures but no interval less than six (6) feet will be permitted.
- (f) A four (4) foot wide grass area furnishing zone adjacent to curb shall be provided for placement of light standards, poles, fire hydrants, mailboxes, etc.
- (g) A minimum three (3) feet wide clearance shall be provided through the path of travel.
- (h) Where a grass area furnishing zone is not provided a maximum two (2) feet wide furnishing zone adjacent to curb shall be provided maintaining a minimum three (3) feet clearance through the path of travel.
- (i) Ramps (curb and driveway) shall be constructed to the dimensions and finished elevations as specified in the plans or Contract Documents and shall also conform to the requirements of the ADA, ADAAG, and ABA. Surface of ramp shall be stable, firm, and slip resistant. Surface texture of ramp shall be that obtained by a coarse brooming transverse to the slope of the ramp. Ramps shall not be constructed using brick or an exposed aggregate concrete finish and shall not contain longitudinal or transverse expansion joints or groves.
- (j) Where existing sidewalks on ramps are to be removed for replacement or to permit other construction the limits of construction shall be considered as extending to the next existing joint marking beyond the normal limits or replacement and/or other construction.
- (k) Where sidewalks are constructed adjacent to permanent structures or other rigid construction on one (1) side and curb on the other extend expansion joint of premolded material only along back at curb and place for the full depth of the slab. Place a premolded expansion joint between the sidewalk and adjacent curb at all crosswalks both public and private. Fasten premolded expansion joint filler to prevent displacement.
- (1) Where sidewalk is constructed in conjunction with adjacent curb the expansion joints in the curb and sidewalk shall coincide. Where such construction is adjacent to the existing curb the expansion joints shall if practicable coincide. Prior to placing concrete around any permanent structure place premolded expansion joint material around such structure for the full depth of Standard Utility Specifications

the sidewalk.

(m) Where existing structures such as light standards, poles, fire hydrants, etc., are within the limits of the sidewalk area place premolded expansion joint around the structure for the full depth of the concrete.

7.7.16 Finishing Concrete

- (a) The concrete shall be struck off with a transverse template resting upon the side forms. After the concrete has been struck off to the required cross section it shall be finished with floats and straight edges until the required surface requirements have been obtained.
- (b) All tool marks shall be removed with a wetted brush or wooden float and the finished surface shall present a uniform and pleasing appearance
- (c) When the use of curb machines is permitted finishing shall be performed as specified above except that contraction joints may be sawed a minimum depth of one-quarter (1/4) the thickness of the section at intervals not less than six (6) feet nor more than ten (10) feet in lieu of constructing the curbs in sections.
- (d) Weep holes or drainage opening shall be placed through curbs as indicated in the plans or as directed by the Engineer and coarse aggregate shall be placed behind each opening as needed.
- (e) When the surface of the concrete is free from water and just before the concrete obtains its initial set it shall be finished and swept lightly with a broom in order to produce a sandy texture. The longitudinal surface variations shall be not more than one-quarter (1/4) inch under a twelve (12) foot straightedge nor more than one- eighth (1/8) inch on a five (5) foot transverse section. The surface of the concrete shall be so finished as to drain completely at all times.
- (f) The edges of the sidewalks, driveways, and median pavement shall be carefully finished and rounded with an edging tool having a radius of one-half (1/2) inch.
- (g) The surface of sidewalks shall be divided into blocks by the use of a grooving tool. The grooves shall be spaced approximately five (5) feet apart and the blocks shall be rectangular unless otherwise ordered by the Engineer. The grooves shall be cut to a depth of not less than one (1) inch. The edges of the grooves shall be edged with an edging tool having a radius of one-quarter (1/4).
- (h) Unless otherwise indicated in the plans marks or grooves may be placed at right angles to the center line of driveways and approximately eight (8) inches apart. These marking shall be between one-eighth (1/8) inch to one-quarter (1/4) inch in depth and shall be made with a suitable marking tool. A grooving tool six (6) inches to eight (8) inches apart may be used. Any irregularities caused by the edges of the marking tool shall be removed by the use of a wetter brush or wooden float. All marking edges shall be rounded satisfactorily.
- (i) Grooves shall not be placed in the surface of sidewalks or driveways reinforced for beam action where the full thickness of concrete is required for strength.
- (j) The edges of the concrete at expansion joints shall be rounded with an edging tool having a radius of one-quarter (1/4) inch. All marks caused by edging shall be removed with a wetted brush or wooden float. The top and ends of expansion joint material shall be cleaned of all concrete and the expansion joint material shall be so trimmed as to be slightly below the surface of the concrete.

7.7.17 Protection and Curing

- (a) Forms may be removed at any time that removal will not damage the concrete. No pressure shall be exerted upon the concrete in removing forms.
- (b) Curing and protection during cold weather shall be performed as provided for in TDOT Standard Specifications Subsection 501.18
- (c) Pedestrians will not be allowed upon concrete sidewalks or driveways until twelve (12)

hours after finishing concrete and no vehicles or loads shall be permitted on any sidewalk or driveway until the Engineer has determined that the concrete has attained sufficient strength of such loads. An accessible alternative route(s) meeting the requirements of the ADA and approval of the Engineer shall be provided by the contractor.

- (d) The Contractor shall construct and place such barricades and protection devices as are necessary to keep pedestrians and other traffic off the sidewalks or driveways. An accessible alternative route(s) meeting the requirements of the ADA and approval of the Engineer shall be provided by the Contractor.
- (e) Any sidewalk or driveway damaged prior to final acceptance of the project shall be repaired at the Contractor's expense by removing concrete within groove limits and replacing it with concrete of the type and finish in the original construction.
- (f) The Contractor shall protect the curb, gutter, and combined curb and gutter until finally accepted. Any concrete that is damaged during that period shall be repaired by removing and reconstructing each ten (10) foot section that has been damaged. This reconstruction shall be at the Contractor's expense.

7.7.18 Backfilling

Immediately after the concrete has set sufficiently and the forms have been removed, the spaces at the back of the curb or combined curb and gutter and along the edges of sidewalk or driveway shall be filled with suitable material. This material shall be placed in layers not exceeding four (4) inches in loose thickness and compacted until firm and stable.

7.7.19 Brick Sidewalk (General)

- (a) Before beginning work on brick sidewalk all necessary clearing and grubbing, removal of structures and obstructions, excavation and undercutting, and embankment construction shall be performed in accordance with the provisions in TDOT Standard Specifications Sections 201, 202, 203, and 205 and in Section 3.1- Clearing, Section 3.2-Excavation and Section, and Section 3.4-Finish Grading.
- (b) Subgrade preparation for brick sidewalks shall be done in accordance with the provisions in Section 7.07 Subsection 3.03 of this document. The foundation for this type of construction shall present a uniform bearing surface and if a reinforced foundation is necessary, it shall be constructed of Class A concrete in accordance with the applicable provisions and requirements set out in TDOT Standard Specifications Section 604.
- (c) Brick sidewalks shall not be constructed in freezing weather nor when bricks contain frost.
- (d) Brick for exposed surfaces, corners, etc., shall be selected from approved brick as to color and uniformity.
- (e) All brick shall be thoroughly cleaned and well moistened with water immediately before being laid and the bed which is to receive the brick shall be thoroughly cleaned and well moistened with water before placing thereon.
- (f) All brick laid in freshly made mortar shall be laid in a substantial and workmanlike manner and true to the lines and grades indicated in the plans or as directed by the Engineer.
- (g) Care shall be taken to keep the exposed surface of brick free from mortar stains. Immediately after laying brick face shall be cleaned thoroughly of all mortar stains.
- (h) In case any brick is moved, has settled, or the joints broken after laying, the brick shall be taken up, the mortar thoroughly cleaned from the brick, bed, and joints, and the brick relaid in fresh mortar.
- (i) When brick is to be laid in sand it shall be laid with sand swept butt joints on a one- half (1/2) inch sand setting bed.
- (j) When brick is to be laid on concrete, the concrete shall be solid four (4) inch thick slab with 6-6-10-10 welded wire mesh reinforcing (if shown in plans or directed by Engineer). Punch holes for concrete slab shall be one (1) inch in diameter at twelve (12) inches center to center spacing each way.
- (k) Prime concrete base with emulsified asphalt (RS-1 or CRS-1) if there is to be vehicular Standard Utility Specifications

traffic over brick.

- (1) After the modified asphalt adhesive is applied (if called for to be used in the plans or directed by the Engineer) carefully place brick by hand in straight courses with hand tight joints and uniform top surface. Good alignment shall be kept, and the pattern shall be that shown in the plans or directed by the Engineer.
- (m) New brick and mortar shall match existing brick and mortar in color and size where integrating with existing sidewalks. Contractor shall submit samples of all brick to Engineer for approval.
- (n) Brick sidewalk shall be protected and kept wet for a period of forty-eight (48) hours after laying brick.

7.7.20 Placing Bituminous Setting Bed for Brick

To install the setting bed over the asphalt binder or concrete base surface place control bars directly over the base. The depth control bars shall be set carefully to bring the brick when laid to proper grade. Thickness of the finished setting bed shall be no more than one (1) inch or less than one-half (1/2) inch.

- (a) The setting bed shall be rolled with a power roller to a nominal depth of three-quarter (3/4) inch. The thickness shall be adjusted so that when the brick is placed the top surface of the brick shall be at the required finished grade. However, under no circumstances shall the setting bed exceed one (1) inch.
- (b) A coating of two (2) percent neoprene modified asphalt adhesive shall be applied by squeegee or trowel over the top surface of the bituminous setting bed so as to provide a bond under the brick.
- (c) After the modified asphalt adhesive is applied (if called for to be used in the plans or directed by the Engineer) carefully place the pavers by hand in straight courses with hand tight joints and uniform top surface. Good alignment shall be kept and the pattern shall be that shown in the plans or as directed by the Engineer.
- (d) Hand tight joints shall read from zero (0) inches to maximum one-quarter (1/4) inch from brick. Sweep a dry mixture of one (1) part Portland cement to match color of brick and three (3) parts sand until joints are flush with top surface. Fog lightly with water. Joints may recede up to one-eighth (1/8) inch. Cement stains that remain should be cleaned. Screenings or other suitable fillers are also acceptable.

7.7.21 Final Clean Up

Final cleanup shall be performed in accordance with the requirements in TDOT Standard Specifications Subsection 104.11 and in Section 3.08-Cleaning and Restoration. This page intentionally left blank.



IN THIS ARTICLE:

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8.1	Storm Drainage	184
8.2	Rip-Rap	186

ARTICLE 8: STORM DRAINAGE

- (a) This work shall consist of the construction of pipe drains, pipe culverts, side drains, slope drains, underdrains, storm sewers catch basins, inlets and pipe end walls of the type, dimensions, and locations as shown on the Plans.
- (b) The construction shall be completed in accordance with these Specifications and TDOT Standard Specifications Section 607, 610, 611, and 710 and related material specifications in subsections 903.17, 905.02, 905.03, 912.01, 912.03, 914.01, 914.02, 914.03, 915.02, 918.07, and 918.27.
- (c) The construction shall be in reasonably close conformity with the lines, grades, and cross sections shown on the Plans.

Related Work

- (a) Section 3.2: Excavation
- (b) Section 3.8: Trenching, Backfilling and Compaction for Utilities
- (c) Section 3.9: Boring
- (d) Section 3.12: Concrete for Utilities
- (e) Section 4.1: Manholes
- (f) Section 4.2: Sanitary Sewers (Gravity)

Applicable Specifications

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"Standard Specifications for Road and Bridge Construction", Latest Revisions, Tennessee Department of Transportation (TDOT).

Applicable References

"American Association of State Highway and Transportation Officials" (AASHTO). "American Society for Testing and Materials" (ASTM).

8.1 Products

8.1.1 General Requirements for Pipe Culverts and Storm Sewers

- (a) The sizes of all pipes shall be identified by the nominal inside diameter.
- (b) Steel and aluminum pipe are considered an option for corrugated metal pipe, pipe arches and underdrains.
- (c) Aluminum coating or bituminous coating may be used in place of paved or coated corrugated metal pipe and pipe arches.
- (d) All non-metallic pipe shall meet all requirements as set forth in TDOT Standard Specifications Section 914 and all metallic pipe shall meet all requirements as set forth in TDOT Standard Specifications Section 915.

8.1.2 Concrete Pipe

- (a) Concrete pipe culverts shall be Class III concrete.
- (b) Non-reinforced concrete pipe shall conform to ASTM C-14 for the specified diameters and strength.
- (c) Reinforced concrete pipe shall conform to ASTM C-76 for the specified diameters and

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strength classes. Horizontal and vertical elliptical pipe shall conform to ASTM C-507. Arch pipe shall conform to ASTM C-506.

(e) Reinforced concrete pipe shall be flat base, round or oval, as shown on the Plans.

8.1.3 Corrugated Metal Pipe (CMP)

- (a) All zinc-coated galvanized) c o r r u g a t e d iron or steel pipe, pipe arches, or underdrains and all special sections (elbows/flared ends) shall be same thickness and shall conform to AASHTO M-36.
- (b) Aluminum coated pipe shall conform to AASHTO M-274.
- (c) All corrugated aluminum pipe, pipe arches or underdrains and all special sections (elbows/flare ends) shall be same gauge and shall conform to AASHTO M-196.

8.1.4 Plastic and Polyethylene Corrugated Tubing

- (a) This tubing/piping shall conform to the requirements of ASTM F-405.
- (b) For specified pipe drains (bridge drains), polyethylene pipe shall meet requirements of AASHTO M-294.
- (c) Contech A-2000 shall meet the following requirements:

1) Structural backfill shall be placed from 6-inches below the pipe to 6-inches above the pipe.

- 2) For depths up to 11':
 - (a) Sand (A1, A3) compacted to 90% standard proctor.
 - (b) Sandy silt (A-2-4, A-2-5) compacted to 90% standard proctor.
 - (c) Dumped crushed stone.
- 3) For depths between 12' and 20':
 - (a) Sand (A1, A3) compacted to 95% standard proctor.
 - (b) Sandy Silt (A-2-4, A-2-5) compacted to 95% standard proctor
 - (c) Compacted crushed stone.
- 4) For depths between 21' and 35':
 - (a) Sand (A1, A3) compacted to 95% standard proctor.
 - (b) Compacted crushed stone.

8.1.5 Concrete Materials

Portland cement concrete shall be Class A concrete, and shall be manufactured, placed and cured in accordance with requirements set for in TDOT Standard Specifications Section 604.

8.1.6 Brick

Brick shall conform to AASHTO M-91, and unless otherwise specified or indicated shall be Grade SM and size $8" \times 3-5/8" \times 2-1/4"$.

8.1.7 Masonry Mortar

Masonry Mortar shall meet all requirements as set forth by TDOT Standard Specifications Subsection 912.03.

8.1.8 Castings

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- a) Gray Iron castings shall be of the type specified and shall be within close conformity with the dimensions shown on the Plans and meet requirements set forth in TDOT Standard Specifications Subsection 908.07.
- b) The castings shall conform to ASTM A-48 and shall be of Class 30.

8.1.9 Manholes and Catch Basins

- (a) Precast manholes and catch basins shall conform to ASTM C-478.
- (b) Section 4.01 of these specifications covers the complete details for manholes and catch basins.

8.1.10 Preparation for Laying Pipes

Suitable bedding for laying pipes shall be prepared in accordance with Section 3.08 of these Specifications.

8.1.11 Installation of Pipe Culverts and Storm Sewers

The installation of pipe culverts and storm sewers shall be conducted in conformance with TDOT Standard Specifications Subsections 607.06 through 607.09 and/or Section 4.02 Subsection 3.01 of these Specifications.

8.1.12 Installation of Manholes and Catch Basins

- (a) The installation of manholes and catch basins shall be conducted in conformance with Section 4.01 of these Specifications.
- (b) Inverts shall be of Class A concrete and shall conform to the shapes indicated on the Plans and conform uniformly to inlet and outlet pipes.

8.1.13 Inlet and Outlet Pipes

Pipes shall extend through the walls of manholes, catchbasins, and inlets for a sufficient distance beyond the outside surface to allow for connections but shall be cut off flush with the wall on the inside surface.

8.1.14 Castings and Fittings

- (a) All castings and fittings shall be installed in accordance with TDOT Standard Specifications Subsection 611.10.
- (b) All castings and fittings shall be placed in the positions indicated on the Plans and shall be set true to line and grade.

8.1.15 Pipe Drains

The construction and placing of pipe drains shall be accordance with TDOT Standard Specifications Subsections 610.04 through 610.10.

8.1.16 Underdrains

The constructing and placing of underdrains shall be accordance with TDOT Standard Specifications Subsections 710.05 through 710.08.

8.2 Rip-Rap

Work Included

(a) This shall consist of furnishing and placing rubble stones, crushed stones, or sacked sand cement within reasonably close conformity to the lines, grades, and cross sections and at the location indicated on the Plans.

ARTICLE 8 – STORM DRAINAGE

(b) The construction shall be completed in accordance with these Specifications and TDOT Standard Specifications Section 709.

Related work

- (a) Section 3.1: Clearing
- (b) Section 3.4: Finish Grading

Applicable Specifications

"<u>Standard Specifications for Road and Bridge Construction</u>", Latest Revision, Tennessee Department of Transportation (TDOT).

Applicable References

"American Association of State Highway and Transportation Officials" (AASHTO).

"American Society for Testing and Materials" (ASTM).

8.2.1 General Information

When rock or stone is used as riprap, the material when subjected to five alternations of the sodium sulfate soundness test (AASHTO T-104), and shall not have a weighted percentage of loss of more than 12.

8.2.2 Rubble-Stone Rip-Rap

- (a) Rubble-stone rip-rap shall consist of stone, broken Class "A" or paving concrete that shall be sound, dense and durable, free from excessive cracks, pyrite intrusions and other structural defects.
- (b) The material shall be rectangular and/or trapezoidal in shape with 80% having a minimum dimension of 10 inches and the other 20% ranging from 2 to 4 inches.

8.2.3 Sacked Sand Cement

- (a) Sacks shall be made of either cotton or jute, standard grade of cloth, which will hold mixture without leakage.
- (b) Sacks shall hold approximately one (1) cubic foot.
- (c) The sand and cement shall meet the requirements set forth by TDOT Standard Specifications Subsections 901.01, 903.01 and/ or 903.02.

8.2.4 Machined Rip-Rap

- (a) Machined rip-rap shall be clean shot rock and shall be uniformly distributed throughout the size range.
- (b) Machined rip-rap shall be classified as Class A-1, A-2, A-3, B or C, as described in TDOT Standard Specifications Subsection 709.03.

8.2.5 Preparation

- (a) Immediately prior to the placing of rip-rap, trim surfaces in reasonably close conformity to the lines and grades indicated on Plans
- (b) On slopes, prepare surface to place the bottom of the rip-rap at least two (2) feet below the natural ground surface.

8.2.6 Rubble-Stone Rip-Rap

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- (a) The construction and placing of rubble-stone rip-rap shall be in accordance with TDOT Standard Specifications Subsection 709.06 and 709.07.
- (b) Stone shall be hand placed upon the prepared foundation, so that the stones are as close together as in practicable to reduce voids.
- (c) The standard depth of the rubble-stone rip-rap shall be 12 inches, unless otherwise indicated on the Plans.

8.2.7 Sacked-Sand Cement Rip-Rap

- (a) The construction and placing of sacked sand-cement rip-rap shall be in accordance with TDOT Standard Specifications Subsection 709.09.
- (b) Sacks shall be filled approximately ³/₄ full with a mixture of sand and cement on the prepared foundation.
- (c) Sacks shall be placed in a manner as to reduce voids.

8.2.8 Concrete Black Rip-Rap

- (a) The construction and placing of concrete block rip-rap shall be in accordance with TDOT Standard Specifications Subsection 709.08.
- (b) The concrete blocks shall be placed by hand upon the prepared foundation with each block against the adjoining blocks with sides and ends in contact.
- (c) The blocks shall be placed in a manner that the joints will be staggered.



IN THIS ARTICLE:

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ARTICLE 9: ELECTRICAL

9.1 Underground Electrical

9

9.1.1 Underground General Methods

- (a) Underground electric distribution for commercial and industrial customers is offered by Southwest Tennessee Electric, hereafter referred to as SWTNE, as an option to the standard overhead distribution.
- (b) Typical construction consists of a pad mounted transformer located on the customer's property. The owner/developer shall furnish and install an underground secondary service from the transformer to meter(s) on the customer's property.
- (c) SWTNE shall have the right to serve other customers from any transformer located upon any premises.

9.1.2 Primary Circuits

- (a) Primary conductors will be furnished and installed by SWTNE in the conduit system.
- (b) The duct bank or conduit shall be furnished and installed by the developer or contractor at the proper depth per applicable standards. Size of the duct or conduit and field location will be determined for the individual job by SWTNE and noted on construction drawings. The Developer may be required to furnish a spare conduit in ditches with service conduit(s) and cap both ends at bends. The Developer is to pull a mandrel through each conduit to check and clear blockage and leave an approved pull tape in each conduit. Pull tape shall be furnished by the Developer and shall be installed by the Developer. Mandrel shall be furnished by Developer. Conduit shall be plugged at both ends.
- (c) Ground wire will be supplied by SWTNE and installed by the owner or developer. Ground wire will be spliced and terminated by SWTNE. All other materials and labor required to complete the duct bank or conduit run with the exception of pull boxes, switch pads, and manholes shall be supplied and installed by the developer or his contractor. All pull boxes, manholes, and switch pads will be supplied and installed by SWTNE and will be included in the total job cost.
- (d) The conduit duct bank shall be turned up at the riser pole with a rigid galvanized elbow and extended for a vertical length of ten feet (10') up the riser pole and capped as appropriately. The radius of the rigid galvanized elbow shall be standard radius or greater. One sweep bend of fifteen (15') minimum radius will be allowed between the riser pole and switch or transformer.
- (e) All trenching, excavation (for pull boxes, manholes, pads, etc.) backfilling and grading shall be done by the developer or contractor where required for pull boxes, switch and transformer pads, manholes, etc., shall be furnished <u>in place</u> by the developer or his contractor.
- (f) Backfilling of conduit trenches under paved areas, around conduit bends at riser poles and under transformer pad areas is to be compacted to 95% of the density of surrounding undisturbed soil as per ASTM D 698. Stabilization must be uniform to bottom of ditch. Alternative stabilization methods for backfilling around conduit bends under transformer pad consist of two (2) sacks of cement mixed with earth backfill or the pouring of concrete backfill with transformer pad. The method used will be governed by prevalent local soil conditions.
- (g) Concrete pads for transformers shall be constructed by the developer or his contractor in accordance with specifications furnished by SWTNE and per all applicable standards. The Developer is to complete rough site grading, establish final grade at pad mounted equipment locations and clear these locations of all obstructions. Any change in final grade which requires the lowering or raising of electrical conductors or associated equipment is at the expense of the Developer. Equipment pads are to be installed a minimum of three (3) inches above finished grade. No equipment pad shall be installed in a pit below the finished grade of the surrounding

area.

- (h) Piers and/or beams are required on all equipment pads unless waived by SWTNE. If required, stabilization method(s) will be determined by SWTNE. The depth shall extend to rock or a change in soil conditions sufficient to bear the load of pad and transformer to prevent settlement due to undercutting for conduit bend installation or washing due to drainage.
- (i) Concrete forms are to be tight and aligned so when forms are removed the finished surface shall require little, if any, corrective measures. Concrete work is to have an acceptable finish free of honeycombs, sharp or irregular surfaces
- (j) All switches and transformers with necessary electrical terminations, protections, and grounding for primary circuits will be furnished and installed by SWTNE

9.1.3 Secondary Service from Pad Mounter Transformer

- (a) The entire installation of service conductors and required conduit shall be provided by the developer's electrical contractor.
- (b) The service conduit(s) must be positioned inside the secondary compartment of the transformer.
- (c) SWTNE will provide and install terminal lugs and make proper connection of the customer's cable at the secondary bushings of the transformer.
- (d) All necessary metering equipment will be supplied by SWTNE.
- (e) The most appropriate locations and types of meters will be determined by SWTNE.
- (f) Proper grounding shall be attained at the meter location by the electrical contractor. SWTNE will connect this ground when installing the meter.
- (g) The maximum size of secondary conductors will be 750 MCM.
- (h) Secondary Conductors: Provide 98% conductivity copper conductors with 600-volt insulation. All conductors shall have THHN/THWN 90° C insulation unless noted otherwise. Conductors shall be manufactured by Triangle, Anaconda, General Cable, or approved equal.

9.1.4 Secondary Service from SWTNE Pole

- (a) Underground secondary service from a SWTNE riser pole to the meter location will be installed for services up to and including 600 amperes, three phase. The service conductors shall be installed by SWTNE.
- (b) SWTNE will also install underground secondary services to approved small loads such as entrance signs, irrigation services, etc. up to 100 amps which are furnished and installed by the developer.
- (c) The developer will provide and install conduit including a conduit turned up at the riser pole with a rigid galvanized elbow and extended for a vertical length of ten feet (10') up the riser pole and capped as appropriately. The developer shall do all trenching and provide concrete encasement as necessary. The location of the riser pole must be approved by SWTNE and must be shown on construction drawings.
- (d) A meter base and/or C.T. cabinet for underground service will be supplied but not installed by SWTNE. The location of the meter shall be determined by SWTNE with input from the customer.
- (e) Proper grounding shall be attained at the meter location by the electrical contractor. SWTNE will connect this ground when installing the meter.

9.1.5 Utility Clearance

(a) A minimum of twelve inches (12") vertical and twelve inches (12") horizontal clearance is required between SWTNE underground circuits and other utility (sewer, water, natural gas, telephone, etc.) unless the said utility has a more stringent requirement. A lateral separation of five (5') feet from electrical conduits to other utilities' conduits is required on private property. 9

- (b) Where more than one utility is to share a common trench, trench width and/or depth shall be expanded by the customer to meet the minimum requirements provided by SWTNE.
- (c) The conduit for SWTNE installed primary and/or secondary circuits shall not be allowed to run under any permanent building. Services which run under permanent buildings shall be relocated at the expense of the developer.

9.1.6 Inspection and Acceptance

- (a) Primary Duct and Conduit
 - 1) When duct is to be used with concrete encasement, inspection by SWTNE is required before and after encasement, prior to backfill.
 - 2) Where galvanized conduit is used, inspection by SWTNE is required prior to backfilling.
 - 3) Direct burial of any type duct or conduit other than galvanized is not acceptable.
- (b) Concrete Transformer Pads
 - 1) SWTNE will inspect size and conduit location and ground the transformer before the concrete is poured.
 - 2) After pouring, concrete pads will be inspected by SWTNE for proper strength, elevation and finish prior to installation of the transformer.
- (c) Services
 - 1) Inspection of customer installed services will be made by the Codes Department or State Electrical Inspector.
- (d) All materials and methods used by the developer for pads and primary duct runs and anything in conjunction with same are subject to SWTNE specifications.

9.2 Overhead Electrical

9.2.1 General

- (a) Typical construction consists of a pole mounted transformer and a riser pole located on the customer's property. The o w n e r /developer s h a 11 furnish and install an underground secondary service from the riser pole to meter(s) on the customer's property.
- (b) SOUTHWEST TENNESSEE ELECTRIC (SWTNE) shall have the right to serve other customers from any transformer located upon any premises.

9.2.2 Primary Circuits

- (a) Primary conductors, poles, guying, and supports will be furnished and installed by SWTNE in the overhead system.
- (b) All switches and transformers with necessary electrical terminations, protections, and grounding for primary circuits will be furnished and installed by SWTNE

9.2.3 Secondary Service from Pole Mounted Transformer or Riser Pole

- (a) The entire installation of a riser conduit with weatherhead and meterbase shall be provided by the developer's electrical contractor.
- (b) The riser conduit shall be of sufficient height to meet the minimum height clearances of the National Electric Code.
- (c) All necessary metering equipment will be supplied by SWTNE.
- (d) The most appropriate locations for riser poles and types of meters will be determined by SWTNE.
- (e) Proper grounding shall be attained at the meter location by the electrical contractor. SWTNE will connect this ground when installing the meter.

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- (f) Secondary Conductors: Provide 98% conductivity copper conductors with 600-volt insulation. All conductors shall have THHN/THWN 90° C insulation unless noted otherwise. Conductors shall be manufactured by Triangle, Anaconda, General Cable, or approved equal.
- (g) A meter base and/or C.T. cabinet for the service will be supplied but not installed by SWTNE. The location of the meter shall be determined by SWTNE with input from the customer.
- (h) Proper grounding shall be attained at the meter location by the electrical contractor. SWTNE will connect this ground when installing the meter.

9.2.4 Lighting

- (a) Poles shall be Cooper Streetworks model RTA6L20AAS16 in clear anodized aluminum with the standard type "A" base and include a ground lug.
- (b) Street luminaire fixtures shall be metal halide only (no substitutions) with photocell- Cooper Streetworks model OVG20M (*)3D4 where * is the ballast and voltage type–selected for each specific application.

9.2.5 Inspection and Acceptance

- (a) Inspection of customer installed services will be made by the Codes Department or State Electrical Inspector.
- (b) Light poles shall be placed at intervals commensurate to maintain optimum lighting levels for the area installed.
- (c) Light poles shall be grounded with an 8' long, 5/8" diameter ground rod that shall be completely covered.

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IN THIS ARTICLE:

10.1	Sanitary Sewer	84
10.2	Water	84



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SANITARY SEWER MAINS HAVING A DEPTH OF 14-FEET OR GREATER MAY NOT BE ACCEPTABLE. DURING THE DESIGN PROCESS, THE TOWN WILL ACCEPT OR REJECT DEEP SEWER MAINS ON A CASE-BY-CASE BASIS. SEE "PVD GRAVITY SEWER PIPE" SECTION FOR PIPE MATERIAL AT VARIOUS DEPTHS.



10.13 S






PIPE SHALL BE CERTIFIED TO AWWA C 904 "CROSS-LINKED POLYETHYLENE (PEX) PRESSURE PIPE, 1/2" THROUGH 3", FOR WATER SERVICE" BY APPROVED TESTING AGENCY. IN ADDITION, PIPE SHALL BE CERTIFIED TO STANDARDS ASTM F876, CSA B137.5, NSF 14, NSF 61 AND PPI TR-4, BY APPROVED TESTING AGENCIES, WITH A STADARD MATERIALS DESIGNATION CODE OF 3006, AS CERTIFIED BY THE PPI.

PIPE SHALL HAVE A CO-EXTRUDED UV SHIELD MADE FROM UV-RESISTANT HIGH-DENSITY POLYETHYLENE, COLOR BLUE. PIPE SHALL HAVE MINIMUM RECOMMENDED UV EXPOSURE TIME OF ONE YEAR WHEN TESTED IN ACCORDANCE WITH ASTM F2657, OR AS PER MANUFACTURER'S RECOMMENDATIONS.

PIPE SHALL BE COMPATIBLE WITH COLD-EXPANSION COMPRESSION-SLEEVE FITTINGS CERTIFIED TO ASTM F2080 FOR INSTALLATIONS AS COLD AS -40°F.

PIPE SHALL BE APPROVED BY MANUFACTURER FOR USE WITH AWWA C800 FITTINGS, WHEN USING STAINLESS STEEL INSERTS. PIPE SHALL BE APPROVED BY MANUFACTURER FOR USE WITH MANUAL PLASTIC PIPE SQUEEZE-OFF TOOLS FOR TEMPORARY STOPPAGE OF FLOW. PIPE SHALL BE APPROVED BY MANUFACTURER TO BE REPAIRED USING HOT AIR, IF KINKED IN THE FIELD. PIPE SHALL HAVE THE MINIMUM MARKINGS: PEXa3006, CSA B137.5, ASTM F876, F2023 AND F2080, NSF-pw. PIPE SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION PROCEDURES AND RECOMMENDATIONS.

NOT TO SCALE

TYPICAL SEWAGE AIR/ VACUUM RELEASE VALVE

STANDARD DETAIL

TOWN OF ATOKA ATOKA, TENNESSEE



STANDARD WATER DETAILS

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то:	Atoka Planning Commission
FROM:	Tom Langford Building/Code Official
MEETING DATE:	February 12, 2024
SUBJECT:	Summit Roofing Sign Application - Recommended Course of Action

STAFF RECOMMENDATION

Denial of Sign Permit

BACKGROUND

On January 24, 2024, our department received a sign permit application from the applicant. Upon thorough examination during the processing phase, it was determined that the sign in question had already been installed before the submission of the application. The current signage is in violation of Zoning Ordinance 6.11.4.3, specifically due to its size, which measures 133 square feet. Furthermore, the application lacks completeness as no rendering was provided at the time of submission.

(Reference: Zoning Ordinance 6.11.4.3 - Wall signs are limited to ten percent of the wall area or 80 square feet, whichever is smaller.)

- 6.11.3.3 Monument signs must be landscaped at the base.
- **6.11.3.4** Wall signs are limited to one sign, with a maximum area of 10% of the wall area, or not more than 150 square feet, whichever is smaller.
- **6.11.3.5** Canopy signs, marquee signs, projecting signs, roof signs, and suspend-ed signs are subject to design review at the time of Site and Design Review by the Planning Commission. Marquees, projecting signs, or suspended signs may not extend into or above the public right-of-way.
- **6.11.3.6** Building markers are permitted.
- **6.11.3.7** Off-premise signs are not permitted.
- **6.11.3.8** Changeable message signs or electronic message signs are not permitted.

6.11.4 Sign Regulation for Highway Corridor (HC) District

- **6.11.4.1** Freestanding signs for property within the US Highway 51 Corridor are limited to no more than eighty square feet in area and twelve feet in height. The sign must maintain a setback of at least ten feet from the property line.
- **6.11.4.2** Monument signs are limited to one sign, no more than forty (40) square feet in area, and eight feet in height. The sign must maintain a setback of at least ten feet from the property line, may be internally or externally lit, designed not to shine light onto residences or oncoming car traffic, and must be landscaped at the base.

6.11.4.3 Wall signs are limited to ten percent of the wall area or 80 square feet, whichever is smaller.

- **6.11.4.4** Canopy signs, marquee signs, projecting signs, roof signs, and suspended signs may not extend into or above the public right-of-way.
- 6.11.4.5 Building markers are permitted.
- **6.11.4.6** Changeable message signs. Signs that have a changeable message component must not contain any flashing component. The message display time of a changeable message sign must remain static for a minimum of ten seconds. The brightness of a changeable message sign shall be governed by the standards of TCA 54-21-122.
- **6.11.4.7** Off-premise signs are not permitted in the Highway Corridor District except in the Highway 51 Corridor Sign Overlay.

6.11.5 Sign Regulation in the Industrial (I) District

- **6.11.5.1** Freestanding signs are limited to one sign, no more than 60 square feet in area and no more than 15 feet in height. The sign must maintain a setback of ten feet from the property line.
- **6.11.5.2** Freestanding signs for property within the US Highway 51 Corridor are limited to no more than eighty square feet in area and thirty feet in height. The sign must maintain a setback of at least ten feet from the property line.



- **6.11.5.3** Monument signs are limited to no more than sixty square feet in area and fifteen feet in height. The sign must maintain a setback of a least ten feet from the property line, may be internally or externally lit. Light may not to shine light onto residences or oncoming car traffic, and be landscaped at the base.
- **6.11.5.4** Wall signs are limited to ten percent of the wall area or 80 square feet, whichever is smaller.
- **6.11.5.5** Canopy signs, marquee signs, and projecting signs are subject to design review upon Site and Design Review by the Planning Commission. Marquee signs or projecting signs may not extend into or above the public right-of-way.
- **6.11.5.6** Building markers are permitted.
- **6.11.5.7** Changeable message signs. Signs that have a changeable message component must not contain any flashing component. The message display time of a changeable message sign must remain static for a minimum of ten seconds. The brightness of a changeable message sign shall be governed by the standards of TCA 54-21-122.

6.12 General Permit Procedures.

The following procedures shall govern the application for and issuance or, all sign permits under this ordinance, and the submission and review of Common Signage Plans and Master Signage Plans.

- **6.12.1 Applications.** All applications for sign permits of any kind and for approval of a Master or Common Signage Plan shall be submitted to the Enforcement Officer on an application form or in accordance with application specifications published by the Enforcement Officer.
- **6.12.2 Fees.** Each application for a sign permit or for approval of a Master or Common Signage Plan shall be accompanied by the applicable fees, which shall be established by the Governing body of the Town from time to time by resolution.
- **6.12.3 Completeness.** Within 30 days of receiving an application for a sign permit or for a Common or Master Signage Plan, the Enforcement Officer shall review it for completeness. If the Enforcement Officer finds that it is complete, the application shall then be submitted to the Planning Commission for review. If the Enforcement Officer finds that it is incomplete, the Enforcement Officer shall, within such 30-day period, send to the applicant a notice of the specific ways in which the application is deficient, with appropriate references to the applicable sections of this ordinance.
- **6.12.4 Action.** Within 30 days of the submission of a complete application for a sign permit, the Planning Commission shall either:
 - **6.12.4.1** Authorize the issuance of a sign permit, if the sign(s) that is the subject of the application conforms in every respect with the requirements of this ordinance and of the applicable Master or Common Signage Plan or,
 - **6.12.4.2** Reject the sign permit if the signs subject of the application fails in any way to conform to the requirements of this ordinance and of the applicable Master or Common Signage Plan. If the Planning Commission rejects the sign permit, the Owner/Developer has a right to appeal to the Board of Zoning Appeals.

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TEN	Town of Atoka		
	PH: (901) 837-5300 / FAX: (901) 837-00	028	
	www.townofatoka.com		
Established	Angliggting for Simon Dawi		
Contraction of the second s	(2018) International Building Code Series is enforce	(t :ed)	
00.	PROPERTY INFORMATION		
Property Logation: 7234	HWY 51.5 Business Name: 5	Junit Roofil	e on Restolation In
State: N Zip: 3004 Map	& Parcel: (D97 & O26-01 Subdivision Nam	N/A	Lot Number: \mathcal{N}/\mathcal{A}
Cross Streets:	and Located in a Flood Pla	ain: Y/N	
Zoning:	(SN8, SN10, MR	, HC, NC, ATC, I, FAR)	
~ 1	OWNER INFORMATION		the second secon
Owner/Lessee: Dun nist Rout	ing one Restation, TAC. Phone	Number: 90(-	430-1974
Mailing Address: 10456 1/1	,4 51.5 Work/C	Cell Phone: 201-4	30-1974
City: Atoho	State: TN Zip: 380	24	
	1		
	CONTRACTOR INFORMATION	N	
Tantanti Tala 11016.	of Contractor Professional Co	onstart Solution	5. 61854
Mailing Address: 179 Belve	VIY DY Contractor. Provide A4	ula st. Tw	Zin: SSD.V
Rusiness Phone: $901 - 8$	70-0343Cell Phone:	<u> </u>	
Point of Contact Person:	1. A Horbest	Phone:	
onn of Contact i cison		I none	
	SIGNAGE INFOMATION		
nstallation: Free Standing	All Mounted V Window Banner Temporary S	Sign	
Electrical Permit #/	issued through tn.gov (PRIOR TO SIGN P	PERMIT ISSUANCE)	
Estimated Cost of Work:	Estimated Start Date:		
Proposed wording on the sign: *Picture of sign must be inclu-	ded with application		<u>ni da seta da seco</u> ndi. Na seta ni seconda da seta da seconda da seco
Dimensions: Length: Width:	LHeight: 6.5		
Dne Sided: Double-sided:			
	CERTIFICATION		
hereby certify that I am the owne	r of record of the named property, or that the propose	ed work is authorized by	y the owner of record
and that I have been authorized by	the owner to make this application as his/her author	ized agent and understa	nd and assume
responsibility for the establishmen	t of the official property lines for required setbacks p	prior to start of construc	tion and agree to

conform to all applicable laws of this jurisdiction. I further certify that the knowledge.	nis inform	ation given is true and correct to the best of my
ASMO		1-22-24
Applicant Signature:	_ Date: _	

1-22-24

 Project Dimension: L _____ x W ____ x H ____
 Total land disturbed _____

 Total Project Area in Sq Ft ______

Measurements: Show lot lines, easements, all proposed or existing structures, streets/roads/driveways, waterlines/wells, sewer lines/septic systems, all property lines, all distance of proposed structure(s) from lot lines and work layout and dimensions. Any omitted information may cause a delay in permit issuance.



INSPECTOR NOTES/OFFICE USE ONLY

Plans Required: Y / N	Joint Plan	Joint Plan Review Required: Y / N				
Building Plan Review: Electric Plan Review:	Approved: Approved:	Not App' d Not App' d:	Date: Date:	Code Official: Code Official:		
Codes Administrator:	Approved:	Not App 'd:	Date:	_ Code Official:		
Zoning Plan Review:	Approved:	Not App 'd:	Date:	Code Official:		
Notes:			a da la composición de la composición d			
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Submittal Guide for Signage Projects

3.10.12 General Permit Procedures –The following procedures shall govern the application for and issuance or, all sign permits under this ordinance, and the submission and review of Common Signage Plans and Master Signage Plans.

3.10.12.1 Applications – All applications for sign permits of any kind and for approval of a Master or Common Signage Plan shall be submitted to the Enforcement Officer on an application form or in accordance with application specifications published by the Enforcement Officer.

3.10.12.2 Fees – Each application for a sign permit or for approval of a Master or Common Signage Plan shall be accompanied by the applicable fees, which shall be established by the Governing body of the Town from time to time by resolution.

3.10.12.3 Completeness – Within 30 days of receiving an application for a sign permit or for a Common or Master Signage Plan, the Enforcement Officer shall review it for completeness. If the Enforcement Officer finds that it is complete, the application shall then be submitted to the Planning Commission for review. If the Enforcement Officer finds that it is incomplete, the Enforcement Officer shall, within such 30-day period, send to the applicant a notice of the specific ways in which the application is deficient, with appropriate references to the applicable sections of this ordinance.

3.10.12.4 Action – Within 30 days of the submission of a complete application for a sign permit, the Planning Commission shall either:

Authorize the issuance of a sign permit, if the sign(s) that is the subject of the application conforms in every respect with the requirements of this ordinance and of the applicable Master or Common Signage Plan or,

Reject the sign permit if the sign(s) that is the subject of the application fails in any way to conform to the requirements of this ordinance and of the applicable Master or Common Signage Plan. If the Planning Commission rejects the sign permit, the Owner/Developer has a right to appeal to the Board of Zoning Appeals.

The following items are required for new commercial projects. Drawings should be drawn to 1/4 or 1/8" scale and shall provide the necessary information to verify compliance with the building code. <u>All Drawings shall bear</u> <u>the stamp and signature of the design professional licensed in Tennessee responsible for the design</u>. Plans must be specific enough to provide the contractor all the necessary information to complete work without reference to other documents and shall include:

Structural Drawings; to include the structural design calculations, geo-technical engineering report, uniform live loads, dead loads, roof & snow loads, wind loads, footing construction detail, foundation construction details, framing construction details, concrete construction details, masonry construction details, wood construction details, steel construction details. Show typical wall-section to indicate type of construction. Show elevations of all sides of the building (existing buildings may substitute photographs of all sides).

Electrical Drawings: to include all lighting facilities, electrically operated equipment, and electrical circuits required for all service equipment of the building or structure. Drawings should include panel schedules, grounding systems, and wiring methods.