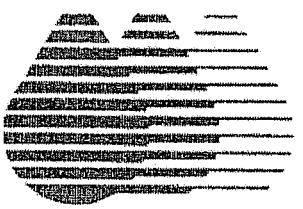
STANDARD SPECIFICATIONS AND DETAIL DRAWINGS

JACKSON COUNTY UTILITY AUTHORITY



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JACKSON COUNTY UTILITY AUTHORITY
WATER AND SEWER STANDARD SPECIFICATIONS

REVISIONS

REVISIONS

1. DATED 01/2008
   - SECTION 0210, PARAGRAPH 2.01.C
   - SECTION 0340, PARAGRAPH 2.01.B
   - SECTION 0410, ENTIRE SECTION
   - STANDARD DETAIL DRAWINGS
2. DATED 06/2008
   - SECTION 0210, PARAGRAPHS 2.01 AND 2.02
   - SECTION 0340, PARAGRAPH 2.01
   - SECTION 0410, PARAGRAPH 2.01
   - STANDARD DETAIL DRAWINGS (PS8, PS9, PW5, AND PW7)

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SECTION 0100
CUTTING AND PATCHING

PART 1 – GENERAL

1.01 Submittals

A. Submit a written request to the AUTHORITY well in advance of executing any cutting or alteration which may be required to access AUTHORITY property.

B. Request shall include:
1. Identification of the work.
2. Description of affected work.
3. The necessity for cutting, alteration or excavation.
4. Description of proposed work:
   a. Scope of cutting, patching, alteration, or excavation.
   b. Trades who will execute the work.
   c. Products proposed to be used.
   d. Extent of refinishing to be done.
5. Alternatives to cutting and patching.
6. Date and time work will commence.
7. Written permission of any separate contractor whose work will be affected

PART 2 – PRODUCTS

2.01 Materials

Comply with specifications and standards for each specific product involved.

PART 3 – EXECUTION

3.01 Inspection

A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products or performance of work.

**** END OF SECTION ****

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SECTION 0110
SITE PREPARATION

PART 1 – GENERAL

1.01 Quality Assurance

Codes and Standards: State and local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

1.02 Job Conditions

Streets, roads, adjacent property and other works and structures which are the property of the AUTHORITY or other governmental entities shall be protected throughout the entire project. CONTRACTOR shall return to original condition, satisfactory to the AUTHORITY or other governmental entity, damaged facilities caused by the CONTRACTOR'S operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 Clearing and Grubbing

A. Limits of clearing shall be all areas within the Right-of-Way and easements except as otherwise required by the engineer. Damage outside these limits caused by the CONTRACTOR'S operations shall be corrected by the CONTRACTOR at no expense to the Authority.

B. Except as noted below, CONTRACTOR shall remove from the site and satisfactorily dispose of all trees, shrubs, stumps, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences and miscellaneous other structures.

C. Trees, stumps and other cleared and grubbed material may not be disposed on site.

D. The CONTRACTOR shall comply with all rules and regulations of the Mississippi Forestry Commission, Office of Pollution Control and any other authority having jurisdiction.

E. Easements for utilities shall be cleared and grubbed as to provide access to the utilities for the Authority.

*** * END OF SECTION * ***

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SECTION 0120
EXCAVATION AND BACKFILL

PART 1 – GENERAL

1.01 Related Work Specified Elsewhere

Section 0160, Pipe Installation.

1.02 Quality Assurance

A. Permits and Regulations:
1. Obtain all necessary permits for work in roads, rights-of-way, railroads, etc.
2. Obtain permits as required by local, state and federal agencies for discharging water from excavations to rivers and streams.
3. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.
1. ASTM A 36, Structural Steel.
2. ASTM A 328, Steel Sheet Piling.
3. ASTM D 422, Particle-Size Analysis of Soils.
4. ASTM D 423, Liquid Limit of Soils.
5. ASTM D 424, Plastic Limit and Plasticity Index of Soils.
6. ASTM D 448, Standard Sizes of Course Aggregate for Highway Construction.
7. ASTM D 698, Moisture-Density Relations of Soils, Using 5.5 lb (2.5 kg) Rammer and 12-in. (304.8 mm) Drop.
8. ASTM D 1556, Density of Soil in Place by the Sand-Cone Method.
9. ASTM D 2487, Classification of Soils for Engineering Purposes.
10. ASTM D 2922, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.03 Job Conditions

A. Protection of Property:
1. Barricade open excavations occurring as part of this Work and post with warning lights.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 – PRODUCTS

2.02 Soil Materials

A. Select Backfill and Select Fill Materials: Select backfill and select fill shall be used under pavements, and as required by the Authority. Select backfill shall be Class B3 Borrow Material and select fill shall be Class B4 Borrow Material, as specified in the "Mississippi Standard Specifications for Road and Bridge Construction", 2004 Edition.

B. Pipe Bedding Material: Pipe bedding material used around and under pipes of all materials shall be Class IB as classified by ASTM D2321, conforming to the gradation set out below, unless otherwise approved by the Authority or as recommended by the pipe manufacturer:

Sieve Size	% Passing by Weight
1 ½"	100%
No. 4	≤ 50%
No. 200	< 5%

In addition, should ground water be encountered in the trench, the Class IB material shall be provided as a filter material in accordance with Section XI.8 of ASTM D2321 and shall have the following gradation requirements:

1. D15/d85 < 5 where D15 is the sieve opening size passing 15% by weight of the coarser material (bedding) and d85 is the sieve opening size passing 85% by weight of the finer material.
2. D50/d50 < 25 where D50 is the sieve opening size passing 50% by weight of the coarser material (bedding) and d50 is the sieve opening size passing 50% by weight of the finer material.
3. If the finer material is a medium to highly plastic clay without sand or silt partings (CL or CH) then the following criteria may be used in lieu of the above:

   D15 < 0.02, where D15 is the sieve opening size passing 15% by weight of the coarser material.

C. General Backfill and Fill Material: Acceptable on site material shall comply with the following conditions:

1. Free of clay, rock or gravel larger than 6 inches in any dimensions, debris, waste, frozen materials, vegetable and other deleterious matter.
2. General backfill and fill shall consist of any non-organic soil, free of debris and capable of being placed and compacted to the specified densities.
3. Unsuitable soils for general backfill and fill material shall include soils which contain: vegetable matter, sod, mud, roots, rubbish, highly plastic clay soils of the CH and MH descriptions, borderline soils of the CL-CH description, and organic soils.

D. All costs associated with tests required by the AUTHORITY to verify that material obtained either on-site or off-site meets the above requirements shall be borne by the CONTRACTOR.

PART 3 – EXECUTION

3.01 Site Preparation

CONTRACTOR shall clear all areas to be occupied by permanent construction of all trees, brush, roots, stumps, logs, wood and other materials and debris in accordance with Section 0110. Sub-grades for fills shall be cleaned and stripped of vegetation, sod, topsoil and organic matter.

3.02 Excavation

A. General:
   1. Scope: Perform all excavation required to complete the Work as shown and specified.
   2. Excavated Materials: Earth, sand, clay, gravel, hardpan, boulders not requiring drilling or hammering to remove, decomposed rock, pavements, sediment, rubbish and all other materials within the excavation limits.

B. Structures and Pipelines: Excavations: Open excavations shall be shored and braced where necessary. All open excavations shall comply with current OSHA requirements.

C. Dewatering:
   1. Placement of Structure below Groundwater Table: Use well points, coffer dams or other acceptable modes to permit construction of said structure or pipeline under dry conditions.
   2. New Concrete and Pipelines: Maintain dry conditions until fresh concrete has reached sufficient strength to withstand earth and hydrostatic loads and until the pipelines are properly jointed, tested and backfilled.
   3. Flooding: Protect excavation from flooding until all walls and floor framing up to and including grade level floors are in place and backfilling has begun.
   4. Water Level: Maintain water level below top of backfill at all times. Under no conditions shall water be permitted to stand in the bottom of an excavation for more than 24 hours.

D. Pumping: Pump excavations in such a manner to prevent the carrying away of unsolidified concrete materials, and to prevent damage to the existing subgrade.

E. Footings:
   1. Consider the elevation of the bottom of footings shown as approximate only and the AUTHORITY may order such changes in dimensions and elevations as may be required to secure a satisfactory footing.
   2. Hand trim all structure excavations to permit the placing of full widths, and lengths of footings on horizontal beds. Rounded and undercut edges will not be permitted.
   3. When excavations are made below the required grades, without the written order of the AUTHORITY, backfill with compacted gravel or concrete as directed by the AUTHORITY at expense of CONTRACTOR.

F. Size of Excavations: Extend excavation sufficiently on each side of structures, footings, etc., to permit setting of forms, installation of sheeting or the sloping of banks.

G. Subgrades:
   1. Subgrade Requirements for Roadways, Structures and Trench Bottoms:
      a. Strong, dense, and thoroughly compacted and consolidated.
      b. Free from mud, muck and other soft or unsuitable materials.
      c. Remain firm and intact under all construction operations.
   2. Soft Subgrades: For subgrades which are otherwise solid, but which become soft or mucky on top due to construction operations, overlay with geotextile fabric prior to placement of crushed stone or gravel. Fabric shall be as manufactured by one of the following:
      a. Marifi 600X by Marifi, Inc.
      b. Typar Style 3601 by Dupont Co.
      c. Or equal.
   3. Install fabric in accordance with manufacturer's recommendations.
   4. Use "Mud-mat" for subgrade.

H. Pipe Trench Preparation:
   1. No more than 100 feet of trench may be opened in advance of pipe laying.
   2. Trench width shall be minimized to greatest extent practical but shall conform to the following:
      a. Sufficient to provide room for installing, jointing and inspecting piping, but in no case wider at top of pipe than pipe barrel O.D. plus 2 feet.
      b. Sufficient to allow thorough compacting of backfill adjacent to bottom half of pipe.
      c. Do not use excavating equipment which requires the trench to be excavated to excessive width.

3.03 Unauthorized Excavation

A. Limits: All excavation outside the lines and grades required.

B. Responsibility: All unauthorized excavation together with the removal and disposal of the associated materials is at the CONTRACTOR'S expense.

C. Backfill: Fill and compact the unauthorized excavation with select backfill and at CONTRACTOR'S expense.

3.04 Drainage and Dewatering

A. General:
   1. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
   2. Remove water from excavation as fast as it collects.
   3. Maintain the ground water level below the bottom of the excavation to provide a stable surface for construction operations, a stable subgrade for the permanent work, and to prevent damage to the Work during all stages of construction.
   4. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations.

B. Disposal of Water Removed by Dewatering System:
   1. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the Work under construction

or completed.

2 Dispose of water in a manner consistent with the Stormwater Pollution Prevention Plan developed for the project.

3. Convey water from the construction site in a closed conduit. Do not use trench excavations as temporary drainage ditches.

3.05 Backfill, Fill and Embankments

A. General: Furnish, place and compact all backfill required for embankments and trenches as required to provide the finished grades as required by the project plans and the Authority. Select backfill and fill shall be installed as support for structure foundations, where the contractor excavates below design subgrade, around and below wetwells, manholes, and valve vaults, in utility trenches through pavements, or as directed by the Authority. General backfill and fill shall be installed in all other locations, unless select fill or backfill is required by the Authority.

B. Restrictions:
1. Make sub-grade surface level, dry, and firm as approved by the Authority.
2. Do not place fill or backfill if any water in on the surface of the area to receive the fill or backfill.
3. Do not place fill or backfill in a frozen condition or on top of frozen material.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
   a. Construction below finish grade including dampproofing, waterproofing, and meter insulation.
   b. Inspection, testing, approval, and recording of locations of underground utilities.
   c. Removal of concrete formwork.
   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
   e. Removal of trash and debris.
   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Placement:
1. Keep excavation dry during backfilling operations. At no time shall water be permitted to stand in the bottom of a trench for more than 24 hours.
2. Bring up backfill evenly on all sides around structures and piping.

D. Pipe Trenches:
Compact in layers of 6 inches (loose thickness). Comply with requirements of Section 0160, Pipe Installation.

A. Rock Excavation:
1. Where pipe is laid in rock excavation, provide a minimum of 4 inches of sand under pipes smaller than 4 inches and a minimum of 6 inches of crushed stone or gravel under piping 4 inches and larger.
2. After laying pipe, place the balance of the backfill as described herein.

B. Pipes in Fill Areas:
1. Prior to the installation of pipes which are to be installed in fill sections, place the fill, as described herein, until a minimum height of 2 feet above the pipe is

reached, unless otherwise required in other Sections.
2. Excavate the fill for the trench width; install the pipe, and backfill.
3. Place the remainder of the fill.

C. Thickness of Lifts: Unless otherwise specified or required, place fill and backfill in horizontal loose lifts not exceeding 6 inches in thickness and mix and spread in a manner assuring uniform lift thickness after placing. Compact each layer of fill or backfill before placement of the next layer.

D. Moisture:
1. Control the water content of fill material during placement within the range necessary to obtain the compaction specified.
2. Moisture Content:
   a. General Fill and Backfill: Maintain the moisture content of the fill within 3 percent of the optimum moisture content for compaction as determined by laboratory tests.
   b. Select Fill and Backfill: Maintain the moisture content of the fill within 4 percentage points from the optimum moisture content of the material unless otherwise specified. Wet the fill as needed during placement to achieve moisture content for effective compaction.
3. Perform all necessary work to adjust the water content of the material to within the range necessary to permit the compaction specified.
4. Do not place fill material when free water is standing on the surface of the area where the fill is to be placed.
5. No compaction of fill will be permitted with free water on any portion of the fill to be compacted.

E. Unacceptable Material:
Remove fill and backfill containing organic materials or other unacceptable material and replace with approved fill or backfill material. Unacceptable material is material containing rubble, debris, wood, other organic matter, and unsuitable soils as described in Paragraph 2.02.C.3.

F. Equipment:
Compact fill and backfill with equipment suitable for the type of material placed and which is capable of providing the densities required.

G. Coverage:
1. Compact fill and backfill by at least two coverages of all portions of the surface of each lift by compaction equipment.
2. One-coverage is defined as the condition obtained when all portions of the surface of the fill material have been subjected to the direct contact of the compactor.

H. Backfill around Structures:
1. Follow the specified procedures for backfill around structures except that within 10 feet of foundations and underground structures, use light compaction equipment with the gross weight of the equipment not exceeding 7,000 pounds.
2. Provide equipment that is capable of the required compaction within restricted areas next to structures and around piping.

I. Compaction:
1. Minimum Density for General Backfill and Fill: CONTRACTOR shall provide independent analysis to demonstrate 95 percent of maximum density obtained in the laboratory in accordance with ASTM D 698 Method C including Note 2. This percentage is of standard Proctor density. The fill is to be tested by an independent lab, every 200' of trench and every 12" of depth.
2. Minimum Density for Select Backfill and Fill: The minimum density to be obtained in compacting the select backfill or fill shall be 95 percent of the maximum density obtained in the laboratory in accordance with ASTM D 698 Method C including Note: This percentage is of standard Proctor Density. The fill is to be tested every 200' of trench and every 12" of depth. The testing laboratory is to be AASHTO certified.
3. If the field and laboratory tests indicate unsatisfactory compaction, provide the additional compaction necessary to obtain the specified degree of compaction.

J. Inadequate Compaction:
1. If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, perform whatever work is required to provide the required densities.
2. This work includes complete removal of unacceptable fill areas and replacement and recompaction until acceptable fill is provided.

K. Settlement:
1. Repair any settlement that occurs during construction and within the warranty period, at CONTRACTOR'S expense.
2. Make all repairs and replacements necessary within 30 days after notice from the AUTHORITY'S REPRESENTATIVE.

L. Disturbed Materials:
1. Provide, place and compact select fill necessary to replace subgrade materials disturbed and softened as a result of the CONTRACTOR'S operations or to backfill unauthorized excavation.
2. Furnish additional fill at CONTRACTOR'S expense.

3.07 Grading

A. General:
1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth subgrade surfaces within specified tolerances.

B. Grading Outside Building Lines:
1. Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
2. Finish surfaces free from irregular surface changes, and as follows:
   a. Turfed Areas or Areas Covered with Gravel, Stone, Wood Chips, or Other Special Cover: Finish areas to receive topsoil or special cover areas to within not more than 1 inch above or below the required subgrade elevations.
   b. Walks: Shape surface of areas under walks to line, grade and cross-

section, with finish surface not more than 1 inch above or below the required subgrade elevation.

c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 2 inches above or below the required subgrade elevation.

C. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.08 Disposal of Excavated Materials

Excess or Unsuitable Material:

A. Haul away from the project site all material removed from the excavations which does not conform to the requirements for fill or is in excess of that required for backfill.

B. Dispose of fill in compliance with municipal, county, state, federal or other applicable regulations.

*** * END OF SECTION * ***

PART 1 – GENERAL

1.01 Related Work Specified Elsewhere

Section 0120, Excavation and Backfill.

PART 2 – PRODUCTS

2.01 Materials

A. Crushed Stone: Shall be size 610 as specified in the "Mississippi Standard Specifications for Road and Bridge Construction", 2004 Edition.

B. Clay Gravel:
   1. Clay Gravel Surface Course: Mississippi Department of Transportation (MDOT) Standard Specifications. Clay gravel shall be Class 5, Group C as outlined in Section 703.07 of the MDOT specifications.
   2. Clay Gravel Base Course: MDOT Standard Specification. Clay gravel base course shall be Class 9, Group C as outlined in Section 703.07 of the MDOT specifications.

PART 3 – EXECUTION

3.01 General

A. Place material, in layers of specified thickness, over ground surface as required in these specifications and standard drawings.

B. Comply with Mississippi Department of Transportation Standard Specification for Road and Bridge Construction, latest edition.

3.02 Grade Control

During construction, maintain lines and grades including crown and cross-slope.

3.03 Placing

A. Place material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness.

B. Maintain optimum moisture content for compacting clay gravel material during placement operations.

C. When a compacted course is required to be 6" thick or less, place material in a single layer.

D. When a compacted course is required to be more than six inches thick, place material in equal layers, except no single layer shall be more than 6" or less than 3" in thickness when compacted.

3.04 Inspection

Examine the subgrade on which the aggregate shall be installed. If conditions are unsatisfactory for installation of aggregate, then do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Authority.

*** * END OF SECTION * ***

SECTION 0122
EROSION CONTROL AND GRASSING

PART 1 — GENERAL

1.01 Section Includes

A. Installation of temporary erosion and sediment control items prior to clearing or demolition and commencing earthwork.

B. Stabilization of denuded areas

C. Protection and stabilization of soil stockpiles

D. Installation of sediment basin and traps, silt barrier fences, and sediment basin risers

E. Temporary seeding, mulching, and sodding

F. Excavation and embankment construction activities

G. Stabilization of construction entrances

H. Maintenance and removal of all sediment and erosion control measures

I. Permanent erosion control systems

J. Slope protection systems

1.02 Related Sections

A. Section 0110 — Site Preparation

B. Section 0120 — Excavation and Backfill

C. Section 0121 — Crushed Stone and Gravel

1.03 Environmental Requirements

The Contractor shall protect adjacent properties and water resources from erosion and sediment damage throughout the life of the project.

1.04 Regulatory Requirements

A. Comply with all applicable codes and with the requirements of agencies having jurisdiction over the work in this Section.

B. If the owner does not already have, Contractor shall bear the responsibility of obtaining the applicable storm water permits from the Mississippi Department of Environmental

Quality.

1.05 Examination

Visually determine storm water discharge locations on the project site and modify erosion control plan as required to eliminate sediment and erosion from discharging off project site.

PART 2 — PRODUCTS

2.01 Materials

Erosion and sediment control materials suitable for site conditions shall be in accordance with requirements imposed by the Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, Sections 234, 235 and 236.

A. Erosion Control Blankets (Ditch Liner):
Curlex blankets by American Excelsior Company or approved equal.

B. Turf Reinforcement Mat (TRM):
Recyclex by American Excelsior Company or approved equal.

C. Mulch: Use one of the following:
1. Wheat or Oat Straw.
2. Wood chips, or bark – produced from on-site grinding of the trees to be cleared and/or off-site supply.
3. Hydromulch.
4. Polyethylene film – 6 mil. black

D. Grass Seed for Temporary Cover: See grass schedule "Seeding Chart" in Mississippi Storm Water Pollution Prevention Plan (SWPPP), Guidance Manual, for Construction Activities.

E. Bales: Air dry, rectangular straw bales.
1. Cross Section: 14" by 18", minimum
2. Bindings: Wire or string, around long dimension

F. Bale Stakes: One of the following, minimum 3' long
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Wood, 2" x 2" in cross section

G. Silt Fence Fabric: Geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Water Flow Rate: 0.3 gal./Sq.Ft./min., minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70% of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-ft, minimum, in cross-machine direction; 124 lb-ft, minimum, in machine direction; when tested in accordance with ASTM D 4632.

5. Elongation: 20%, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-ft, minimum, when tested in accordance with ASTM D 4533.

H. Silt Fence Posts: One of the following, minimum 5N long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot
2. Hardwood, 2" x 2" in cross section

PART 3 — EXECUTION

3.01 Erosion Control and Slope Protection Implementation

A. Erosion and Sedimentation control best management practices are required during all ground disturbing activity until permanent measures have been installed.

B. In all cases, if permanent erosion resistant measures have been installed, temporary preventive measures are not required.

C. All preventive measures shall comply with the BMPs as indicated in Mississippi Storm Water Pollution Prevention Plan (SWPPP), Guidance Manual, for Construction Activities, latest edition.

3.02 Installation and Maintenance

Installation and Maintenance of Erosion Control Measures shall be in accordance with the requirements of Mississippi Standard Specifications for Road and Bridge Construction, latest edition, Sections 234, 235 and 236 and Mississippi Storm Water Pollution Prevention Plan (SWPPP), Guidance Manual, for Construction Activities, Latest Edition.

3.03 Clean Up

A. Remove temporary measures after permanent measures have been installed.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**** END OF SECTION ****

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SECTION 0130
CONCRETE

PART 1 – GENERAL

1.01 Reference Standards

Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified.

A. ACI 301, Specifications for Structural Concrete for Building (includes ASTM Standards referred to herein except ASTM A 36).

B. ACI 347, Recommended Practice for Concrete Formwork.

C. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

D. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.

E. ACI 305, Recommended Practice for Hot Weather Concreting.

F. ACI 306, Recommended Practice for Cold Weather Concreting.

G. ASTM A 36, Structural Steel.

H. Concrete Reinforcing Steel Institute, Manual of Standard Practice, include ASTM Standards referred herein.

PART 2 – PRODUCTS

2.01 Concrete Materials

A. Portland Cement: ASTM C 150, Type II.

B. Aggregates: ASTM C 33.
   1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.
   2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
      a. Crushed stone, processed from natural rock or stone.
      b. Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
      c. Size: either No. 57 or 67

C. Water: Clean, potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Water-Reducing Admixture: ASTM C 494. Only use admixtures which have been tested and accepted in mix designs.

F. Slump Limits: Proportion and design mixes to result in concrete slump at the point of placement of not less than one inch and not more than four inches.

2.02 Form Materials

A. Provide Form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

B. Exposed Concrete Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces. Use largest practical sizes to minimize form joints.

C. Unexposed Concrete Surfaces: Suitable material to suit project conditions.

D. Provide: ¾" inch chamfer at all exposed corners.

2.03 Reinforcing Materials

A. Reinforcing Bars: ASTM A 615, Grade 60.

B. Welded Wire Fabric: ASTM A 185.

C. Steel Wire: ASTM A 82.

D. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place.
   1. Use wire bar type supports complying with CRSI recommendations, except as specified below. Do not use wood, brick, or other unacceptable materials.
   2. For slabs on grade, use supports with sand plates or horizontal runners where base materials will not support chair legs.
   3. For all concrete surfaces, where legs of supports are in contact with forms, provide supports complying with CRSI, Manual of Standard Practice as follows: Either hot-dip galvanized, plastic protected or stainless steel legs.

2.04 Grout

A. Non-metallic, 100 percent solids, high strength epoxy grout.
   1. Use clean well graded sand with epoxy resins suitable for use on dry or damp surfaces.
   2. Product and Manufacturer: Provide one of the following:
      a. Euco High Strength Grout by the Euclid Chemical Company.
      b. Sikadur 42 Grout by Sika Chemical Company.
      c. Five Star Epoxy Grout by U.S. Grout Corporation.
      d. Or equal.

B. Nonshrink, Nonmetallic Grout:
   1. Premixed nonstaining cementitious grout requiring only the addition of water at the job site.
   2. Product and Manufacturer: Provide one of the following:

a. Euco N-S by the Euclid Chemical Company.
b. Masterflow 713 by Master Builders Company.
c. Five Star by U.S. Grout Corporation.
d. Or equal.

C. Ordinary Cement-Sand Grout:
Except where otherwise specified use 1 part cement to 3 parts sand complying with the following:
1. Cement: ASTM C 150, Type II.
2. Sand: ASTM C 33.

2.05 Expansion Joints

A. Expansion joint filler shall be preformed complying with ASTM D1752, Type II cork.

B. Expansion joint sealer:
1. Exterior and Interior Joints in Horizontal Planes: Two-Component Polyurethane Sealant:
a. Polyurethane-based, 2-part elastomeric sealant complying with the following:
(1) FS TT-S-00227, Type 1 (self-leveling) Class A.
(2) Water Immersion Bond, FS TT-S-00227; Elongation of 25 percent with no adhesive failure.
(3) Hardness (Standard Conditions), ASTM C 661: 30-40.
(4) Stain and Color Change, FS TT-S-00227 and ASTM C 510: No discoloration or stain.
(5) Accelerated Aging, ASTM C 793: No change in sealant characteristics after 250 hours in weatherometer.
b. Product and Manufacturer: Provide one of the following:
(1) Sonolastic Paving Joint Sealant by Sonneborn Division of Contech Incorporated.
(2) Vulkem 255 by Mameco International.
(3) Or equal.

PART 3 – EXECUTION

3.01 Formwork

A. Formwork: Construct so that concrete members and structures are correct size, shape, alignment, elevation and position, complying with ACI 347.

B. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.02 Reinforcement, Joints, and Embedded Items

A. Comply with the applicable recommendations of specified codes and standards, and CRSI, Manual of Standard Practice, for details and methods of reinforcement placement and supports.

B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials

which reduce or destroy bond with concrete.

C. Position, support, and secure reinforcement against displacement during formwork construction or concrete placement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
   1. Place reinforcement to obtain the minimum concrete converges as shown and as specified in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16 gage wire to hold reinforcement accurately in position during concrete placement operations. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.

D. Provide sufficient numbers of supports of strength required to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

E. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars.

F. Install welded wire fabric in as long lengths as practical, lapping at least one mesh.

G. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs on ground to stabilize differential settlement and random cracking.

H. Installation of Embedded Items: Set and build into the Work anchorage devices and embedded items required for other Work that is attached to, or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided under other Sections and other contracts for locating and setting.

3.03 Concrete and Placement

A. Proportioning and Design of Mix:
   1. Minimum compressive strength at 28 days: 3500 psi, unless otherwise specified.
   2. Maximum water cement ratio by weight: 0.45.
   3. Minimum cement content: 564 pounds per cubic yard.
   4. Normal weight: 145 pounds per cubic foot.
   5. Use air-entraining admixture in all concrete: Provide not less than 4 percent nor more than 8 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.
   6. Calcium Chloride: Do not use calcium chloride in concrete. Do not use admixtures containing calcium chloride.

B. Job-Site Mixing: Use drum type batch machine mixer, mixing not less than 1 minute for one cubic yard or smaller capacity. Increase mixing time at least 15 seconds for each additional cubic yard or fraction thereof.

C. Ready-Mixed Concrete: ASTM C 94.

D. Concrete Placement: Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections.

E. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of forms.

F. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.
   1. In cold weather comply with ACI 306.
   2. In hot weather comply with ACI 305.

3.04 Quality of Concrete Work

Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.

3.05 Curing

Begin initial curing after placing and finishing concrete as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protection as required to prevent damage to exposed concrete surfaces.

3.06 Finishes

A. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently. Use a wood float only. Check and level the surface plane to a tolerance not exceeding ¼" inch in 10 feet when tested with a 10 foot straightedge placed on the surface at not less than 2 different angles. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.

B. After floating, begin the first trowel finish operation using a trowel. Begin final toweling when the surface produces a ringing sound as the trowel is moved over the surface.

C. Consolidate the concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding ¼" inch in 10 feet when tested with a 10 foot straight edge. Grind smooth surface defects.

D. Use trowel finish for the following: Interior exposed slabs unless otherwise shown or specified.

E. Apply non-slip broom finish to exterior concrete slab.

3.05 Grout Placement

A. Place grout as shown and in accordance with manufacturer's instructing.

B. Drypacking will not be permitted.

C. Placing grout shall conform to the temperature and weather limitations described in Article 3.03 above.

*** * END OF SECTION * ***

SECTION 0140
CASED CROSSINGS

JACKSON COUNTY UTILITY AUTHORITY
WATER AND SEWER STANDARD SPECIFICATIONS

PART 1 — GENERAL

1.01 Related Work Sections

A. Section 0120, Excavation and Backfill

B. Section 0160, Pipe Installation

1.02 Quality Assurance

A. Cased crossings shall be performed by Contractors who are familiar with and experienced in such work.

B. The Contractor shall provide and maintain the principal equipment necessary to perform all of the work herein specified in an orderly manner. The equipment shall consist of approved units designed or selected to perform and expedite all of the work and incidental items of construction.

C. Reference Standards: Comply with the applicable provisions of ASTM A 139, Specification for Electric fusion (Arc) — Welded Steel Pipe

1.03 Job Conditions

Scheduling: The Contractor shall notify the Authority's Representative not less than 72 hours in advance of commencing work. Contractor shall obtain all necessary permits and submit them to the Authority prior to commencing work.

PART 2 — PRODUCTS

2.01 Casing Pipe

A. Carrier Pipes of 2" or Smaller
   1. Design and Material Requirements
      a. Material: Extra High Molecular weight, high density polyethylene (PE 3408), ASTM D 3350
      b. Pipe: ASTM F 714 and ASTM D 3261
      c. Diameter: Minimum, twice the diameter of the carrier pipe, unless shown on drawings.
      d. Length: As shown on the Drawings
      e. Joint: Butt fusion, ASTM D 2657
      f. Wall Thickness: DR-17

B. Carrier Pipes Larger than 2"
   1. Design and Material Requirements

a. Material: Arc welded steel pipe, ASTM A 139, Grade B or better
b. Diameter: As shown on the Drawings
c. Length: As shown on the Drawings
d. Minimum Yield Strength: 35,000 psi
e. Wall Thickness: Comply with the following.

Outside Diameter (inches)	Minimum Wall Thickness (inches)	
	Highways	Railroads*
16	0.250	0.281
20	0.250	0.281
24	0.313	0.313
30	0.375	0.469
36	0.438	0.469
42	0.500	0.562
48	0.500	0.625

*Meets A.R.E.A. Specifications for Pipelines for Conveying Nonflammable Substances

2. Protective Coating: Steel casing pipe coating requirements:
   a. Surface Preparation: SSPC-SP 6 Commecial Blast Cleaning
   b. Product and Manufacturer: Provide one of the following:
      (1) Carboline/Kop-Coat:
         (a) Primer: Bitumastic No. 300-M thinned 33% — one coat, 3.0-4.5 dry mils, 200-300 square feet per gallon
         (b) Finish: Bitumastic 30-M — two coats, 8.0-10 dry mils, 90-155 square feet per gallon per coat
      (2) Tnemec:
         (a) Primer: 46-41 thinned 20 percent — one coat, 4.0-6.0 dry mils, 200-300 square feet per gallon
         (b) Finish: 46-41 — two coats, 8.0-10.0 dry mils, 90-120 square feet per gallon
      (3) Or equivalent
3. Total dry mil thickness of coating system shall be 20 mils minimum.

2.02 Casing Spacers

A. Provide carrier pipe spacers according to AWWA specifications for each cased crossing.

B. Materials: Stainless steel unless otherwise ordered by the Engineer.
   1. Shells: 14 gauge min. T304 stainless steel
   2. Risers: 10 gauge min. T304 stainless steel
   3. Fasteners: 5/16" min. T304 stainless steel
   4. Liner: PVC 0.090" thick 85-90 durometer
   5. Runners: Ultra high molecular weight polymer, standard width 1.5"
   6. Side Bolts: 5/16" — 18 T304 stainless steel

C. Size: According to manufacturer's recommendations.

D. Product and Manufacturer: Provide one of the following:
   1. Cascade Waterworks Manufacturing Company

2. Or equivalent

2.03 Casing End Seals

A. Material: Neoprene rubber 0.093" thick

B. End Seal: Cone shape, standard length 20"

C. Both ends of casing and seal shall be fastened with an adjustable stainless steel band.

PART 3 — EXECUTION

3.01 Dry Boring

A. Casing pipe shall be installed by drilling a hole of a size no larger than 1" in diameter around the outside circumference of the casing pipe.

B. All borings shall be made with the auger inside the casing pipe with the cutting edges positioned just ahead of the pipe.

C. Water-bearing sands and mucky soils shall be well-pointed as required prior to commencing the bore.

D. Care shall be exercised at all times to kept he auger properly positioned with respect to the casing pipe and to maintain forward pressure on the casing pipe to quickly run through any pockets of loose soil.

**** END OF SECTION ****

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SECTION 0150
CASTINGS

JACKSON COUNTY UTILITY AUTHORITY
WATER AND SEWER STANDARD SPECIFICATIONS

PART 1 – GENERAL

1.01 General

A. Castings shall be for the following types of construction:
   1. Manholes.
   2. Valve Boxes.

B. Related Work Specified Elsewhere:
   1. Section 0210, Water Valves and Appurtenances.
   2. Section 0310, Manholes and Wetwells.
   3. Section 0340, Sewer Valves and Appurtenances.

1.02 Reference Standards

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
   1. ASTM A 48, Gray Iron Castings.
   2. ASTM D 2146, Propylene Plastic Molding and Extrusion Materials.

1.03 Delivery, Storage and Handling

Castings which are cracked, chipped, distorted or otherwise damaged will not be acceptable.

PART 2 – PRODUCTS

2.01 Materials

A. Product and Manufacturer: Provide manhole frames with covers as manufactured by one of the following:
"Standard" Manholes:
   1. C.L. Dews & Sons Foundry, Model No. DF-25(7) J.S. (Sewer).
   2. Or equal.

B. Manhole Steps:
   1. Type: Grade 60 steel, 2 inch reinforcing rod encapsulated with copolymer polypropylene and equipped with serrated tread and tall end lugs.
   2. Product and Manufacturer: Provide manhole steps as manufactured by one of the following:
      a. M.A. Industries, Model PS1-PF.
      b. Or equal.

C. Design and Fabrication

Fabricate castings true to pattern so that component parts fit together.

A. Identification Markings:
   1. All markings shall be subject to review by the AUTHORITY.
   2. Markings for manholes shall include "JCUA SEWER."
   3. Markings for sewer valve boxes shall include "JCUA SEWER."
   4. Markings for water valve boxes shall include "JCUA WATER."

2.02 Finish

Iron: Coat with asphaltic paint.

PART 3 – EXECUTION

3.01 Installation

A. Follow manufacturer's printed instructions.

B. Set castings accurately to required location, alignment and elevation, plumb, level, true and free of cracks, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork.

**** END OF SECTION ****

SECTION 0160
PIPE INSTALLATION

PART 1 – GENERAL

1.01 Related Work Specified Elsewhere

A. Section 0120, Excavation and Backfill

B. Section 0200, Water Distribution Pipe

C. Section 0300, Centralized Sanitary Sewer Pipe

D. Section 0400, De-Centralized Sanitary Sewer Pipe

1.02 Quality Assurance

A. Requirements of Regulatory Agencies:
   1. Comply with requirements of NFPA Standard No. 24 for "Outside Protection" and the International Fire Code, 2003 or Latest Edition, where applicable to water pipe systems which are used for fire protection.
   2. Comply with applicable requirements of UL and other authorities having jurisdiction.
   3. Comply with the requirements of the Mississippi State Department of Health, Division of Water Supply for separation of water and sewer mains.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. AWWA C111 (ANSI A21.11), Rubber Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings.
   2. AWWA C600, Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.
   3. AWWA M9, Installation of Concrete Pipe.
   4. AWWA M23, PVC Piping.
   5. ASCE MOP No. 37, Design and Construction of Sanitary and Storm Sewers.
   6. Concrete Pipe Handbook, American Concrete Pipe Association.
   7. NFPA No. 24, Outside Protection.
   8. ASTM D-2321, Underground Installation of Flexible Thermoplastic Sewer Pipe.

PART 2 – PRODUCTS

2.01 Materials

A. Pipe materials are specified under each applicable pipe material Specification Section.

B. Pipe Marking:
   1. General:
      a. Each piece of pipe or fitting shall be clearly marked with a designation.

b. Class designation shall be cast or painted on each piece of pipe or fitting four inches in diameter and larger.
c. Piping, smaller than four inch diameter shall be clearly marked by manufacturer as to material, type and rating.

2. Underground Warning Tape:
   a. CONTRACTOR shall place an aluminum core, detectable warning tape approximately 12 to 18 inches below grade in all Plastic Pipe trenches.
   b. Plastic piping warning tape:
      (1) Messages:
         (a) "CAUTION BURIED SEWER LINE BELOW"
         (b) "CAUTION BURIED WATER LINE BELOW"
      (2) Size: 3-inch wide.
      (3) Color: Warning tape color shall conform to APWA Uniform Color Code.
   c. Product and Manufacturer: Provide one of the following;
      (1) Terra Tape Sentry Line by Reef Industries, Inc.
      (2) Or equal.

3. Tracer Wire:
   a. CONTRACTOR shall place a 12 gauge or heavier (smaller AWG number), solid, insulated, copper wire above all plastic pipe.
   b. The wire must be one continuous, unbroken length and is to be coiled at meters, valves, and bored crossings.

PART 3 – EXECUTION

3.01 Installation

A. General:
1. Install piping as shown, specified and as recommended by the manufacturer.
2. Pipe, fittings and accessories that are cracked, damaged or in poor condition or with damaged linings will be rejected.
3. Minimum cover over piping shall be three feet.
4. Earthwork required is in Section 0120 of these specifications.

B. Maintain separation of sanitary piping from water mains in accordance with the following:
1. Sanitary sewer shall be laid at least 10 feet horizontally and 18" vertically from any water lines with water lines always located above sewer lines.
2. All other scenarios shall be approved on a case by case basis.

C. Pipe Bedding and Backfill:
1. Bedding
   a. Material: Select bedding material shall be as called for in Section 0120, Excavation and Backfill.
   b. Trench Classification for Installation: (Installation of bedding to be determined by Engineer based on soil conditions, pipe material, and depth of bury)
      (1) Class "D" Bedding: The pipe shall be bedded in compacted select bedding placed on a flat trench bottom. The select bedding shall have a minimum thickness of four inches under the barrel and extend to six inches above the pipe.
      (2) Class "C" Bedding: The pipe shall be bedded in compacted select bedding placed on a flat trench bottom. The granular

bedding shall have a minimum thickness of four inches under the barrel and shall extend to three inches above the springline on cut depths up to 14 feet deep and shall extend to six inches above the top of pipe in cut depth greater than 14 feet.

(3) Class "B" Bedding: The pipe shall be bedded in compacted select bedding placed on a flat trench bottom. The granular bedding shall have a minimum thickness of four inches under the barrel and shall extend to the spring line of the pipe.

(4) Class "A: Bedding: The pipe shall be bedded in compacted select bedding placed on a flat trench bottom. The granular bedding shall have a minimum thickness of four inches under the barrel.

(5) Or other installations as recommended by pipe manufacturer or designed by the engineer and approved by the Authority depending on soil conditions, depth of bury, and materials.

2. Backfill:
   a. Materials for backfilling pipe trenches shall be as specified in Section 0120.
   b. Initial Backfill shall be installed by hand and compacted in accordance with these specifications and shall extend to six inches above the top of the pipe.
   c. Trench Backfill shall be select or general backfill depending on location of the trench.
   d. Installation: Promptly after the pipe is laid, all trenches and excavation shall be backfilled and compacted until it covers the pipe at least one foot. This backfill shall be brought up and tamped equally and thoroughly along each side of the pipe in such a manner as to avoid displacement of or damage to the pipe. The select bedding material shall be thoroughly compacted to a density at least equal to 95 percent of the maximum density determined by the Standard Proctor in accordance with ASTM D 698 Method C including Note 2, if applicable.
4. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.
5. Concrete Encasement: Comply with applicable provisions of Section 0130. Concrete Encasement shall be installed when piping is installed below creeks or other major drainage ways or as required by the Authority on a case by case basis.

D. Laying Pipe:
1. Comply with manufacturer's instructions and with AWWA C600, AWWA M9, AWWA M23 and ASTM 2321 where applicable.
2. Install all pipe accurately to line and grade shown. Remove and relay pipes that are not laid correctly.
3. Slope piping uniformly between elevations given.
4. Ensure that water level in trench is at least six inches below bottom of pipe. Do not lay pipe in water. Maintain dry trench until jointing and backfilling are complete.
5. Place bell and spigot pipe so that bells face the direction of laying.
6. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.
7. Permissible deflections at joints shall not exceed 75 percent of the amount allowed by manufacturer.

8. Take every precaution to ensure that no foreign material enters the piping prior to and during installation.
9. All pipe and fittings shall be carefully examined for cracks, damage or other defects while suspended above the trench before installation. Defective materials shall be immediately removed from site.
10. Interior of all pipe and fittings shall be inspected and all dirt, gravel, sand, debris or other foreign materials shall be completely removed from pipe interior before it is moved into the trench.
11. Bell and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is laid.
12. Every time that pipe laying is not actively in progress the open ends of pipe shall be closed by a watertight plug.
13. Field cutting pipe, where required, shall be made with a machine specially designed for cutting piping. Cuts shall be carefully done, without damage to pipe or lining, so as to leave a smooth end at right angles to the axis of pipe. Cut ends shall be tapered and sharp edges filed off smooth. Flame cutting will not be allowed.
14. Blocking under piping shall be permitted only for special conditions. Comply with requirements of AWWA C600 where permitted.
15. Touch up protective coatings in a satisfactory manner prior to backfilling.
16. CONTRACTOR shall notify the AUTHORITY in advance of any backfilling operation.

E. Jointing Pipe:
1. General:
   a. Clean completely all jointing surfaces and adjacent areas immediately before making joint.
   b. Lubricate and adjust gaskets and "O" rings as recommended by manufacturer.
   c. After "O"-rings are compressed and before pipe is brought fully home, each gasket shall be carefully checked for proper position around full circumference of the joint. Conform to AWWA C111 and to manufacturers' recommendations pertaining to jointing pipe.
2. Push-on Joints: Comply with AWWA C111 and to manufacturers' recommendations pertaining to jointing pipe.
3. Mechanical Joints:
   a. The plain end of pipe shall be centered and pushed into the bell and the gasket shall be firmly pressed evenly into the bell. The gland shall be slid to the bell for bolting. All bolts with oiled threads shall be alternately torque tightened 180 degrees opposite to each other to seat the gasket evenly. The maximum torque shall be as follows:

Bolt Size (Inches)	Applied Torque (ft-lbs)
5/8	50
¾	80
1	90
1 ¼	110

   b. All bolts and nuts shall be heavily coated with an approved bituminous coating.

(1) Flanged Joints:
(2) Use hexagon head nuts and bolts on all flanged joints. Bolts shall project not more than 1/4-inch from nor fall short of the end of the nut.
(3) Use 1/8-inch rubber full-faced gaskets unless otherwise approved by AUTHORITY. Gaskets shall be suitable for service intended in accordance with manufacturers' ratings and instructions.
(4) Clean and lubricate bolt threads and gasket faces.

4. Butt Fusion: Follow manufacturer's instructions for fusion procedures.

F. Restraints, Supports and Thrust Blocks:
1. Install restrained joints as shown, specified, required, and as recommended by manufacturer.
2. Provide concrete and steel, collars, thrust blocks and cradles as shown or otherwise approved by AUTHORITY.

G. Transitions from One Type of Pipe to Another:
1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or when connecting pipe made by different manufacturers.
2. Encase all such connecting joints with six inches minimum of 3000 psi concrete unless otherwise shown, specified or recommended by manufacturer.

H. Closures:
1. Provide all closure pieces shown or required to complete the Work.
2. Locate closures in straight runs of pipe.

I. Backfilling:
1. Conform to applicable requirements of the Division 2 Specifications.
2. Backfill by hand and use pneumatic tamping until pipe is covered by at least one foot of fill.

J. Plastic Piping: Supplementary Requirements.
1. Conform to Paragraph 3.01.B above unless otherwise specified below.
2. Follow manufacturer recommendations for jointing and ASTM D-2321 for installation.
3. Backfill with materials free of rocks or other sharp objects from an elevation a minimum of six inches from pipe top surface to surface of ground.
4. Conform to requirements of ASTM D 2774.

3.02 Work Affecting Existing Piping

A. Location of Existing Piping:
1. CONTRACTOR is responsible for determining exact location of existing piping to which he must make connections, or which he may disturb during earth moving operations, or which may be affected by his work in anyway.
2. Conform to applicable requirements of Section 0100, Cutting and Patching.

B. Work on Existing Pipelines:
1. Install temporary plugs to keep out all mud, dirt, water and debris.
2. Provide all necessary adapters, fittings, pipe and appurtenances required.

3.03 Testing of Piping

A. General:
   1. Test all piping as specified in each pipe specification section below.
   2. Notify AUTHORITY in advance of testing.
   3. Provide all testing apparatus, including pumps, hoses, gauges, and fittings.
   4. Pressure pipelines shall hold the specified test pressure for a period of two hours.
   5. Pipelines which fail to hold specified test pressure or which exceed the allowable leakage rate shall be repaired and retested.
   6. Unless otherwise approved, conduct all tests in the presence of the AUTHORITY.

B. Deflection Testing:
   1. Gravity sewer pipe will be tested for excessive deflection after installation.
   2. A "go, no-go" mandrel that is sized such that it will not pass a deflection greater than 5% shall be used.
   3. The mandrel shall be drawn through the pipe by hand. Irregularities or obstructions encountered in the line shall be corrected by the Contractor.
   4. If a section of pipe with excessive deflection is found, the Contractor shall uncover the pipe for inspection. Damaged pipe will be replaced. If the pipe is undamaged, the Contractor may reinstall the bedding and backfill and retest the pipe.
   5. Mandrel test shall also be completed on gravity sewer pipe 1 month prior to end of warranty period.

C. Gravity Interceptor Air Testing Procedure:
   1. Air testing shall be conducted for the completed gravity interceptor sewer after backfilling. The line to be tested shall be tested between adjacent manholes. The line shall be sealed at both ends, with the seal at one end equipped with an orifice through which to pass air into the pipe.
   2. The air supply line shall contain an on-off gas valve and a pressure gauge having a range of 0 to 15 psi. The gauge shall have divisions of 0.10 psi and shall have an accuracy of 0.04 $\pm$ psi.
   3. Pressurizing equipment should include a regulator or relief valve to avoid over pressuring and damaging the line being tested.
   4. Pressurize the pipe line being tested to a pressure of 4 psig. The line shall be permitted to stabilize between 4 psig and 3.5 psig for a period of no less than 5 minutes.
   5. After the stabilization period, the air supply valve should be closed. When the line pressure drops to 3.5 psig, commence timing with a stop watch. The stop watch shall be allowed to run until such time as the line pressure drops to 2.5 psig.
   6. The stop watch should be stopped and the measured time lapse compared with the allowable time lapse in the table below:

Time in Min:Sec Required for Pressure
To Drop to 2.5 PSIG
(Based on 0.003 CFM per Square Foot and 2.0 CFM)

Length of Test Section (ft)	Pipe Diameter (inches)						
	6	8	10	12	15	18	21
100	5:40	7:34	9:26	11:20	14:10	17:00	19:50
150	5:40	7:34	9:26	11:20	14:10	19:13	26:10
200	5:40	7:34	9:26	11:24	17:48	25:38	34:54
250	5:40	7:34	9:53	14:15	22:15	32:03	43:37
300	5:40	7:36	11:52	17:05	26:42	38:27	52:21
350	5:40	8:52	13:51	19:56	31:09	44:52	61:00
400	5:42	10:08	15:49	22:47	35:36	51:16	69:48
450	6:24	11:24	17:48	25:38	40:04	57:41	78:31

7. If the measured time lapse is greater than that specified in the above table, the section undergoing testing shall have passed, and the test may be discontinued at that time.
8. If the measured time lapse is less than that specified in the above table, the section undergoing testing has not passed the test and the CONTRACTOR shall be required to find the leaks, repair them and retest until the section passes. These repeated tests shall be performed at the CONTRACTOR's expense.
9. The CONTRACTOR is advised to exercise extreme caution when conducting air tests to avoid injury or damage to personnel, equipment or installed pipe and appurtenances.

D. Pressure Pipe Test Procedure:
1. Backfill and compaction shall be completed at least to the pipe centerline or as required to prevent movement while under test pressure before testing. Backfill and compact around all blocking before testing and as required to assure restraint by harnessed joints.
2. Allow concrete for blocking to reach design strength before testing.
3. Fill section to be tested slowly with water and expel all air. Install corporation cocks, if necessary, to remove all air.
4. Maintain test pressure constantly for a two-hour period and accurately measure the amount of water which must be added to maintain the test pressure. Test pressure shall be no less than 1.50 times the normal operating pressure of the system, pressure shall not exceed the design pressure for the pipe and the system appurtenances.
5. Test pressures required are at the lowest elevation of the pipeline section being tested unless otherwise specified.
6. Allowable leakage rate is 0.10 gallons per hour per 1,000 feet per inch diameter.

3.04 Cleaning

All piping shall be thoroughly cleaned and flushed prior to placing in service. Piping 24 inches diameter and larger shall be inspected from inside and all debris, dirt and foreign matter removed.

3.05 Disinfection of Potable Water Lines

A. Disinfect all water mains and water services. Flush piping prior to disinfection with water at a minimum velocity of 2-1/2 feet per second.

B. Conform to procedures described in AWWA C651.

C. Water for flushing, testing and chlorination shall be furnished and paid for by the CONTRACTOR. Chlorine will be supplied by CONTRACTOR.

D. Bacteriologic tests will be sampled by the certified water plant operator for the system and shall be analyzed by the Mississippi Department of Health or at a laboratory approved by the Mississippi Department of Health.

E. Chlorine concentration in the water entering the piping shall be between 50 and 100 parts per million, such that a minimum residual concentration of 25 mg/l will be left after a 24-hour retention period. The operation shall be repeated as necessary to provide complete disinfection.

F. Complete disinfection shall be defined as less than one coliform bacteria per 100 ml for samples taken on two consecutive days.

****END OF SECTION****

PART 1 – GENERAL

1.01 Record Documents

A. The Contractor shall submit two (2) complete sets of record documents for the project at the completion of the project.

B. The Contractor shall label each document "PROJECT RECORD" with rubber stamp in red ink.

C. The Contractor shall record information concurrently with construction progress and shall not conceal any work until required information is recorded.

D. The Contractor shall submit proof of a Mississippi State License for installation of such improvements.

E. The Contractor shall legibly mark drawings, in red ink, to record actual construction:
1. Elevations of various structure elements in relation to elevation datum. All underground piping with elevations and dimensions, changes to piping location, horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements, actual installed pipe material, class, etc.
2. Location of internal utilities and appurtenances concealed in the construction by referencing to visible and accessible features of the structure
3. Field changes of dimension and detail
4. Details not on original design drawings
5. Equipment and piping relocations

1.02 Operations and Maintenance Data

A. General
1. Compile and submit product data and related information appropriate for Authority's maintenance and operation of equipment furnished under Project, unless instructed otherwise by the Authority. Contractor shall coordinate as to ensure that Authority receives all necessary data.
2. Instruct Authority's personnel in maintenance of products and in operation of equipment and systems, when requested by the Authority.
3. Data shall be compiled and submitted in 3-ring binder on 8½"x11" paper. Data shall be manufacturer's published information or neatly typed. Binder shall be labeled on the cover with the name of the Project and titled "OPERATIONS AND MAINTENANCE MANUAL."

B. Content for Mechanical Equipment or where appropriate:
1. A complete neatly typewritten table of contents listing documents in all volumes shall be included and arranged in systematic order.

a. Contractor, name of responsible principal, address and telephone number.
b. A list of each product required to be included, indexed to content of the volume.
c. List, with each product, name, address and telephone number of:
(1) Subcontractor or installer
(2) Maintenance contractor, as appropriate
(3) Identify area of responsibility of each
(4) Local source of supply for parts and replacement

2. Identify each product by product name and other identifying symbols as set forth in Project's Documents.
3. Written text, as required to supplement product data for the particular installation:
a. Organize in consistent format under separate headings for different procedures.
b. Provide logical sequence of instructions of each procedure.
4. Copy of each warrant, bond and service contract issued and provide information sheet for Authority's personnel, giving proper procedures in the event of failure and instances which might affect the validity of warranties or bonds.
5. Provide for each unit of equipment and system, as appropriate:
a. Description of unit and component parts.
(1) Function, normal operating characteristics, and limiting conditions
(2) Performance curves, engineering data and tests
(3) Complete nomenclature number of replaceable parts including standard or manufacturer's part
b. Operating procedures:
(1) Start-up, break-in, routine and normal operating instructions
(2) Regulation, control, stopping, shutdown, and emergency instructions
(3) Summer and winter operating instructions
(4) Special operating instructions
c. Maintenance Procedures:
(1) Routine operations
(2) Guide to "troubleshooting"
(3) Disassembly, repair, and reassembly
(4) Alignment, adjusting, and checking
d. Servicing and lubrication schedule including a list of lubricants required
e. Manufacturer's printed operating and maintenance instructions
f. Description of sequence of operation by control manufacturer
g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance including the following:
(1) Predicted life of parts subject to wear
(2) Items recommended to be stocked as spare parts
h. As-installed control diagrams by controls manufacturer
i. Charts of valve tag numbers, with location and function of each valve
j. Cataloged list of manufacturer's spare parts supplied with the equipment or system, manufacturer's current prices, and recommended quantities to be maintained in storage
k. Other data as required under pertinent sections of Specifications

C. Content, for each electric and electronic system, as appropriate:
1. Description of system and component parts.

a. Function, normal operating characteristics, and limiting conditions
b. Performance curves, engineering data and tests
c. Complete nomenclature including standard or manufacturer's part number of replaceable parts

2. Circuit directories of panelboards
   a. Electrical service
   b. Controls
   c. Communications
3. As-installed color coded wiring diagrams
4. Operating procedures:
   a. Routine and normal operating instructions
   b. Sequences required
   c. Special operating instructions
5. Maintenance procedures:
   a. Routine operations including recalibration procedures.
   b. Guide to "troubleshooting"
   c. Disassembly, repair, and reassembly
   d. Adjustment and checking
6. Manufacturer's printed operating and maintenance instructions
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage
8. Other data as required under pertinent section of specifications

1.03 Design and Submittal Requirements

A. Submittals

1. Mississippi Department of Health approval for design of potable water system prior to review by Authority.
2. Mississippi Department of Environmental Quality approval for design of sanitary sewer collection systems prior to review by Authority.
3. Design documents, including drawings and specifications, sealed by an Engineer registered in the State of Mississippi for review by Authority prior to installation.
4. Operations and maintenance data shall be provided to the Authority at the completion of the project for all specialty equipment or as requested by the Authority.
5. Test reports shall be provided to the Authority for review upon completion of installation of water distribution system and sanitary sewer collection system prior to acceptance and connection to the Authority's existing distribution and collection system.
6. Casing Pipe shall be installed when required by the Authority and under all County, State, and Federal maintained roadways. Casing Pipe shall be installed by Jacking and Boring unless open cutting of existing roadway is permitted by governing authorities. Written documentation from governing authorities shall be submitted to the Authority prior to installation.
7. Submit pressure sewer system design information for review, stating methods used for determining flow for sizing force mains and proposed flow through each section. Description of method and proposed system design flows shall be stated on design plans.

B. Water Distribution System Design

1. Domestic water systems shall be designed to provide additional capability that might be necessary to provide domestic water to areas located beyond or away from elements of the existing distribution system as defined by the Authority.