SECTION 801
EXCAVATION, BACKFILLING, AND COMPACTION
FOR SANITARY SEWERS AND RELATED STRUCTURES

801-1 DESCRIPTION: This Work shall include, but not necessarily be limited to, excavation and trenching operations to install pipe, manholes, pump stations, and other structures and all related work such as shoring, bracing, water handling, and miscellaneous clearing and grubbing; filling and grading under and around sanitary sewer structures; and all backfilling, compaction, grading, import of backfill material, disposal of surplus and unsuitable materials.

801-2 GENERAL:

a. All work shall be performed in compliance with L.R.S. 40:1749.11-22, "Louisiana Underground Utilities and Facilities Damage Prevention Law", OSHA regulations and applicable codes, ordinances, and standards of governing authorities having jurisdiction.

b. Open excavations, including incomplete manholes and pump stations, shall be barricaded and posted with operating warning lights in accordance with Federal, State and local requirements.

c. Public and private structures, utilities, driveways, sidewalks, pavements, and other facilities shall be protected from damage caused by settlement, lateral movement, undermining washout, construction activities, and other hazards created by these operations. All settlement or other damage caused by the Contractor's operations shall be repaired within 7 days, or the facilities shall be replaced, at the Contractor's sole expense and at the discretion and direction of the Engineer. This includes the warranty period as well.

801-3 MATERIALS:

a. **Definitions:**

1. **Sanitary Sewer Bedding/Backfill Materials:** Bedding and initial backfill material shall be a sand-aggregate mixture. The aggregate shall be free of angular stones that could score, crack, or puncture the pipe. The sand-aggregate mixture shall meet the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	95-100
No. 4	30-50
No. 10	20-45
No. 200	0-10

2. **Usable Excavated Soils:** Usable excavated soils shall have a maximum PI of 25 and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less will not be allowed. Soil shall be tested at Owner's option by the Owner's testing lab. Usable excavated material may be neatly stockpiled at the site where designated by the Engineer provided there is an area available that will not interfere with the Owner's access nor inconvenience traffic or adjoining property owners.

3. **#610 Stone Backfill:** The 610 Stone shall be one hundred percent quarried material. The stone shall pass the ASTM soundness test and abrasion test. Soundness loss shall not exceed fifteen percent when subjected to five cycles of

the magnesium sulfate soundness test in accordance with AASHTO 104. The stone shall show an abrasion loss of not more than forty percent when tested in accordance with AASHTO 96. The 610 Stone backfill shall meet the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
3/4 inch	70-100
No. 4	35-65
No. 40	12-32
No. 200	5-12

4. **#57 Stone Backfill:** The stone shall be one hundred percent quarried material. The stone shall pass the ASTM soundness test and abrasion test. Soundness loss shall not exceed fifteen percent when subjected to five cycles of the magnesium sulfate soundness test in accordance with AASHTO 104. The stone shall show an abrasion loss of not more than forty percent when tested in accordance with AASHTO 96. The 57 Stone backfill shall meet the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5
No. 200	0-1

5. **Imported Clay Fill:** Where shown on the Drawings or as directed by the Engineer, clay shall be imported from a borrow site approved by the Engineer. Soils meeting the Unified Soil Classification CL and free of organic material are acceptable clay fill. The clay material shall have the following properties:

   i. Maximum Liquid Limit of 50
   ii. Maximum Plasticity Index of 30
   iii. Organic content less than 5%.

6. **Geotextile Fabric:** The geotextile fabric shall consist of a nonwoven geotextile fabric Class B, C, or D, as contained in the latest edition of the LADOTD QPL.

7. **Controlled Low-Strength Material (CLSM)**: CLSM shall consist of Type I Portland Cement, Class C or F Fly Ash, sand, and water in the following proportion per cubic yard:

i. Portland Cement	50 pounds
ii. Fly Ash – Class C or F	125 pounds
iii. Sand	2900 pounds
iv. Water	50 to 65 gallons

   Mixing and hauling equipment shall conform to Section 1005.

8. **Select Imported Material**: Selected soils are natural soils with a maximum PI of 20, maximum Liquid Limit of 35, and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less will not be allowed. Any select material used to supplement or replace unusable excavated soil shall meet these requirements and must be approved by the Engineer.

9. **Granular Material:** Granular material shall be non-plastic and siliceous material, and shall comply with the following gradation:

Sieve Size	Percent Passing
1/2 inch	100
No. 10	75-100
No. 200	0-10

b. **General:** The Contractor shall notify the Engineer of the source of each material. At the request of the Engineer, the Contractor shall furnish for testing and approval a representative sample of each material weighing approximately fifty (50) pounds, at least ten (10) calendar days prior to the date of anticipated use of such material.

Select materials shall be furnished as required from approved off-site sources and hauled to the site. Disposal of unsuitable material is specified in Section 801-7.

c. **Structural Fill:** Structural fill shall be used below spread footing foundations, slab-on-grade floors, and other portions of structures. Structural fill material shall be as defined on the drawings. If not defined elsewhere in the Contract Documents acceptable structural fill materials are non-expansive clay with a Plasticity Index between 10 and 25, a maximum Liquid Limit of 45, less than 5% organics, and free of degradable material or debris. Well-graded crushed stone aggregate such as an ASTM D1241 gradation C stone may also be acceptable.

Any structural fill material encountered during the excavation may be stored in segregated stockpiles for reuse. All material that, in the opinion of the Engineer, is not suitable for reuse shall be handled as specified herein for disposal of unsuitable materials.

d. **Trench Backfill:** Backfill methods for trenches, as shown on the Contract Documents, are classified into three zones, bedding, initial backfill, and secondary backfill. Bedding and initial backfill material shall be the sand-aggregate mixture as described in Section 801-3.a.1. Secondary backfill material shall be as follows:

In locations where any part of the trench pay limit (as defined on the Contract Documents) falls under existing asphaltic or PCC roadways and/or existing parking lots, the secondary backfill shall be:

1. #610 Stone material in dry trenches,
2. #57 Stone in wet trenches or in wet trench bottoms,
3. #610 Stone material above the groundwater line in wet trenches,
4. CLSM when shown on the Contract Documents or as directed by the Engineer.

In locations where any part of the trench pay limit (as defined on the Contract Documents) falls within 10 feet of an existing major structure foundation, the edge of an existing road/shoulder/back of curb, or under the limits of a future asphaltic or PCC roadway/parking lot to be constructed subsequent to sanitary sewer installation; the secondary backfill shall be the sand-aggregate mixture as described in Section 801-3.a.1. In these situations the sand-aggregate material shall be placed and compacted to within 3.5 feet of the surrounding grade, and usable excavated soils or select imported fill shall be placed and compacted for the remainder of the backfill to surrounding or specified grade.

e. In areas outside those described above, secondary backfill material shall consist of

usable excavated soils supplemented by select imported fill or the materials listed above to replace unsuitable excavated soil.**Manhole and Pump Station Bedding and Backfill:** Bedding material used below base foundations of manhole and pump station structures shall be #57 stone material, encapsulated in geotextile fabric. The material shall be placed in maximum 12 inch lifts with each lift rodded and vibrated to orient the stone and eliminate voids to create uniform bedding support for the pipe.

The manhole and pump station structures shall be backfilled with granular material or as specified on the Plans. In the case of manholes within existing or planned roadways alignments, the granular material shall be placed and compacted to within 2 feet of the surrounding grade, and #610 stone shall be placed and compacted for the remainder of the backfill to surrounding or specified grade. In the case of manholes located in unimproved surface areas, the granular material shall be placed and compacted to within 2 feet of the surrounding grade, and useable excavated soil shall be placed and compacted for the remainder of the backfill to surrounding or specified grade.

f. **Geotextile Fabric:** In trenches requiring the use of #57 Stone, this material shall be encapsulated in geotextile fabric. Geotextile fabric shall be class B, C, or D.

g. **Controlled Low-Strength Material (CLSM):** CLSM shall be used to backfill trenches where shown on the Drawings or as directed by the Engineer.

801-4 PRE-INSTALLATION INSPECTION PROCEDURE: Prior to the start of any pipe laying activities, the Contractor shall perform proposed pipe installation procedures for inspection purposes at the location shown on the Drawings or as determined by the Engineer. Contractor shall submit all relevant submittals, and have received approval from Engineer prior to scheduling of pre-installation inspection procedure. The purpose of this inspection is to demonstrate how the trench will be excavated, the bedding will be placed, and the initial and secondary backfill placed and compacted. In addition, at the time of the final surface restoration for paved areas, a mock-up pavement restoration sample will be performed. At least one mock-up will be performed for each type of pavement restoration (asphalt and PCC) required on the Project. This mock-up will demonstrate how the pavement will be restored in accordance with the Contract Documents and serve as the standard required for all remaining pavement restoration for the Project.

a. At a minimum, the following pre-installation inspections are required:

   1. Linear pipeline projects – Contractor shall lay first 200 linear feet of pipe.

   2. Rehabilitation projects – Contractor shall perform first 4 point repairs (2 under pavement and 2 outside of pavement). Also first 200 linear feet of removal and replacement of pipe.

b. The pre-installation inspection procedure shall be as follows:

   1. Contractor shall schedule timing of the pre-installation inspection with the Engineer and provide a minimum 72 hour notice prior to inspection.

   2. Contractor shall layout pavement removal limits in agreement with the Engineer and perform pavement removal as specified.

   3. Contractor shall excavate trench as specified.

   4. Pipe bedding shall be placed and compacted in bottom of trench as specified.

   5. Pipe sections shall be placed on pipe bedding in trench as specified.

6. Initial and secondary backfill shall be placed and compacted as specified. The in-place density shall be measured after each lift of initial and secondary backfill as specified. Additional lifts of initial and secondary backfill shall not be placed until the previous lift has met the specified density. If tests on a lift of backfill show that the specified density is not obtained, the Contractor shall increase the amount of coverages, decrease the lift thicknesses or obtain a different type of compactor until the specified densities are obtained.

7. The Contractor shall demonstrate to the Engineer precautions taken to maintain the compaction of the backfill when moving the trench box.

8. Pipe deflection shall be measured 48 hours after the completion of backfilling. The maximum deflection shall be as specified. If the pipe deflection exceeds the specified deflection, the installation shall be judged to not meet this Section and the Contractor shall repeat the pre-installation inspection procedure.

9. After concurrence of the procedures, the Contractor may continue work. The Contractor shall use the pipe pre-installation procedure, which no exception was taken by the Engineer, for the installation of the pipeline. If during the course of work, it is determined that the established procedure is not producing the specified results, the Contractor shall repeat the pre-installation inspection procedure to determine a new installation procedure which will produce the desired results and is acceptable to the Engineer. The Contractor shall repeat as many times as necessary, the pre-installation inspection procedure at no cost to the Owner.

10. The Contractor shall submit in writing to the Engineer, the established procedure in such detail that it can be followed and repeated consistently by any personnel change that may occur throughout the project. Any change to the established procedure, including but not limited to means, methods, or equipment shall require another successful pre-installation inspection procedure and revised detailed procedure write-up before additional pipe installation.

c. Contractor shall schedule timing of the pavement restoration mock-up with the Engineer and provide a minimum 72 hour notice prior to mock-up. Contractor shall remove temporary surfacing and base, install and finish permanent pavement restoration as specified. After concurrence of the procedures and final pavement restoration product, the Contractor may continue pavement restoration work. This mock-up pavement restoration will serve as the established standard for all remaining pavement restoration for the Project.

801-5 PLACEMENT OF FILL:

a. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

b. Material placed in fill areas shall be deposited within the lines and to the grades shown on the Contract Documents or as directed by the Engineer, making due allowance for settlement/shrinkage of the material. Fill shall be placed only on properly prepared surfaces that have been inspected and approved by the Engineer. If sufficient fill material is not available from excavation on site, the Contractor shall provide select material as may be required.

c. Fill shall be brought up in substantially level loose lifts of maximum of eight (8) inches in depth and compacted throughout the site, starting in the deepest portion of the fill. During the process of dumping and spreading, all roots, debris, and other objectionable material shall be removed from the fill areas. The entire surface of the Work shall be

maintained free from ruts and in such condition that construction equipment can readily travel over any section. All fill materials shall be placed and compacted "in-the-dry."

d. Where trench backfill and compaction work is following pipe laying or where the entire area of the backfilling cannot be completed with full area lifts, the trench backfill will be benched.

    1. Benches shall be a maximum of three lifts tall.

    2. Benches shall be separated by a minimum 8 foot horizontal distance.

e. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.

f. Fill shall not be placed against concrete structures until they have been in place a minimum of fourteen (14) days or have been shown to reach a minimum of 75% of their design compressive strength.

801-6 EXCAVATION: Excavation consists of removal and handling of material encountered when establishing required grade elevations in accordance with the Contract Documents.

a. **Trench Excavation:** Excavation of trenches required for the installation of pipes and ducts shall be made to the depths required to accommodate placement of bedding material as shown in the Contract Documents. Widths shown on the Contract Documents are the established pay limits and may be adjusted to provide appropriate room for bracing, supporting, and dewatering facilities if necessary with prior approval of the Engineer. Excavation outside the established pay limits shall be at no additional cost to the Owner.

b. **Additional Excavation:** When excavation has reached required subgrade elevations, notify the Engineer or his representative who will make an inspection of conditions. If unsuitable, unsatisfactory bearing materials are encountered at the required subgrade elevation, carry excavation deeper and replace the additional excavated material with #57 Stone wrapped in geotextile fabric or CLSM as directed by the Engineer. Sand-aggregate bedding shall then be placed and compacted over the #57 Stone separated by the geotextile fabric or placed and compacted over the CLSM.

    Removal of unsuitable material and its replacement as directed beyond the authorized limits will be paid on the basis of the Contract Documents and in accordance with Section 10.

c. **Excavation for Pipelines, Manholes, Pump Stations and Structures:** Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection, or as shown on the Contract Documents.

    Care shall be taken not to disturb the bottom of excavation. Trim bottoms to required lines and grades to leave solid base to receive required bedding material. The pipe or duct shall be evenly supported on the bedding material. Bell holes shall be made as required.

    The bottom of the excavations shall be firm and dry. Sides of excavations are to be maintained in a safe condition until the completion of backfilling.

801-6.1 Shoring and Bracing in Excavations:

a. The Contractor shall be fully responsible for designing, constructing, and maintaining cofferdams consisting of shoring and bracing, as required, to support the sides of excavations to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction, and to protect adjacent structures, existing utilities, and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the shoring, but if voids are formed they shall be immediately filled with suitable material (either useable excavated soils or selected imported material if approved by Engineer), compacted by hand or mechanical means to condition judged visually comparable to condition of adjoining native soil.

b. As part of the submittal of schedules and other data indicating the plan of Work, the Contractor shall provide drawings of the planned supporting system (including the sequence of installation and removal). This submittal is not for review by the Engineer but for informational purposes only. The Engineer shall use the schedule in tracking the progress of the Work. The drawings shall be stamped by a Professional Engineer licensed in the State of Louisiana and be of sufficient detail to adequately disclose the method of operation that the Contractor plans to use for each of the various stages of construction. The Work shall not begin until such drawings are reviewed and any questions posed by the Engineer have been adequately addressed by the Contractor.

c. Wooden trench shoring for pipes is not to be withdrawn when driven below mid-diameter of any pipe, and no wood shoring shall be cut off at a level lower than two (2) feet above the top of any pipe or no more than two (2) feet below natural ground, unless otherwise directed by the Engineer.

d. All steel trench shoring and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, existing utilities, existing piping, or personnel and property. Care shall be taken not to disturb or otherwise injure any finished facility. All voids left or caused by withdrawal of shoring shall be immediately refilled with **Sanitary Sewer Bedding/Backfill Materials as defined herein** and rammed/compacted with tools especially adapted for that purpose, by hydraulic compaction, or as otherwise directed.

e. The right of the Engineer to order shoring and bracing left in place shall not be construed as creating any obligation on the Engineer's part to issue such orders. In addition, the Engineer's failure to exercise this right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or on the Work occasioned by negligence or other cause, growing out of a failure on the part of the Contractor to leave in place sufficient shoring and bracing to prevent any caving or moving of the ground.

f. The Contractor may construct the cofferdams and shoring outside the neat lines of the foundation for pipes and manholes, unless indicated otherwise, to the extent deemed desirable for the planned method of operation so long as it does not encroach on areas outside the limits of the Work. Shoring shall be plumb and securely braced and tied in position. Shoring, bracing, and cofferdams shall be adequate to withstand all pressures to which the existing or new structure or excavation will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a safe manner and shall avoid disturbing any completed construction. The Contractor shall provide the necessary clearances and dimensions to correct any movement or bulging that may occur.

g. The Contractor shall maintain shoring and bracing in excavations regardless of time

period excavations will be open, and shall carry down shoring and bracing as excavation progresses.

h. As an alternate to shoring, the Contractor is authorized to utilize an OSHA approved mechanical trench box or slide-rail system, the size and construction of which shall be designed for the intended depth/loads. Documentation of the trench box or slide-rail system shall be submitted to the Engineer for informational purposes only.

801-6.2 Dewatering, Drainage and Flotation:

a. The Contractor shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems necessary for handling groundwater and surface water encountered during construction of structures, pipelines, and compacted fills. The Contractor is responsible for providing temporary power for any pumping operation that may be required.

b. The Contractor is responsible for complying with the requirements and obtaining necessary permits of all agencies having jurisdiction and control over use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, the Contractor is required to take early action to pursue and submit for the required approvals so that construction is not delayed beyond that represented to the Engineer.

c. Prior to excavation, the Contractor shall submit detailed drawings and design calculations descriptive of the proposed means and method of dewatering and maintaining dry conditions to the Engineer. This submittal shall be prepared and sealed by a professional engineer licensed in the State of LA. The Contractor shall be responsible for the satisfactory performance of the system and for correcting any disturbance of natural bearing of soils or damage to structures caused by the dewatering system or by interruption of the continuous operation of the system as specified.

d. The Contractor shall construct and place all pipelines, concrete work, structural fill, bedding, and base course in-the-dry (no standing water in the trench). In addition, the Contractor shall make the final twenty-four (24) inches of excavation for this work in-the-dry, and not until the groundwater level is a minimum of twelve (12) inches below proposed bottom of excavation. The Contractor shall provide means and methods to control the potential for excavation base instability from either excess hydrostatic water pressures or basal heave in the design of their shoring system.

e. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to promptly remove and dispose of all water entering excavations and shall keep such excavations dry to obtain a satisfactory undisturbed subgrade foundation condition. Dewatering shall be required until the fill, structure, or pipes to be built have been completed to the extent that they will not be floated or otherwise damaged by allowing water levels to rise or return to natural elevations.

f. Wellpoints or larger wells may be required, with the approval of the Engineer, for predrainage of the soils prior to final excavation for deeper below-ground structures or piping, and for maintaining the lowered groundwater level. If so, this system shall be designed by a professional engineer licensed in the State of LA. A copy of the subsurface characterization, calculations, layout, and narrative descriptive of operation through removal and/or abandonment shall be submitted for information and comment. After comment has been offered and questions answered, the Contractor may proceed with installation. Wellpointing and larger wells shall be maintained until construction has

been completed to such an extent that the structure, pipeline, or fill will not be floated or otherwise damaged. Wellpoints or larger wells shall be surrounded by suitable filter sand and no fines shall be removed by pumping. The Contractor may be required to demonstrate the adequacy of the proposed system and filter sand by means of a test installation at the direction of the Engineer. Discharge water shall be clear, with no visible soil particles in a one-quart sample.

g. If requested by the Engineer, the Contractor's proposed method of dewatering shall include a minimum of two (2) each 2-inch diameter, Schedule 40 PVC operating groundwater observation wells, with factory slotted screen and appropriate sand pack. The observation wells shall be screened within each stratum to be dewatered at each structure as directed by the Engineer. A bentonite seal and grout shall be provided above the screened depth to the surface. Observation wells are to be used to determine/monitor the water level during construction of the structure. Locations of the observation wells shall be at structures and along pipelines as approved by the Engineer and at no additional cost to the Owner. During backfilling and construction, water levels shall be measured in observation wells at frequencies as directed by the Engineer. Contractor shall be responsible for maintaining and repairing/replacing damaged observation wells during the project. Removal or abandonment of observation wells shall be as directed by the Engineer.

h. While dewatering for new construction in the vicinity of existing structures, depletion of the groundwater level underneath these existing structures may cause settlement of within the site footprint and at some distance beyond the footprint. To avoid this settlement, the groundwater level under these structures shall be maintained by appropriate methods. In conditions where dewatering in excess of 20 gpm for over 24 hours is anticipated, a professional engineer specializing in geotechnical engineering should evaluate the potential for settlements created by dewatering that may be detrimental to existing structures. This evaluation should include an investigation of the specific soil and groundwater conditions to a depth of at least 2 times the depth of the excavation including the permeability and compressibility of the various soil strata (either by direct measurement or by empirical methods), an interpretation of the water table drawdown at the location of any potentially affected structure(s), the duration of the dewatering program, and the resulting amount of settlement that will be created at the structure(s).

801-7 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL: If at the time of excavation it is not possible to place any material in its proper section of the permanent structure, it shall be stockpiled in approved areas for later use. No extras will be considered for the stockpiling or double handling of excavated material. Unsuitable and surplus excavated materials, unless specified otherwise, shall become the property of the Contractor. Contractor shall remove and dispose of unsuitable or surplus material off of the project site at an appropriate disposal site approved by the Engineer. Unsuitable material includes all paving removed for the Work.

801-8 BACKFILLING AROUND STRUCTURES, MANHOLES, PUMP STATIONS AND PIPELINES:

a. All backfill shall be placed in layers having a maximum thickness of eight (8) inches in loose state and shall be compacted as specified in 801-9 of this Section.

b. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength as described previously. Backfilling shall be subject to approval by the Engineer.

c. Backfilling shall be carried up evenly on both sides of the pipeline. Contractor shall take special care to ensure proper support, compaction and elimination of voids under the

haunches of the pipe.

d. In the case of trenches across or along roadways with open ditch drainage refer to subsection 801-11c for backfill and protection of roadside ditch sloped areas.

e. In locations where pipes pass through structure walls, the Contractor shall take the following precautions to consolidate the backfilling up to an elevation of at least one (1) foot above the bottom of the pipes:

    1. Place sand-aggregate bedding and initial backfill in such areas for a distance of not less than three (3) feet either side of the centerline of the pipe in level loose layers not exceeding eight (8) inches in thickness. Compact each layer.

    2. Place and thoroughly compact adjacent layers simultaneously.

f. The final finished surface of filled areas shall be graded to smooth, true lines, strictly conforming to grades indicated on the grading plan, and no soft spots or uncompacted areas will be allowed in the Work.

g. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure, and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling. Contractor shall take precautions as to not disturb the compaction of the backfill when removing the bracing.

g. Controlled Low Strength Material placement will cause hydrostatic uplift pressure on the pipe in cases where bedding and initial backfill material may not be used. Therefore, the Contractor shall anchor the pipe to remain on its intended alignment and grade. Contractor shall submit to the Engineer a pipe anchorage plan for the use of CLSM backfill. The plan shall include at a minimum:

    1. Anchor/ballast material,

    2. Size and weight of each,

    3. Required spacing

    4. Dams to confine the CLSM

    At a minimum the anchorage shall be located at the pipe joints and midpoints. The anchoring/ballasting system shall be designed and stamped by a Professional Engineer licensed in the State of Louisiana. In addition to the anchorage system the CLSM shall be placed in incremental lifts around the pipe. Each lift shall be allowed to attain partial set before placing the next lift. The recommended incremental lifts are as follows:

    1. First lift = 1/4 pipe outer diameter (OD)

    2. Second lift = 1/3 OD

    3. Third lift placed to the pipe crown

    4. Remainder of backfill may be placed in one lift

    Anchoring system is not required when bedding and initial backfill material is used in accordance with Standard Plan 801-01.

801-9 COMPACTION:

a. **General:** Contractor shall control soil compaction during construction and obtain the minimum required percentage of the maximum dry densities as specified herein and as shown on the Contract Documents. **Soil compaction with a backhoe bucket or any other heavy apparatus not designed specifically for soil compaction is not allowed**. The Contractor shall maintain the backfill for a period of one year after Final Acceptance and shall restore any backfill that fails and repair any pavement or other structures, which may be damaged as a result of backfill failure. It shall be the Contractor's responsibility to notify the Engineer in writing that the compaction tests as required can be performed.

The frequency for density tests will be a minimum of one test per lift per 100 linear feet of trench excavation and one randomly selected test per 2,500 square feet of excavation for open areas. If the density tests indicate that the Work does not meet specified density requirements, the Engineer may require additional density tests to determine the extent of the deficient Work at the Contractor's expense. The Contractor will not be allowed an extension of Contract Time as a result of any density testing. The Contractor shall be required to remove, replace and compact deficient Work at no additional cost to the Owner.

It is the Contractor's responsibility to provide equipment and labor as needed to achieve the required compaction as specified herein. Should the rates of compaction fall below the values specified herein; the Engineer has the right to instruct the Contractor to alter his work and/or to provide different equipment to assure that the required backfill quality is consistently achieved. Any decision by the Engineer to forgo such instructions shall in no way relieve the Contractor of his responsibility to provide backfill of the specified quality.

b. **Percentage of Maximum Density Requirements:** Compact subgrade, and fill materials to not less than the following percentages of maximum dry density as determined in accordance with ASTM 698, the Standard Proctor Test.

1. **Structural Fill below Spread Footing Foundations, Slabs-on-Grade, and other Portions of Structures**: Structural fill shall be place in horizontal lifts not exceeding eight-inch (8") loose thickness, or less if necessary to obtain proper compaction. Moisture content shall be within 3% of optimum as determined in accordance with ASTM D698, with stability present. Clay structural fill shall be compacted full depth to a minimum of 95 percent of the maximum dry density. Granular structural fill, with less than 5% passing the No. 200 Sieve shall be compacted full depth to at least 75% of the relative density as determined by ASTM D4253 and D4254.

2. **Manholes, Pump Stations, Structures, and Buildings:** Areas adjacent to structures shall be compacted with vibratory mechanical compaction equipment approved by the Engineer. Compact eight-inch (8") loose lifts to a minimum of 95 percent of the maximum dry density as determined by ASTM D698. Moisture content of backfill material shall be within 3% of optimum as determined in accordance with ASTM D698. Granular backfill, with less than 5% passing the No. 200 Sieve, shall be compacted to at least 75% of the relative density as determined by ASTM D4253 and D4254.

   The #57 stone bedding shall be placed in maximum 12" loose lifts, rodded and vibrated to orient the stone and eliminate voids to create uniform bedding support for the pipe, with the material compacted to 100% of the materials maximum dry rodded weight in accordance with ASTM C29.

3. **Compaction of Bedding and Initial Backfill Material:** Bedding and initial backfill shall be compacted. Compact eight-inch (8") loose lifts to a minimum of 95 percent of the maximum dry density as determined by ASTM D698. Bedding material will be rodded and vibrated to orient the stone and eliminate voids to create uniform bedding support for the pipe. Bedding material will not be compacted until rodding is complete. Moisture content of bedding and initial backfill material shall be within 3% of optimum as determined in accordance with ASTM 698.

4. **Compaction of Backfill Directly Under Existing Pavements:** Secondary backfill directly under existing pavements (roadways and parking lots) shall be #610 Stone material and placed in loose layers of eight (8) inches and compacted. Backfill shall be compacted with vibratory compaction equipment to not less than 95 percent of the maximum dry density as determined by ASTM D698. Moisture content of backfill material shall be within 3% of optimum as determined in accordance with ASTM 698.

5. **Compaction of Backfill Near Existing Structures and Pavements or Directly Under Future Pavements:** Secondary backfill within 10 feet of an existing structure foundation, the edge of an existing road/shoulder/back of curb, and/or directly under the limits of a future asphaltic or PCC roadway/parking lot to be constructed subsequent to sanitary sewer installation shall be bedding and initial backfill (sand-aggregate) material. In this situation the sand aggregate material shall be placed and compacted to within 3.5 feet of the surrounding grade, and usable excavated soils or select imported fill for the remainder of the backfill to surrounding or specified grade. Both materials shall be placed in loose layers of eight (8) inches and compacted. All backfill shall be compacted with vibratory compaction equipment to not less than 95 percent of the maximum dry density as determined by ASTM D698. Moisture content of backfill material shall be within 3% of optimum as determined in accordance with ASTM 698.

6. **Unsuitable Subgrades or Wet Trench Bottoms:** If trench bottoms contain unsuitable subgrades, muck bottoms, or wet bottoms that cannot be pumped dry, then at the direction of the Engineer, #57 Stone encapsulated in geotextile fabric, shall be used in accordance with the Standard Detail 801-01. #57 Stone shall be placed and compacted in lifts suitable to provide a suitable, non-yielding working surface for the required construction operations.

7. **Compaction of All Other Backfill:** Where a trench is in open ground and the backfill is not influenced by loading conditions, secondary backfill shall be as shown on the Contract Documents and compacted in loose layers of eight (8) inches and compacted to a minimum 90 percent of the maximum dry density. If the Contractor is unable to dry the excavated soil to an appropriate moisture content in order to achieve the required rate of compaction, he shall request authorization from the Engineer to deem the excavated soil as unusable and replace with imported select material for backfill. The final surface shall be left in a condition equal to that originally found at the start of the Work. The backfill shall be finished over the trench flush with the ground surface. The Contractor will add backfill material monthly during the contract duration and during the warranty period to compensate for settlement and erosion.

c. **Moisture Control:** Contractor shall condition subgrade or fill material to moisture content sufficiently near optimum to accommodate compaction meeting the required percent compaction. When the material is too dry to be compacted efficiently, the Contractor shall uniformly apply water to soil material and thoroughly mix the soil to achieve moisture content near the optimum level to facilitate compaction. Contractor

shall remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

d. Incidental compaction due to traffic by construction equipment will not be credited toward the required minimum compaction as required for any material.

801-10 GRADING:

a. **General:** Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades as are required or shown on the Contract Documents.

b. **Grading Outside Building Lines:** Grade areas adjacent to building lines, as shown on the Drawings, to drain away from structures and to prevent ponding. Finish surface free from irregular surface changes and to within not more than 0.10 feet above or below the required elevation.

c. **Grading Surface of Fill under Building Slabs:** Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of one-half inch when tested with a ten (10) foot straightedge.

d. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed by the Engineer, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the prosecution or condition of the Work.

e. The Engineer reserves the right to make adjustments or revisions in lines or grades if found necessary as the Work progresses, in order to obtain satisfactory construction.

801-11 MAINTENANCE:

a. **Protection of Graded Areas:** Protect newly graded areas from traffic and erosion. Keep areas free of trash and debris and repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

b. **Protection of Sloped Areas:** If a fill section or backfilled trench zone falls within a sloped area then Contractor shall place an erosion control blanket over the slope. Areas requiring an erosion control blanket shall be approved prior to placement. After materials are placed and spread, lumps, stones, roots and other foreign matter shall be removed from the area. Erosion control blanket shall be placed in a timely manner to prevent erosion. Payment for the erosion control blanket shall be in accordance with Section 903.

c. **Protection of Roadside Ditch Sloped Areas:** In the case of roadways with open ditch drainage - when any portion of a sewer (sanitary or storm) excavation trench limit falls within 1 foot inside or 5 feet outside the pavement edge the Contractor shall place and compact Imported Clay Fill for the length of the trench excavation as shown on the Roadside Ditch Slope Stability Treatment Detail included at the end of this Section.

After placement and compaction of the clay material, a layer of topsoil shall be placed on the slope. The topsoil shall be seeded and fertilized in accordance with subsection 903-3.2.1. Once the topsoil has been seeded and fertilized the Contractor shall overlay the topsoil with an Erosion Control Mat in accordance with subsection 903-3.2.4. The Contractor shall maintain existing roadside slopes, ditch side slopes and ditch flow lines by undercutting existing grades for placement of the clay fill and topsoil. The cost

of the topsoil, seeding, and erosion control matting shall be included in the Imported Clay Fill pay item.

d. **Reconditioning Compacted Areas:** Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

801-12 MEASUREMENT:

a. **Sewer Point Repair Excavation, Backfill, and Compaction:** Measurement for the excavation, bedding, backfill and compaction for each sewer line point repair shall be made on a linear foot basis, measured to the nearest whole foot, for the depths listed under this Item of the Bid Form. Payment for excavation on each sewer point repair will be based on the actual length of main line pipe replaced plus one (1) additional foot of excavation on each end, up to and including twenty-two (22) feet in length. When tying into a manhole, measurement will be based on the actual length of main line pipe replaced (from outside face of manhole) plus one (1) additional foot of excavation on one end only. The other end will be paid for under the Bid Item for connection to existing manhole. Any additional excavation, authorized by the Engineer, beyond the twenty-two (22) foot sewer point repair excavation limit will be paid for under the Sewer Remove and Replace Excavation, Backfill, and Compaction Bid Item.

   The depth will be the average of measurements taken every twenty (20) feet, or as determined by changes in ground elevation, measured from ground elevation to the pipe invert along the horizontal centerline of the existing pipe. Trench width shall be as specified in the Contract Documents.

b. **Sewer Remove and Replace Excavation, Backfill, and Compaction:** Measurement for the excavation, bedding, backfill, and compaction for each sewer line remove and replacement as designated in the Contract Documents, shall be made on a linear foot basis, measured to the nearest whole foot, for the depths listed under this Item of the Bid Form. Payment for excavation will be based on the actual length of main line pipe replaced plus one (1) additional foot of excavation on each end. When tying into a manhole, measurement will be based on the actual length of main line pipe replaced (from outside face of manhole) plus one (1) additional foot of excavation on one end only. When tying into a manhole on both ends, measurement will not include one (1) additional foot of excavation on either end that is tied into the manhole. It will be paid for under the Bid Item for connection to existing manhole.

   The depth will be the average of measurements taken every 25 feet, or more often as determined by changes in ground elevation, measured from ground elevation to the pipe invert along the horizontal centerline of the existing pipe. Trench width shall be as specified in the Contract Documents.

c. **Sewer Service Lateral Excavation, Backfill, and Compaction:** Measurement for the excavation, bedding, backfill, and compaction for sewer service laterals shall be made on a linear foot basis, measured to the nearest whole foot, from the edge of the mainline trench pay limit of excavation, bedding, backfill, and compaction to the end of the each sewer service lateral repair. The additional footages on the ends do not apply to sewer service laterals.

d. **#57 Stone Backfill:** Measurement for #57 stone backfill shall be the in-place measure of the number of cubic yards of limestone required to be used as needed and as authorized by the Engineer due to unsuitable material encountered in the trench bottom.

e. **#610 Stone Backfill:** Measurement for #610 stone backfill shall be the in-place measure of the number of cubic yards of backfill required to be used as needed and as authorized by the Engineer.

f. **Select Material for Backfill:** The Contractor shall use all such usable excavated soils available from excavations made in this Contract prior to supplying select material from other sources. Measurement for select material for backfill shall be the in-place, compacted measure of the number of cubic yards of select material required to be used as needed and as authorized by the Engineer. Select material does not include transporting, placing, and compacting usable excavated soils from excavations made in the Contract.

   Select material used to fill voids resulting from unauthorized excavation outside the established pay limits, or where required for dewatering, shall not be measured for payment even though the Engineer ordered their use.

g. **Imported Clay Fill:** Measurement for this item shall be the in-place measure of the number of cubic yards of imported clay fill required to be used as needed and as authorized by the Engineer.

h. **Controlled Low Strength Material:** Measurement for CLSM will be by the cubic yard from plant batch tickets.

i. **Sand-Aggregate for Secondary Backfill:** Measurement for sand-aggregate mixture for secondary backfill shall be the in-place measure of the number of cubic yards of secondary backfill required to be used as needed and as authorized by the Engineer.

801-13 PAYMENT:

a. **Sewer Point Repair Excavation, Backfill, and Compaction:** Payment for this Item will be full compensation for miscellaneous clearing and grubbing, traffic control, trench excavation, trench dewatering, shoring and bracing, bedding, backfilling, compaction, restoring the trench surface to grade, top soiling, test pits, and driving and removing shoring and bracing, in accordance with the Contract Documents. Sand-aggregate for bedding and initial backfill material and useable excavated soil for secondary backfill, as shown on City-Parish Standard Detail 801-01 shall be included in this pay item. When required, special bedding and backfill material such as #57 Stone Backfill, #610 Stone Backfill, CLSM Backfill, Sand-Aggregate for Secondary Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item. Sewer pipe and fittings required for sewer point repairs will be paid for under the relative pay item in Section 802.

b. **Sewer Remove and Replace Excavation, Backfill, and Compaction:** Payment for this Item will be full compensation for miscellaneous clearing and grubbing, traffic control, trench excavation, trench dewatering, shoring and bracing, bedding, backfilling, compaction, restoring the trench surface to grade, top soiling, test pits, and driving and removing shoring and bracing, in accordance with the Contract Documents. Sand-aggregate for bedding and initial backfill material and useable excavated soil for secondary backfill, as shown on City-Parish Standard Detail 801-01 shall be included in this pay item. When required, special bedding and backfill material such as #57 Stone Backfill, #610 Stone Backfill, CLSM Backfill, Sand-Aggregate for Secondary Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item. Sewer pipe and fittings required for sewer point repairs will be paid for under the relative pay item in Section 802.

c. **Sewer Service Lateral Excavation, Backfill, and Compaction:** Payment for this Item

will be full compensation for miscellaneous clearing and grubbing, traffic control, trench excavation, trench dewatering, shoring and bracing, bedding, backfilling, compaction, restoring the trench surface to grade, top soiling, test pits, and driving and removing shoring and bracing, in accordance with the Contract Documents. Sand-aggregate for bedding and initial backfill material and useable excavated soil for secondary backfill, as shown on City-Parish Standard Detail 801-01 shall be included in this pay item. When required, special bedding and backfill material such as #57 Stone Backfill, #610 Stone Backfill, CLSM Backfill, Sand-Aggregate for Secondary Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item. Sewer pipe and fittings required for sewer point repairs will be paid for under the relative pay item in Section 802.

d. **#57 Stone Backfill:** Payment for this Item will be full compensation for geotextile fabric and #57 stone backfill furnished transported, placed, and compacted as shown in the Contract Documents and not specifically included under other Bid Items.

e. **#610 Stone Backfill:** Payment for this Item will be full compensation for #610 stone backfill furnished transported, placed, and compacted as shown in the Contract Documents and not specifically included under other Bid Items.

f. **Select Material for Backfill:** Payment for this Item will be full compensation for select material furnished from sources other than excavations made in this Contract, transported, placed, and compacted as ordered by the Engineer and not specifically included under other Bid Items. No payment will be made for usable excavated soil obtained from excavations made in this Contract.

g. **Imported Clay Fill:** Payment for this Item will be full compensation for imported clay material, transported, placed, and compacted as ordered by the Engineer. The cost of the topsoil, seeding, and erosion control matting associated with the Roadside Ditch Slope Stability Treatment shall be included in the included in this pay item.

h. **Controlled Low Strength Material:** Payment for this Item will be full compensation for CLSM backfill, including pipe anchorage, furnished, transported and placed as ordered by the Engineer.

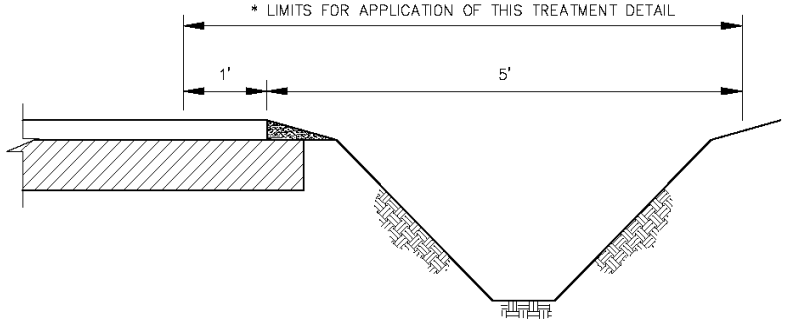
i. **Sand-Aggregate for Secondary Backfill:** Payment for this Item will be full compensation for sand-aggregate mixture required as secondary backfill furnished transported, placed, and compacted as shown in the Contract Documents and not specifically included under other Bid Items.

801-14 PAY ITEMS:

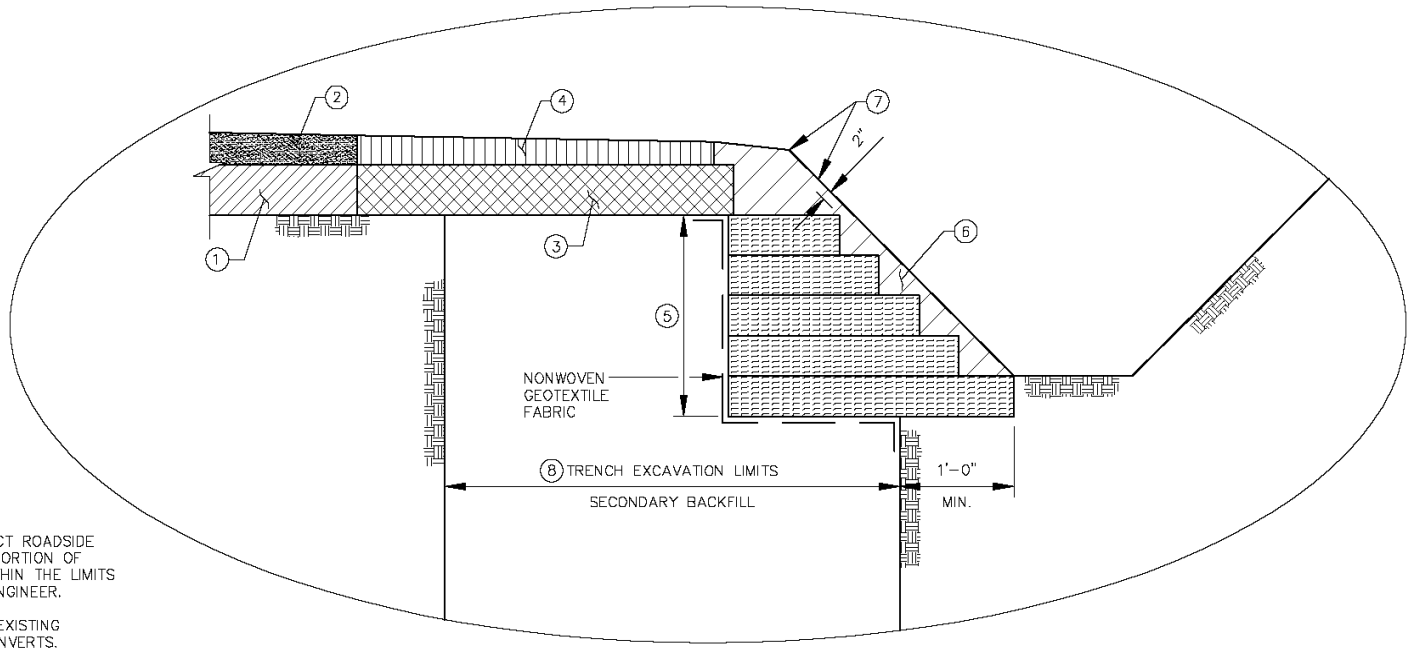
Trench Depth Schedule

0	=	0	-	6	Feet
1	=	6.1	-	8	Feet
2	=	8.1	-	10	Feet
3	=	10.1	-	12	Feet
4	=	12.1	-	16	Feet
5	=	16.1	-	20	Feet
6	=	20.1	-	24	Feet
7	=	24.1	-	28	Feet
8	=	28.1	-	32	Feet
9	=	32.1	-	36	Feet

Item No.	Item	Unit
801100_	Sewer Point Repair Excavation, Backfill, and Compaction (_' – _' depth)	Linear Foot
801200_	Sewer Remove and Replace Excavation, Backfill, and Compaction (_' – _' depth)	Linear Foot
8012100	Sewer Service Lateral Excavation, Backfill, and Compaction	Linear Foot
8013000	#57 Stone Backfill	Cubic Yard
8013100	#610 Stone Backfill	Cubic Yard
8013200	Select Material for Backfill	Cubic Yard
8013300	Imported Clay Fill	Cubic Yard
8013400	Controlled Low Strength Material	Cubic Yard
8013500	Sand-Aggregate for Secondary Backfill	Cubic Yard



1. EXISTING PAVEMENT BASE TO REMAIN
2. EXISTING ASPHALTIC CONCRETE SURFACING TO REMAIN
3. REQUIRED FULL DEPTH ASPHALT CONCRETE BASE (PG 64-22)
4. REQUIRED ASPHALTIC CONCRETE SURFACING (TYPE B MIX, (PG-76-22M) 4" MIN. DEPTH)
5. REQUIRED COMPACTED CLAY, 8" LOOSE LIFTS. THE COST OF IMPORTING, PLACING, AND COMPACTING THE CLAY SHALL BE INCLUDED IN THE PRICE PER CUBIC YARD FOR IMPORTED CLAY FILL
6. REQUIRED TOPSOIL (SEEDED PER SPECIFICATION SECTION 903)
7. REQUIRED EROSION CONTROL BLANKET
8. SEWER PIPE REPAIR EXCAVATION (SEE STANDARD PLAN 801-01)



NOTES:

1. *CONTRACTOR SHALL CONSTRUCT ROADSIDE DITCH TREATMENT WHEN ANY PORTION OF TRENCH EXCAVATION FALLS WITHIN THE LIMITS SHOWN, OR AS DIRECTED BY ENGINEER.
2. CONTRACTOR SHALL MAINTAIN EXISTING ROADSIDE SLOPES AND DITCH INVERTS.
3. PLACEMENT AND COMPACTION OF CLAY, TOPSOIL (INCLUDING SEED) AND EROSION CONTROL BLANKET SHALL BE INCLUDED IN THE IMPORTED CLAY FILL PAY ITEM.

ROADSIDE DITCH SLOPE STABILITY TREATMENT DETAIL

N.T.S.