SECTION 02220

EXCAVATION, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation, backfilling, and compaction for sanitary sewer pipelines, service lines, manholes and incidental construction.

1.02 RELATED WORK

A. Section 02575 - Pavement Repair
B. Section 02605 – Manholes
C. Section 02730 - Sanitary Sewer Pipelines
D. Section 02732 - Sanitary Sewer Service Lines
E. Section 02930 - Lawns & Grasses
F. Section 02935 - Ground Cover

1.03 QUALITY ASSURANCE

A. If required, laboratory analysis shall be provided for moisture density relation for material per AASHTO Designation T-180.
B. Determine the field density of backfill in accordance with AASHTO Designation T-147.

1.04 REFERENCES

AASHTO Designation T-99
AASHTO Designation T-147
AASHTO Designation T-180
ASTM D 2487
ASTM D 2321

ASTM D 33

ArDOT Standard Specifications

1.05 PROTECTION

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

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

C. The Contractor shall comply with the Arkansas One-Call System and shall alert potentially conflicting utility systems accordingly.

D. In all cases, the Contractor is responsible for protecting public and private property; and protecting any person or persons who might be injured as a result of the Contractor’s work.

PART 2 – PRODUCTS

2.01 EMBEDMENT MATERIALS – GENERAL

A. Embedment materials for gravity sewer mains, sewer force mains, and sewer service lines as required are restricted to materials as described in sections 2.02, 2.03, and 2.04 below.

B. Gravel material for select backfill across streets, roads, driveways, and for placement of "gravel" surfaced areas, shall be Class 7 material conforming to ArDOT Standard Specifications, latest edition.

2.02 CLASS I EMBEDMENT MATERIAL

A. Class I embedment material shall conform to class 1A embedment materials in accordance with ASTM D 2321, latest edition. Material shall meet the grading requirements of ASTM C 33, gradation 67, commonly referred to as ASTM #67 or 3/4" concrete aggregate. Maximum aggregate size shall be 3/4 inch. This includes materials such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells.

2.03 SELECT NATIVE BACKFILL MATERIAL

A. Select native material shall be good earth, sand, or gravel that is free from large rocks, stumps or hard lumpy materials. Never use materials of perishable, organic, spongy or otherwise unsuitable nature as select material.

2.04 FLOWABLE FILL MATERIAL

A. Flowable fill material for select backfill across streets, roads, and driveways shall be Flowable Select Material conforming to ArDOT Standard Specifications, latest edition. Flowable Fill material shall only be used when written permission is obtained from Little Rock Water Reclamation Authority.

PART 3 - EXECUTION

3.01 EXCAVATION - GENERAL

A. All excavation shall be carried accurately to the line and grade shown on the Plans as established by the Engineer of Record.

B. When excavation is carried below or beyond that required, fill the over-excavated space with compacted Class I material, or with concrete as approved by the Engineer of Record.

C. The Contractor shall use a trench box or provide and install shoring where necessary to protect the laborers, the work, or adjacent property. Shoring shall be maintained in place until the backfill has proceeded to a point where it can be safely removed.

D. Dewater all excavations before any construction is undertaken. Install pipe only in dry trenches. Place concrete upon dry, firm foundation material only.

3.02 DISPOSAL OF EXCAVATED MATERIALS

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

B. Disposal of excess material shall only be allowed on private property with written permission of the owner of the property. A copy of the written permission must be forwarded to the Engineer of Record and Little Rock Water Reclamation Authority.

3.02 SEWER FLOW CONTROL

A. Plugging or Blocking: A sewer line plug shall be inserted into the line upstream of the section or sections being worked. The plug shall be designed so that all or any portion of the sewerage can be released. After the work has been completed, flow shall be restored to normal.

B. Pumping and Bypassing: The Contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the manhole section or sections in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm. The Contractor shall be responsible for furnishing the necessary labor and supervision to set

up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, then engines shall be equipped with mufflers keep noise to a minimum.

C. Flow Control Precautions: When flow in a sewer line is plugged, blocked, or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

D. The Sewer Flow Control plan shall be submitted to Little Rock Water Reclamation Authority and written approval obtained prior to commencing work.

3.03 EXPLOSIVES

A. Notify the Engineer of Record in advance if the use of explosives is necessary for the efficient execution of the work.

B. All work pertaining to the use of explosives shall be performed by qualified personnel.

C. The Contractor shall obtain all the necessary permits from all governmental bodies. Copies of permits must be submitted to the Engineer of Record, and the Contractor shall keep copies of all permits on the job site at all times.

D. Follow all governing OSHA safety regulations.

E. Exercise every precaution to prevent damage to adjoining improvements or property.

F. Always use a blasting shield or mat.

G. Any damage to private property resulting from the use of explosives is the liability of the Contractor.

3.05 TRENCH DEWATERING

A. Dewater all trenches to the extent that sanitary sewer pipe can be placed on a dry and firm trench bottom. Never place pipe in a wet or unstable trench. The allowable dewatering methods are:

1. Well pointing; and,
2. Over Excavation and Sump Pumping.
3. Submit for approval other trench dewatering procedures.

B. Well Pointing Procedure

1. Install well points where required to keep the excavation dry and the subgrade stable.
2. Install well points when the excavation is within two (2) feet of the water table.
3. Provide sufficient pumping equipment, in good working order and available at all times, to remove any water that accumulates in the excavation so a stable subgrade is obtained.
4. Keep all dewatering equipment in continuous operation until backfill is completed.

C. Pump, pipe, and drain all water resulting from dewatering operations in accordance with ADEQ requirements. Prevent flooding of streets or private property.

D. In soils that cannot be properly dewatered, excavate and install Class I bedding material tamped in place to such a depth to provide a firm trench bottom.

E. Divert surface runoff water away from the excavation. Where the excavation crosses natural drainage channels, care should be taken to prevent unnecessary damage or delays. Route diverted surface water into existing drainage structures, such as storm sewers, ditches, or streams per ADEQ requirements. Prevent flooding of streets or private property.

F. Discharge of trench water or surface runoff into a sanitary sewer is a violation of City of Little Rock Ordinance and violators will be prosecuted as prescribed by law.

3.06 SHEETING AND SHORING

A. Provide sheeting and shoring of trenches to:

1. Protect the safety of workers;
2. Provide suitable means for constructing the sewer line;
3. To maintain the trench free from slides or cave-ins;
4. And, to protect public or private property, including existing utilities, buildings, streets, or other structures that are close to the trench.

B. Follow all governing OSHA safety regulations.

C. Keep shoring in place until the backfill has proceeded to a point where it can safely be removed.

3.07 EXCAVATION – SEWER LINE TRENCHES

A. Keep the trench widths within the limits specified below. This requirement is to avoid superimposed loading in excess of the designed and specified pipe strength and to provide sufficient room for proper installation and bedding of sewer pipe.

Inside Pipe Diameter (Inches)	Maximum Width of Trench From Top of Pipe to 2' Above Top of Pipe
6, 8, 10	2' - 6"
12, 14, 15, 16	3' - 0"
18, 21	3' - 6"
24, 30	4' - 0"
36	4' - 6"

B. If necessary to prevent sliding and caving, cut the trench banks back on a slope above an elevation two (2) feet above the outside top of the pipe to reduce the earth load on the trench sides. Never exceed the specified maximum width until 2 feet above the outside top of the pipe.

C. Do not advance trench excavation more than three hundred (300) feet ahead of the completed pipe work and backfill.

3.08 OVER EXCAVATION

A. Over excavate below the required subgrade only under the conditions as listed below.
   1. The soil at the bottom of the trench is mucky or in such condition that it cannot be properly shaped and graded.
   2. The subgrade material is too soft to properly support rigid gravity sewer pipe.

B. After over excavating, provide and install a fill consisting of Stone Backfill (B Stone) material thoroughly tamped into place in a maximum of twelve (12) inch lifts up to an elevation sufficient to prepare the subgrade for the particular bedding class required.

3.09 BEDDING AND BACKFILLING – GENERAL

A. Install all sewer pipe using embedment materials as appropriate for pipe type, laying conditions, and location, as specified herein and/or in LRWRA Standard Details.
B. It is essential that the complete backfill be done in such a manner to minimize voids in the backfill.
C. Backfilling includes refilling and consolidating the fill in the excavation up to the surrounding ground surface or road grade.
D. Use select native materials for backfilling in unpaved areas.
E. Where trenches are to be located beneath existing or proposed streets, drives, and parking areas, all backfilling procedures shall be in accordance with the LRWRA Standard Details.
F. Use mechanical compaction devices to compact backfill materials in trenches.

3.10 BEDDING AND BACKFILLING RIGID PIPE

A. Bed rigid pipe as described below and in accordance with the standard trench details shown in the LRWRA Standard Details. The intent of the bedding is to create a uniform support which will protect the pipe from localized stress points and to provide for a well graded trench bottom.
B. Extend the trench excavation to a minimum depth of six (6) inches below the bottom of the pipe.
C. Install bedding material in no greater than eight (8) inch lifts.
D. Compact all bedding material to a minimum density of 95% modified proctor as outlined in AASHTO T-99.
E. Install pipe in accordance with Section 02730 – Sanitary Sewer Pipelines.
F. Backfill the excavation.

3.11 BEDDING AND BACKFILLING FLEXIBLE (PVC) PIPE

A. Bed flexible (PVC) pipe as described below and in accordance with LRWRA Standard Details. The intent of this bedding is to provide uniform support for the flexible pipe.
    1. For PVC gravity main lines greater than 4" in size, Class I Embedment Material is required, in accordance with Section 2.02, above.
    2. For PVC 4" sewer service lines, where installed under pavement including streets, parking lots, and driveways, Class I Embedment Material is required, in accordance with Section 2.02, above.
    3. For PVC 4" sewer service lines, where installed under unpaved areas, Class I Embedment Material is not required. In this case, pipe bedding may consist of Select Native Backfill material, as described in Section 2.03, above. This material must be tamped in or walked in to achieve a minimum density of 75% standard proctor up to the springline of the pipe and approved by the LRWRA Inspector before additional embedment or fill is placed.
B. Extend the trench excavation to a minimum depth of six (6) inches below the bottom of the pipe.
C. Install bedding materials in no greater than eight (8) inch compacted lifts. Install bedding from six (6) inches below the pipe to six (6) inches above the pipe. Thoroughly shovel slice bedding beneath the pipe haunches.
D. Compact all bedding material as described above or as appropriate for the type of material.
E. The maximum depth of bury for PVC pipe is sixteen (16) feet. Any depths greater than sixteen (16) feet require rigid pipe.
F. Backfill and compact the excavation.

3.12 MANHOLE EXCAVATION

A. Excavate the base area no larger than necessary to provide an adequate base.

B. Dewater all excavations if required before starting any permanent construction.
C. Provide sheeting and shoring as required.
D. Leave at least twelve (12) inches between the outer surface of manholes and the excavation or shoring.
E. If over excavation occurs, bring the excavation back to proper grade with either:
    a. Stone Backfill (B Stone) material compacted to 95% modified proctor; or
    b. Concrete poured monolithically with the base.

3.13 BACKFILLING MANHOLES

c. Do not backfill around manholes until adequate strength has been obtained from the manhole to support the backfill without damage to the manhole.
d. Never backfill poured-in-place manholes until the concrete has cured 48 hours.
e. Backfill manholes with select native material compacted to a density sufficient to prevent excessive settlement.
f. In public streets or roads, backfill and compaction requirements shall be the same as for trench crossings.

3.14 EXCAVATION, BACKFILLING, AND COMPACTION FOR SEWER FORCE MAINS

A. Excavate trenches for force mains to:
    1. Provide a minimum cover of thirty (30) inches over the top of pipe barrel and,
    2. Allow for the proper bedding material to be installed.
B. Excavate trenches wide enough for pipe installation and joint makeup. The trench width at the top of the pipe must never exceed the outside diameter of the pipe plus two (2) feet.
C. Class I Embedment Material, as described in Section 2.02, above, shall be required to be installed for **all** Flexible (PVC) Pipe Sewer Force Mains. This embedment material shall be installed completely surrounding the PVC Force Main pipe at a 6" minimum thickness of the aggregate envelope.
D. Class I Embedment Material may be used but is not required if using rigid pipe for force mains. In this case, extend the trench excavation to a minimum depth of six (6)

inches below the bottom of the pipe and place pipe bedding consisting of Select Native Backfill material, as described in Section 2.03, above. This material must be tamped in to achieve a minimum density of 90% standard proctor up to the springline of the pipe and approved by the LRWRA Inspector before additional embedment or fill is placed.

E. Excavate for pipe bells to ensure a smooth bearing surface.
F. If the soil at the bottom of the trench is mucky or unstable so that it cannot properly support the pipe, over excavate and backfill as described above for gravity pipelines.
G. Backfill the trench and compact the materials as stated above for gravity lines.

3.15 EXCAVATION, BACKFILLING AND COMPACTION FOR MISCELLANEOUS STRUCTURES

A. Excavate a sufficient distance from walls and footings to allow for forms and for proper inspection.
B. Leave at least (12) inches between the outer surface of miscellaneous structures and the excavation or shoring.

3.16 EXCAVATION, BACKFILLING AND COMPACTION FOR SEWER SERVICE LINES

A. Backfilling and compaction requirements for service lines shall be as described in sections 3.09, 3.10, and 3.11, above, for the type of sewer pipe installed, laying conditions, and location.
B. All excavation, backfilling and compaction of sewer service lines in public right-of-way shall be made in accordance with the regulations of the City of Little Rock.

END OF SECTION 02220