

SECTION 02221

TRENCHING, BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
 - 2. Section 02722 - Sewers: Sanitary, Gravity.
 - 3. Section 02729 – Rehabilitation of Existing Sewer Utilizing Cured-in-Place Pipe.
 - 4. Section 02730 – Rehabilitation of Existing Manholes.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

1.3 JOB CONDITIONS

- A. Existing utilities:
 - 1. There now exists in the construction areas, waterworks, storm drainage, sanitary sewers, street paving, gas mains and other utilities.
 - 2. Location of certain underground lines and structures are not shown on the plans.
 - 3. Locate these and other possible unknown utility lines using electronic pipe finder, or other approved means.
 - 4. Locate, excavate and expose all existing underground lines in advance of trenching operations.
 - 5. The Contractor will be held responsible for the workmanlike repair of any damage done to any of these utilities in the execution of his work under this Section.
 - 6. The Contractor shall familiarize himself with the existing conditions and be prepared to adequately care for and safeguard himself and the Owner from damage.
- B. Notification of intent to excavate:
 - 1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil

- penalty of up to one thousand dollars (\$1,000) for each violation of the Act.
2. Notification of intent to excavate may be given by calling this toll free number: 1-888-721-7877.
- C. Protecting trees, shrubbery and lawns:
1. Trees and shrubbery in developed areas and along the trench line shall not be disturbed unless absolutely necessary, and subject to the approval of the Engineer.
 - a. Any such trees and shrubbery necessary to be removed shall be heeled in and replanted.
 2. Where trenches cross private property through established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replacement is approved by the Engineer.
 - a. Topsoil underlying lawn areas shall be removed and kept separate from general excavated materials.
- D. Removing and resetting fences:
1. Where existing fences must be removed to permit construction of utilities:
 - a. Remove such fences and, as the Work progresses, reset the fences in their original location and condition.
 - b. Provide temporary fencing or other safeguards as required to prevent stock and cattle from wandering to other lands.
- E. Restoration of disturbed areas:
1. Restore all areas disturbed by, during or as a result of construction activities to their existing or better condition.
 - a. For existing areas with sod type grasses, replace with new sod. Existing sod may be reused where properly removed and stored.
 2. Do not interpret this as requiring replacement of trees and undergrowth in undeveloped sections of the rights-of-way.

PART 2 - PRODUCTS

2.1 EXCAVATED MATERIALS

- A. Perform all excavation of every description and of whatever substances encountered to depths indicated or specified.
- B. Pile material suitable for backfilling in an orderly manner at safe distance from banks or trenches to avoid overloading and to prevent slides or cave-ins.
- C. Remove and deposit unsuitable or excess materials as directed by the Engineer.

2.2 BACKFILL MATERIALS

- A. Provide from materials excavated for installation of utility.
 1. Select soil material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension for backfill up to 12" above top of utility being covered.
 2. Do not permit rocks larger than 2" in greatest dimension in top 6" of backfill.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.
- B. Should the quantity of suitable on-site material be insufficient to complete the work, provide suitable borrow material as approved by the Engineer at no additional expense to the Owner.
- C. Provide select materials from on-site if acceptable material as approved by the Engineer is available on-site. Otherwise, provide approved select material from an off-site source.

PART 3 - EXECUTION

3.1 PROCEDURES

- A. Existing utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
 - 2. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
 - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 - 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Locations within streets or highways:
 - 1. Comply with South Carolina Department of Transportation's (SCDOT) "Encroachment Permit" issued for the Work, and the South Carolina Department of Transportation's (SCDOT) "*A Policy for Accommodating Utilities on Highway Rights-of-Way*".
 - 2. Take all precautions and comply with all requirements as may be necessary to protect the improvements, including barricades for protection of traffic.
 - 3. Keep minimum of one lane open to traffic at all times where utility crosses street or highway.
- C. Protection of persons and property:
 - 1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
 - 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, washout and other hazards created by operations under this Section.

D. Dewatering:

1. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.
2. Maintain the ground water level a minimum of 3-feet below the trench bottom during excavation, installation and backfilling.
 - a. Material disturbed below the invert elevation due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.
 - b. Use sumps, pumps, drains, trenching, wells, vacuum or well point system as necessary to maintain the ground water level a minimum of 3-feet below the trench bottom and maintain a dry excavation.
 - c. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.
 - d. Provide monitoring wells sufficient in size, location, number and depth to monitor the ground water level in the construction area during excavation and backfill operations.
 - e. Maintain dewatering operations until backfilling and compaction operations are complete.
3. Water pumped or drained from trenches must be treated by an appropriately sized sediment and erosion control device prior to leaving the site. Discharging untreated or contaminated dewatering effluent is prohibited.
 - a. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
 - b. Prevent flooding of streets, roadways, or private property.
 - c. Prevent onsite erosion that can be caused by concentrated discharges related to dewatering pumping, drains, or trenching.
 - d. Provide engines driving dewatering pumps with residential type mufflers.

E. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

F. Maintain access to adjacent areas at all times.

3.2 TRENCH EXCAVATION (Unclassified)

- A. Provide sloping, sheeting, shoring, and bracing for excavations conforming with 29CFR1926 Subpart P-Excavations and the Contract Documents.
- B. Remove all materials of whatever substance encountered.
- C. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- D. Open cut:
 1. Excavate for utilities by open cut.
 2. If conditions at the site prevent such open cut, and if approved by the Engineer, tunneling may be used.
 3. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
 4. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.

5. Remove wet or otherwise unstable soil incapable of properly supporting the utility, as determined by the Engineer, to depth required and backfill to proper grade with stone bedding material, at no additional cost to the Owner.
 6. Excavating for appurtenances:
 - a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Owner.
- E. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- F. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.
1. Remove in units when level of backfilling has reached the elevation necessary to protect the utility work and adjacent property.
 2. Sheeting at the bottom of trenches over 10' deep for sewers 15" and larger in size, shall remain in place and be cut off no less than 2" above top of pipe, at no additional cost to the Owner.
- G. Depressions:
1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 2. Except where rock is encountered, do not excavate below the depth indicated or specified.
 3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified, and to provide 6" clearance in any horizontal direction from all parts of the utility and appurtenances.
- H. Special requirements relating to excavation for specific types of utilities shall comply with the following:
1. Sanitary sewer lines:
 - a. Comply with requirements of Section 02722.
 - b. Do not excavate trench more than 200' ahead of pipe laying, unless permitted by Engineer.
 - c. Maintain trench sides vertical to point not less than 2' above top of pipe.
 - d. Upper portion of trench may be sloped to any width which will not cause damage to adjoining structures, utilities, pavements or private property.
- I. Comply with pertinent OSHA regulations in regards to the excavation of utilities.

3.3 BACKFILLING

A. General:

1. Backfill trenches and excavations immediately after the pipes are laid, unless other protection is directed or indicated.

2. Select and deposit backfill materials with special reference to the future safety of the pipes.
 3. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the Engineer.
 4. Surplus material shall be disposed of as directed by the Engineer.
 5. Original surface shall be restored to the approval of the Engineer.
 6. Maintain proper dewatering during backfill and compaction operations.
- B. Lower portion of trench:
1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24" over sewers and 12" over other utility lines.
 2. Take special care in backfilling and bedding operations not to damage pipe and pipe coatings.
- C. Remainder of trench:
1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or 1/2 the layered thickness, whichever is smaller, in any dimension.
 2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the soil engineer.
- D. Adjacent to buildings: Mechanically compact backfill in 6" layers within ten (10') feet of buildings.
- E. Under roads, streets and other paved areas:
1. Mechanically tamp in 6" layers using heavy duty pneumatic tampers or equal.
 2. Tamp each layer to a density equivalent of not less than 95% of an ASTM D 698 Proctor Curve.
 3. Provide additional compaction by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone.
 4. Refill any settlement with crushed stone and continue such maintenance until replacement of pavement is authorized by the Engineer.
- F. Undeveloped areas:
1. Backfill in wooded, swampy or undeveloped areas shall be as specified hereinbefore, except that tamping of the backfill above a level 2' over the top of the pipe will not be required.
 2. Mound excavated material neatly over the ditch to provide for future settlements.

3.4 MEASUREMENT AND PAYMENT

- A. Unclassified excavation for trenching:
1. No measurement or direct payment will be made for the Work under this Section and all costs for same shall be included in the price bid for the utility line to which it pertains.

END OF SECTION

TRENCHING, BACKFILLING FOR UTILITIES
02221-6

60555165

SECTION 02260

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide protection of the environment during the construction of this project to reduce soil erosion and siltation to the lowest reasonably achievable level.

1.2 GENERAL

- A. Exercise every reasonable precaution, throughout the life of the project, to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground or roadway surfaces, or other property. Erosion control practices to be used for this project are shown on the drawings and are to conform to South Carolina Department of Health and Environmental Control regulations.

PART 2 - PRODUCTS

2.1 CRUSHED STONE

- A. Provide No. 1 aggregate (ASTM C 33) as defined in Section 815 of the SCDOT Standard Specifications for Highway Construction, Latest Edition, for the stabilized construction entrance and exit.
- B. Provide #57 crushed stone for temporary sediment barriers around inlets and for temporary stone check dams.

2.2 GRASSING

- A. Comply with Section 02930 - Grassing.

2.3 SILT FENCE

- A. All posts to be self-fastener angle steel, 5' in length.
 - 1. Wooden posts are not acceptable.
- B. Woven wire shall conform to the requirements of ASTM A 116, Class I zinc coating for wire. Each woven square shall measure 6" x 6". The top and bottom wires shall be 10 gauge. All other wires shall be 12-1/2 gauge.
 - 1. Securely attach woven wire to posts with wire ties.
- C. Provide filter fabric meeting the requirements of the South Carolina Department of Health and Environmental Control (SCDHEC), complying with the most current edition of the SCDOT Standard Specifications for Highway Construction and appearing on the SCDOT Approved Materials Sheet #34.
 - 1. Limit splices in filter fabric using continuous rolls whenever possible.
 - 2. Whenever splices are necessary a minimum overlap of 6" is required and all splices must occur at a post so that the integrity of the fence is not compromised.
 - 3. Securely attach filter fabric to top of woven wire and at posts with wire ties.

- D. Silt fences should be continuous and transverse to the flow. The silt fence should follow the contours of the site as closely as possible. Place the fence such that the water cannot runoff around the end of the fence.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construct and maintain all erosion control measures until the substantial completion of the project.

3.2 TEMPORARY CONSTRUCTION ENTRANCE/EXIT

- A. Construct a gravel area or pad at points where vehicles enter and leave a construction site.
- B. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade and place gravel to the grade and dimensions shown on the plans.
- C. Construct drainage channels to carry water to a sediment trap or other suitable outlet.
- D. Use geotextile fabrics to improve stability of the foundation in locations subject to seepage or high water table.
- E. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site by periodic top dressing with two inches of stone.
- F. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary.
- G. Immediately remove objectionable materials spilled, washed, or tracked onto public roadways.

3.3 TEMPORARY GRASSING

- A. Provide a temporary cover for erosion control on disturbed areas that will remain unstabilized for a period of more than 30 days in accordance with Section 02930.
- B. This practice applies to cleared areas, diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles where vegetation is needed for less than 1 year.
- C. Provide grassing on slope 5% or greater within 14 days of disturbance. Comply with Section 02930.

3.4 SILT FENCE

- A. Provide silt fence barrier where shown on the plans and on utility construction parallel to the disturbed trench where perpendicular sheet flow runoff occurs on disturbed areas with slopes greater than 4%.
- B. Place at the extreme limits of the area to be disturbed as shown.
- C. Construct temporary sediment barriers of filter fabric, buried at the bottom, stretched and supported by posts and install below small disturbed areas as indicated on the drawings to retain sediment by reducing the flow velocity to allow sediment deposition.

- D. Space posts 10'-0" on center, maximum or as indicated on the drawings.
- E. Remove sediment deposits prior to reaching one-third height of the fence.
- F. Monitor site frequently and place additional silt fencing should evidence indicate that erosion is about to occur at locations other than those shown on plan.

3.5 INLET PROTECTION

- A. Construct temporary sediment barriers around storm drain curb inlets using block and gravel as directed by Engineer or City of Georgetown's field representative.
- B. Construct metal frame barriers around grate and frame of drop inlets as indicated on the drawings.
- C. Inspect structure after each rainfall and repair as required.
- D. Remove sediment when trap reaches one-half capacity.
- E. Remove structure when protected areas have been stabilized.

3.6 MAINTENANCE

- A. Place all erosion control devices or measures prior to any land disturbing activity within the drainage area they are located.
- B. Inspect erosion control devices and clean or otherwise remove silt buildup as necessary once a week or 24-hours following a rain event of ≥ 0.1 ".

3.7 REMOVAL

- A. Remove temporary structures after protected areas have been stabilized.

3.8 MEASUREMENT AND PAYMENT

- A. All work under this Section will be measured and paid for as specified hereinafter.
- B. No measurement or direct payment will be made for temporary construction entrance/exit.
- C. No measurement or direct payment will be made for temporary grassing.
- D. ~~Silt fencing will be measured and paid for at the unit price per linear foot as stated in the Bid Form and shall include the costs for excavation, materials, installation, maintenance, removal and backfill.~~ Silt fencing included in lump sum price.
- E. ~~Inlet protection will be measured and paid for at the unit price per linear foot as stated in the Bid Form and shall include the cost for materials, installation, maintenance, and removal~~ Inlet protection included in lump sum price.
- F. Maintenance costs and log book records for the erosion control devices utilized shall be included in the unit price bid for the item to which it pertains.

END OF SECTION

SECTION 02513
ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide asphaltic concrete paving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Certificates, signed by the materials producer and the asphalt paving Subcontractor, stating that materials meet or exceed the specified requirements.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and products used shall comply with pertinent sections of the South Carolina Department of Transportation's (SCDOT) "Standard Specifications for Highway Construction" and latest revisions and supplements.

2.2 ASPHALTIC CONCRETE MIXTURE (BINDER COURSE)

- A. Materials and composition of mixture shall comply with Section 402 of the SCDOT's "Standard Specifications for Type 1 Mix" and latest revisions and supplements.
- B. Provide hot plant mixed asphaltic concrete paving materials.

1. Temperature leaving the plant: 290°F minimum, 320°F maximum.
2. Temperature at time of placing: 280°F minimum.

2.3 ASPHALTIC CONCRETE MIXTURE (SURFACE COURSE)

- A. Materials and composition of mixture shall comply with Section 403 of the SCDOT's "Standard Specifications for Type 1 Mix" and latest revisions and supplements.
- B. Provide hot plant mixed asphaltic concrete paving materials.
 1. Temperature leaving the plant: 290°F minimum, 320°F maximum.
 2. Temperature at time of placing: 280°F minimum.

2.4 EQUIPMENT

- A. Comply with requirements of Section 401 of SCDOT's "Standard Specifications" and latest revisions and supplements.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
 1. Sweep primed surfaces if needed.
 2. Adjust frames and covers if needed.

3.2 WEATHER RESTRICTIONS

- A. Do not apply asphalt mixtures to a wet or frozen surface or when air temperature is below 40°F in the shade and falling, or below 35°F in the shade and rising.

3.3 SPREADING AND FINISHING

- A. On arrival at point of use, dump directly into mechanical spreader.
- B. Immediately spread and strike off true to the line, grade and cross section indicated, to such loose depth that when work is completed, the indicated thickness or weight per square yard will be secured.
- C. Correct irregularities while the mixture is still hot.
- D. At locations not readily accessible to mechanical spreaders, acceptable hand spreading methods may be used.
- E. Finished surfaces placed adjacent to curbs, gutters, manholes, etc., shall be approximately 1/4" above the edges of these structures.

3.4 COMPACTION

- A. Perform initial rolling with 3-wheel steel roller or a steel wheel 2-axle tandem roller.
- B. Follow initial rolling with at least four complete coverages by a pneumatic tired roller.

- C. Complete rolling with steel wheel 2-axle tandem roller.
- D. Rolling shall start longitudinally at the sides and proceed gradually toward the center of the pavement, overlapping on successive trips approximately 1/2 the width of the roller.
- E. Use hand or mechanical tampers in areas not accessible to powered rollers.
- F. Surface mixture after compaction shall be smooth and true to the established crown and grade.
- G. Finished paving smoothness tolerance:
 - 1. Free from birdbaths.
 - 2. No deviations greater than 1/8" in 6'.

3.5 PROTECTION OF SURFACE

- A. Allow no traffic on surface until the mixture has hardened sufficiently to prevent distortion.

3.6 FLOOD TEST

- A. Flood the entire asphaltic concrete paved area with water by use of a tank truck or hoses.
- B. If a depression is found where water ponds to a depth of more than 1/8" in 6', fill or otherwise correct to provide proper drainage.
- C. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

3.7 MEASUREMENT AND PAYMENT

- A. Measurement of length and width of paved areas will be made.
- B. Payment will be made at the unit price per square yard as stated in the Bid Form. The unit price shall include all labor, materials, thermoplastic striping, cleanup, testing, etc. for complete installation.
- C. No extra payment will be made for repair of deficient or unacceptable work.

END OF SECTION

SECTION 02615
REMOVING AND REPLACING PAVEMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Removal and replacement of existing pavements for installation of utility lines, as specified herein, and as needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
 - 2. Section 02221 - Trenching, Backfilling for Utilities.
 - 3. Section 02722 - Sewers: Sanitary, Gravity.
 - 4. Section 02729 – Rehabilitation of Existing Sewers Utilizing Cured-in-Place Pipe.
 - 5. Section 02730 – Rehabilitation of Existing Manholes.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods for proper performance of the work of this Section.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

1.5 WARRANTY

- A. All remove and replace pavement work within the South Carolina Department of Transportation (SCDOT) rights-of-way shall be warranted for two years beginning on the date of acceptance by the SCDOT.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Comply with Section 03300, using strength specified herein.

2.2 ASPHALTIC CONCRETE

- A. Use Types 1 and 2 complying with South Carolina Department of Transportation Standard Specifications, Section 403 and latest revisions and supplements.

2.3 AGGREGATE BASE COURSE WITH PRIME

- A. Comply with applicable portions of South Carolina Department of Transportation Standard Specifications, Section 305, Macadam Base Course, and latest revisions and supplements.

PART 3 - EXECUTION

3.1 GENERAL

- A. Remove to neat lines and dispose of as directed.
- B. Replace with bases and pavements similar to type removed, unless otherwise indicated.

3.2 CUTTING

- A. Concrete pavement or base:
 - 1. Cut on straight and true lines, to a minimum depth of 2", using powered concrete saw.
 - 2. Shear off remaining depth with pneumatic tools.
- B. Concrete sidewalks shall be removed back to the nearest joint on each side of the crossing.
- C. Asphaltic concrete pavements: Cut to straight and true lines with powered concrete saw.

3.3 REPLACEMENT

- A. Concrete pavements:
 - 1. Use 4000 psi concrete.
 - 2. Replace to 6" below existing slab and undercut each edge 6" to form shelf.
 - 3. Finish surface to match existing surface.
- B. Concrete sidewalks:
 - 1. Replace with 4000 psi concrete.
 - 2. Depth shall be equal to existing section removed, but not less than 4".
 - 3. Finish surface to match existing sidewalk.
- C. Flexible pavements (Ditch Line) – Secondary and Primary Roads:
 - 1. Backfill in accordance with Section 02225 with 2" depression and details shown on the plans.
 - 2. Top with 2" of asphaltic concrete.
- D. Flexible pavements (Ditch Line) - Driveways:
 - 1. Compact subgrade thoroughly.
 - 2. Place 8" deep aggregate base course with prime.
 - 3. Top with 2" of asphaltic concrete.

E. Flexible pavements (Resurfacing):

1. In some instances where utilities are installed within existing pavements, resurfacing of the entire width of the original pavement will be required.
2. Replace pavement in ditch line as specified above.
3. Prime and resurface with 2" of asphaltic concrete.
4. Taper resurfacing to existing pavement evenly.
5. Comply with Section 02513.

3.4 MEASUREMENT AND PAYMENT

A. Concrete Sidewalk Replacement:

1. Measurement for payment for concrete sidewalk replacement shall be the actual number of linear feet (LF) of concrete sidewalk replaced. Included in the unit price bid item shall be saw cutting, removal, haul, subgrade preparation to match existing, grading, forms, concrete testing and other incidental work to replace concrete sidewalk to original condition.

B. Concrete Driveway Replacement:

1. Measurement for payment for driveway replacement shall be the actual number of linear feet (LF) of driveway replaced. Included in the unit price bid item shall be saw cutting, removal, haul, excavation, subgrade preparation to match existing, grading, forms, concrete testing, and other incidental work to replace curb and gutter to original condition, including culvert replacement.

C. Pavement Replacement:

1. The measurement for payment for pavement replacement shall be the actual quantity of pavement replaced at the locations, based on the total linear footage of the pavement at grade based on the roadway open cut or roadway replacement details. Units of measurement for all pavement replacement shall be linear foot.
2. The unit price shall include base course (including installation and removal of steel plates), screenings, compaction testing, binder, primer, tack coat, furnishing, placing and installing asphalt or concrete pavement to original grade.
3. No extra payment will be made for repair of deficient or unacceptable work.

D. Traffic Control:

1. The measurement for payment for Traffic Control shall be the lump sum price stated in the Bid Schedule. The lump sum price shall include all necessary signage, Jersey barriers, flagmen, detours, traffic control plans and other related requirements of the SCDOT and City of Georgetown.

2. Payment shall be divided into equal monthly amounts based on price bid and scheduled duration (time) of project.
- E. Materials Testing:
1. No measurement or direct payment will be made for testing and all cost shall be included in the Price Bid to which it pertains.

END OF SECTION

SECTION 02722
SEWERS: SANITARY, GRAVITY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide gravity sanitary sewer as shown on the drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
 - 2. Section 02221 – Trenching, Backfilling for Utilities.
 - 3. Section 02615 – Removing and Replacing Pavements.
 - 4. Section 02729 – Rehabilitation of Existing Sewers Utilizing Cured-in-Place Pipe.
 - 5. Section 02730 – Rehabilitation of Existing Manholes.
 - 6. Section 02930 – Grassing.
 - 7. Section 11307 – Temporary Bypass Piping.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. All materials in this Section are to be manufactured in the United States.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.
- B. Storage of PVC pipe:
 - 1. Store in unit packages as received from manufacturer until just prior to use.
 - 2. Stack units in such a manner as to prevent deformation to pipe barrel and bells.
 - 3. Protect from direct sunlight by covering with opaque material if storage period will exceed six weeks.
- C. Avoid severe impact blows, gouging or cutting by metal surfaces or rocks.

1.5 ORDER AND ACCEPTANCE OF WORK

- A. Engineer shall direct on what line or street the Contractor shall work and the order thereof.
 - 1. Generally, Work shall commence with outfalls, to mains, thence to laterals.
- B. Owner reserves right to accept and use any portion of Work whenever it is considered to be in the public interests to do so.

1.6 PROTECTION OF OTHER UTILITIES

- A. Location:
 - 1. Approximate location of certain known underground lines is shown.
 - 2. Existing small lines not shown.
 - 3. Locate small and other possible utility lines using electronic pipe finder, or other approved method.
 - 4. Excavate and expose existing underground utilities ahead of trenching operations.
- B. Repair or replace any damaged utility line or structure at no additional cost to Owner.

1.7 JOB CONDITIONS

- A. Work under this Section may require construction or work in a confined space, defined as any space having one or more of the following characteristics:
 - 1. Limited openings for entry and exit.
 - 2. Unfavorable natural ventilation.
 - 3. Not designed for continuous worker occupancy.
- B. The Contractor shall have on the job site at all times the following minimum safety equipment:
 - 1. Gas monitor capable of testing and detecting for combustible gas, oxygen deficiency and hydrogen sulfide.
 - 2. Confined space access and retrieval winch system.
 - 3. Ventilating fan with large diameter ventilating hose.
 - 4. Supplied air respirator, MISHA/NIOSH approved type.
 - 5. Safety harness and lifelines.

This equipment to be available for use by the Contractor, Engineer and Owner for the duration of the project.

- C. All entries into or work within confined spaces to be conducted in accordance with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health [DHHS (NIOSH)] Publication No. 87-113, A Guide to Safety in Confined Spaces.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe shall be subject to Engineer's observation, at plant, trench or other point of delivery, for culling and rejecting pipe, independent of laboratory tests, not conforming to specifications.

- B. Rejected pipe will be marked by the Engineer and Contractor shall remove it from project site.

2.2 PIPE AND FITTINGS

- A. Use any pipe material specified herein, except where use of a particular pipe material is indicated on the Contract Drawings.
- B. Ductile-iron pipe and fittings (DIP) (for depths 14' or greater):
 - 1. Comply with ANSI/AWWA C151/21.51, latest revision.
 - 2. Wall thickness in accordance with Table 51.1 of ANSI/AWWA C151/A21.51 with working pressure of 150 psi, depth of cover indicated and Type 3 bedding conditions, minimum Class 52.
 - 3. Use mechanical or push-on joints complying with ANSI/AWWA C111/A21.11 as modified by ANSI/AWWA C151/A21.51.
 - 4. Use rubber gaskets and lubricant complying with ANSI/AWWA C111/A21.10.
 - 5. Use wall thickness in accordance with table included herein for depth and bedding conditions.
 - 6. Provide 250 psi rated ductile iron fittings or specials unless otherwise indicated, complying with ANSI/AWWA C110/A21.10 and in accordance with ANSI/AWWA C111/A21.11.
 - 7. Clearly cast the manufacturer's mark, country where cast, year in which the fitting was produced, and the letters "DI" or "Ductile" on the fitting."
 - 8. Use lining complying with the following:
 - a. Amine cured Novalac Epoxy polymeric lining, 40 mils nominal thickness. The standards of quality are based on Protecto 401 by Vulcan Painters, Birmingham, Alabama or Corrosion-Clad Polymer Lining No. 210 by Sauereisen Cements, Pittsburgh, Pennsylvania, or approved equal.
 - 9. Polyethylene encasement:
 - a. Provide polyethylene encasement of pipe on all ductile iron pipes.
 - b. Minimum nominal thickness of 8 mils.±10%.
- C. Polyvinyl chloride pipe (PVC):
 - 1. Use integral wall bell and spigot, minimum of SDR35, complying with ASTM 3034.
 - 2. Use elastomeric gasket joints, providing watertight seal.
 - 3. Furnish pipe in 12.5 or 20-foot lengths.
- D. Transition couplings:
 - a. For transition between ductile iron pipe and PVC pipe use ductile iron adapter with Protecto 401 lining by Romac Industries, Inc. Model 501 Transition Coupling, full circle SS Sleeve JCM 101, or approved equal.
 - b. Fasteners to be Type 304 stainless steel.

2.3 MANHOLES

- A. Use precast manholes:
 - 1. Provide reinforced precast concrete ring and eccentric cone sections complying with ASTM C 478 and the following.
 - 2. Use portland cement complying with ASTM C 150, Type II.
 - 3. Cast base slab monolithically with walls.
 - 4. Design flat slab top sections for HS-20 traffic loadings.

5. Provide tongue and groove with vulcanized butyl rubber sealant or O-ring rubber gasketed joints.
 6. Cast or factory cut pipe opening in manholes:
 - a. Provide flexible pipe boot conforming to ASTM C923M.
 - b. Attach boot to piping with dual stainless steel straps.
 - c. All other hardware to be stainless steel.
 - d. Provide Kor-N-Seal or equal.
 7. Size lift holes and inserts for a precision fit with the lift devices.
 - a. Holes shall not penetrate through the manhole wall.
 - b. Comply with OSHA Standard 1926.704.
 8. Provide flat slab tops where manhole depth is less than 4'0".
 9. Provide manhole sealant using the inorganic copolymer water proofing admixture "Ipanex" by IPA Systems in accordance with the manufacturer's dosage and mixing instruction or an approved equal method.
- B. Steps:
1. Manhole steps are not required.
- C. Exterior joint collar:
1. Install an exterior joint collar on all manhole joints.
 2. Provide a 12" wide band.
 - a. Provide an outer layer of polyethylene with an under layer of rubberized mastic reinforced with a woven polypropylene fabric.
 - b. Provide a peelable protective paper against the mastic that is removed when the collar is applied to the joint.
 - c. Design the collar so that when it is applied around the joint the ends overlap at least 6".
 3. Provide SealWrap Exterior Joint Sealer as manufactured by Mar-Mac Manufacturing Company or an approved equal.
- D. Frames and covers:
1. Provide gray iron castings, complying with ASTM A 48, Class 35B iron and AASHTO M-306.
 2. Provide a minimum recycled material content of 75 consisting of post-consumer material.
 3. Castings shall be of uniform quality, free from sand holes, gas holes, shrinkage, cracks and other surface defects ground smooth and clean by shot blasting.
 4. Cast or machine bearing surfaces between rings and covers with such precision to prevent rocking.
 5. Casting dimensional tolerances shall be +/- 1/16" per foot.
 6. Conduct a first article proof load test and make the results of that proof load available upon request.
 - a. Conduct in accordance with the method and procedure outlined in AASHTO M-306.
 - b. Test casting on a suitable and calibrated load testing machine. Casting shall hold a 40,000 pound proof load for one minute without experiencing any cracks or detrimental permanent deformation.
 - c. Maintain test results for each lot of castings by the foundry for a minimum of seven years. Make available upon request.
 7. Provide inspections in accordance with AASHTO M-306 and furnish results of these tests upon request.
 8. Furnish a foundry certification stating that samples representing each lot have been tested, inspected, and are in accordance with this specification.

9. Each casting shall be identifiable and show, at a minimum, the following: name of the producing foundry, country of manufacturer, ASTM material designation, recycle symbol, individual part number, cast or heat date.
10. Provide frame weighing not less than 155 lbs. with inside opening between 21.8" and 24".
11. Provide circular cover with two "pick" holes, one 1" diameter vent hole, and weighing not less than 130 lbs.
12. Covers to have the words "CITY OF GEORGETOWN" and "WASTEWATER" cast in the metal.
13. Coat frames and covers with two (2) shop coats of water based bitumastic paint, MC4 MPFC by Molecular Coating Specialist of Cedar Hill, Texas or approved equal.
14. Provide non corrosive polymer coating where indicated on the plans
 - a. Heat castings in a furnace with temperatures ranging from 800° - 1200° F.
 - b. Induce gases into the furnace that will diffuse into the porous layer of the iron to create a corrosion-resistant layer on the casting surface.
 - c. Cool the casting to 200° and dip into a polymer mix.
 - d. Provide Ultrawear Plus process or approved equal
15. Provide East Jordan Iron Works, Inc. Catalogue Number 1020921022 frames and 10204 covers or approved equal.

E. Precast grade rings:

1. Use Precast Grade Rings to adjust ring and covers to finished grade.
2. No more than 8 vertical inches of grade rings will be allowed per manhole.
3. Conform to ASTM C 478
4. Provide no less than 4" in height.
5. Use cement brick for adjustments less than 4".

F. Precast inverts:

1. Provide precast inverts.
 - a. Pipe openings shall provide clearance for pipe projecting a minimum of 2" inside the manhole.
 - b. The height of the transition from the pipe opening to the invert trough shall be equal to one-half of the Opening ID minus Pipe ID, $\pm 1/4"$.
2. The crown of small I.D. pipe shall be no lower than the crown of the outlet pipe.
 - a. When the fall between the inlet and the outlet holes is greater than 4", the inlet end of the trough shall be below the inlet pipe invert and aligned horizontally within 1".
 - b. Form and finish troughs to provide a consistent slope from the pipe outlet to the inlets up to 4" fall.
 - 1) Minimum fall-1".
 - 2) Minimum bending radius of the trough centerline-1.5 times the pipe I.D.
 - 3) Provide a 1/2" radius at the intersection of 2 or more channels.
 - 4) The minimum concrete thickness from the bottom of the trough to the bottom of the base shall be 7".
 - c. Float finish benches to provide a uniform 2-1/2" slope, $\pm 1"$, from the high point at the manhole wall to the low point at invert trough.
 - 1) Provide a 1/4" radius at the edge of the bench and trough.
 - d. Fill, depressions, high spots, voids, chips, or fractures over 1/4" in diameter or depth with a sand cement paste and finish to a texture reasonably consistent with the formed surface.

2.4 CLEANOUTS

- A. Provide cleanouts on each separate service line.
 - 1. Locate within the Owner's right-of-way.
 - 2. For cleanouts located in roadway or driveway:
 - a. Provide J. R. Smith, Josam or equal.
 - b. Provide Smith #4253S-G (taper thread - bronze plug, cast iron top) or Josam #58860-22-5 or equal.
 - c. Coat with 2 shop coats of bitumastic paint.
 - 3. For cleanouts located in grassy area:
 - a. Provide Sched 40 PVC.
 - 4. Provide cleanouts of the same diameter as lines in which they are installed up to 4", and not less than 4" for larger pipe diameters.
 - 5. Comply with the latest adopted version of the International Plumbing Code or local codes where applicable.
 - 6. Provide concrete protection pad set at grade.

2.5 SERVICE PIPE FITTINGS

- A. Provide PVC fittings in conformance with the requirements of ASTM D-3034 with minimum wall thickness of SDR35.
- B. Provide PVC material with cell classification of 12454-B or C as defined in ASTM D-1784.
- C. Gaskets will have a minimum cross-sectional area of 0.20 square inches and conform to ASTM F-477.
- D. Provide fittings with socket depths not less than the minimum depths shown in Table 2 of ASTM D-3034 latest revision.

2.6 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 LAYING OUT WORK

- A. Provide all materials, labor, instruments, etc. required to lay out Work.
- B. Prepare "cut sheets" under direct supervision of the Engineer.
- C. Exercise proper precaution to verify figures on the drawings prior to laying out Work. Contractor will be held responsible for any errors therein that otherwise might have been avoided.
- D. Promptly inform Engineer of errors or discrepancies found, in order that proper corrections may be made.
- E. **The Contractor shall be responsible for locating all utilities within the excavation limits. The Contractor is responsible for any damaged caused to existing utilities during point repair and other excavation activities.**

3.2 LOCATION

- A. Sewer lines in relation to water lines must conform to South Carolina Standards for Wastewater Facility Construction R.61-67 section 67-300 paragraph A.14.
- B. Where the sewer location is not located clearly by dimensions on the drawings, locate the sewer:
 1. Not closer than 10' horizontally from a water supply main or service line. The distance shall be measured edge to edge.
 2. Where it is not practical to maintain a 10' horizontal separation, the sewer pipe may be installed closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so the bottom of the water main is at least 18" above the top of the sewer.
 3. Where sewers are crossing a water main, either above or below, provide a minimum vertical distance of 18" between the outside of the water main and the outside of the sewer.
 4. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.
 5. Where a water main crosses under a sewer, fully encase the sewer pipe for a distance of 10' on each side of the crossing; or
 6. Use acceptable pressure pipe with no joint closer horizontally than 3' feet from the crossing. This pipe will be pressure tested to assure watertightness prior to backfilling.
 7. Where concrete encasement is used, provide not less than 4" thickness including that on pipe joints.

3.3 INSTALLATION

- A. Trench, backfill and compact for the work of this Section in strict accordance with pertinent provisions of Section 02221 and Section 02615 of these specifications, and the following requirements:
 1. Maximum trench widths, depths and bedding methods.
 - a. Install all sewers complying with tables for depths of cut and class of bedding included hereinafter.
 - b. Where trenches are excavated beyond specified widths, or trench walls collapse, lay sewer complying with requirements of the next better class of bedding at no additional cost to the Owner.
 - c. Include cost of special bedding and tamping in unit prices bid for sewer.
 2. Ductile-iron pipe:

MAXIMUM DEPTHS IN FEET						
			CLASS OF BEDDING			
			D	C	B	A
PIPE SIZE	MAX. TRENCH WIDTH	CLASS OF PIPE	FLAT BOTTOM TRENCH	TYPE 1 OR TYPE 2	TYPE 1 OR TYPE 2	SPECIAL CONCRETE BEDDING
8"	2'2"	50	24	28	32	35
10"	2'4"	50	15	24	32	35
10"	2'4"	51	24	32	35	35
12"	2'6"	50	16	20	32	35
12"	2'6"	51	20	24	35	35
12"	2'6"	52	28	32	35	35

3. Polyvinyl chloride pipe (SDR35):

MAXIMUM DEPTHS IN FEET					
		CLASS OF BEDDING			
		D	C	B	A
PIPE SIZE	MAX. TRENCH WIDTH	FLAT BOTTOM TRENCH	TYPE 1 OR TYPE 2	TYPE 2* ONLY	SPECIAL CONCRETE BEDDING
4"	2'0"	**	**	30	30
8"	2'2"	**	**	30	30
10"	2'4"	**	**	30	30
12"	2'6"	**	**	30	30
15"	2'10"	**	**	30	30
*		Class B Bedding (Type 2) shall extend to the top of the pipe.			
**		Do not use this Class of bedding for this pipe size and trench width.			

4. Bedding and tamping requirements for the various classes of bedding shall comply with the following specifications:
- a. Class A Bedding - Excavate trench to one-fourth of nominal pipe diameter below pipe grade; lay pipe to grade on concrete blocking; place 2500 psi concrete around pipe for full width of trench up to one-fourth nominal pipe diameter above the invert.
 - b. Class B (Type 1) Bedding - Shape bottom of trench to a level 2" below bottom of pipe; bring bed to proper level by spreading and thoroughly tamping fine granulated moist earth and sand to conform accurately to one-fourth circumference of pipe barrel; provide suitable material if not available from trench excavation; lay pipe, backfill and hand tamp in thin layers to height three-fourths of pipe diameter, using material same as bedding material; complete trench backfill complying with Section 02221.
 - 1) Trenches excavated to excess depths shall be brought to grade with stone or gravel bedding at the Contractor's expense.
 - 2) Exercise care to avoid disturbing pipe grade, alignment or joints at all times.
 - 3) In lieu of this class bedding, Contractor may elect to use Class B (Type 2) bedding.
 - c. Class B (Type 2) Bedding - Undercut 4" below pipe barrel, full width of trench; bring to grade with approved backfill and compacted crushed stone complying with SCDOT Aggregate No. 5; except for PVC sewers, use SCDOT Aggregate No. 57, then:
 - 1) For pipe other than PVC, place stone in six-inch layers to mid-point of pipe, compacting by slicing with shovel.
 - 2) For PVC pipe, place stone (Aggregate No. 57) in six-inch layers to the top of the pipe, compacting by slicing with shovel.
 - 3) Complete trench backfill complying with Section 02221.
 - d. Class C (Type 1) bedding - Shape trench bottom by hand to conform accurately to bottom one-quarter of pipe barrel circumference.
 - 1) Use Class C (Type 2) bedding if unable to properly shape trench bottom.
 - 2) If shaping is not performed accurately, the Contractor will be required to use Class C (Type 2) bedding.
 - e. Class C (Type 2) Bedding - Undercut 4" below bottom of pipe barrel; full width of trench; bring to grade with approved backfill and compacted crushed stone complying with SCDOT Aggregate No. 5;

lay pipe; place stone in 6" layers to quarter-point of pipe, compacting by slicing with shovel; complete backfill complying with Section 02221.

- f. Class D Bedding - Excavate bell holes in flat-bottomed trench; lay pipe; backfill complying with Section 02221.

B. Pipe laying:

1. General:
 - a. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
 - b. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in direction of flow.
 - c. Lay each pipe accurately to the indicated line and grade, aligning so the sewer has a uniform invert.
 - d. Continually clear interior of the pipe free from foreign material.
 - e. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.
 - f. Use gasket lubricants as recommended by the pipe manufacturer.
 - g. Place, fit, join and adjust the joints to obtain the degree of water tightness required.
2. Polyvinyl chloride pipe:
 - a. Select proper bedding class from preceding table as determined by pipe size and depth of cut.
 - 1) Class B (Type 2) or better bedding shall be used for all PVC and CCRRPMP sewers.
 - b. Comply with ASTM D2321, except as otherwise specified herein.
3. Ductile-iron pipe:
 - a. Select proper bedding class from preceding table as determined by pipe size and depth of cut.
 - 1) Class D bedding limited to maximum pipe size of 24", Class 52 at 14' foot depth.
 - b. Comply with ANSI/AWWA C600, except as otherwise specified herein.
4. Remove defective pipe and replace with sound pipe, at no cost to the Owner.

3.4 INSTALLATION OF MANHOLES

- A. Set bases level so that walls will be plumb.
- B. Clean bells and spigots.
- C. Apply joint sealer, or ring gasket to wall section(s), set firmly in place to assure watertight joints.
- D. Set risers and cones so steps align.
- E. Tightly connect pipe boot to piping with dual stainless steel straps.
- F. Grout lift holes from the outside using non-shrink grout.
- G. Install exterior joint collar.
 1. Follow manufacturer's recommendations.
 2. Clean surface.
 3. Remove the protective paper and place the band around the manhole, mastic side to the manhole and spanning the joint.
 4. Cover exposed strap with the closing flap.

H. Install manhole to grade utilizing precast grade rings.

3.5 SERVICE LINES

- A. Connect to street sewers using wye branches and ells as indicated on the plans.
- B. Do not stack service lines vertically over the sewer main.
- C. Provide sufficient fittings to route piping without bending the pipe sections.
- D. The Contractor is responsible for coordinating with the property owner and the utility owner's representative to determine the depth and location of both the sewer line connection and clean out to best provide a sewer service connection point for the property being served.
- E. The Contractor is responsible for locating service lines to avoid conflicts with existing utilities and exposure of line in ditches.

3.6 CLEANOUTS

- A. Secure the Engineer's approval of locations for cleanouts in finished areas prior to installation.
- B. Pour 4" concrete protection pad around cleanout.

3.7 INSPECTIONS AND TESTING

- A. General:
 - 1. All sewers will be visually inspected, tested and gauged for infiltration and/or exfiltration.
 - 2. All visible leaks shall be repaired even if infiltration is within allowable limits.
 - 3. Broken or cracked pipe, mislaid pipe and other defects shall be corrected.
 - 4. All repairs, relaying of sewers, etc., required to bring the sewers to specified status shall be made at no additional cost to the Owner.
 - 5. Expense of all testing will be borne by the Contractor.
- B. Construction observation:
 - 1. Clean and prepare for observation each block or section of sewer upon completion, or at such other time as the Engineer may direct.
 - 2. Each section between manholes shall show a full circle of light when viewed from either end.
- C. Deflection tests:
 - 1. Perform deflection tests on all PVC pipe in the presence of the Engineer.
 - 2. No pipe to exceed a deflection of 5%.
 - 3. Conduct deflection testing after the final backfill, and compaction thereof, has been in place at least thirty (30) days and prior to placing the sewer lines into operation.
 - 4. Conduct the deflection tests using a rigid ball or mandrel having a diameter equal to 95% of the inside diameter of the pipe.
 - 5. Do not use mechanical pulling devices for the deflection tests.

- D. Air testing:
 - 1. Where sewers are installed above the groundwater table, conduct air tests complying with ASTM C 828 for ductile iron and concrete pipe and ASTM F 1417 for PVC pipe.
- E. Vacuum Test of Manholes:
 - 1. Vacuum test manholes in accordance with ASTM C-1244.
 - 2. Typical Field Test Procedure.
 - a. The test head gauge shall be placed at the top of the manhole or in accordance with the manufacturer's recommendations.
 - b. A vacuum of 10 in. of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. of mercury.
 - c. The manhole shall pass if the time for the vacuum reading to drop from 10 in. of mercury to 9 in. of mercury meets or exceeds the values indicated in the Table 1 below.
 - d. If the manhole fails the initial test, necessary repairs shall be made. The manhole shall then be retested until a satisfactory test is obtained.
 - 3. Minimum test times for various diameter manholes.

TABLE 1

<u>Depth of Manhole (feet)</u>	<u>Diameter of manhole (feet)</u>		
	4'	5' <u>Time (Sec.)</u>	6'
To – 8	20	26	33
8 - 10	25	33	41
10 – 12	30	39	49
12 – 14	35	46	57

- F. Point Repairs:
 - 1. Testing of pipelines installed for point repairs shall be based on a visual review of the results of the post-construction television inspection. If excessive infiltration or leakage at the joints with the existing pipes or manholes is present, or noticeable deflection in the pipe is observed, the Contractor shall make all necessary repairs at no additional cost of the Owner.

3.11 MEASUREMENT AND PAYMENT

- A. All work under this Section will be measured and paid for as specified hereinafter.
- B. Sewer pipe will be measured from center to center of manholes and depth of cut from invert to original ground at centerline. Payment will be made at the unit prices per linear foot as stated in the Bid Form, and shall include cost of excavation, materials, removal of existing sewer pipe and proper disposal, bedding, dewatering, temporary bypass pumping system, trench box and sheeting (if necessary), metallic detection tape, backfilling, compaction, cleanup, testing, etc. for complete installation.

- C. Manholes will be measured from the lowest invert elevation to the top rim of the frame and paid for at the unit price each as stated in the Bid Form, which shall include all costs of excavation, dewatering, backfilling, materials, grade rings, stone base, standard frame and cover, trench box and sheeting (if necessary), testing, clean-up, etc. for complete installation.
- D. Sewer Service Laterals (by open-cut) will be measured along the top of the pipe from bell of the wye branch to stoppered end and payment made at the unit cost per linear foot as stated in the Bid Form. Payment will include all cost of excavation, dewatering, backfilling, materials, fittings, metallic detection tape, bedding, testing, clean-up, restoration, etc. for complete installation
- E. ~~Cleanouts – Payment will be made at the unit price stated for each in the Bid Form. Payment shall include cost of piping to the cleanout and plug.~~
- F. Wyes – Payment will be made at the unit price stated for each in the Bid Form. Payment shall include cost of all materials, proper bedding, etc. for complete installation.
- G. ~~Point Repairs (up to 10 LF): Payment will be made at the unit price per each as stated in the Bid Form and shall include up to 10 LF of new sewer pipe (to match existing pipe size diameter), coupling, removal of existing pipe, excavation, dewatering, temporary bypass pumping, proper bedding, trench box and/or sheeting (if necessary), backfilling, grassing, etc. for complete installation. Pavement replacement will be paid for at the unit price as stated in the Bid Form.~~
- H. ~~Point Repairs (greater than 10 LF): Payment will be made at the unit price per linear foot as stated in the Bid Form. Payment will include removal of existing pipe, new sewer pipe (to match existing pipe size diameter), coupling, excavations, dewatering, temporary bypass pumping, proper bedding, trench box and/or sheeting (if necessary), backfilling, cleanup, grassing, etc. for complete installation. Pavement replacement will be paid for at the unit price as stated in the Bid Form.~~

END OF SECTION

SECTION 11307

TEMPORARY BYPASS PUMPING SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. Work included: Provide all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing flow around work areas for the duration of the interruption to normal operation of the facilities.
- B. Provide complete design, installation and operation of the temporary pumping system.
- C. Provide a complete and operable system, fully self-sufficient, requiring no external power.
- D. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 02722 – Sewers: Sanitary, Gravity.
 - 3. Section 02729 – Rehabilitation of Existing Sewers Utilizing Cured-in-Place Pipe.
 - 4. Section 09811 – Epoxy Lining for Manhole Interiors

1.2 QUALITY ASSURANCE

- A. Referenced provider of temporary bypass pumping system is Godwin Pumps of America, and is named to establish standards of quality. Products by other suppliers conforming to this specification and conforming to the Bid Form may be provided upon approval by the Engineer.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Provide a minimum of five (5) references of projects similar in size, complexity and nature performed by the system supplier within the past three years and where reliable 24 hour service can be demonstrated.
- D. Comply with the requirements of all codes and regulatory agencies having jurisdiction.
- E. The bypass system is an integrated system and to be furnished by a single manufacturer or system supplier who shall provide all the equipment and appurtenances necessary to achieve a fully integrated and operational system and be responsible to the Contractor for operation of the entire system.
 - 1. System supplier to be certified by the pump manufacturer to install and service the equipment.
- F. Maintain water flow around the work area in a manner that will not cause surcharging of gravity systems or damage to facilities, and that will protect public

and private property from damage.

- G. Protect water resources, wetlands, and other natural resources.
- H. If required, obtain approval from the South Carolina Department of Health and Environmental Control.

1.3 SUBMITTALS

- A. Submit bypass pumping and/or diversion plans for review at least 30 working days prior to the work.
- B. Submit plans and descriptions outlining all provisions and precautions to be taken regarding the handling of existing flows. The plan to include but not be limited to details of the following:
 - 1. Staging areas for pumps.
 - 2. Pipe plugging method and types of plugs.
 - 3. Number, size, material, location and method of installation of suction piping.
 - 4. Number, size, material, method of installation and location of installation of discharge piping.
 - 5. Bypass pump sizes, capacity, number of each size to be on site and power requirements.
 - 6. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted).
 - 7. Method of protecting discharge structures from erosion and damage.
 - 8. Restraint system for all piping.
 - 9. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
 - 10. Method of noise control for each pump and/or generator to ensure all local noise ordinances are met. Provide enclosure where specified or required by local regulations or ordinances.
 - 11. Any temporary pipe supports and anchoring required.
 - 12. Design plans and computation for access to bypass pumping locations indicated on the drawings.
 - 13. Calculations for selection of bypass pumping pipe size.
 - 14. Schedule for installation of and maintenance of bypass pumping lines.
 - 15. Plan indicating selection location of bypass pumping line locations.
 - 16. Plan must include proper protection of the bypassing facilities.
 - 17. Bypass pumping plan must include an emergency response plan to be followed in the event of a failure of the bypass pumping system.
 - 18. Emergency contact number, providing 1 hour response time, 24 hours a day, 7 days a week.
 - 19. Safety and security plan to protect and minimize risk to public and to prevent vandalism.
- C. Notify Engineer 48 hours prior to commencing with the bypass pumping operation.

1.4 JOB CONDITIONS

- A. Provide safety equipment per OSHA Regulation.
- B. Access to some parts of the project is challenging. The contractor is to visit the site and consider all issues and include cost of access and working in the existing conditions into the price bid for the work to be performed.
- C. Provide on the job site at all times the following minimum safety equipment:

1. Gas monitor capable of testing and detecting for combustible gas, oxygen deficiency and hydrogen sulfide.
2. Confined space access and retrieval winch system.
3. Ventilating fan with large diameter ventilating hose.
4. Supplied air respirator, MSHA/NIOSH approved type.
5. Safety harness and life lines.
6. This equipment to be available for use by the Contractor, Engineer and Owner for the duration of the project.
7. All entries into or work within confined spaces to be conducted in accordance with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health [DHHS (NIOSH)] Publication No. 87-113, A Guide to Safety in Confined Spaces.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide only reliable, clean equipment and materials in accordance with these specification and applicable regulatory requirements.
- B. Provide fully automatic units.
- C. Provide one of the following:
 1. Self-priming pump units that do not require the use of foot-valves or vacuum pumps in the priming system and are constructed to allow dry running for long periods of time to accommodate the cyclical nature of flows.
 2. Submersible units where an electrical connection is available.
- D. Provide one stand-by pump of each size to be maintained on site.
 1. Installed back-up pumps to be on-line and isolated from the primary system by a valve.
 2. System to meet design conditions with the largest pump out of service.
- E. Provide 24 hour per day monitoring of the by-pass operation and 24-hour per day emergency response to any pump failure or other by-pass pumping system problems.
- F. Provide sound attenuated enclosure.

2.2 PERFORMANCE

- A. Provide bypassing operation for the locations and flows shown below.
- B. Submit bypass system design information in accordance with this specification for each individual required pumping operation.

Location	Min Flow (gpm)	Max Flow (gpm)	Static Head (FT)
Existing Manholes	As Needed	As Needed	As Needed

C. Fuel:

1. Provide all fuel necessary to perform bypass operations specified under this project.

2.3 PUMPS

- A. Provide fully automatic units.

2.4 PIPING

- A. Temporarily construct all discharge systems of rigid pipe with positive, restrained joints or welded HDPE pipe in order to prevent the accidental spillage of flows.
- B. Discharge hose will only be allowed in short sections and by specific permission from the Engineer.
- C. Provide all necessary air release valves for proper operation of the pumping system.
- D. Aluminum "irrigation" type piping or glued PVC pipe will not be allowed.

2.5 ENGINE/PUMP CONTROL SPECIFICATIONS

- A. Start, stop, and control the engine by a high performance state of the art digital controller.
1. Supply by the pump manufacturer.
 2. Provide weather proof enclosure.
 3. Provide an external weatherproof 12-position keypad accessible without the need to remove or open any protective cover or enclosure.
 4. Design to start/stop the engine at a signal supplied by high and low level floats or a 4-20 mA transducer.
 5. Provide the specified functions without modification, factory recalibration, or change of chips or boards, by simply accessing the keypad.
- B. Keypad:
1. Provide a capacitive touch sensing system.
 2. Mechanical switches will not be acceptable.
 3. Capable of operating in extreme temperatures, with gloves, through ice, snow, mud, grease, etc. and maintain complete weather-tight sealing of the PrimeGuard controller.
- C. In automatic mode, the unit shall conserve energy and go to "sleep".
- D. Controller to function interchangeably from float switches, pressure switch, or transducer, as well as manual start/stop by selection at the keypad.
1. No other equipment or hardware changes are required.
- E. Provide automatic throttle control, capable of varying the engine speed to maintain a constant level in a process without a change to the controller other than via the keypad.
- F. Provide programmable start function for three separate functions each day for seven days (i.e. a start, warm up, exercise cycle on two separate days at different times and for a varying length of time all via the keypad).

- G. Provide Manual-Automatic Button:
 1. In Manual Mode, manual "Start" button starts engine and runs until "Stop" button is depressed or an emergency shutdown occurs.
 2. In Automatic Mode, start/stop sequencing is initiated by either two normally-open narrow angler float switches, pressure switch, transducer, or a signal from a digital input.
- H. Controller to integrate the engine safety shut-off for low and high oil temperature, and provide over-speed protection.
- I. Controller to include standard, field-adjustable parameters for engine cycle crank timer, shutdown time delay, warm-up time delay, and cool-down time delay.
- J. Controller to have only one circuit board with eight built-in relays. Each relay can be named to provide any function, all via the keyplay without changing relays, chips, printed circuits, or any hardware or software.
- K. Standard components to consist of (24) digital inputs, (7) analog inputs, (1) magnetic pick-up input, (8) 20-amp form "C" relays, (1) RS232 port, (1) RS485 port, (1) RS232/RS485 port, (1) J1939 port, and (1) 64X128 pixel full graphic LCD display with backlight.
- L. Controller to withstand Vibration of 3 g, 3 axis, frequency swept 10-1000 Hz, in an operating temperature Range of 4° to 176°F (-20° to 80°C) and an operating humidity range of 0-95% Non-Condensing.
- M. Provide level control device, float switches, transducer, etc., suitable for the bypassing operation.

2.6 SOUND ATTENUATED ENCLOSURE

- A. Reduce pump and engine noise to (68) sixty-eight dBA or less at a distance of thirty feet.
- B. The engine and pump to be completely enclosed with fourteen-gauge sheet metal panels backed with one-inch and two-inch layers of poly-damp acoustical sound-deadening material.
- C. Provide removable panels for easy access to the engine / pump for maintenance and repair.
- D. Provide a locking access door for visual inspection to the engine control panel.
- E. For maintenance and service needs to the pump discharge side of the trailer, provide a hinged door for quick access to the engine oil fill, fuel fill port, oil dipstick, and filters.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL AND MAINTENANCE

- A. Testing:
 1. Perform leakage and pressure tests at 150% of design pressure of the bypass pumping discharge piping using clean water prior to actual operation.
 2. Notify the Engineer 48 hours prior to testing.

- B. Inspect bypass pumping system as required for fueling and maintenance to ensure that the system is working correctly and provides continuous operation.
- C. Insure that the temporary pumping system is properly maintained and a responsible operator will be on hand at all times when pumps are operating.
- D. Extra Materials:
 - 1. Keep spare parts for pumps and piping on site.
 - 2. Maintain on the site adequate hoisting equipment for each pump and accessories.

3.2 PREPARATION

A. Precautions

- 1. Locate any existing utilities in the area the Contractor selects to locate the bypass pipelines.
- 2. Locate bypass pipelines to minimize any disturbance to existing utilities and obtain approval of the pipeline locations from the Engineer.
- 3. Protect the Owner's facilities and private property from damage inflicted by bypassing operation.

3.3 INSTALLATION AND REMOVAL

- A. Make connections to the existing facilities and construct temporary bypass pumping system only at the access location indicated on the approved submittal drawings.
- B. Sterilize the entire bypass pumping system in accordance with Section 02751 - Plant Piping, Valves and Appurtenances and perform coliform bacteria testing.
- C. Dechlorinate contents of bypass pumping system in accordance with Section 02751 - Plant Piping, Valves and Appurtenances and discharge as indicated in the approved submittals.
- D. Incorporate primary and secondary plugging device on the plugging or blocking of flows.
 - 1. When plugging or blocking is no longer needed for performance and acceptance or work, remove in a manner that permits the flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.
- E. Exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible oxygen-deficient atmospheres, and confined spaces.
- F. The installation of the bypass pipelines is prohibited in all salt marsh/wetland areas.
 - 1. Locate off streets sidewalks and on shoulders of the roads.
- G. In the event that the bypass pipeline crosses local streets or private driveways, place the bypass pipelines in trenches and cover with temporary pavement. Obtain all approvals for placement of the temporary pipeline within public ways.
- H. System to remain in place and operation until the completion of the initial start up

period.

- I. Upon completion of the bypass pumping operations, and after the receipt of written permission from the Engineer, the Contractor will remove all the piping, restore all property to pre-construction condition and restore all pavement.

3.8 MEASUREMENT AND PAYMENT

- A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the item to which it pertains.

END OF SECTION