SPECIFICATIONS AND
CONTRACT DOCUMENTS

VOLUME II

# ANN STREET TO GREEN STREET SANITARY SEWER RELOCATION

PWC
Fayetteville's
HOMETOWN UTILITY

JUNE 2022


Fayetteville Public Works Commission
Water Resources Engineering
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DIVISION 2
SITE WORK

02111 SITE CLEARING (Utility)

SCOPE

Work described in this section includes clearing and grubbing, site, protecting adjoining property and trees as indicated on the drawings or as specified herein. The work shall include the complete removal and satisfactory disposal of all growth including trees, stumps, logs and roots; organic material, and other debris or items that interfere with construction operations. The site clearing operations shall be conducted in a manner to ~~i~~ensure minimum interference with roads and other adjacent occupied or used facilities.

PROTECTION OF TREES AND VEGETATION

Trees and vegetation to be left standing shall be protected from damage incidental to clearing, grubbing, and construction operations. The protection shall include un-necessary cutting, breaking or skinning of roots; skinning and bruising of bark; smothering of trees by stockpiling construction materials or excavated material within the drip line; excessive foot and vehicular traffic including parking of vehicles within drip line. Trees and vegetation receiving damage shall be repaired or replaced in a manner acceptable to the Engineer.

Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1 - 1/2" or more in diameter and shall be trimmed of live branches to such heights and such manner as directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branch. Cuts more than 1-1/2” in diameter shall be painted with an approved tree wound paint.

CLEARING AND GRUBBING

Clearing and grubbing shall be performed within the permanent right-of-ways. In the interest of conserving natural resources and protecting the environment, clearing shall be kept to a minimum within the temporary right-of-ways limits. Where permanent and temporary right-of-ways are offset, the additional temporary area may be used as a "buffer" zone to aid in sediment control where possible. Clearing shall consist of cutting trees, with a stump left not more than two inches (2") above natural ground. Saleable timber shall become the property of the Contractor. Reasonable care shall be taken during construction to avoid damage to vegetation not located in the right-of-ways. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed to improve the appearance. Tree trunks receiving damage shall be treated with approved tree dressing.

Several areas along the main where a temporary easement is indicated on the plans and is located in people's yards, the Contractor shall limit clearing only as absolutely necessary for the sewer

installation. Where possible, individual trees shall be worked around and preserved. These particular areas will be noted on the plans.

In the interest of erosion and sediment control, if possible, clearing and grubbing should be staged in ½ mile sections or less. In all cases, the time of disturbance between clearing and grubbing operations and actual sewer line construction should be kept to a minimum, particularly if ditches and temporary roads are utilized for access to the project.

DIVISION 2 SITE WORK

02211 GRADING, UTILITIES

## GENERAL

This section covers grading for the roadways and drives including all excavations, formation of embankments, preparation of subgrade for pavements and finishing and dressing of graded earth areas, shoulders, and ditches.

## MATERIALS

Topsoil, material obtained from excavation suitable for topsoils, is defined as natural, friable soil, characteristics of representative soils in the vicinity that produce heavy growth of crops, grass, or other vegetation. Topsoil shall be free from roots, stones, and other materials that hinder grading, planting, and maintenance operations, and free from objectionable weed seeds.

Satisfactory soil materials are defined as those in accordance with AASHTO Soil Classification Groups, A-1, A-2-4, A-2-5 and A-3 (or in accordance with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, SC.) as determined by the Engineer. Satisfactory material shall be free from roots, organic matter, trash, debris, frozen material or stones larger than three (3) inches in any dimension.

Unsatisfactory soil materials are defined as those in accordance with AASHTO Soil Classification Groups A-2-6, A-2-7, A-4, A-5, A-6, A-7 (or in accordance with ASTM D2487 soil classification groups GC, ML, MH, CL, CH, OL, OH, and PT) as determined by the Engineer.

Materials determined by the Engineer as too wet or too soft to provide a stable subgrade, foundation, or fill will be classified as unsatisfactory regardless of soil classification. The Engineer may require the Contractor to condition the wet and/or soft soils to provide a stable subgrade, foundation, or fill. The Contractor shall recondition the materials at no additional cost to the Owner.

## CONSERVATION OF TOPSOIL

Areas designated for operations that contain a blanket of soil, which is more satisfactory for the growth of grass than the embankment material to be placed, shall be stripped to a depth of approximately four (4) to six (6) inches and placed in convenient stockpiles as directed in the field, for later use as a topsoil blanket on the new graded areas specified herein, or as designated. The stripping of material for use as topsoil shall be carefully determined and only the quantity required shall be stripped and stockpiled. Material ordered stockpiled shall be placed in a satisfactory manner to afford drainage. When grading operations permit, instead of stockpiling, the topsoil shall be hauled and spread directly on the areas to receive topsoil.

Topsoil shall be placed on all shoulders, slopes, ditches, and other earth areas graded under this contract, excluding borrow areas, unless otherwise specified on the plans. Topsoil shall be uniformly placed on these areas to a compacted depth of not less than three (3) inches or more than four (4) inches. The material shall be free from clods of soil, matted roots greater than ½ inch in diameter, and any other objectionable material which might hinder subsequent grass and mowing operations. The material shall be placed, leveled, and lightly compacted with at least one pass of a cultipacker, or other approved equipment weighing 100 to 160 pounds per linear foot of roller, to required cross sections, but shall be left one-tenth of a foot below the finished earth grade as specified in the paragraph FINISHED EXCAVATION.

BORROW EXCAVATION (Select Backfill)

Where satisfactory materials are not available in sufficient quantities from the required excavation, approved materials shall be obtained from borrow areas. Borrow excavation material shall be supplied by the Contractor from borrow areas located off-site. The work covered by this section shall consist of the excavation of approved material from borrow sources and the hauling and utilization of such material as required on the plans or directed by the Engineer. The borrow material shall be approved by the Engineer and shall not contain roots, root mats, stumps, highly plastic clay or other unsatisfactory materials. The material shall be a soil material which meets requirements of AASHTO Ml 45 for soil classification A-i-a, A-i-b, A-2-A, A-3 acceptable for select backfill. All borrow material shall be in accordance with the NCDOT Standard Specification for Roads and Structures, most recent edition. Borrow excavation shall be in accordance with the NCDOT Standard Specification for Roads and Structures, most recent edition. Excess material removed within the work limits, suitable for borrow excavation, during "Unclassified Excavation" operations shall not be considered or paid for as borrow excavation.

UNDERCUT EXCAVATION

When the Owner determines that the natural soil materials in areas where fill is to be placed, or in the finished graded subgrade roadway cross section, or in areas supporting structures or pipes, are determined to have a poor supporting value, the Engineer may require the Contractor to remove the materials and backfill with approved properly compacted material to the finished graded section. The Contractor shall conduct undercut operations in such a way that the Engineer can take the necessary measurements before any backfill is placed. Any material removed and backfilled without the approval of the Engineer, and/or all necessary measurements taken, and/or to a depth, length or width exceeding the dimensions shall not be considered undercut excavation and will not be paid for such. All undercut excavation shall be in accordance with the NCDOT Standard Specification for Roads and Structures, most recent edition. Undercut excavations suitable for backfill on toes of slopes and other approved areas will not be paid for as borrow excavation.

FINISHED EXCAVATION

All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth-graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations, except as otherwise specified. Ditches shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. Surfaces shall be finished not more than 0.15 foot above or below the established grade and approved cross section. In areas where the bulking of soil as a result of grassing operations will tend to retard surface drainage along the edge of pavements, the finished grades shall be left 0.1 foot below grade prior to grassing.

Newly graded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades re-established to the required elevations and slopes. Embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained in such a manner as to drain effectively at all times. The finished subgrade shall not be disturbed by traffic of other operations and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade shall not be permitted. No base course or pavement shall be laid until the subgrade has been checked and approved, and in no case shall base, surfacing, or pavement be placed on a muddy, spongy, or frozen subgrade. All work shall be conducted in accordance with the environmental protection requirements of the contract.

# DIVISION 2
# SITE WORK

## 02222 EXCAVATION AND BACKFILLING FOR UTILITY SYSTEMS

### GENERAL

Work described in this section consists of the excavation, backfill, compaction, and finish grading required to install the utility systems. The intent and purpose of these specifications is to require a complete and satisfactory installation in every respect and any defect in material or workmanship shall be cause for the replacement and correction of such defect as directed by the Public Works Commission.

### RELATED SECTIONS

A. 02305 – Pipe Bursting
B. 02660 – Water Distribution
C. 02730 – Sanitary Sewer Systems
D. 02732 – Sewage Force Mains
E. Chapter 24 of the City of Fayetteville Ordinance (most recent version)

### MATERIALS

Suitable soil materials are defined as those in accordance with AASHTO Soil Classification Groups A-1, A-2-4, A-2-5 and A-3 (or in accordance with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, SC) as determined by the Public Works Commission. Suitable material shall be free from roots, organic matter, trash, debris, frozen material or stones larger than three (3) inches in any dimension.

Unsuitable soil materials are defined as those in accordance with AASHTO Soil Classification Groups A-2-6, A-2-7, A-4, A-5, A-6, A-7 (or in accordance with ASTM D2487 soil classification groups GC, ML, MH, CL, CH, OL, OH, and PT) as determined by the Public Works Commission. Unsuitable material as defined above shall be replaced with select material as determined by the Public Works Commission.

Suitable materials determined by the Public Works Commission as too wet or too soft to provide a stable subgrade, foundation, or fill will be deemed as unsuitable regardless of soil classification. Materials deemed unsuitable shall be conditioned or replaced, as directed by the Public Works Commission. The Contractor shall recondition and stockpile the materials at no additional cost to the Public Works Commission.

### EXCAVATION

All excavation shall be to the lines and grades indicated. The work shall consist of the excavation, placement, and compaction of suitable material as outlined in this Specification and proper disposal of all unsuitable materials. During excavation, suitable material for backfilling shall be stockpiled. The stockpiles shall be protected from contamination by unsuitable excavated material or other material. If

any material becomes unsuitable, such material, if directed, shall be removed and replaced with suitable on-site or imported material from approved sources at no additional cost to the Public Works Commission.

Where the line parallels a creek and/or ditch the excavated material shall be stockpiled opposite the creek, with the trench separating the two. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. Grading shall be done to prevent surface water from entering the excavation. Any water within the trench shall be removed.

Suitable excavated material shall be stockpiled or placed in the excavation's backfill. Excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Unauthorized over excavation shall be backfilled with select bedding material at no additional cost to the Public Works Commission. The Contractor, at their expense, shall properly dispose of all excess excavated material unless directed to place it in another area of the project by the Public Works Commission. The Contractor's obligation to remove and dispose of excess materials shall in no manner convey to him any rights of property in any material taken from any excavation.

It shall be the Contractor's responsibility to investigate the site and existing conditions. No compensation will be allowed due to excavation and/or grading being different than anticipated.

## TRENCH EXCAVATION

The trench width shall be in accordance with the PWC standard details. All work shall be in accordance with the applicable OSHA regulations.

The subgrade beneath the centerline of the pipe shall provide uniform support for each section of the pipe. Stones three (3) inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed.

Where unsuitable material is encountered at the elevation established for installation of pipe or structures, additional undercut excavation shall be done as directed by the Public Works Commission. The additional undercut excavated area shall be backfilled with stone bedding material. Unauthorized undercut excavation shall be backfilled with stone bedding material and compacted as directed by the Public Works Commission. The Contractor shall conduct undercut operations in such a way that the Public Works Commission can take the necessary measurements before any backfill is placed. Any material removed and backfilled without the approval of the Public Works Commission, and/or all necessary measurements taken, and/or to a depth, length or width exceeding the dimensions shall not be considered undercut excavation and will not be paid for such.

Where unsuitable material is encountered at the elevation established for installation of roads, parking lots, or other paved areas, additional undercut excavation shall be done as directed by the responsible agency (i.e., City of Fayetteville, Town of Hope Mills, NCDOT, etc.). The additional undercut excavated area shall be backfilled with stone bedding material. Unauthorized undercut excavation shall be backfilled with stone bedding material and compacted as directed by the responsible agency. The

Contractor shall conduct undercut operations in such a way that the responsible agency can take the necessary measurements before any backfill is placed. Any material removed and backfilled without the approval of the responsible agency, and/or all necessary measurements taken, and/or to a depth, length or width exceeding the dimensions shall not be considered undercut excavation. All undercut excavation shall be in accordance with the NCDOT Standard Specification for Roads and Structures (most recent edition), or the responsible agency's specifications.

Excavation for manholes, meter vaults, or similar structures shall leave a minimum of 12-inches clear space around the structure. Removal of unsuitable material shall be as specified above. Preparation of the subgrade shall be in accordance with the applicable detail and as directed by the Public Works Commission.

## PIPE LAYING

All pipe shall be installed in accordance with PWC Specification Section 02660 – Water Distribution, Specification Section 02730 – Sanitary Sewer Systems, and/or PWC Specification Section 02732 – Sewage Force Mains.

## TRENCH SAFETY

All excavations shall comply with all Federal, State, and local rules and regulations. The Contractor shall have a trenching and shoring "competent" person on the job at all times when there is an open excavation. Under no circumstance shall an employee of the Public Works Commission be considered the "competent" person for the operation.

## TRENCH STABILIZATION (SHORING)

The Contractor shall furnish, install, and maintain all necessary shoring to ensure a safe excavation. The method of shoring and excavation shall be in strict accordance with OSHA Regulations. The Contractor shall be responsible for installation, maintenance, and removal of all trench stabilization measures. The Contractor shall be responsible for any damage to adjacent structures resulting from the installation, maintenance, removal, or absence of trench stabilization measures.

## DEWATERING

Excavations shall be kept dry at all times. Any required dewatering shall be the Contractor's responsibility. The Contractor shall be responsible for any damage to the adjacent property resulting from the installation, maintenance, discharge, and removal of the dewatering system. All discharge from the dewatering system shall be in accordance with the applicable erosion control rules and regulations.

## BACKFILL

Backfill shall consist of suitable material free from debris, stone, etc. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. The backfill operation shall be conducted to prevent damage and/or movement of the pipe.

Backfill material in trenches shall be placed in layers not exceeding six (6) inches loose thickness to a point at least 12-inches above the pipe compacted to 90 percent maximum density. The remainder of the trench shall be backfilled in layers not exceeding six (6) inches in loose thickness compacted as specified in subparagraph COMPACTION. Each layer shall be thoroughly compacted by an approved mechanical tamping device.

Backfill material around structures shall be placed in a manner that the structure will not be damaged. No backfill shall be placed around manholes, thrust blocks, or similar structures until the concrete has been allowed to cure for three (3) days. The backfill material shall be compacted as specified in subparagraph COMPACTION.

No backfilling will be allowed when weather conditions prevent compliance with these Specifications.

## BORROW EXCAVATION (Select Backfill)

Borrow excavation material shall be supplied by the Contractor when sufficient quantities of suitable materials are not available within the project limits. The borrow material shall be approved by the Public Works Commission and shall not contain roots, root mats, stumps, highly plastic clay or other unsatisfactory materials. All borrow material shall be in accordance with the NCDOT Standard Specification for Roads and Structures, most recent edition.

## COMPACTION

Backfill shall be compacted in accordance with the following table as a percentage of the maximum density at optimum moisture content as determined by the Standard Proctor Test, ASTM D-698.

| Area | Percent ASTM D-698 Maximum Dry Density |
|---|---|
| Around and 1' above top of pipe | 95 |
| Remaining trench (within 4' of subgrade) | 95 |
| Pavement subgrade and shoulders | |
| Last 1' of fill (below subgrade) | 100 |
| Last 3' of fill to 12" below subgrade | 98 |
| Base material | 100 |
| Adjacent to structures (Areas not paved) | 95 |
| Under structures | 98 |
| Utility Outfalls (Cross Country) | 95 |

Compaction testing may be performed at the option of the PWC Project Coordinator, or as required by the responsible agency (i.e., City of Fayetteville, NCDOT, etc.). Compaction testing shall be done in

accordance with the responsible agency's requirements. Deficiencies shall be corrected by the Contractor without additional cost to PWC.

## FINISHED EXCAVATION

All areas covered by the project shall be uniformly graded to the established elevations and approved cross sections. Ditches shall be graded to permit proper drainage. Newly graded areas shall be protected from traffic and/or from erosion, and any settlement or washing prior to acceptance shall be repaired and the required grades re-established. Ditches and drains along the subgrade shall be maintained to drain at all times. The finished subgrade shall be protected and maintained by the Contractor. The storage or stockpiling of materials on the finished subgrade shall not be permitted. No base course or pavement shall be laid until the subgrade has been checked and approved. All work shall be conducted in accordance with the environmental protection requirements of the Contract.

**DIVISION 2**
**SITE WORK**

## 02272 EROSION CONTROL - GENERAL PROVISIONS

GENERAL

The Contractor shall be responsible for conducting his site grading and drainage operations in such manner as to prevent or lessen excessive soil erosion of the construction site work areas. He shall at all times provide satisfactory means to prevent or minimize the movement and washing of large quantities of soil. The Contractor is expected to review his site grading and drainage operations periodically to determine the areas most susceptible to erosion by excessive rainfall and periodically maintain all installed measures for the project duration. The Contractor shall correct any deficiencies or problem areas as directed by the Owner or the North Carolina Department of Environmental Quality (NCDEQ) inspector within 48 hours.

EXECUTION

The Contractor's attention is directed to the fact that unless exposed earth areas are properly cared for during construction, they may result in substantial sedimentation damage downstream from the construction area. He shall at all times provide satisfactory means to prevent or minimize the movement and washing of quantities of soil onto pavements or into adjacent ditches, swales, inlets, and drainage pipes, to avoid the possibility of these structures becoming clogged with soil. Should this happen as a result of erosion at the site of this construction, the Contractor will be required to immediately provide means for removal of the soil and/or debris from the structures to restore the proper functioning of these structures. The Contractor shall assume all responsibilities to the affected property owners for correction of all damages. The Contractor is expected to review his site grading and drainage operations periodically with the Owner with the view in mind of determining the areas most susceptible to erosion by excessive rainfall and shall take necessary temporary measures in sufficient time to minimize the washing away of the site soils that would likely occur before the areas are finished graded, topsoiled and planted. The temporary measures to be provided by the Contractor at the critical areas may consist of, but not limited to, any one or a combination of the following, or by other approved means selected by the Contractor:

Silt Fence
Gravel Construction Entrance/Exit
Inlet Protection

If any earthwork is to be suspended for any reason whatsoever for longer than 15 days, the disturbed areas shall be seeded with temporary vegetative cover or otherwise protected against excessive erosion during the suspended period. Suspension of work in any area of operation does not relieve the Contractor of the responsibility for the erosion control and temporary measures will not be considered cause for a change in the price bid.

MAINTENANCE

The Contractor shall inspect and maintain each erosion control measure until the project is stabilized and accepted. After each significant rainfall, the Contractor shall remove and dispose of silt accumulation from each individual measure. The following maintenance may be required for each specific erosion and sediment control measure:

Silt Fence: Fabric shall be removed and replaced whenever deteriorated to such an extent the effectiveness is reduced. The toe of the fabric shall be buried a minimum of 6 inches.

Gravel Construction Entrance/Exit: Periodic top dressing with two inches (2") of graded stone. Remove all objectionable materials spilled, washed or tracked onto public roadways.

Sediment Trap: Remove sediment and restore trap to original dimensions when accumulated silt volume equals ½ the design depth. Replace the contaminated gravel facing.

Gravel Inlet Protection: Remove sediment as necessary to provide adequate volume. Replace contaminated gravel facing if required.

Rip-Rap: Make repairs to dislodged stone and/or supplement as required if erosion occurs during heavy rainfalls.

REMOVAL

After the area has been stabilized and the project accepted, the Contractor shall remove all temporary erosion and sediment control measures. Silt fences shall be removed, sediment traps/pits and/or basins filled with suitable soil, compacted and seeded. The materials removed shall remain the property of the Contractor and shall be disposed of off-site, or may be reused in other locations if approved by the Owner.

**DIVISION 2**
**SITE WORK**

## 02273 TEMPORARY SILT FENCE

GENERAL

The work covered by this section consists of furnishing, installing, maintaining and removing a water permeable filter type silt fence for the purpose of removing suspended particles from the water passing through it.

The quantity of temporary silt fence to be installed will be affected by the actual conditions which occur during the construction of the project. The quantity of temporary silt fence may be increased, decreased, or eliminated entirely at the direction of the Owner. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

MATERIALS

Either wood posts or steel posts may be used. Wood posts shall be a minimum of 6 feet long, at least 3 inches in diameter, and straight enough to provide a fence without noticeable misalignment. Steel posts shall be 5 feet long, 1 3/4 inches wide and have projections for fastening the wire to the fence.

Wire fence fabric shall be at least 32 inches high, and shall have at least 6 horizontal wires. Vertical wires shall be spaced 12 inches apart. The top and bottom wires shall be at least 10 gage. All other wires shall be at least 12½ gage.

Burlap shall be at least 36 inches wide and shall weigh at least 6.7 ounces per square yard. Other materials may be used in lieu of burlap, provided those materials have been approved by the North Carolina Department of Environmental Quality (NCDEQ).

Wire staples shall be No. 9 staple and shall be at least 1½ inches long.

INSTALLATION

The Contractor shall install temporary silt fence as shown on the plans and details. The silt fence shall be constructed at the locations shown on the plans and at other locations directed by the Owner.

Posts shall be installed so that no more than 3 feet of the post shall protrude above the ground and at least18 inches are driven into the ground. Filter fabric shall be attached to the wire fence fabric by wire or other acceptable means. The fabric shall be continual in length. The fabric shall extend into a 6"x 6" trench along the uphill side of the fence. The trench shall be backfilled and compacted. Place 6 inches of No. 57 stone along the toe of the fence to secure the fabric in place. The single stripe located approximately 6 inches form the silt fence outer edge should not be visible if the fabric and fencing are installed properly.

DIVISION 2
SITE WORK

# 02274 GRAVEL CONSTRUCTION ENTRANCE/EXIT

## GENERAL

The work covered by this section consists of furnishing, installing, maintaining and removing temporary gravel construction entrance/exits. The entrance/exit shall be located at points where vehicles enter and exit the project and as indicated on the plans to limit sediment "tracked" off the site.

Where there are differences or conflict between this specification and those requirements outlined in an approved Erosion Control Plan, the specifications in the erosion control plan shall take precedence

## MATERIALS

The stone shall be two inch (2") to three inch (3") washed stone.

## INSTALLATION

The Contractor shall install the gravel construction entrance as shown on the plans and details. The construction entrance shall be constructed at the locations shown on the plans and at other locations directed by the Engineer.

The area to receive the stone shall be cleared of all vegetation, roots and other objectionable materials. The subgrade shall be graded and properly compacted. Areas yielding shall be covered with engineering fabric or undercut as directed by the Engineer. The stone shall be placed, graded and compacted to a minimum depth of eight inches (8") and as shown on the plans. The minimum construction entrance dimensions shall be 50 feet in length and 12 feet in width. The construction entrance/exit shall be maintained and the stone supplemented throughout the life of the project and shall be removed upon stabilization and disposed of off-site at the Contractor's expense.

**DIVISION 2**
**SITE WORK**

## 02275 BLOCK AND GRAVEL INLET PROTECTION

GENERAL

The Contractor shall install block and gravel inlet protection when storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. The inlet protection applies to areas of heavy runoff and provides for overflow capacity to prevent excessive ponding; however, shallow temporary flooding should be anticipated.

INSTALLATION

The Contractor shall install the block and gravel inlet protection as shown on the detail drawing and at the locations indicated. As an option, the concrete blocks may be omitted and the entire structure made of gravel and stone. A structure made entirely of stone is commonly called a "gravel doughnut". In this case, keep the stone slope toward the inlet at 3:1 or flatter. Stone shall be washed stone with minimum 3 inch size on the basin side for stability and 1 inch or smaller (No. 57) on the flow side.

**DIVISION 2**
**SITE WORK**

## 02350 STEEL "H" PILES

### GENERAL

The work covered by this section consists of furnishing and driving steel H piles as indicated on the plans and as directed by the Engineer, in conformity with these specifications and to the bearing and penetration required.

### MATERIALS

Steel H piles shall be of the sizes and weights shown on the drawings and shall conform to the requirements of ASTM A-36. The Contractor shall submit a manufacturer's certification to the Engineer that the H piles are in accordance with the project specifications.

### INSTALLATION

Steel piles shall be handled and stored by methods that will not injure the pile. The piles shall be stored above the ground on platforms, blocks, or other supports. The piles shall be kept free from dirt, grease, and other foreign matter and shall be protected in so far as practical from corrosion.

The Contractor shall furnish sufficient lengths to develop load requirements as stated on the plans. Full butt-welded splices shall be used. H piles shall be driven to a minimum penetration of 10 feet by an approved hammer developing not less than 7500 ft.-lbs. of energy per blow. The load capacity of each pile shall be determined by the following formula:

$$Ra = \frac{2E}{S + 0.3}$$

where:

| | | |
|---|---|---|
| Ra | = | Safe load (lbs.) |
| E | = | Energy per blow (ft.-lbs.) |
| S | = | Final penetration per blow (inches) (average of last 6 blows) |

Deviation of the location of the top of the pile from that shown on the plans shall not exceed 2 inches. A suitable driving cap shall be provided to prevent undue damage to the top of the pile. Piles shall be cut off at the required elevations along a plane normal to the axis of the pile. Methods used in cutting off piles shall meet the approval of the Engineer.

## SHOP PAINTING

All steel piling shall be sandblasted in the shop to a minimum of SSPC-SP6-63. All sandblasted surfaces shall receive one (1) coat of Epoxy Primer the same day that piles are blasted. The primer shall be applied at the rate of 385 sq. ft. per gallon, which will provide 1.5 mils dry film thickness. Application method of the primer can be made by brush, roller brush, and conventional or airless spray.

## FIELD PAINTING

After the piles have been driven, exposed primed surfaces shall be cleaned of dust and other foreign materials prior to applying two (2) coats of Coal Tar Epoxy at the rate of 90-115 square feet per gallon, which will provide a dry thickness of 8-10 mils coat. The minimum dry film thickness for the two coats shall be 16 mils. Application may be by brush, roller, conventional air spray or airless spray.

The re-coat time for the Coal Tar Epoxy can be as little as three (3) hours, but must not exceed 24 hours. Drying time of the coating is greatly affected by the temperature and humidity. If the first coat has exceeded the allotted time, it will be necessary to treat the coating prior to application of the second coat. The Coal Tar Epoxy shall not be applied in the rain or when the temperature is lower than 50 degrees F. Damaged surface areas due to handling and field welding must be wire brushed to original surface preparation and then coated with two (2) coats of Coal Tar Epoxy with minimum dry film thickness of 16 mils as specified above.

**DIVISION 2**
**SITE WORK**

**02500 – TRAFFIC CONTROL**

## GENERAL

The purpose of these specifications is to outline the Contractor's requirements for furnishing, erecting, maintaining, relocating, and removing traffic control devices for the maintenance of traffic during the Contractor's construction operations. The Contractor shall furnish all labor, materials, accessories, equipment and tools for performing all required traffic control operations.

## REFERENCES

All work shall be in accordance with:

A. The North Carolina Department of Transportation Standards and Specifications for Roads and Structures (most recent edition)
B. The North Carolina Department of Transportation Roadway Standard Drawings (most recent edition)
C. The Manual on Uniform Traffic Control Devices (MUTCD) – most recent edition
D. The North Carolina Supplement to the MUTCD
E. Section 01000 – Special Conditions, of these Contract Documents

## REQUIREMENTS

TRAFFIC CONTROL PLAN

The Contractor shall submit a traffic control and phasing plan for the overall project to be reviewed and approved by the FPWC Project Engineer, prior to starting construction. The Contractor shall obtain an approved copy of the traffic control plan for the overall project area prior to any excavation within roadways. The plan must indicate how traffic will be managed, signage to be used, and potential traffic patterns resulting from plan implementation. The plan shall be submitted to the FPWC Project Engineer in accordance with Section 01000 "Special Conditions" and Section 01300 "Submittals" of these Contract Documents. Failure of the Contractor to submit the required traffic control plan sufficiently in advance shall not entitle the Contractor to any extension of Contract Time.

TRAFFIC CONTROL DEVICES

The Contractor working in public rights-of-way on streets open to vehicular traffic, shall be required to provide, erect, and maintain all necessary traffic control devices throughout the project area to include any connecting streets affected by construction activities. The Contractor shall provide a sufficient number of personnel, and take all precautions for the protection of the work and safety of the public. All traffic control devices in place shall be in accordance with the approved traffic control plan. All traffic control devices and device installation shall be placed and maintained in strict accordance with the resources listed above.

The Contractor shall be liable for any damages resulting from using unapproved and/or inadequate work zone traffic control. The Fayetteville Public Works Commission reserves the

right to stop any work for non-compliance. The Contractor shall have no claim for delay due to stoppage of work as a result of non-compliance.

TRAFFIC CONTROL PLAN AND ROAD CLOSURE NOTIFICATION

1. TRAFFIC CONTROL PLAN – The Contractor shall notify the FPWC Project Engineer, in writing, by 5:00 p.m. Wednesday, indicating which roadways will be affected by the work the following week. The Contractor shall notify NCDOT of work to be done per the terms of the approved encroachment agreement. The FPWC Project Engineer shall receive copies of all correspondence via fax or email (FPWC fax 910-829-0203; email addresses will be provided at the pre-construction meeting).

Traffic cannot be altered without notification as outlined in the above paragraph. Failure to do so will result in the Contractor not being able to work within the street the next week.

No work on the individual streets shall start until all the traffic control devices required for the particular work activity have been installed in accordance with the approved traffic control plan.

2. ROAD CLOSURE NOTIFICATION - When deemed to be in the best interest of the public, the Fayetteville Public Works Commission and the Contractor, a street may be closed for a duration mutually agreed upon. The Contractor shall submit a request in writing to the FPWC Project Engineer for approval to have a street closed. The FPWC Project Engineer will forward the request to the appropriate agency (i.e., City, NCDOT) for approval of the closure. The FPWC Project Engineer will include their recommendation regarding approval or disapproval of the request. The FPWC Project Engineer will respond in writing with any recommendation for approval or disapproval of the request.

   The request shall be submitted a minimum of five (5) business days prior to the desired closure date. The request shall include the street name and the limits of the closure based on the points of intersection. The request shall also state the proposed duration the street is to be closed and shall include a traffic control plan showing the detour route, traffic control devices, etc. The traffic control plan submitted shall be in accordance with the requirements listed in this Specification.

   Once the street closure has been approved, in writing, by the FPWC Project Engineer, the Contractor accepts full responsibility for the closure, to include the installation, maintenance, and removal of all traffic control devices and all implied liability.

TRAFFIC CONTROL LOOPS

The Town of Hope Mills and NCDOT maintain traffic detection loops at various intersections throughout the project limits. Due to the location of the proposed utility improvements, it may be necessary for these detection loops to be damaged. The Contractor shall contact the Town of Hope Mills Traffic Services at (910) 429-3383, a minimum of three (3) days prior to excavating, in order for the Town to locate these loops, or make any necessary revisions to the traffic signal facilities.

The Town of Hope Mills will hire a third-party contractor to repair the damaged traffic detection loops. The invoice for this work shall be submitted to the Contractor for payment. The cost for this shall be incidental to the Contract.

STEEL PLATING ROADWAYS

Steel plating shall not be used without the prior written approval of the Project Engineer. The Contractor shall submit their proposed plan to utilize steel plates a minimum of five (5) working days prior to the proposed activity. Plating shall only be considered if the trench depths are 14 feet or greater. Should plating be approved the Contractor shall adhere to the following:

1. The trench shall be adequately shored to support bridging and traffic loads.
2. The trench box shall be sealed so there are no open voids.
3. Steel plates shall rest on trench box.
4. Steel plates shall extend beyond the outer edges of the trench box on all four sides.
5. There must be a minimum of two (2) feet of compacted backfill above steel plates.
6. Compacted backfill shall match existing street grade.
7. Provide documentation that the plates are capable of supporting potential loads.

Steel plating shall not exceed two (2) consecutive calendar days in any given week. However, provided that work is progressing in that particular section of sewer the Contractor may be allowed to utilize plating for a longer duration as approved in writing by the Project Engineer.

STEEL PLATING ROADWAYS (NCDOT STREETS)

Steel plating shall not be used without the prior written approval of the Fayetteville Public Works Commission Project Engineer. The Contractor shall submit their proposed plan to utilize steel plates a minimum of five (5) business days prior to the proposed activity. Should plating be approved, the Contractor shall adhere to the following:

1. The plates shall be secured against any movement from traffic. Options include "countersinking" the plates to be flush with the existing pavement, or bolting the plates to the pavement.
2. The plates shall overlap the excavation a minimum of two (2) feet on all sides.
3. The plates shall be sufficient to withstand the expected traffic loads.
4. Provide documentation that the plates are capable of supporting potential loads.

Steel plating shall not exceed two (2) consecutive calendar days in any given week. However, provided that work is progressing in that particular section of the project, the Contractor may be allowed to utilize plating for a longer duration as approved in writing by the Fayetteville Public Works Commission Project Engineer.

## MATERIALS

A. The Contractor shall utilize interim pavement marking paint as specified in the North Carolina Department of Transportation Standards and Specifications for Roads and Structures (most recent edition)

B. Traffic cones may be utilized when approved by the Fayetteville Public Works Commission Project Engineer. If approved, traffic cones shall either be double stacked or weighted to prevent movement by traffic.

C. All traffic control devices furnished by the Contractor shall remain the property of the Contractor, unless otherwise specified in these Contract Documents.

## INSTALLATION

The furnishing, erecting, maintaining, relocating, and removal of traffic control devices shall be in accordance with the MUTCD (most recent edition), the requirements outlined in the approved traffic control plan, and these Contract Documents.

All traffic control devices shall be in place prior to the Contractor beginning work, removed during intervals when work is not on-going, and removed at the end of each business day (unless otherwise approved, as outlined in this specification).

The Contractor shall not obstruct or impede any traffic on adjacent streets, during the installation or removal of the traffic control devices, or during construction.

The Contractor shall not close a lane to through traffic after normal working hours and during periods of construction inactivity, unless otherwise approved in writing by the Fayetteville Public Works Commission Project Engineer.

The Fayetteville Public Works Commission Project Engineer may restrict the Contractor from placing lane closures during certain hours, holidays, or as deemed necessary for the convenience of the public. All lane closure types, hours of installation, and durations shall be as approved in writing by the Fayetteville Public Works Commission Project Engineer.

The use of police and/or trained flaggers to control traffic through the work site shall be provided by the Contractor as required. The Contractor shall be responsible for obtaining trained personnel to direct traffic and contacting local authorities for use of police for traffic control where applicable.

INTERIM PAVEMENT MARKINGS

The Contractor shall be required to place interim pavement markings (centerlines, lane lines, edgelines, railroad, and school symbols) daily on any street with existing pavement markings that have been obliterated.

THERMOPLASTIC PAVEMENT MARKINGS

The Contractor shall be required to place thermoplastic pavement marking centerlines, lane lines, and edge lines within three (3) calendar days after the completion of the resurfacing operation.

The Contractor shall be required to place all thermoplastic pavement marking symbols (arrows, crosswalks, stop lines, school symbols, railroad symbols, raised pavement markers, etc.) within seven (7) calendar days of the completion of the project.

## NCDOT STREETS

All traffic control measures for work within NCDOT road rights-of-way shall be in accordance with the approved NCDOT encroachment agreement, and as specified herein. Where there is a conflict between the requirements of this specification and the approved encroachment, the requirements of the approved encroachment shall govern.

***END OF SECTION***

**DIVISION 2**
**SITE WORK**

# 02505 ADJUSTMENT OF EXISTING STRUCTURES

## GENERAL

The work covered by this specification consists of the raising or lowering of existing manholes and valve boxes encountered within the limits of the project to match the adjacent finished work.

## RELATED SECTIONS

A. 02222 – Excavation and Backfilling for Utility Systems
B. 02660 – Water Distribution
C. 02730 – Sanitary Sewer Systems

Where conflicts occur between the specifications, the more stringent requirement shall apply.

## MATERIALS

All materials shall be in strict accordance with the requirements of the Public Works Commission and as set forth in this standard.

Adjustable riser rings are not approved for use within the Public Works Commission water and/or sewer system. All manhole adjustments shall be done utilizing a concrete grade ring. If a concrete grade ring cannot be utilized, the manhole shall be broken down and rebuilt to the proper grade, in accordance with PWC standards.

## INSTALLATION

Adjustment of structures shall not be performed until after placement of base course and/or any leveling course, and prior to placement of final course. All adjustments of structures shall be accomplished a minimum of 72 hours prior to placing the final surface course. All defective, damaged, or worn castings shall be replaced with new castings provided by the Public Works Commission at no cost to the Contractor. The Contractor shall be responsible for exchanging castings at the Public Works Commission's facility.

The Contractor shall take all necessary precautions to prevent debris from entering the sanitary sewer system. Any debris that falls into the manhole or valve box during adjustment shall be removed immediately.

Manholes

For all manholes that need adjustment, the Contractor shall remove all concrete grade rings to the top of the cone section. All loose material shall be removed and properly disposed of. The Contractor shall utilize new concrete grade rings to ensure that the new manhole ring and cover will be at final grade. If no concrete grade rings are required to adjust the structure to final grade, the Contractor shall set the ring and cover in a bed of clean fresh mortar.

If the manhole needs to be lowered, and there are no existing concrete grade rings, then the Contractor shall tear down the existing manhole and rebuild it, utilizing new riser and cone sections, in order to ensure that the installed ring and cover will be at final grade. The Contractor shall remove all necessary sections of the existing manhole in order to make the adjustment.

If the manhole needs to be raised, and there are 12-inches of concrete grade rings already in place, the Contractor shall tear down the existing manhole and re-build it. The Contractor shall utilize new riser and cone sections, as required, to ensure that the installed ring and cover will be at final grade. The Contractor shall remove all necessary sections of the existing manhole in order to make the adjustment.

Valve Boxes

In order to adjust valve boxes, the top section of the valve box shall be raised or lowered as required to meet the final grade. If the height of the final grade exceeds the length of the existing top section, the Contractor shall remove the existing valve box and install a new one at final grade.

All adjustments shall be protected for at least 72 hours before the placement of any surfacing material, in order to allow the concrete to properly set. The Contractor shall be responsible for protecting the raised structure from damage due to traffic. After the 72 hours, a temporary asphalt transition shall be placed around the raised structure, to allow vehicular traffic to pass over. The asphalt transition shall extend a minimum of 18 inches from the structure in every direction. The Contractor shall be responsible for maintaining this asphalt transition until such time the final surface course is placed. Immediately prior to paving, the asphalt transition shall be removed. In the event paving is stopped for the day prior to completing the work, the Contractor shall re-install the temporary asphalt transition. The finish surface tolerance shall not vary more than ¼" (0.25 inch) in any direction. Every effort shall be made to ensure that the surface course and castings provide as smooth a ride as possible.

# DIVISION 2
# SITE WORK

## 02730 SANITARY SEWER SYSTEMS

### GENERAL

Sanitary sewer lines and all appurtenant items shall be constructed of materials specified or indicated on the drawings. The intent and purpose of these specifications is to require a complete and satisfactory installation in every respect and any defect in material or workmanship shall be cause for the replacement and correction of such defect as directed by the Public Works Commission.

### RELATED SECTIONS

A. 02211 – Grading, Utilities
B. 02222 – Excavation and Backfilling for Utility Systems
C. 02732 – Sewage Force Mains

### MATERIALS

#### SEWER MAINS

Prior to shipment each joint of pipe shall be stamped by an independent testing laboratory, certifying compliance with the specifications stated therein. Pipe sizes indicated shall be understood to be nominal inside diameter of the pipe. All sewer pipe materials shall be either PVC (as specified herein) or ductile iron (as specified herein), unless otherwise approved in writing by the Public Works Commission. Written approval shall be obtained prior to installation.

#### DUCTILE IRON PIPE

All ductile iron pipe and fittings shall be in strict accordance with ANSI A21.51 and AWWA C151, Class 50 or Class 51, as applicable, in every respect. The working pressure shall be a minimum of 200 psi. Pipe shall be furnished in 18 or 20-foot lengths. All pipe joints used in open trench construction shall be furnished with "push-on" joints, unless otherwise indicated on the drawings or specified. All joints and fittings shall be in accordance with ANSI A21.11 and AWWA C111. All ductile iron interior surfaces shall be lined with two (2) coats of ceramic epoxy to produce a total minimum dry film thickness of 40 mils (Protecto401 or approved equal). The exterior pipe surfaces shall be protected with asphaltic coating as specified in AWWA C151 and C110. Specifications for the ceramic epoxy can be found in Specification Section 09802.

For aerial crossings which are 4 inches through 12 inches in diameter, manufactured restrained joint ductile iron pipe Class 53, or Class 53 flanged ductile iron pipe shall be utilized in accordance with the standard Public Works Commission detail for aerial crossings. Mega-lugs, field-lok, and gripper rings are not an allowable means of restraint for aerial crossings. For aerial crossings larger than 12 inches, or as

noted specifically on the plans, flange joint ductile iron pipe, Class 53, shall be utilized in accordance with the standard Public Works Commission details. The location of flanges shall be specifically designed for each application. The flange pipe shall be in accordance with ANSI/AWWA C-115/A21.15. Threads for threaded flange pipe shall be in accordance with ANSI B2.1, shop fabricated as outlined by AWWA 115 with serrated faces furnished on the pipe, completely factory installed. Welding of flanges to the body of the pipe will not be acceptable. Ductile iron fittings and flanges shall be in accordance with ANSI/AWWA C-110/A21.10 with a minimum working pressure of 250 psi. Gaskets shall be full faced SBR rubber per ANSI/AWWA C-111/A21.11 with a minimum 1/8" thickness. Linings and coatings shall be as outlined for ductile iron pipe.

If the Public Works Commission determines that an expansion coupling is required, it shall be installed as indicated on the drawings. The expansion coupling shall not be buried.

For subsurface water crossings (i.e., streams, wetlands), restrained joint ductile iron pipe shall be utilized. No mechanical restraint systems (e.g., mega-lugs, field-lok gaskets, etc.) shall be utilized. The pipe shall be installed in a casing, in accordance with the approved Public Works Commission detail, unless otherwise specifically approved by the Public Works Commission.

## PVC PIPE

PVC sewer pipe and fittings 4 inches thru 15 inches shall be in accordance with ASTM D-3034 with a standard dimension ratio (SDR) of 26 for sewer mains and laterals. Larger diameter pipe (18 inches through 27 inches) shall be in accordance with ASTM F-679, with a SDR of 26. Both pipe and fittings shall be made of PVC plastic having a cell classification of 12454 as specified in ASTM D-1784.

Pipe joining shall be push on elastomeric gasket joints only and the joints shall be manufactured and assembled in accordance with ASTM D-3212. Elastomeric seals shall meet the requirements of ASTM F-477. The pipe shall be furnished with integral bells and with gaskets that are permanently installed at the factory and in accordance with ASTM D-3212 and contain a steel reinforcing ring. PVC sewer pipe shall be made by continuous extrusion of prime green unplasticized PVC and contain identification markings as required by the applicable ASTM standard.

## SEWER FITTINGS

Ductile Iron Push-on Fittings:

Ductile iron sewer fittings on PVC mains shall be deep bell, gasketed joint, and air test rated. Gasket groves shall be machined in the factory. Material shall be ductile iron, in accordance with ASTM A536, Grade 65-45-12 and ASTM F1336. Wall thickness shall meet the requirements of AWWA C153. Gaskets shall have a minimum cross sectional area of 0.20 square inches, and conform to ASTM F477. All ductile iron fittings shall have an interior coating of Protecto 401, or approved equal. All ductile iron fittings on PVC pipe shall provide a flow line that provides a smooth transition between the materials. Ductile iron fittings shall be as manufactured by the Harrington Corporation (Harco), or approved equal.

Mechanical Joint Fittings:

Joints shall be installed in accordance with AWWA C-600 and shall conform to AWWA Standard C-111. Mechanical joints shall be of the stuffing box type and shall conform to ANSI A21.11 for four inch (4") pipe and larger. Fittings and specials shall be ductile iron and shall be manufactured in accordance with AWWA Standard C-110 (ANSI A21.11). Compact fittings shall be ductile iron in accordance with ANSI A 21.53 (AWWA C-153) for 4" thru 24" sizes only. Note: mechanical joint wyes are not included in the AWWA C-153 specification. Pressure rating shall be not less than 200 psi unless otherwise specified. All ductile iron fittings shall have an interior coating of Protecto 401, or approved equal. Mechanical joint fittings shall be utilized on ductile iron mains and ductile iron laterals. Mechanical joint fittings shall not be utilized on PVC mains, unless otherwise approved by the Public Works Commission.

PVC Fittings:

PVC fittings shall be manufactured in accordance with ASTM D-3034, F-1336, and F-679. Molded fittings shall be utilized in sizes from 4" to 8" (or larger, if available). Fabricated fittings shall only be utilized with prior approval from the Public Works Commission. Fabricated fittings are defined as those fittings that are made from pipe or a combination of pipe and molded components. All PVC fittings shall contain identification markings as required by the applicable ASTM standard. All PVC fittings shall be gasketed joint, except as indicated for interior drop structures. Plastic fittings shall be as manufactured by GPK Products, Inc., Plasti-Trends, the Harrington Corporation (Harco), or approved equal.

Ductile Iron Pipe Size x SDR26 Transition Adapter:

All ductile iron x PVC transition adapters shall be one (1) piece, bell x bell (gasket x gasket). Transition adapters shall range in size from four (4) inches through 12 inches. Transition adapters for pipe larger than 12-inches shall be as specified by the Public Works Commission. All transition adapters shall have a flow way tapered to allow a smooth transition between the ductile iron and PVC. Transition adapters shall be either PVC or ductile iron, in accordance with the following:

PVC – All PVC transition fittings shall be made from DR 18 C900 pipe stock. The C900 pipe stock shall meet the requirements of AWWA C900/C905, and have a minimum cell classification of 12454 as defined in ASTM D1784. The wall thickness shall meet or exceed DR 18. PVC transition fittings shall have SBR gaskets in accordance with ASTM F477. All six (6) inch and eight (8) inch adapters shall be molded. Molded fitting joints shall be 235 psi rated, in accordance with ASTM D3139, and shall have SBR rubber gaskets. Four (4) inch, ten (10) inch and 12 inch transition adapters shall have SBR Rieber style gaskets meeting ASTM F477. Joints shall be 235 psi rated, in accordance with ASTM D3139 for the C900 (ductile iron) bell, and in accordance with ASTM D3212 for the sewer (SRD26) bell. Molded C900 bell depths shall comply with AWWA C907. Fabricated (4-inch, 10-inch and 12-inch) bell depths and molded sewer (SDR26) bell depths shall be in accordance with ASTM F1336. PVC transition adapters shall be manufactured by the Harrington Corporation (Harco), GPK Products, or approved equal.

Ductile iron – Ductile iron transition fittings shall be deep bell, push-on joint, and air test rated. The ductile iron material shall comply with ASTM A536, Grade 65-45-12 or 80-55-06. The bell depth shall be in accordance with ASTM F1336. Gaskets shall be of SBR rubber, in accordance with ASTM F477. Transition gaskets are not allowed. All ductile iron transition fittings shall have an interior coating of

Protecto401 or approved equal. Ductile iron transition fittings shall be manufactured by the Harrington Corporation (Harco) or approved equal.

Saddles:

Sewer service saddles may be utilized for sewer lateral installations. All sewer service saddles shall be ductile iron with stainless steel straps, bolts, nuts, and washers. The nuts shall be coated to prevent galling. The saddle body shall be ductile iron, in accordance with ASTM A536, Grade 65-45-12. The gasket material shall be SBR, in accordance with ASTM D2000. Saddles for PVC or DI laterals shall have an alignment flange. Sewer service saddles shall be as manufactured by Geneco, or approved equal. All stainless steel straps shall be pre-formed at the factory, to the specified outside diameters of the pipe.

## SEWER LATERALS

Ductile iron laterals – For ductile iron mains, utilize mechanical joint fittings or an approved saddle with an alignment flange (Geneco or approved equal). For PVC mains, utilize an approved saddle with an alignment flange (Geneco or approved equal) or ductile iron fittings as specified above.

PVC laterals – utilize a saddle with an alignment flange (Geneco or approved equal) on PVC or ductile iron mains; utilize a mechanical joint tee with SDR 35 transition gaskets on ductile iron mains; or utilize PVC fittings as specified above on PVC mains.

The following table summarizes the materials to be utilized for sewer main to lateral connections:

| | PVC Main | DI Main |
|---|---|---|
| DI Lateral | DI fitting or approved saddle | MJ fitting or approved saddle |
| PVC Lateral | PVC fitting or approved saddle | MJ fitting with transition gasket or approved saddle |

Sewer laterals shall be in accordance with these Specifications and PWC standard details S.10, S.11, and S.12.

## PRECAST CONCRETE MANHOLES

Pre-cast circular reinforced concrete manhole units shall be in accordance with ASTM C-478. The tongue and groove ends of the manhole sections shall be manufactured for jointing with rubber gaskets (i.e., con-seal). An eccentric cone shall be utilized on all manholes, unless otherwise approved by the Public Works Commission.

Manhole steps shall be placed in all manholes and shall be steel reinforced (½" grade 60) copolymer polypropylene plastic steps in accordance with ASTM C-478 for material and design. The steps shall be spaced 16" on center with serrated treads and wide enough to stand on with both feet.

Manhole frames and covers shall be made of gray cast-iron, and the iron shall possess a tensile strength of not less than 18,000 psi. Cast iron shall conform to ASTM Specification A 48-83 Class 35. The frame

and cover shall be manufactured by the same manufacturer. All castings shall be in accordance with Public Works Commission standard details. Any defective castings shall be removed and replaced.

Any special linings and coatings that are specified for a manhole and installed at the production facility, in the field, or during repairs, shall be applied in accordance with the applicable special coatings specification and the manufacturer's specifications for that material.

Camlock ring and covers shall be in accordance with Public Works Commission standard details. Camlock bolt head shall be compatible with PWC standard tool for turning camlock mechanism. Camlock ring and covers shall be installed as indicated on the drawings, in accordance with PWC standard details.

## SELECT BEDDING MATERIAL

Select bedding material shall be crushed stone (No. 57 or No. 5), in accordance with Public Works Commission standard details. Bedding material shall be provided for all pipe materials.

## INSTALLATION

Pipe installation shall be in strict accordance with Specification Section 02222 – Excavation and Backfilling for Utility Systems and as outlined herein.

## PIPE LAYING

Pipe installation shall be in accordance with the manufacturer's instructions. Proper equipment shall be utilized to perform the work in a manner satisfactory to PWC. All pipes and fittings shall be carefully lowered into the trench in such a manner to prevent damage to the protective coatings and linings. Under no circumstances shall pipe materials be dropped or dumped into the trench. Pipe shall be carried into position and not dragged.

All dust, dirt, oil, tar (other than standard coating), or other foreign matter shall be cleaned from the jointing surfaces, and the gasket, bell, and spigot shall be lubricated with lubricant recommended by the manufacturer.

The pipe shall be laid upgrade, beginning at the lower end with the tongue or spigot ends pointing in the direction of the flow to the correct line and grade, unless otherwise approved by PWC. The pipe section to be installed shall be aligned by batter board or laser beam with the last installed pipe section. Mechanical equipment should not be used to assemble the pipe. Pipe shall be assembled in accordance with the pipe manufacturer's instructions. Any damage resulting from the use of mechanical equipment shall be replaced as directed by PWC.

Adjustments in grade by exerting force on the barrel of the pipe with excavating equipment shall not be allowed. The Contractor shall verify line and grade after assembling each joint.

At any time when pipe laying is not in progress, the open ends of the pipe shall be closed by a water tight plug or other means approved by the PWC Project Coordinator. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or where in the PWC Project Engineer's and/or PWC Project Coordinator's opinion trench conditions are unsuitable. Every precaution shall be taken to prevent material from entering the pipe while it is being installed.

## ALIGNMENT AND GRADE

All pipe shall be installed to the required lines and grades. Structures shall be installed at the required locations. The lines and grades of the pipe will generally be indicated by stakes parallel to the line of the pipe. The Contractor shall be responsible for installing the pipe to proper line and grade.

Pipe shall be visually inspected by shining a light between structures and /or by closed circuit television inspection. Any defects discovered, including poor alignment, shall be corrected as directed by the Public Works Commission.

The bottom of the trench shall be excavated to a minimum of four inches (4") below the outside bottom of the pipe being installed to allow adequate placement and compaction of bedding material prior to installation.

Select bedding material shall be placed a minimum of four inches (4") and a maximum of six inches (6") under the pipe for full width of the trench and halfway up the pipe on the sides. Bedding material shall be placed in layers not exceeding six inches (6") loose thickness for compacting by vibratory mechanical tamps under the haunches and concurrently on each side of the pipe for the full width of the trench. The final result shall be "Class B" bedding for rigid pipe. If the existing material under the pipe bedding material is unsuitable, the unsuitable material shall be removed and replaced with select bedding material (No. 57 or No. 5 stone), as authorized and approved by the Public Works Commission Project Coordinator.

The same material pipe shall be utilized from manhole to manhole, unless otherwise approved by PWC. If the section of pipe between manholes is 250 feet or less, no transitions will be allowed (either all PVC or all ductile iron). Should the length between manholes exceed 250 feet, only one transition will be allowed. Use of a C900 x SDR 26 adaptor shall be used to accomplish the transition. A transition is defined as the use of one C900 x SDR26 adaptor. No more than one (1) adaptor shall be utilized in any given manhole to manhole segment.

All manholes shall be constructed to Public Works Commission's standards. Installation shall be in accordance with ASTM C-891 and PWC standards.

Manholes shall be constructed of precast reinforced concrete circular sections installed on a base riser section with integral floor and shall be cored to accommodate the various pipe connections, as indicated on the drawings. Pipe connections to a manhole shall be by gasketed flexible watertight connections (boot for small diameter and A Loc for larger diameter pipe) or as approved by the Public Works Commission. The manhole size shall be in accordance with the following table, unless otherwise specified:

| Pipe Size | Manhole Diameter ** |
|---|---|
| 24" and less | 48" * |
| 27" - 36" | 60" |
| 42" | 72" |

* Where interior drop structures are required, use 60" diameter as required in the Public Works Commission standard details.
** Where multiple connections or acute angles are required, larger diameter manhole may be required as indicated on the plans.

The invert channel shall be constructed of brick and mortar, in accordance with Public Works Commission standard details. **Precast inverts are not allowed**. The invert channel shall be smooth and semicircular in shape conforming to the inside of the connecting sewer section. Changes in direction of flow shall be made with a smooth curve as large as a radius as the size of the manhole will permit without a decrease in flow velocity. Changes in size and grade of the channel shall be made gradually and evenly. The invert channel walls shall be constructed to three quarters (3/4) of the height of the crown of the outlet sewer and in such a manner not to obstruct maintenance, inspection or flow in the sewers. The inverts shall have a minimum slope of one (1) percent across the bottom of the manhole. A shelf shall be provided on each side of any manhole invert channel. Inverts in manholes with standing water will not be acceptable. The shelf shall be sloped not less than 1:12 (min) and no more than 2:12 (max). The bottom of the boot for the new sewer main or lateral shall be set one inch above existing shelf unless otherwise indicated.

When used in a paved street, the ring and cover shall be set in suitable mortar surrounded by a concrete collar in accordance with Public Works Commission standard details. When used in places other than in a paved street, the ring and cover shall be set to the grade shown on the plans or directed by the Public Works Commission. In unpaved areas cam-lock ring and cover shall be used. Camlock ring and cover shall be installed in accordance with Public Works Commission standard details.

The interior manhole riser joints, lift holes and grade adjustment rings shall be sealed with non-shrinking mortar to provide a watertight manhole. Lift holes sealed by the manufacturer with plastic caps do not require mortar seal. The hardened mortar shall be smooth to rub with no sharp edges. Use of grade rings with cam-lock ring and cover are not allowed, unless approved by the PWC Project Coordinator. **Use of grade rings is not allowed for above grade adjustments**.

All exterior manhole riser joints, including the joint at the cone, shall be sealed with an external rubber sleeve. The sleeve shall be made of stretchable, self-shrinking rubber, with a minimum thickness of 30 mils. The back side of each wrap shall be coated with a cross-linked reinforced butyl adhesive. The butyl adhesive shall be a non-hardening sealant, with a minimum thickness of 30 mils. The seal shall be designed to stretch around the manhole joint and then overlap to create a fused bond between the rubber and butyl adhesive. The application shall form a continuous rubber seal for the life of the application. The sealing system shall be as manufactured by Concrete Sealants, Inc. (Con-Seal), Sealing Systems, Inc., or approved equal. The wrap shall be a minimum of six (6) inches in width, and shall be centered on the

joint. All manhole joints (including the cone section to the last riser) shall be wrapped and sealed. Care shall be taken to prevent damage to the wrap during backfill operations. The manhole surface shall be prepared in accordance with manufacturer's specifications, prior to installing the joint wrap.

Materials shall not enter the sewer line during construction of the manhole. The manhole shall be kept clean of any and all debris or materials. Any debris or material that entered the manhole shall be immediately removed. This condition shall be maintained until final acceptance of the work.

## CONNECTION TO EXISTING MANHOLES OR LIFT STATIONS

All connections to existing manholes and/or lift stations shall be approved by the Public Works Commission. Where new mains are to be connected to existing active sanitary sewers, the active sewers shall remain in service. Unless otherwise indicated, where new lines are connected into existing manholes, all or such portion of the manhole invert as is necessary shall be removed and a new invert shall be constructed to accommodate both new and existing flows. All work shall conform to the requirements specified for new manholes. The existing structure connection shall be cored and a flexible watertight connection (i.e., boot) installed. The boot shall be installed in accordance with Public Works Commission standard details and requirements. The Contractor shall coordinate and cooperate with the Public Works Commission's Project Coordinator.

## PIPE TO MANHOLE CONNECTOR (BOOT)

A watertight, flexible pipe-to-manhole connector shall be utilized on all pipe to manhole connections, for both new and existing manholes and pipes, unless otherwise specifically authorized in writing by the Public Works Commission.

The connector assembly shall be the sole element to provide a watertight seal of the pipe to the manhole or other structure. The connector shall consist of a rubber gasket, an internal compression sleeve, and one or more external take-up clamps. The connector shall consist of natural or synthetic rubber and Series 300 non-magnetic stainless steel. No plastic components shall be allowed.

The rubber gasket shall be constructed of synthetic or natural rubber, and shall meet or exceed the requirements of ASTM C-923. The connector shall have a minimum tensile strength of 1,600 psi. The minimum cross-sectional thickness shall be 0.275 inches.

The internal expansion sleeve shall be comprised of Series 300 non-magnetic stainless steel. No welds shall be utilized in its construction.

Installation of the connector shall be performed utilizing a calibrated installation tool furnished by the connector manufacturer. Installation shall require no re-tightening after the initial installation. Installation shall be done in accordance with the manufacturer's instructions.

The external compression take-up clamps shall be Series 300 non-magnetic stainless steel. No welds shall be utilized in its construction. The clamps shall be installed utilizing a torque-setting wrench

furnished by the connector manufacturer. Installation shall be done in accordance with the manufacturer's instructions.

The Contractor shall utilize the proper size connector in accordance with the connector manufacturer's recommendations. All dead-end pipe stubs shall be restrained in accordance with ASTM C-923.

The finished connection shall provide a sealing to a minimum of 13 psi, and shall accommodate a minimum pipe deflection of seven (7) degrees without the loss of seal.

The pipe to manhole connector shall be PSX: Direct Drive as manufactured by Press-Seal, or approved equal.

## INSIDE DROP MANHOLE STRUCTURE

Inside manhole drop structures shall be constructed and installed in accordance with Public Works Commission standard details.

## CLEANING

Prior to final inspection, all sanitary sewer laterals, mains, and manholes newly installed on the collection system shall be flushed and cleaned. During the flushing operation, the downstream manhole shall be closed with a watertight plug to protect the existing sewer main. All water and debris shall be removed and properly disposed of by the Contractor. This condition shall be maintained until the Public Works Commission issues final acceptance for the project.

## TESTING

Completed sewers shall be tested in accordance with the provisions outlined below. The Contractor shall furnish all equipment, labor, materials, and pay all costs associated with the tests performed. The Contractor shall schedule all testing with the Public Works Commission's Project Coordinator, a minimum of 48 hours in advance. The Contractor shall cooperate with the Public Works Commission's Project Coordinator and furnish any needed assistance necessary to complete the required testing.

For annexation and/or retrofit projects: No testing shall be conducted prior to successful completion of the compaction testing.

For all other projects: No testing shall be completed until all utilities are installed, prior to preparation of the road subgrade. The Contractor may elect to perform testing to satisfy them that the sewer utility is installed properly prior to commencing installation of other utilities. However, such testing shall not be construed as acceptance by PWC.

The deflection/mandrel test shall not be performed until a minimum of thirty (30) calendar days after backfill operations are completed and the area graded to final contours. In lieu of waiting thirty (30) calendar days, the Contractor has the option to have an independent testing laboratory verify that

compaction has been completed to achieve the maximum density as shown in the detail. The location and elevation of the compaction testing shall be determined reviewed and approved by the Public Works Commission's Project Coordinator. The Contractor shall provide the Public Works Commission with a copy of the density testing results.

Compaction testing shall be done in accordance with Specification Section 02222 – Excavation and Backfilling for Utility Systems.

## Vacuum Testing Manholes:

All precast sanitary sewer manholes installed by the Contractor shall be vacuum tested for leakage. This test shall be done in accordance with ASTM C-1244 and in the presence of a Public Works Commission Project Coordinator. The Contractor shall be responsible for providing all the necessary labor, materials, equipment, testing apparatus, and all other incidentals necessary to complete the vacuum test. All testing equipment utilized shall be approved for use in vacuum testing manholes.

Each manhole shall be tested after assembly. All lift holes shall be plugged with an approved non-shrink grout. All lines, including laterals, entering the manhole shall be temporarily plugged. The Contractor should take care to ensure that the pipes and plugs are secure in place to prevent them being drawn into the manhole. The test head shall be placed directly on top of the concrete surface of the manhole following the manufacturer's recommendations, rather than to the cast iron seating ring.

Manholes may be tested either prior to backfill or post backfill at the contractor's option. For pre-backfill testing, a vacuum of 10 inches of Mercury (inches Hg) 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 inches of Mercury (inches Hg). The manhole is acceptable if the time for the vacuum reading to drop from 10 inches of Mercury to 9 inches of Mercury meets or exceeds the values indicated below:

| | **Diameter of Manhole** | | |
|---|---|---|---|
| **Manhole Depth** | **4' Diameter** | **5' Diameter** | **6' Diameter** |
| **10' or less** | **25 sec** | **33 sec** | **41 sec** |
| **11' to 15'** | **38 sec** | **49 sec** | **62 sec** |
| **16' to 20'** | **50 sec** | **65 sec** | **81 sec** |
| **21' to 25'** | **62 sec** | **82 sec** | **101 sec** |
| **25' to 30'** | **74 sec** | **98 sec** | **121 sec** |

Vacuum testing backfilled manholes is not recommended in the presence of groundwater. Vacuum testing a backfilled manhole that is subjected to hydrostatic pressure may exceed the design limits of the flexible connecters and could lead to failure of the structure, joints, and/or connectors. Where groundwater is present a reduction in the vacuum pressure applied to the manhole will be required. The

vacuum shall be reduced by 1 inch of Mercury for every 1 foot of hydrostatic head between 12 feet and 21 feet. A vacuum test should not be performed when the hydrostatic head exceeds 22 feet. See the chart below:

| Hydrostatic Head (ft)* | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vacuum Pressure (in Hg) | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ** |

*Hydrostatic head above the critical connector (critical connector is bottom most flexible connector)
**Do not perform vacuum test

If the manhole fails the initial test, the manhole shall be repaired by an approved method until a satisfactory test is obtained. All repair methods shall be approved by the Public Works Commission prior to being utilized. Retesting shall be performed until a satisfactory test is accomplished.

## Mandrel Testing:

Deflection tests shall be performed on all PVC pipe installations. PVC pipe's maximum deflection after backfilling shall not exceed five (5) percent. The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on the type of pipe manufactured and the applicable ASTM Standard. The PVC pipe shall be measured in compliance with ASTM D2122 “Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings”. The Contractor shall supply all labor, equipment and materials necessary to perform the test in the presence of the Public Works Commission’s Project Coordinator. The test shall be performed without mechanical pulling devices. The mandrel shall be constructed so as to preclude any yield in diameter, and with a pull line on each end to facilitate withdrawal. If the deflection exceeds the allowable, the Contractor shall remove and replace the pipe.

## Air Testing:

Air testing shall be performed on all mains and laterals to determine acceptability. The length of sewer subject to an air test shall be the distance between two adjacent manholes. The tests shall be conducted in accordance with the appropriate ASTM standard. The air test shall be coordinated with the Public Works Commission. The Contractor is required to supply all equipment, labor, materials and pay all costs associated with the test performed.

### Air Test for PVC Pipe

The low pressure air test on PVC pipe shall be performed with satisfactory results in accordance with ASTM F1417 “Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air”. The pipe, including lateral assemblies, shall be plugged and air added slowly until the internal pressure of the line is raised to 4.0 psi. After the pressure of 4.0 psi is obtained, regulate the air-supply so that the pressure is maintained between 3.5 and 4.0 psi for at least two (2) minutes, depending on air/ground temperature conditions. The pressure will drop slightly until equilibrium is obtained; however, a minimum of 3.5 psi is required. Once the 3.5 psi is maintained, the test will begin. If the pressure drops 1.0 psi within the time indicated below, the test fails.

| Pipe Dia (in) | Minimum time (minutes) | Length for Min Time (ft) | Time for Longer Length (sec) |
|---|---|---|---|
| 4 | 3:46 | 597 | 0.380L |
| 6 | 5:40 | 398 | 0.854L |
| 8 | 7:34 | 298 | 1.520L |
| 10 | 9:26 | 239 | 2.374L |
| 12 | 11:20 | 199 | 3.418L |
| 15 | 14:10 | 159 | 5.342L |
| 18 | 17:00 | 133 | 7.692L |
| 21 | 19:50 | 114 | 10.470L |
| 24 | 22:40 | 99 | 13.674L |
| 27 | 25:30 | 88 | 17.306L |
| 30 | 28:20 | 80 | 21.366L |
| 33 | 31:10 | 72 | 25.852L |
| 36 | 34:00 | 66 | 30.768L |

The Contractor shall observe all safety precautions to include allowing no one in the manholes during testing, securing all plugs and providing additional plug bracing. The Contractor shall be required to furnish, install and remove after testing at no additional cost, a temporary glue cap/plug to be airtight for all cleanout stacks to accomplish air testing. The air pressure shall never exceed 8 psi. All gauges shall be accessible outside of the manholes.

## HYDROSTATIC TESTS

After the ductile iron sewer pipe has been laid within the "protected" area and backfilled to finished grade, the pipe shall be subjected to a hydrostatic pressure test. All laterals within the “protected” area shall be ductile iron. All sewers subject to hydrostatic testing shall include (1) sewers entering or crossing streams, (2) sewers located less than 100 feet from any public or private water supply source including any WS-I waters or Class I or Class II impounded reservoirs, (3) where the minimum 18 inch vertical and 10 feet horizontal separation cannot be maintained between sewers and water mains (see NC DENR Regulations), or (4) as specified and/or indicated on the drawings. The Contractor will furnish all labor and material, including test pumps, plugs, and all other incidentals for making hydrostatic tests. Hydrostatic pressure testing shall be conducted on the completed main, including the laterals.

The duration of the pressure test shall be at least one hour or longer, as directed by the Public Works Commission. The hydrostatic pressure shall be 150 psi. Each section of pipe shall be slowly filled with water and the specified test pressure based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Public Works Commission. Before applying the specified test pressure, all air shall be expelled from the pipe.

All joints showing visible leaks shall be made tight. Cracked or defective pipe, joints, laterals, and fittings discovered in consequence of the pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to

remain exposed for the hydrostatic test may be waived by the Public Works Commission in certain situations. The test shall be repeated until satisfactory to the Public Works Commission.

The results of the pressure tests shall be satisfactory as specified. All replacement, repair, or retesting shall be accomplished by the Contractor. All repairs shall be reviewed and approved by the Public Works Commission prior to backfill. The use of couplings, sleeves, etc. shall be reviewed and approved by the Public Works Commission prior to use.

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# DIVISION 2
# SITE WORK

## 02750 WASTEWATER FLOW CONTROL

### GENERAL

The intent and purpose of these specifications is to provide wastewater flow control, i.e., bypass pumping, of the sanitary sewer flows during the Contractor's operations. The Contractor shall furnish all labor, materials, accessories, equipment and tools for performing all operations required to bypass pump sewage around a manhole or sewer section in which work is to be performed.

The Contractor shall provide all pumps, piping, and other equipment to accomplish this task; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities to equal or better condition to the satisfaction of the Fayetteville Public Works Commission. The Contractor shall be responsible for the design, installation, operation, and maintenance of the temporary bypass pumping system. The Contractor shall provide sufficient documentation to the Fayetteville Public Works Commission to demonstrate that he, or his designated subcontractor, have the experience in the design, installation, and maintenance of temporary bypass pumping systems.

### RELATED SECTIONS

A. Section 02305 – Pipe Bursting
B. Section 02500 – Traffic Control
C. Section 02730 – Sanitary Sewer System
D. Section 02760 – Television Inspection
E. Section 02766 – Sewer Line Cleaning
F. Section 02780 – Cured-in-Place Lining

### REQUIREMENTS

The Contractor shall be responsible for all aspects of the bypass operation, including but not limited to: providing access to install, move, and maintain the pumps in the proper position, traffic control, installation and removal of bypass equipment, pump monitoring, testing of the bypass system, re-fueling, maintenance, notification of property owners (should access to private property be necessary), wastewater and fuel spill containment, and removal and replacement of manhole cones (if necessary). The bypass system (pumps and piping) shall be monitored by Contractor personnel at all times, when the bypass operation is in effect.

The Contractor shall have all materials and equipment on site to immediately respond to any emergencies or other event that could impact the bypass system (i.e., leak in the discharge piping, pump failure, flooding, etc.). The Contractor shall have sufficient support staff and equipment to mobilize to repair and/or service any equipment within one (1) hour of notification, 24 hours a day, seven (7) days a week. In the event of an emergency, the Contractor shall provide an immediate response and fully cooperate with the Fayetteville Public Works Commission.

The Contractor shall install the bypass pumps, equipment, and discharge lines to minimize impacts to the property owners, residents, and environment. The Contractor shall be responsible for determining the best

location for the bypass equipment, to include, but not limited to, the need for any special provisions to ensure access for the customers, preventing the pumps and manholes from flooding, etc. Such special provisions include, but are not limited to: installation of ramps, excavation and burial of the bypass lines, temporary fencing, sandbagging, construction of berms, raising the pumps, etc. The Contractor bears all responsibility for the maintenance and restoration of any trenches, ramps, access, etc. necessary for the temporary bypass pumping operation.

The Contractor shall take appropriate steps to ensure that all pumps, piping and hoses that carry raw sewage are protected from traffic. The Contractor shall identify the proposed methods to protect the temporary bypass pumping system from traffic as part of the detailed temporary bypass pumping plan. Traffic control shall be performed in accordance with these Contract Documents.

The bypass pumping system shall be monitored by Contractor personnel at all times (24 hours a day, 7 days a week), when the bypass operation is in effect. The Contractor's personnel shall be on-site at all times (24 hours a day, 7 days a week), and stationed at the primary bypass pumps. Depending on the location and system set-up, it may be necessary for the Contractor to station personnel at each of the various bypass pump locations. Unless otherwise approved by the Fayetteville Public Works Commission, one (1) person cannot monitor multiple bypass pump locations. All bypass pumps, regardless of their location (primary or on secondary lines), shall be equipped with an automatic dialer (or other similar device). The Contractor personnel shall immediately respond to any issue regarding the temporary bypass pumping system. All temporary bypass piping shall be periodically monitored (patrolled from pumps to discharge), but no less frequently than once every 12 hours. The bypass pumping equipment shall be automated and capable of functioning without the assistance of an operator.

## SUBMITTALS

All submittals shall be provided in accordance with these Contract Documents, and the requirements outlined herein. The Contractor shall submit a detailed bypass pumping plan to the Fayetteville Public Works Commission for approval, prior to initiating the bypass operation. The Contractor shall submit this information far enough in advance to allow sufficient time to complete the necessary coordination, including but not limited to obtaining permits (i.e., encroachments), getting permission from property owners to cross and/or utilize their property, and gaining any necessary regulatory approvals. Failure to submit a complete and comprehensive bypass pumping plan in a timely manner shall not be cause for any extension of the Contract Time.

The detailed temporary bypass pumping plan shall include the following information:

- Method of monitoring the pumps to ensure proper operation, to include method of notifying personnel (Fayetteville Public Works Commission and Contractor) in the event of an emergency, activation of back-up pumps, etc.
- Method of monitoring upstream system levels to ensure surcharging does not result in back-ups into buildings, overflows, etc.
- The amount, if any, of any required surcharging.
- Method to initiate back-up pumps.
- Map showing general location of the pumps and bypass lines. This shall include means to maintain access to driveways, etc.
- Measures to secure the bypass system (lines, pumps, etc.) from traffic, vandalism, high stream flows, etc.

- Method of plugging (and securing the plug(s)) and type of plugs.
- Size and location of manholes or other access points for suction and discharge piping.
- Size of pipeline(s) or conveyance system(s) to be bypassed.
- Number, size, material, location, and method of installation of suction piping.
- Number, size, material, location, and method of installation of discharge piping.
- Bypass pump sizes, capacities, and number of each size to be provided on-site, including all primary, secondary, and spare pumping units.
- Calculations of static lift, friction losses, minimum inlet submergence, and flow velocity (pump curves showing pump operating range shall be submitted). Calculations shall be signed and sealed by a licensed Professional Engineer registered in the State of North Carolina. Calculations shall be provided for both the peak flow rate and a normal daily rate (see PUMPING AND BYPASSING section for sizing requirements).
- Measures to protect discharge manhole(s) or structure(s) from erosion and damage due to the bypass operation.
- Erosion control measures.
- Emergency contact information for the personnel responsible for the pump operation.
- Emergency contact information for Contractor personnel to respond in the event of an emergency.
- List of available resources (equipment, materials, personnel) and contact information for emergency response.
- Method to contain potential releases of sewer flow from air release valves.
- Contingency plan for responding to potential sewer spills caused by weather, vandalism, acts of God, etc. The plan shall include communication protocols, available resources, and the steps to be taken in the event of an emergency.

**No bypass operations shall proceed until all bypass submittals have been reviewed and approved by the Fayetteville Public Works Commission.**

## COORDINATION

The Contractor shall fully coordinate their temporary bypass pumping operations with the Fayetteville Public Works Commission. It is the Contractor's responsibility to fully determine the scope and location of the temporary bypass pumping system. As outlined in these Contract Documents, the Fayetteville Public Works Commission may provide assistance with the building and maintenance of access roads, clearing of easements, etc. All coordination (to include location of the pumps and discharge lines) shall be fully discussed and agreed to prior to commencement of bypass operations.

The Contractor shall schedule a coordination meeting with the Fayetteville Public Works Commission and other personnel (Contractor, bypass sub-contractor, etc.) a minimum of three (3) business days prior to starting the temporary bypass pumping system. The purpose of this coordination meeting is to ensure that the Contractor and their sub-contractors have a good understanding of the requirements and expectations of operating the temporary bypass pumping system, discuss contingency plans (to include protocols for emergency contacts), identify location(s) of pumps, verify necessary materials (repair sleeves, containment devices, etc.) are on-site and available, and any other items necessary to ensure that the Fayetteville Public Works Commission has confidence that the appropriate personnel can operate and maintain the temporary bypass pumping system. Should, for any reason, the Fayetteville Public Works Commission deem that the Contractor and/or their sub-contractor is not prepared to operate and maintain the temporary bypass pumping system, the temporary bypass pumping system shall not be started. The Contractor shall take all necessary steps to address any concerns to the satisfaction of the Fayetteville Public Works Commission. Upon

completion of those actions, another coordination meeting shall be held, in order for the Fayetteville Public Works Commission to confirm that the Contractor and their sub-contractor is prepared to operate and maintain the temporary bypass pumping system. This process will be repeated until the Fayetteville Public Works Commission is satisfied that the Contractor and their sub-contractor are prepared to operate and maintain the temporary bypass pumping system. No additional contract time will be granted for this delay.

The temporary bypass pumping system shall run for a minimum of 24 hours, or longer as deemed by the Fayetteville Public Works Commission, prior to any activity occurring (cleaning, closed circuit television {CCTV}, etc.) within the main(s) being bypassed.

## FLOW CONTROL PRECAUTIONS

Where the raw sewage flow will be blocked during the Work as a result of the temporary bypass pumping operation, the Contractor shall take all necessary precautions to protect the public health. No septic conditions shall be allowed due to Contractor's operations. The sewer system (mains, manholes, laterals, etc.) shall also be protected from damage. The following occurrences shall not be allowed:

1. No sewage shall be allowed to back up into any homes or buildings.
2. No sewage shall overflow any manholes, cleanouts or any other access to the sewers.
3. Users upstream of the project area shall be able to use all their water and sewer utilities without interruption or limitations.

If any of the above occur or are expected to occur, the Contractor shall take immediate action to alleviate one or all of the conditions. Additionally, the Contractor is required to observe the conditions upstream of the plug and be prepared to immediately increase bypass pumping or release the flows, as required. Any damage claims resulting from the Contractor’s failure to properly maintain sewer flows shall be the Contractor's responsibility.

All sump pumps, bypass pumps, trash pumps or any other type pump which pulls sewage or any type of material out of the sanitary sewer system shall discharge into another sanitary sewer manhole, or appropriate vehicle or container acceptable to the Fayetteville Public Works Commission. Under no circumstances shall untreated sanitary sewer be discharged, stored or deposited on the ground, swale, road or open environment. The Contractor shall not allow any flow of sewage onto private property, streets, or into creeks and drainage systems. Damage due to negligence of the Contractor, including, but not limited to, flooded dwellings, damaged property, damaged driveways, etc., shall be corrected immediately by the Contractor at no additional cost to the Fayetteville Public Works Commission.

## PLUGGING AND BLOCKING

In some applications, the wastewater flow may be plugged and contained within the capacity of the collection system. This shall only be done when it has been determined the system can accommodate the surcharging without any adverse impact. The Contractor has the sole responsibility for determining whether the system can accommodate surcharging. If this option is selected, the Contractor shall be responsible for continuously monitoring the system to ensure no sewer spills or overflows occur.

A sewer line plug shall be inserted into the line at a manhole upstream from the section being surveyed or repaired. The plug shall be so designed that all or any portion of the operation flows can be released. The Contractor shall secure the plug, to prevent it from being dislodged and moving downstream. Flows shall be bypassed for the initial CCTV inspection and shall be bypassed throughout the duration of the work, to

include the final CCTV inspection. Flows shall be bypassed in accordance with the approved temporary bypass pumping plan. Upon acceptance of the work by the Fayetteville Public Works Commission, the temporary bypass pumping system shall be removed and flows restored.

## PUMPING AND BYPASSING

The Contractor, when and where required, shall divert sewer flows for the sewer pipe rehabilitation process, cleaning, television inspection, pipe repairs, manhole replacement and/or rehabilitation, obstruction removals, or other related as required to complete the Work. The pumps and bypass lines shall be of adequate capacity and size to handle and prevent backup or overflow for all flows.

The temporary bypass pumping system shall be designed to maintain the flows necessary to meet the requirements of each particular location. The temporary sewer bypass system shall have the capacity to handle the flows outlined in these Contract Documents. The temporary sewer bypass system shall be sized to handle 2.5 times the average daily flow rate, or the specified peak flow – whichever is greater.

The Contractor shall be responsible for furnishing the necessary labor and supervision to set up, operate, and maintain the temporary bypass pumping system. A "set up" consists of the necessary pumps, conduits and other equipment to divert the flow of sewage, from the start to finish of work performed. Each "set-up", regardless of location, shall have Contractor personnel on-site at all times (24 hours a day, 7 days a week) and stationed at the pumps, unless otherwise approved by the Fayetteville Public Works Commission. The temporary bypass pumping system shall include:

- A minimum of one (1) redundant pump so that the temporary bypass pumping system is capable of transmitting the peak flow with the largest duty pump out of service.
- Pumps shall be provided with a means of automatic control via level sensing. Systems requiring manual starting and/or stopping shall not be allowed.
- All equipment (primary and secondary pumps) shall be equipped in a manner to keep noise to a maximum of 65 dBA at 30 feet.
- An automatic dialer (or similar) to immediately notify (in a sequential operation) Contractor and Fayetteville Public Works Commission personnel in the event of equipment failure. The automatic dialer shall be set to issue notifications prior to flow level reaching critical elevations and having a spill occur. All bypass pumps (regardless of location) shall be equipped with an automatic dialer (or similar).

The temporary bypass pumping system shall be provided in such a way as to maintain access for businesses and residences. The Contractor shall be responsible for determining the best location for the bypass equipment, and the need for any special provisions to ensure access for the residents and businesses. Such special provisions include, but are not limited to: installation of ramps, excavation and burial of the bypass lines, etc. The Contractor shall use bridges over the bypass lines, temporary lines under driveways, alternate routes, or other means to accomplish this item. The bypass plan submittal shall indicate the means of maintaining access. The Contractor bears all responsibility for the maintenance of any trenches, ramps, etc. necessary for the bypass operation.

Pumps, equipment, and bypass lines shall be continuously (24 hours a day, 7 days a week) monitored by on site Contractor personnel capable of starting, stopping, refueling and maintaining these pumps during the Work. The temporary bypass pumping system shall be provided with an automatic dialer (or other similar device) that will immediately notify (in a sequential operation) the Contractor and the Fayetteville Public Works Commission in the event of equipment failure. All bypass pumps (regardless of location) shall be

equipped with an automatic dialer. This automatic dialer (or similar) shall be set to issue notifications prior to flow levels reaching critical elevations and having a spill occur.

The automatic dialer shall be set to issue notifications through a sequential operation. Automatic dialers that are not set up for sequential notifications shall not be acceptable. The Contractor's personnel shall be the first to receive any notifications from the automatic dialer. The automatic dialer shall only notify the PWC personnel after all Contractor notifications have been ignored and/or not responded to. The Contractor shall properly adjust the level at which the automatic dialer initiates notification to provide adequate time for the sequential notification to occur. If the PWC personnel are notified by the automatic dialer, the PWC personnel shall assume that a spill is occurring or is imminent, and respond accordingly. The Contractor shall be responsible for all costs for the PWC to mobilize and respond to the notification, regardless if a spill occurred or not.

In some applications, it may be necessary to surcharge the system in order to ensure proper pump operation. This shall only be done when it has been determined the system can accommodate the surcharging without any adverse impact. The Contractor has the sole responsibility for determining whether the system can accommodate surcharging. In the event surcharging is necessary, the Contractor shall be responsible for continuously monitoring the system to ensure no sewer spills occur.

All bypass piping shall successfully pass a hydrostatic test prior to bypassing the sewer flows. The hydrostatic test pressure shall be no less than the expected discharge pressures, and shall be held for a minimum of one (1) hour. All testing shall be observed by the Fayetteville Public Works Commission. Testing shall be coordinated with the Fayetteville Public Works Commission a minimum of 24 hours in advance.

## SPILL RESPONSE

The Contractor shall not discharge or pump any sewage, solids, or debris on the ground, streets, storm water system, ditches, or streams. Any sewage spills shall be immediately reported to the Fayetteville Public Works Commission Water Resources Construction Department, (910) 223-4716. After normal business hours, the Contractor shall contact the Fayetteville Public Works Commission Dispatch Center, (910) 678-7400 or (910) 323-0178. The Contractor shall take complete responsibility for all costs related to the clean-up of the spill, including any fines issued by the North Carolina Department of Environmental Quality (NC DEQ).

In the event that raw sewage (in any quantity) is spilled, discharged, leaked or otherwise deposited in the open environment, due to the Contractor's work, the Contractor is responsible for any cleanup of solids and disinfection of the area affected. This work will be performed at the Contractor's expense with no additional cost to the Fayetteville Public Works Commission. The Contractor is also responsible for complying with any and all regulatory requirements in regards to the size spill with no additional cost to the Fayetteville Public Works Commission. The Contractor shall cooperate fully with the Fayetteville Public Works Commission and the applicable State agencies in responding to and cleaning up the spill. Any work completed by the Fayetteville Public Works Commission in responding to a spill caused by the Contractor's operations shall be billed to the Contractor.

Where sewage has backed up into a property due to any aspect of the Contractor's operation, the Contractor shall immediately notify the Fayetteville Public Works Commission, inspect the property with the Fayetteville Public Works Commission and agree on remedial measures. The Contractor shall be responsible for all cleaning, repair and/or replacement of damaged property, temporary relocation of all occupants of the affected properties, if required, all to the satisfaction of the property owner. These actions shall be undertaken

immediately upon learning of the backup. Cleaning shall be performed by firms specializing in this type of work. All costs associated with the cleaning, repair, replacement of damages, occupant accommodations, insurance and spill remediation shall be borne by the Contractor. All remediation measures required as part of a spill response are part of acceptance of the project, and final payment shall not be made until such time all required measures are addressed and approved by the appropriate regulatory agency.

*** END OF SECTION ***

**DIVISION 2**
**SITE WORK**

## 02831 CHAIN LINK FENCING

### GENERAL

Where shown on the plans there shall be installed a "chain link" fence with all necessary posts, braces, top rail, gates, fabric, extension arms, and three strand barbed wire.

The erected fence shall meet the following requirements:

> The enclosing fence shall have an overall fabric height of six feet (6') and an additional one foot (1') of three strand barbed wire, for a total height of seven (7'). The gates shall be seven feet (7') in overall height.

### MATERIALS

Fabric: Fencing shall be chain link #9 gauge aluminized continuously woven wire 2" uniform square mesh without knots or ties, except for knuckling and barbing. Both the top and bottom edges of the fabric shall be barbed unless otherwise shown on the plans. The Contractor shall not piece together a number of short pieces of fence fabric.

Tensile Strength Test: Wire pickets of which this fabric is made to stand a tensile strength test of approximately 70,000 pounds per square inch based on the cross sectional area of the galvanized wire.

Framework: All posts and other appurtenances used in construction shall be hot-dipped, galvanized with a minimum of 1.8 oz. per square foot surface.

Line Posts: Hot dip galvanized "H" column (2" x 2 1/4") weight 4.1 pounds per linear foot, minimum carbon content 0.355. No used or open seam material will be permitted in posts or rails. (Alternate 2 1/2" O.D. galvanized pipe weight 3.65 pounds per linear foot or C-section line posts of the same dimension as H-post, 0.120 in wall thickness and fabricated from steel conforming to ASTM A-570, Grade E.) Intermediate posts shall be evenly spaced no more than 10 feet apart on center.

Top Rail: Hot dip galvanized pipe 1 5/8" O.D., weight 2.27 pounds per linear foot protected with outside sleeve type couplings at least 7 inches long. No used or open seam material will be permitted.

Terminal Posts: End, corner and pull posts hot dip galvanized pipe 3" O.D. - 5.79 pounds per linear foot. Gate posts hot dip galvanized pipe of "H" construction as specified.
Tension Wire: A bottom tension wire 7 gauge, alzd. (0.4 oz./s.f.), 6 inches above grade. Wire shall be fastened to fabric with aluminum rings at 24" on center and to each intermediate post.

Extension Arms: Hot dip galvanized. Line post arms of pressed steel malleable base; end, and corner post arms of malleable iron; gate posts to have ornamental top. Each extension arm to carry three strands of barbed wire approximately 12 inches out from fence line. Barbed wires to be securely fastened in by means of self-locking grooves. The barbed wire shall support a minimum of 400 lbs. vertical dead load from tip of arm. The barbed wire shall be 4-point pattern composed of two strands of No. 12 1/2 gauge galvanized wire.

Gates: Frame to be galvanized pipe 2.0 inches O.D. weighing 2.27 pounds per foot. Each frame to be equipped with 3/8-inch diameter adjustable truss rods. Gateposts and corner posts shall be 3 inches O.D. weighing 5.11 pounds per foot. Gates are to be manufactured using 2" aluminum tubing in lieu of the specified Schedule 40 steel pipe. Gateposts and corner posts shall be 6 5/8" O.D. for swing gates (greater than 20 feet in length and 4" O.D. for slide gates, weighing minimum of 5.11 pounds per foot. Corner fittings to be heavy pressed steel or malleable castings. Fabric to be same as in fence. Gates to be completed with malleable ball and socket hinges, catch, stops and rest. Hinges to permit gate to swing back against fence, 180 degrees if required. Latches shall be arranged for padlocking so that the padlock will be accessible from both sides of the gate regardless of the latching arrangement.

Braces: Brace material to be hot dip galvanized and same as top rail, to be spaced midway between top rail and ground, and to extend from terminal post to first adjacent line post. Braces to be securely fastened to post by suitable connections, and then trussed from line post back to terminal post with 3/8 inch round rod equipped with a turnbuckle for adjusting.

Fittings: Hot dip galvanized. All fittings to be malleable, cast iron or pressed steel.

Fabric-Bands: Fabric to be fastened to line post with (9 gauge) fabric bands spaced approximately 18 inches apart, and to top rail with wires (9 gauge) spaces approximately 24 inches apart.

Locks: Locks will be provided by the Owner.

## INSTALLATION

General: Installation shall be made in a workmanlike manner by skilled workers experienced in the erection of this type of fence and in accordance with the manufacturer's recommendations. The fence shall be erected on a previously prepared surface to the lines and grades indicated on the plans.

Post Setting: All posts shall be set plumb and in alignment into a 36-inch concrete footing of proper size and shape so as to furnish sufficient support to withstand any strain or shock ordinarily brought to bear on a fence of this character. The concrete strength shall be 3000 psi (ASTM C-94) and the foundations a minimum of 9 inches in diameter for line post and 12 inches for terminal post. Concrete shall be thoroughly compacted so as to be free of voids and finished in a dome. Straight runs shall not exceed 500 feet between brace posts. Concrete shall cure a minimum of 72 hours before any further work is done on the posts.

Fabric: The fabric and barbed wire shall be stretched to the proper tension as recommended by the manufacturer and securely fastened to the framework members to result in a straight fence line without sagging. The bottom of the fabric shall be held as uniformly as is practicable to the finished grade.

**DIVISION 2**
**SITE WORK**

**02931 SOD**

## GENERAL

Restoration of existing lawn areas outside of the public right-of-way disturbed by construction activities shall be by installation of new sod. Restoration and sod shall be performed as soon as practical, but the time period between initial disturbance, the utility installation and sod placement shall not exceed 60 days. Sod is defined as blocks, squares, strips of turf grass and adhering soil used for vegetative planting. Sodding and preparation of the sod bed shall be performed by an experienced landscape subcontractor specializing in this type of operation unless otherwise approved by the Public Works Commission in writing.

The Contractor shall adhere to the standards set forth by the American Association of Nurseryman and the Associated Landscape Contractors of America. All personnel shall be appropriately trained with regard to the degree of involvement so to assure the Owner the highest level of workmanship. Sod species suitable in this area are hybrid bermuda, centipede and zoysia; however the sod placed for each individual's lawn shall be the same species of sod as existing. Sodding may be performed at any time of the year except frozen sod shall not be placed nor shall sod be placed on frozen ground. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of a vigorous, disease free and weed free sod lawn.

## MATERIAL

Materials, equipment and products incorporated in the work shall be approved by the Public Works Commission. The Contractor shall submit a list of the proposed materials with samples, if required. Package materials should be delivered in unopened original containers showing weight, analysis and name of manufacturer. The Contractor shall protect the material from deterioration and/or damage

Sod shall contain 95 percent permanent grass; not more than five (5) percent weeds and undesirable grasses, good texture and free from obnoxious grasses, roots, stones and foreign materials. Sod shall be uniformly 1 ½ to 2 inches thick with a well developed fibrous root mat system in topsoil with clean cut edges. The sod shall be sufficiently dense and cut to the minimum required thickness such that if the sod is suspended by one corner, the sod will not tear apart. The sod shall be recently mowed to a height of not more than three (3) inches prior to harvest. The sod shall be supplied and maintained in a healthy condition as evidence by the grass being a normal green color in appearance, dense, and free from insects, pests, disease or injury. Sod shall be delivered to the job site within 24 hours after being cut and shall be installed within 24 hours after delivery. Any sod which is torn, broken or too dry will be rejected.

## SOIL BED PREPARATION

Before landscape construction is to begin, the site shall be cleaned and disposed of brush, rubbish, stones, gravel and other foreign material within the area to be landscaped. Exposed ground surfaces disturbed during construction activities shall be graded to the original contours (allowing for the thickness of the sod) or as in the case of an altered contour such as a fill slope, graded as directed by the Public Works Commission to finish grade, or typical cross section. The sod bed shall be excavated to such a depth that after sod placement the top of the sod shall be flush with surrounding grade or contours. Rake areas to be sodded smooth, free from unsightly variations, bumps, ridges or depressions. Do not start work until conditions are satisfactory and do not work during inclement or impending inclement weather.

The surface area to receive sod shall contain a minimum of four (4) inches of good, fertile, friable, organic natural topsoil loam as a base for laying the sod. Topsoil shall be free of clumps, brush, sticks, weeds, stones, roots, trash or other objectionable material. Contractor shall insure all topsoil to be free of plants or plant parts of quackgrass, johnson grass, nut sedge, poison ivy or other noxious weeds. The Contractor shall furnish and supplement the existing topsoil at no additional costs to the Public Works Commission providing a minimum four (4) inch thickness as specified. Soil preparation shall not be performed in frozen or extremely wet conditions. The finished topsoil bed shall be uniform in grade, with a yard like appearance. All changes in grade shall have a smooth, rounded peaks and valleys.

The soil shall be scarified or otherwise loosened to a depth of not less than five (5) inches and all clods shall be broken. The top four (4) inches shall be worked into an acceptable smooth, friable and uniformly fine texture sod bed by use of soil pulverizes, drags, harrows or by other methods approved by the Public Works Commission. Commercial grade fertilizer (8% nitrogen, 8% phosphate, 8% potash) shall be applied at a rate of 20 pounds per 100 square feet, super-phosphate at 12 pounds per 1,000 square feet and lime (dolomite limestone containing not less than 85% total carbamates) shall be applied at a rate of 25 pounds per 1,000 square feet or at a rate recommended for the type of sod being placed. Apply soil amendments within 24 hours after raking topsoil base surface and not more than 48 hours prior to laying sod. Mix thoroughly a minimum depth into the upper four (4) inches of topsoil and lightly water to aid in dissipation. Sod placement shall not begin until the soil preparation is inspected and approved by the Public Works Commission. During application of soil amendment fertilizer etc., adequate precautions shall be taken to prevent damage to existing features such as traffic, structures, landscape, trees, vegetation, utilities or any other appurtenances. The Contractor shall be required to repair or clean any damages.

## PLACING SOD

The Contractor and his landscape subcontractor shall coordinate the placing of the sod to begin

within 24 hours after the topsoil base preparation is completed and accepted by the Public Works Commission. Sod shall be brought to the site as near to the time of placing as possible. Store sod in the shade, and keep watered particularly in extreme hot and dry condition to insure vitality and to prevent the dropping off of soil during handling. During wet weather, the sod shall be allowed to dry sufficiently to prevent tearing. Handling shall be done in a manner which will prevent tearing, breaking, drying or other damage. Carefully place sod in rows with the longer side perpendicular to slopes and the ends staggered in each successive row in a brick-like pattern. Butt the ends and sides together tightly and do not overlap or stretch the sod. Do not leave any voids or gaps. Unavoidable gaps shall be closed with small pieces of torn or broken sod if kept moist and approved by the Public Works Commission. After the sod is laid, irrigate thoroughly to allow water to penetrate a minimum six (6) inches into the soil below the sod. Sod shall not be placed when the atmospheric temperature is below 32oF.

Tamp and roll completed sod installation with a manual roller or approved equipment to eliminate minor irregularities and to form close contact with the soil bed immediately after placing and watering. The type of rolling and tamping equipment to be used shall be submitted to the Public Works Commission for approval prior to construction. On steep slopes 3:1 (horizontal and vertical) or greater, in drainage ditches or any areas where sod slipping may occur, anchor sod with approved wooden stakes (½"x ¾" x 12") or staples spaced not over two (2) feet apart in any direction and/or in sufficient number to prevent slippage or displacement. The anchors shall be driven flush with the surface of the sod. The wide flat side of the stake shall be driven parallel to the slope. Staking shall be done concurrently with sod placement and prior to tamping. Sod shall be laid with the long horizontal edge of the strips parallel to the contour starting at the bottom of the slope. The edge of the sod shall be turned slightly in the ground at the top of a slope and a layer of earth placed over it and compacted so as to conduct the surface water over and onto the top of the sod. Upon completion of the above described work, the surface of the sodded areas shall coincide with the finished grade and not exceed ¼" plus or minus variation to adjoining grade or proposed contour. Extreme care shall be taken to prevent the installed sod from being torn or displaced.

## MAINTENANCE

The Contractor shall, at no additional cost to the Public Works Commission, make whatever arrangements necessary to supply water of suitable quality and purity to sustain and encourage vigorous plant growth, and supply all equipment for proper delivery and application to planted areas. Water obtained from a PWC fire hydrant shall be metered and properly protected with an approved backflow prevention device. PWC must inspect and approved any connections to their water system to include the proposed water application and storage equipment. The Contractor shall not use private resident's water. The Contractor is solely responsible to provide watering of the sod. The method of application of water shall be approved by the Public Works Commission. Limit watering to early morning or late afternoon to enable to soil the absorb maximum amount of water.

Maintenance shall begin immediately after sodding operation. The Contractor shall maintain all sodded areas until sod is firmly established and as outlined below. Maintenance will include watering, fertilizer, pest control, soil amendments, disease control, erosion repair, mowing, protecting turf area from traffic (i.e. temporary fences, barriers, signs, etc.) and replacement of any dead or damaged sod.

Watering

- Water lawn areas once a day with a minimum ½ inch water for the first three (3) weeks after area sodded.
- After the three (3) week period, water twice a week with a ¾ inch of water each time unless a comparable amount of rainfall has occurred.
- Make weekly inspections to determine moisture content of soil and supplement the above watering schedule as needed.
- Excessive runoff puddling and wilting shall be prevented.

Fertilizer and Pest Control

- Evenly spread fertilizer composite at a rate of 40 pounds per 5,000 square feet or as recommended by the manufacturer. Fertilizer shall not be applied until two (2) weeks after initial placement of the sod or prior to the advent of winter dormancy.
- Treat areas of weed and insect infestation as recommended by the treatment manufacturer.

Mowing

- The Contractor shall do mowing operations, (in yards not being mowed by residents) until provisional acceptance.
- Mowing shall be done only when the grass is dry with a rotary type mower having a blade height set not lower than one and one half (1½) inches nor higher than three (3) inches.
- Mowing operations shall be conducted at intervals, which ensure grass height does not exceed four (4) inches between mowing.
- The Contractor shall complete at least one mowing operation before the work will be considered for acceptance.

The Contractor shall protect and not allow access of vehicular traffic into any newly sodded areas and shall repair any damaged turf to original grade. Maintenance shall continue for a period of 90 days after placement or until provisional acceptance by the Public Works Commission. A written record shall be furnished to the Owner of the maintenance work performed. At least two weeks shall elapse after chemical control is applied before a request of inspection.

## ACCEPTANCE

Fifteen (15) days prior to the end of the 90 day maintenance period, the Contractor shall make a written request to the Public Works Commission for an inspection and provisional acceptance of

the sod. Failure to notify the Public Works Commission will not relieve the Contractor of the maintenance provisions required and the Contractor will continue to be responsible for the maintenance of the sod.

Replacement of dead sod shall be performed within seven (7) days after notification by the Public Works Commission and the maintenance period for these areas or individual lawns shall be extended for the 90 day maintenance period. Failure to replace dead sod within the specified seven (7) day period will result in the Public Works Commission having the work performed and deducting the cost from the Contract; however, the Contractor shall be responsible for the maintenance.

Final acceptance will be given upon satisfactory contract performance exhibited at final inspection and acceptance. Sodded areas are to be fully rooted prior to acceptance. The Owner shall be the sole judge as to whether or not the lawns are acceptable. Should any deficiencies be disclosed at final inspection, the Contractor shall make the necessary corrections in a timely manner and request re-inspection.

## GUARANTEE

The Contractor shall guarantee a dense, vigorous stand of turf free of weeds, disease, pests or any dead areas more than one half of a square foot in size for a period of 90 days from initial placement or replacement whichever is greater. Total dead area shall not exceed one percent (1%) of total square footage for each individual resident's lawn.

**DIVISION 2**
**SITE WORK**

# 02933 LAWNS AND GRASSES (SEEDING)

## GENERAL

All exposed ground surfaces that have been disturbed during construction shall be graded to original contours as practicable, shaped to drain, and free of trash and debris. Grassing shall be accomplished as soon as practicable after sections of work are completed. Seeding and/or planting shall be performed by an experienced subcontractor specializing in this type of operation, unless otherwise approved by the Public Works Commission in writing. Disturbed sections shall not exceed one mile, without prior approval by the Public Works Commission. Grassing shall be in accordance with the Contract Documents.

## PREPARATION OF THE SOIL

The surface area to receive seed shall contain a minimum of four (4) inches of good, fertile, friable, organic natural topsoil loam as a base for spreading the seed. Topsoil shall be free of clumps, brush, sticks, weeds, stones, roots, trash or other objectionable material. Contractor shall insure all topsoil to be free of plants or plant parts of quackgrass, johnson grass, nut sedge, poison ivy or other noxious weeds. The Contractor shall furnish and supplement the existing topsoil at no additional costs to the Public Works Commission providing a minimum 4 inch thickness as specified. Soil preparation shall not be performed in frozen or extremely wet conditions. The finished topsoil bed shall be uniform in grade, with a yard like appearance. All changes in grade shall have a smooth, rounded peaks and valleys.

The topsoil shall be loosened and mixed to the depth of four inches (4"). Suitable equipment (cultipackers, harrows, drags) meeting the approval of the Public Works Commission shall be used. This operation shall be accomplished by cutting on one (1) foot centers parallel to the contour of the slopes. On slopes that are steeper than 2:1, both depth preparation and degree of smoothness may be reduced, if approved by the Public Works Commission, but in all cases the slope surface shall be scarified groove, trenched or punctured so as to provide a textural plane of cut forming pockets, ridges, or trenches in which seeding material can lodge. Soil preparation shall not be performed when the soil is frozen, extremely wet or in an otherwise unfavorable working condition. The soil shall be free of any substance that might inhibit plant growth. Assistance of the local agricultural agent is recommended.

Lime shall be applied at the rate of 1/2 tons per acre. 10-20-20 commercial fertilizer shall be applied at the rate of 1,000 pounds per acre and well worked in to the top four inches (4”) of top soil. If hydroseeding, use 500 pounds of 10-10-10 fertilizer on slopes steeper than 1/2 horizontal

to 1 vertical.

## SEED MIXTURE AND SOWING THE SEED

Seed shall be seed certified to be the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. The producer's seed label shall indicate it the minimum percent of pure live seed (which shall be 82.45 for Bermuda, 88 for Rye Grain), the minimum percent of germination in hard seed and maximum percent of weed seed (no more than 1 percent for Bermuda, 0.5 percent for Rye Grain). Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable State seed laws. Seed that has become wet, moldy, or otherwise damaged will not be acceptable.

The following seed mixture shall be used:

| | POUNDS OF SEED PER ACRE | | | |
|---|---|---|---|---|
| | K-31 Fescue | Grain Rye | Common Bermuda | Centipede |
| April 15 - Sept. 1 | 75 | - | 60 (hulled) | 5 |
| Aug. 15 - Nov. 15 | 120 | - | 25 (hulled) | 5 |
| Nov. 1 - April 1 | 120 | 120 | 25 (un-hulled) | 5 |

Note: If there are differences in the seed mixture between the mixture stated in these specifications and that which is specified as part of an approved Erosion Control Plan, the seed mixture specified in the erosion control plan shall take precedence.

Where construction crosses a pasture that has been grassed, the Contractor shall re-seed the area with the same type of grass as found on the site. All highway rights-of-way, and private yards disturbed shall also be re-seeded or with the same type of grass previously found. The seed mixture specification shall be used as a guide and the Contractor is charged with the responsibility of seeding areas with the proper type of grass that matches the existing.

Seed shall be broadcast uniformly by hand or by approved sowing equipment. One half of the seed shall be sown in one direction and the remaining shall be sown at right angles to the first. Do not seed when the wind velocity exceeds five (5) miles per hour. Rake lightly into top 1/8 inch of the soil prior to compacting, with a roller not exceeding 100 pounds.

All seeded areas will be mulched with two (2) tons per acre of small grain straw or wood cellulose fiber spread uniformly, approximately 1/4 of ground should be visible to avoid

smothering seedlings. Asphalt emulsion (ASTM D-977 and ASTM D-2028) shall be used to anchor the straw applied at 150 gallons per ton of straw, or crimped to stabilize. Asphalt emulsion shall be required from November 1st to March 31st. The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water or other causes and promptly remove any blockage which may occur.

## SPECIAL CONSIDERATIONS

Shrubbery shall be expertly removed and carefully preserved for replanting, unless otherwise directed by the Public Works Commission adequate earth ball shall be removed to guard against damage to the root system. Shrubbery shall be replanted only after all construction is complete. The excavation made for replanting shall be six inches (6") larger in every dimension than the root ball removed. This additional space shall be filled with a mixture of one half topsoil and one half peat moss. Care shall be taken to set the top of the ball slightly above or flush with the surrounding surface. Any shrubbery damaged or that dies shall be replaced with an equal or better plant material at the Contractor's expense.

## MAINTENANCE

The Contractor shall protect and maintain grassed areas as necessary to establish a uniform turf composed of the grasses specified. The Contractor shall re-seed any bare areas and repair all eroded areas.

Watering of seeded areas will be required during periods of dry weather to promote maximum growth. The Contractor shall supplement natural rainfall to insure a minimum of one (1) inch of rainfall weekly.

Maintenance of lawns begins immediately after the area is planted and continues for the period required to establish acceptable lawns, but not less than sixty (60) days after initial seeding, or until provisional acceptance by Owner. Maintain seeded areas by watering, fertilizing, mowing, weeding and other operations such as rolling, re-grading, replanting, aerating, and mulching as required to establish an acceptable lawn free of eroded or bare areas.

## ACCEPTANCE

Fifteen (15) days prior to the end of the sixty (60) day maintenance period, the Contractor shall make a written request to the Owner for an inspection and provisional acceptance of the seeded area. Failure to notify the Owner will not relieve the Contractor of the maintenance provisions required and the Contractor will continue to be responsible for the maintenance of the seeded area.

Replacement of dead seed area(s) shall be performed within seven (7) days after notification by the Public Works Commission and the maintenance period for these areas or individual lawns

shall be extended for an additional sixty (60) day maintenance period. Failure to replace seeded area(s) within the specified seven (7) day period will result in the Owner having the work performed and deducting the cost from the Contract; however, the Contractor shall be responsible for the maintenance.

Final acceptance will be given upon satisfactory contract performance exhibited at final inspection and acceptance. Seeded areas are to be fully rooted prior to acceptance. The Owner shall be the sole judge as to whether or not the lawns are acceptable. Should any deficiencies be disclosed at final inspection, the Contractor shall make the necessary corrections in a timely manner and request re-inspection.

Payment to the Contractor for seeding areas will be approved once the seed has been established and meets the requirements of this paragraph of this specification.

## GUARANTEE

The Contractor shall guarantee a stand of turf is considered acceptable when a live vigorous stand of permanent grass is established with growing sprouts visible at the surface showing not less than 9 seedlings of permanent grass at least 2 inches long in each square foot, and where no gaps larger than 4 inches in diameter occur anywhere in the lawn area. Permanent grass is defined as Common Bermuda, Centipede, and Fescue.

**DIVISION 2**
**SITE WORK**

## 03301 CONCRETE CONSTRUCTION (UTILITY)

## GENERAL

Concrete construction specified in this section shall be applicable to all "site work" and is not intended to cover general building specifications. The concrete work shall include all furnishing, hauling, fine grading and subgrade, form work, etc. and all incidentals necessary for completion of the work as it pertains.

## MATERIALS

Concrete

The Contractor shall furnish and place concrete in strict accordance with the requirements of ACI 318 (most recent edition). Ready-mixed concrete from an approved mixing plan shall be used throughout the work and conform to the requirements of ASTM C-94 for batch, mixing, and transporting. Concrete shall be in accordance with the following requirements:

A. Under Ground - Regular Weight Concrete

| | |
|---|---|
| 28-day compressive strength | 3000 psi |
| Coarse aggregate | 1 ½" max. size stone |
| Slump | 2" minimum, 4" maximum |
| Air Entrainment | No requirement |

B. Walls, Slabs, Sidewalks, Curb and Gutter - Regular Weight Concrete

| | |
|---|---|
| 28-day compressive strength | 3000 psi |
| Coarse aggregate | 3/4" max. size stone |
| Slump | 2" minimum, 4" maximum |
| Air Entrainment | 5 more or less 1 |

The Contractor shall submit for approval mix designs, designed and tested by an approved testing laboratory, following the requirements of ACI 318 for each class of concrete to be used on this project. Mix designs in excess of one year old shall be verified. The Contractor will be responsible for all costs involved in the mix design. Material suppliers and material proportions incorporated in the mix design and certification shall not change without written permission from the Public Works Commission.

Admixtures used to produce entrained or air shall be sulforated hydrocarbons or neutralized vinsol resins conforming to ASTM C-260. Calcium chloride, other accelerators, or "anti-freeze"

shall not be used without written approval by the Public Works Commission.

Reinforcing Steel

Reinforcing bars shall be new billet stock and shall conform to ASTM A-615, Grade 60. Bars shall be deformed to conform to ASTM A-305. The Contractor shall check and submit for approval four (4) sets of shop and erection drawings prepared by the fabricator. Reinforcement detailing and placement shall conform to ACI 318. All reinforcing bars shall be tied in place according to approved erection drawings, using bar supports and accessories conforming to ACI 315. Laps or splices shall conform to ACI 318, and consist of the following minimum dimensions:

| | |
|---|---|
| Tension Splices | 36 Bar Diameters |
| Compression Splices | 30 Bar Diameters |

All reinforcing bars shall be tagged and stored in such manner as to be readily available at the time needed. Tag mark substitutions will not be made.

Welded wire mesh fabric reinforcing shall conform to the requirements of ASTM A-185. Lap splices shall be at least one full mesh plus 2" staggered to avoid continuous laps in either direction and securely wired or clipped.

## GRADING

The Contractor shall use every effort to observe any possible misalignments in line or grade of the installed forms and will call such to the attention of the Public Works Commission promptly. The Contractor is cautioned that he shall be responsible for any damage to utility lines caused by his negligence. The Public Works Commission or his representative shall then inspect the forms and if approved, pouring operations may begin. Where unstable material exists, the Contractor shall remove such material to a depth required to provide a stable subgrade at no additional cost to the Public Works Commission.

## FORM WORK

Metal forms shall be used throughout the work except for short, odd length sections and in accordance with ACI 301 and ACI 347 (most recent editions). Earth cuts may be used as forms for unexposed vertical surfaces on footings, provided the soil and workmanship allow an accurate and curable excavation. Forms shall be kept in good condition at all times. Any forms which have become out of shape or otherwise unsuitable shall be removed from the work. Forms shall be of such section and design that they will adequately support the concrete and any construction equipment used in the work. Form sections shall be provided with interlocking joints to insure that the forms are tightly jointed together free from movement. Forms shall be held in place by metal pins, not less than eighteen (18) inches in length, with fastenings of metal and wedges to insure a correct, rigid setting.

Forms shall be of the dimension required for the designed cross-section shown on the plans. Built up sections to attain the required depth will not be permitted.

Forms shall be set true to the lines and grades established by the Design Engineer or as indicated on the plans.

Forms shall be held rigidly in position and shall be of sufficient strength to resist springing out of line when concrete is placed.

## PLACING CONCRETE

Prior to placing concrete, the subgrade shall be moistened and the contact side of the forms shall be cleaned and coated with a heavy oil. The Contractor shall not place any concrete without the forms, reinforcing steel and subgrade being inspected and approved by the Design Engineer. Placing of concrete is to be in accordance with ACI 304 (most recent edition). Water shall be removed from the excavation before placing concrete and water shall be diverted to prevent washing over freshly deposited concrete.

Concrete shall be placed as not to disturb concrete already in place and in such a manner as to require the minimum amount of lateral movement. Concrete shall be deposited in the forms without segregation. A tremie shall be used when the fall exceeds five (5) feet. Care shall be taken not to upset any forms during the concrete pouring operations. Any concrete showing misalignment due to form movement shall be removed and replaced at no additional cost to the Public Works Commission.

All concrete shall be consolidated in accordance with ACI 309 (most recent edition). Mechanical vibrators shall be operated by experienced workmen. Spading and rodding may be required to supplement mechanical vibration. Consolidation shall be adequate to remove any voids and after removal of the forms, no honeycomb shall be present. Should any honeycomb be present, the Design Engineer shall determine if the honeycomb is of a minor nature, the voids may be filled with mortar as approved by the Design Engineer.

All concrete within forms shall be brought to true section by the use of an approved straight edge and shall be tamped with straight edge to bring mortar to the surface, after which it shall be floated smooth by means of wood floats. No steel floats will be permitted. After true surface of section has been obtained, and after initial set has taken place, the entire surface shall be brushed with a dampened brush. All joints and all exposed edges shall be rounded off with approved jointing and edging tools. The type of finish required will be specified in the specific item of work specified or indicated on the drawings. All exposed surfaces of retaining walls, structures, etc. shall be given a Class 2 finish with ¼ inch chamfered edges.

No more concrete shall be laid than can be properly finished and covered during the daylight, unless adequate artificial light satisfactory to the Design Engineer is provided.

Immediately after finishing operations have been completed, the entire surface of the concrete shall be sprayed with an approved curing compound. The use of liquid retarding agents shall conform to standards specified by current AASHTO or ASTM Specifications.

Cold weather concreting shall be in accordance with ACI 306 (most recent edition) and hot weather concreting shall be in accordance with ACI 305 (most recent edition). Concreting shall be done when weather conditions are favorable unless otherwise directed by the Design Engineer. Concrete operations shall be discontinued when the temperature of 40 degrees Fahrenheit is reached on a falling thermometer. No concreting shall be attempted when local weather bureaus indicate temperatures below freezing within the ensuing 24 hours unless proper precautions are made to protect concrete by covering with straw or other thermal insulation satisfactory to the Design Engineer. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather or hot weather and any concrete damaged by frost action or freezing shall be removed and replaced as directed by the Design Engineer and/or the Public Works Commission at the Contractor's expense.

Forms shall not be removed from the concrete for a minimum of 7 days, unless approved by the Design Engineer. The Contractor shall apply a curing compound or provide measures to maintain moisture for proper curing at his expense, if early form removal is approved. Immediately after the forms have been removed, all honeycomb areas shall be repaired (with one part cement and two parts sand) and earth backfill material shall be placed adjacent to the finished concrete and smoothed off to prevent an accumulation of standing water, subgrade saturation or under wash in the event of rain.

Both pedestrian and vehicle traffic shall be excluded from crossing the concrete for a period of 14 days by the erection and maintenance of suitable barricades. Contractor shall be responsible for any damage resulting from traffic within the 14 day period and he shall remove and replace any concrete damaged as directed by the Design Engineer and/or Public Works Commission.

## MASONRY MATERIALS

Brick shall be in accordance with ASTM C-32 Grade MS laid in full beds of mortar with shove joints.

Concrete masonry blocks shall be in accordance with ASTM C-139. Blocks shall be at least 5", but not more than 8" in thickness nor less than 8" in length and of such shape that the joints can be effectively sealed and bonded with cement mortar.

Cement mortar for brick work shall be in accordance with ASTM C-270, Type M. Use Type IIA cement in accordance with ASTM C-150.

## TESTING

The requirements of ACI318 (most recent edition) shall be used to control the evaluation of all concrete strengths. The strength is to be checked during construction by four (4) cylinders at the option and cost of the Public Works Commission, of which 1 shall be broken at 7 days, 2 at 28 days. If the specified strength is not achieved in 28 days, 1 reserved shall be stored and broken as specified by the Design Engineer. Cylinders shall be made and stored in accordance with ASTM C-13. Cylinders shall be for each day concrete is poured in excess of 10 cubic yards of each different type of concrete, as determined by the Design Engineer. All additional expenses required because of the failure of the materials to meet routine testing requirements, or poorly scheduled concrete deliveries, shall be borne by the Contractor.

# DIVISION 2
# SITE WORK

## 09801 ANTI-MICROBIAL ADMIXTURE

## GENERAL

All reinforced concrete precast manholes shall include a liquid anti-microbial admixture to render the concrete uninhabitable for bacterial growth. The admixture shall be included in the fabrication of the manhole by an approved concrete precast manhole manufacturer. Coatings applied to the interior walls of the manhole shall not be acceptable.

Further, all field mixed mortar, utilized in concrete precast manholes, shall include the anti-microbial admixture. The intent and purpose of this specification is to render all concrete and/or mortar within sanitary sewer service uninhabitable for bacterial growth. Any defects shall be cause for the replacement and correction of such defect as directed by the Fayetteville Public Works Commission (PWC), at no expense to the Fayetteville Public Works Commission.

## RELATED SECTIONS

A. 02730 – Sanitary Sewer Systems
B. 02732 – Sewage Force Mains

## REFERENCES

A. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections
B. ASTM C1443 – Standard Specification for Precast Reinforced Concrete Pipe
C. ASTM C1577 – Standard Specification for Precast Reinforced Concrete Pipe

## SUBMITTALS

All submittals shall be provided in accordance with the Contract Documents, and the requirements outlined herein. The Contractor shall submit, in accordance with the Contract Documents, product data, certifications, and product data, to include the following:

1. U.S. Environmental Protection Agency (EPA) registration number.
2. Documentation that the product has a minimum of 10 years of successful prevention of microbial induced corrosion in sanitary sewers.
3. Documentation that the precast facility is certified by the anti-microbial manufacturer.
4. Documentation from the precast facility stating that the correct amount and correct mixing procedure was followed for all anti-microbial concrete.

## QUALITY ASSURANCE

A color identifier shall be applied to the interior of each concrete piece fabricated with the anti-microbial admixture. Each piece shall also be plainly stenciled with the name of the anti-microbial admixture on the exterior of each piece.

## MATERIALS

All manholes shall conform to PWC standard specifications and details, unless otherwise approved in writing by the Fayetteville Public Works Commission. All concrete and mortar utilized in the construction of the manholes shall contain an anti-microbial admixture.

### Anti-Microbial Admixture:

The liquid anti-microbial admixture shall be used in accordance with the manufacturer's recommendations. The amount of the admixture shall be included in the total water content of the concrete or mortar mix design. The admixture shall be added to the concrete or mortar mix water, to ensure even distribution of the admixture throughout the concrete or mortar mix. When properly prepared, the anti-microbial admixture shall render the concrete or mortar uninhabitable for bacterial growth.

The anti-microbial admixture shall be ConShield, ConBlock, or approved equal. The ConShield liquid anti-microbial admixture can be obtained from ConShield Technologies, Inc. or an approved precast facility. TheConBlock liquid anti-microbial admixture can be obtained from ConSeal Concrete Sealants, Inc., or an approved precast facility.

### Field Repairs:

Field repairs to the precast concrete or mortar shall be in accordance with the admixture manufacturer's recommendations. All field repairs shall be completed in accordance with PWC requirements.

## ACCEPTANCE

Acceptance of the concrete and mortar with the anti-microbial admixture shall be based on conformance with the requirements herein, the Fayetteville Public Works Commission's review of the installed manhole, and results of all testing.

**DIVISION 2**
**SITE WORK**

# 09804 SPECIAL COATINGS – EPOXY LINING STEEL AND DUCTILE IRON PIPE AND FITTINGS

## GENERAL

The interior surfaces of all ductile iron pipe and fittings in sanitary sewer service shall be fully coated with a ceramic epoxy lining. The lining system shall be a two component, amine cured novalac epoxy. The ceramic epoxy lining shall be applied to ductile iron pipe free of any other interior lining material. The finish coat shall be applied to yield a minimum dry film thickness of 40 mils for a complete lining. Any defects in the lining shall result in the pipe or fitting being replaced, at no additional cost to the Public Works Commission.

## RELATED SECTIONS

A. 02730 – Sanitary Sewer Systems
B. 02732 – Sewage Force Mains

## REFERENCES

A. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus
B. ASTM C 413 – Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
C. ASTM C 868 – Standard Test Method for Chemical Resistance of Protective Linings
D. ASTM D 714 – Standard Test Method for Evaluating Degree of Blistering of Paints
E. ASTM D 870 – Standard Practice for Testing Water Resistance of Coatings Using Water Immersion
F. ASTM D 1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
G. ASTM D 1653 – Standard Test Methods for Water Vapor Transmission of Organic Coatings
H. ASTM D 2240 – Standard Test Method for Rubber Property – Durometer Hardness
I. ASTM D 2370 – Standard Test Method for Tensile Properties of Organic Coatings
J. ASTM D 2583 – Standard Test Method ofr Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
K. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
L. ASTM D 4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
M. ASTM D 4400 – Standard Test Method for Sag Resistance of Paints Using a Multinotch Applicator
N. ASTM D 4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
O. ASTM G 8 – Standard Test Methods for Cathodic Disbonding of Pipeline Coatings
P. ASTM G 95 – Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings

Q. ASTM G154 – Standard Practice for Operating Fluorescent Ultraviolet Lamp Apparatus for Exposure of Nonmetallic Materials

Unless otherwise specified, references to documents shall mean the documents in effect at the time of bid. If the referenced document(s) have been discontinued by the issuing organization, references to those documents shall mean the replacement documents or the last version of the document before it was discontinued.

Where conflicts exist between the standards and this specification, the more stringent shall apply.

## MATERIALS

All ductile iron pipe and fittings shall be in accordance with the Public Works Commission standard specification 02730 – Sanitary Sewer Systems, Public Works Commission standard specification 02732 – Sewage Force Mains, and these Contract Documents.

The lining material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment (no silica fume, fly ash, or alumina dust). The lining shall be both coal tar (polycyclic aromatic hydrocarbons) free and hazardous air polluting solvents (HAPS) free. The lining system shall be 100% solids by volume.

The ceramic epoxy lining system shall be the Perma-Shield PL Series 431 as manufactured by Tnemec Company, Inc., Permox-CTF as manufactured by Permite Corporation, or approved equal.

The ceramic epoxy lining system shall meet the following minimum performance requirements:

A. Abrasion (ASTM D 4060, CS-17 wheel, 1,000 grams) – 76 mg loss
B. Adhesion (ASTM D 4541) – not less than 1,860 psi
C. Severe Wastewater Analysis Test (150oF, 500 ppm H2S, 4,000 ppm NaCl, 10% sulfuric acid, EIS Permeation Analysis) – Initial impedance of 11.2 (log-z). No blistering, cracking, checking, or loss of adhesion. Reduction in electrical impedance of 0.5 after 28 days of exposure.
D. Cathodic Disbondment (ASTM G 8, 1.5 V, Classification Group A) – no more than 0.000 inch disbanded equivalent circle diameter.
E. Dielectric Strength (ASTM D 149) – greater than 600 V per mil
F. Hardness (ASTM D 2240) – Shore D hardness of 79
G. Impact (ASTM D2794) – No visible cracking or delamination after 160 inch-pounds direct impact.
H. Chemical resistance by immersion testing, in accordance with ASTM D 714, as outlined in the following table:

| | |
|---|---|
| 20% Sulfuric Acid at 77º F | 2 years, no effect |
| 25% Sodium Hydroxide at 140º F | 2 years, no effect |
| 5% Sodium Chloride at 77º F | 2 years, no effect |
| Distilled Water at 160º F | 2 years, no effect |

I. Salt Spray (ASTM B 117) – No blistering, cracking, rusting, or delamination of film. No rust creepage at scribe after 1,000 hours.
J. Sag Resistance (ASTM D 4400) – Not less than 90 mills wet film thickness.
K. Water Absorption (ASTM C 413) – 0.0 percent water absorption
L. Water Vapor Transmission (ASTM D 1653, Method B, Wet Cup, Condition C) – 1.25 g/m2 per 24 hour water vapor transmission and 0.09 perms water vapor permeance.

The above requirements shall be verified and tested by an approved testing laboratory. Copies of the laboratory test showing that the lining conforms to the specifications shall be furnished to the Public Works Commission upon written request and certified by the Supplier.

## QUALITY ASSURANCE

The manufacturer of the specified coating system shall have a minimum of 10 years experience in manufacturing high performance epoxy coating systems. The epoxy coating material shall be from a single manufacturer.

Application of the ceramic epoxy lining system shall be in accordance with the manufacturer's requirements. Preparation of the ductile iron pipe to be lined shall be completed by an installer approved by the lining system manufacturer.

## SUBMITTALS

In accordance with these Contract Documents, the Contractor shall submit the following:

1. Manufacturer's certification that the coatings comply with the specified requirements and are suitable for the intended application.
2. Product data sheet.
3. Material Safety Data Sheet.
4. Copies of test data for all the physical, chemical, and permeation properties listed within this specification.

## WARRANTY

The ceramic epoxy lining manufacturer shall warranty its products as free from material defects for a period of five (5) years. The Public Works Commission will solely determine whether the pipe should be replaced if any defects are discovered in the lining within the warranty period. All costs to replace the pipe or fitting, including but not limited to, bypass pumping, excavation, and traffic control shall be the manufacturer's responsibility.

## APPLICATION OF LININGS

Application of the ceramic lining system shall be completed by an installer approved by the manufacturer of the lining system.

Surface Preparation: All interior barrel and joint surface areas which will be exposed to the sewer liquids and gases shall be prepared for lining by removing all laitance, form oil and other loose, foreign or

deleterious materials which would adversely affect the bond of the lining compound of the pipe surface. All areas to receive the protective coating shall be abrasive blasted using compressed air nozzles with sand or grit media. The entire surface to be lined shall be struck with blast media so that all rust, loose oxides, etc., are removed from the surface. Any area where rust appears before lining must be re-blasted.

Qualification of Applicator and Workmen: The ceramic epoxy lining shall be applied by a competent firm with a ten (10) year history of lining sewer pipe. The workmen employed by the applicator shall be experienced and competent in the application and inspection of the lining compound to be applied. The Public Works Commission shall have the right to require the applicator to furnish bonds covering proper performance and guaranteeing the payment of all obligations arising as a result of improper materials and workmanship.

Equipment: All application equipment shall be as recommended by the suppliers of the lining compound.

Application Technique: After the surface has been thoroughly prepared for application, the interior of the pipe shall be coated with the ceramic epoxy to a minimum dry film thickness of 40 mils. No lining shall take place when the substrate or ambient temperature is below 40$^{o}$F. The surface must be dry and dust free. The number of coats of lining material applied shall be as recommended by the lining manufacturer, but in no case shall it be applied above the dry film thickness per coat recommended by the lining manufacturer. The time between coats shall be that specified by the lining manufacturer.

Repair: All damaged areas or test areas shall be repaired by the lining manufacturer prior to shipment, in accordance with the manufacturer's recommendation, so that the repaired areas are equal to the undamaged lined areas in all respects.

Inspection: All pipe linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done in accordance with the method outlined in SSPC-PA-2 film thickness rating. The interior linings shall also be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired as noted above. All ceramic epoxy lined pipe and fittings shall be visually inspected for any defects, including runs, sags, or debris within the lining. All repairs shall be performed by the manufacturer prior to shipment.

Markings: Each joint, manhole unit, or fitting shall be marked with the date of application of the coating system, the date of inspection, and the numerical sequence of application on that date.

Shipping and Handling: Equipment used to handle and transport the lined pipe shall be suitably designed and operated not to damage the lining. Any damaged pipe or fitting shall be replaced at no cost to the Public Works Commission.

## INSTALLATION

Cutting Pipe: The Contractor shall cut the pipe without damaging the pipe or interior ceramic epoxy coating. All cuts shall be at right angles to the pipe axis. All cut ends shall be dressed with a power grinder to remove all sharp edges. The cut ends of push-on joint pipe shall be beveled in accordance with the pipe manufacturer's instructions. All field cuts shall be coated and sealed prior to installation. Application of the lining shall be done in accordance with the ceramic epoxy lining manufacturer's recommendations.

Handling: All ceramic epoxy lined pipe and fittings shall be handled only from the outside. No forks, chains, straps, hooks, cables, or other equipment shall be placed inside the pipe and fittings for lifting, positioning, or installation. The pipe and fittings shall not be dropped or unloaded by rolling. The pipe and fittings shall not strike sharp objects while moving or unloaded. Ductile iron pipe shall not be placed on grade utilizing hydraulic pressure from machinery or hammers. The use of nylon straps or other similar lifting devices are to be used.

Pipe Installation: All pipe and fittings shall be installed in accordance with PWC standard specifications 02222 – Excavation, Trenching, and Backfilling for Utility Systems, 02730 – Sanitary Sewer Systems, 02732 – Sewage Force Mains, and these Contract Documents.

# 09960 – AERIAL CROSSINGS & PIPE BRIDGES HIGH PERFORMANCE COATINGS

## GENERAL

The work of this section includes the surface preparation and painting of the exterior surface of the aerial water main. The work shall be performed in a shop setting, unless otherwise noted in these contract documents.

## RELATED SECTIONS

A. Section 02515 – Steel Pipe

Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of surfaces shall conform to the applicable requirements of the Steel Structures Painting Council (SSPC), National Association of Corrosion Engineers (NACE), and the manufacturer's printed instructions.

The Fayetteville Public Works Commission's (PWC) decision shall be final as the interpretation and/or conflict between any of the referenced specifications and standards contained herein.

## CONTRACTOR

The Contractor shall have five (5) years practical experience and successful history in the application of specified products in similar projects. The Contractor shall substantiate this requirement by furnishing a list of references, with contact information, and job completion (a minimum of three (3) similar projects completed within the last three (3) years shall be submitted).

The Contractor must successfully demonstrate to the product manufacturer the ability to apply the material correctly and within the confines of these specifications. The Contractor shall provide a letter from the manufacturer stating their acceptance of the Contactor for this project to apply these products.

## QUALITY ASSURANCE

General: Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application, and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the PWC.

Surface Preparation: Surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC-Vis-1 and ASTM Designation D2200; "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces" SSPC-Vis-2 and ASTM Designation D610; "Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive".

Application: No coating or paint shall be applied: When the surrounding air temperature or the temperature of the surface to be coated is below the minimum required temperature for the specified product; too wet or damp surfaces or in fog or mist; when the temperature is less than 5 degrees F. above the dewpoint; or when the air temperature is expected to drop below 40 degrees F. within six (6) hours after application of coating. Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. If any of the above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.

Thickness and Holiday Checking: Thickness of coatings and paint shall be checked with a non-destructive, magnetic type thickness gauge. Steel surfaces requiring holiday detection shall conform to NACE Standard Practice for Holiday Detection, SP 0188. All pinholes shall be marked, repaired in accordance with the

manufacturer's printed recommendations, and retested. No pinholes or other irregularities will be permitted in the final coating.

Inspection Devices: The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of coating and paint. The Contractor shall also furnish U.S. Department of Commerce; National Bureau of Standard certified thickness calibration plates to test accuracy of dry film thickness gauges and certified instrumentation to test accuracy of holiday detectors.

All necessary testing equipment shall be made available for the PWC's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the PWC.

## SAFETY AND HEALTH REQUIREMENTS

General: In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personnel protective lifesaving equipment for persons working on or about the project site.

Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets, which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices and air purifying half mask or mouthpiece respirators with appropriate filters. Barrier creams shall be used on any exposed areas of skin.

Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.

Sound Levels: Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.

Confined Space: When applicable it is mandatory that all work be performed in compliance with the Occupational Safety and Health Administration's (OSHA) rules and regulations for working in confined space. Atmospheres within confined spaces as defined by the OSHA are classified as being either a Class A, Class B or Class C environment.

## MATERIALS

A. Materials specified are those that have been evaluated for the specific service.

   Manufacturer's color charts shall be submitted to the PWC at least thirty (30) calendar days prior to paint application. General contractor and painting contractor shall coordinate work so as to allow sufficient time for paint to be delivered to the jobsite.

B. All materials shall be brought to the jobsite in original, sealed containers. They shall not be used until the PWC has inspected contents and obtained data from information on containers or labels. Materials exceeding storage life recommended by the manufacturer shall be rejected.

   1. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paint must be stored to conform to Local, State, and Federal safety codes for flammable coating or paint materials. At all times, coating and paints shall be protected from freezing.

   2. Coating Systems:

**Steel:**

**Shop Application:**

Surface Preparation: SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning to remove all existing coatings and provide a minimum angular anchor profile of 2.0 mils.

1st Coat: Moisture Cured Zinc-Rich Polyurethane applied at 2.5 –3.5 dry mils. (Tnemec Series 94H20 Hydro-Zinc or Sherwin Williams Corathane 1 GalvaPac Zinc Primer)

OR

Organic Zinc Rich Epoxy applied at 3.0-5.0 dry mils. (Carboline Carbozinc 859)

Surface Preparation: Pressure wash the surface to remove oils, dirt, dust, or other foreign contamination. SSPC-SP3 Power Tool Cleaning to all rusted abraded bare metal areas.

Spot Prime: Moisture cured aromatic polyurethane applied at 3.0-4.0 dry mils. (Tnemec Series 1 Omnithane or Sherwin Williams Corathane 1 GalvaPac Zinc Primer)

OR

Phenalkamine Epoxy applied at 5.0-10.0 dry mils. (Carboline Carbomastic 615)

2nd Coat: Polyamidoamine Epoxy applied at 4.0-6.0 dry mils. (Tnemec Series N69 Hi-Build Epoxoline II or Sherwin Williams Macropoxy 646 FC Epoxy)

OR

Epoxy Polyamide applied at 4.0-6.0 dry mils. (Carboline Carboguard 60)

3rd Coat: Aliphatic Acrylic Polyurethane applied at 2.0-3.0 dry mils (Tnemec Series 73 Endura-Shield, Sherwin Williams Hi-Solids Polyurethane, or Carboline Carbothane 133HB)

Stripe Coat: During the application process both the primer and intermediate coat shall be brush or roller applied to all weld seams, sharp angles, edges, nuts and bolts.

## INSTALLATION

General:

All surface preparation, coating and painting shall conform to applicable standards of the SSPC, NACE, and the manufacturer's printed instructions. Material applied prior to approval of the surface by the manufacturer's technical representative shall be removed and reapplied at the expense of the Contractor.

All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the PWC.

Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.

The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the PWC.

Application of the first coat shall follow immediately after surface preparation and cleaning and before rust bloom or flash rusting occurs. Any cleaned areas not receiving first coat within this period shall be re-cleaned prior to application of first coat.

Surface Preparation:
The latest revision of the following surface preparation specifications of the SSPC and NACE shall form a part of this specification:

1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.

2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wire brushing.

3. Power Tool Cleaning (SSPC-SP3): Removal of all loose mill scale, loose rust, loose paing, and other loose detrimental foreign matter by hand chipping, scraping, sanding, and wire brushing.

4. Commercial Blast Cleaning (SSPC-SP6/NACE 3): Blast Cleaning until at least 66 percent of each element of surface area is free of all visible residues.

Blast cleaning for all surfaces shall be by dry method unless otherwise directed.

Particle size of abrasives used in blast cleaning shall be that which will produce a 1.5 – 2.0 mil (37.5 microns - 50.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.

Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the PWC.

During blast cleaning operations, caution shall be exercised to insure that surrounding existing coatings or paint are not exposed to abrasion from blast cleaning.

The Contractor shall keep the area of his work and the surrounding environment in a clean condition. He shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities, or nuisance to the surrounding environment.

Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. No coatings or paint shall be applied over damp or moist surfaces.

Specific Surface Preparation: Surface preparation for the specific system shall be as noted in Section 2.01 Paragraph B.2.

## APPLICATION

General:
Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specification SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting," and the manufacturer of the coating and paint materials.

Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paint from being spattered onto surfaces that are not to be coated or painted. Surfaces from which materials cannot be removed satisfactorily shall be recoated or repainted as required to produce a finish satisfactory to the PWC.

When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.

Film thickness per coat specified in Section 2.01 Paragraph B.2 is the minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats as to achieve the specified thickness.

All material shall be applied as specified.

All welds, edges and other irregular surfaces shall receive a brush coat of the specified product prior to application of the first complete coat.

After completion of surface preparation as specified for the specific system, materials shall be applied as noted in Section 2.01 Paragraph B.2.

Colors: Submittals shall be made to the PWC for approval prior to application.

Where appropriate all solvent vapors shall be completely removed by suction-type exhaust fans and blowers before placing in operating service.

Clean Up:
Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in a manner approved by the PWC. Coating or paint spots and oil or stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the satisfaction of the PWC at no cost to the PWC.

## WARRANTY

The Contractor will warrant the work free of defects in material and workmanship for a period of one (1) year from the acceptance of the work. At the end of one (1) year, as scheduled by the PWC, the one (1) year anniversary inspection is to be conducted. The Contractor will correct any deficiencies found with no cost to the PWC. Inspections shall be conducted to conform to PWC requirements.