

## 6. ABBREVIATIONS

Abbreviations of standards, codes, and publications used within these Specifications are as follows:

ASTM	American Society of Testing and Materials
ANSI	American National Standard Institute
KYTC	Kentucky department of Transportation, "Standard Specifications for Road and Bridge Construction," Current Edition
KYDOH	Kentucky Department of Highways, "Standard Specifications for Road and Bridge Construction," Current Edition

## 7. STAKING

- 7.1 The CONTRACTOR shall furnish all staking that may be required to accurately complete the Work as specified in the Contract Documents. The staking is considered incidental to the contract and no direct payment will be made.
- 7.2 Prior to the beginning of construction, the ENGINEER will provide the CONTRACTOR with information regarding the location of reference points and benchmarks. It will be the CONTRACTOR'S responsibility to establish all office projection centerlines shown on the Plans. Should, during the course of construction of this Project, any construction stakes be destroyed by others, it will be the CONTRACTOR'S responsibility to reset the stakes at no additional cost to the OWNER.
- 7.3 To the extent that it does not conflict with the content of the Plans, Contract Documents, and Specifications, Section 201 of the KYTC Standard Specifications, current edition, is incorporated into this technical specification.

## 8. CONSTRUCTION TOLERANCES--EARTHWORK

The CONTRACTOR shall make every reasonable effort to construct the Project uniformly. Tolerances which will be allowed, before any decreases in the quantity to be paid are made or before reworking of the constructed item is required, are as follows:

- a. The distance from centerline to the toe of the side slopes in excavations and the top of side slopes in fills shall not deviate more than 6 inches from the dimension shown on the Drawings, and the total width of the bottom of the excavation shall not be deficient by more than 6 inches at any location.
- b. The sloped surfaces between the bottom of slope line or the crest of the embankment and the original ground shall not be inside the specified slope limits more than one foot, measured horizontally.
- c. No payment will be made for any earthwork performed outside the limits specified by the neat lines of the cross-sections on the Drawings or by the ENGINEER and no extra material shall be removed or placed more than one foot outside of these limits without permission by the ENGINEER.

## **9. EXACT DIMENSIONS AT SITE**

Prior to furnishing materials and equipment for this Contract, the CONTRACTOR shall obtain exact dimensions at the site. The lengths and locations shown on the Drawings shall not, under any circumstances, be so construed as to relieve the CONTRACTOR from responsibility for taking measurements at the site and furnishing materials or equipment of the correct length and side.

## **10. MEASUREMENT AND PAYMENT**

### **10.1 Measurement of Quantities**

All work completed under the Agreement will be measured by the ENGINEER according to United States standard measure.

10.1.1 All items which are measured by the linear foot, such as pipe, will be measured along the centerline distance of the installed item with no allowance for connections, fittings, or laps at connections.

10.1.2 In computing volumes of excavation and embankment, the average end-area method will be used. For the purpose of ascertaining quantities, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of areas.

### **10.2 Lump Sum**

When a complete structure, structural unit or other item (in effect, "Lump Sum" Work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

### **10.3 Plan Quantities**

When the Plan Quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will be made, unless the dimensions of said portions of the Work shown on the Drawings are revised by the ENGINEER. When revised dimensions result in an increase or decrease in the quantities of such Work, the final quantities for payment will be revised in the amount represented by the authorized changes in dimensions.

### **10.4 Actual Quantities**

When Actual Quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will be made. The Actual Quantities will be determined by the difference in field measurements before and after construction. All required field measurement shall be made by a Registered Land Surveyor hired by the CONTRACTOR. No separate measurement or payment will be made for CONTRACTOR Surveying.

## 10.5 Scope of Payment

The Contract Unit Prices whether based on Lump Sum, Plan Quantities, or Actual Quantities for the various Bid Items of the Contract Documents shall be considered full compensation for all labor, materials, supplies, equipment, tools, and all things of whatever nature required for the complete incorporation of the item into the Work the same as though the items were to read "in Plan" unless the Contract Documents provide otherwise.

## 10.6 Payments

Estimates for payment, partial payments, and final payments shall be in accordance with and follow procedures set forth in the Standard Terms and Conditions.

## 10.7 Variations in Quantities

Where the quantity of a Pay Item is a Plan Quantity (Paragraph 10.3) or Actual Quantity (Paragraph 10.4) and where the approved quantity of such Pay Item varies more than 15 percent above or below the quantity shown on the Bid Schedule, an equitable adjustment in the Contract Price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the quantity shown on the Bid Schedule.

# 11. TESTING LABORATORY SERVICES

## 11.1 General

### 11.1.1 Work Included

From time to time during the progress of the Work, the ENGINEER or OWNER may require that testing be performed to determine the materials provided meet the specified requirements. LFUCG will select a testing laboratory to perform the testing services. The cost of such services shall be the responsibility of the CONTRACTOR.

- a. *Codes and Standards:* Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials (ASTM).
- b. *Cooperation with the Testing Laboratory:* Representatives of the testing laboratory shall have ready access to the Work at all times. The CONTRACTOR shall provide facilities for such access in order that the laboratory may properly perform its function.

### 11.1.2 Related Work Described Elsewhere

Requirements for testing maybe described in various sections of these Specifications; where no testing requirements are described, but the OWNER decides that testing is required, the OWNER may require testing to be performed under current pertinent standards for testing.

### 11.1.3 Selection of Testing Laboratory

The OWNER will select a testing laboratory.

### 11.1.4 Codes and Standards

Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and materials.

### 11.1.5 Product Handling

The CONTRACTOR shall promptly process and distribute all required copies of test reports for which he is responsible and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the Work.

## 11.2 Payment for Testing Services

### 11.2.1 Initial Services

The OWNER will pay for all initial testing services required by the OWNER.

### 11.2.2 Retesting

When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting made necessary by the non-compliance shall be performed by a testing laboratory selected by the CONTRACTOR and approved by the OWNER and the costs thereof will be paid directly by the CONTRACTOR.

### 11.2.3 CONTRACTOR'S Convenience Testing

Inspection or testing performed exclusively for the CONTRACTOR'S convenience shall be the sole responsibility of the CONTRACTOR.

## 11.3 Execution

### 11.3.1 Cooperation with Testing Laboratory

Representatives of the testing laboratory shall have access to the Work at all times. The CONTRACTOR shall provide facilities for such access in order that the laboratory may properly perform its functions.

### 11.3.2 Schedules for Testing

#### 11.3.2.1 Establishing Schedule

By advance discussion with the testing laboratory selected by the OWNER, the CONTRACTOR shall allow for the time required for the laboratory to perform its tests and to issue each of its findings. The CONTRACTOR shall allow for this time within the construction schedule.

#### 11.3.2.2 Revising Schedule

When changes of construction schedule are necessary during construction, the CONTRACTOR shall coordinate all such changes of schedule with the testing laboratory as required.

#### 11.3.2.3 Adherence to Schedule

When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributed to the delay may be backcharged to the CONTRACTOR and shall not be borne by the OWNER.

#### 11.3.2.4 Taking Specimens

All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

## 12. SUBMITTALS AND SUBSTITUTIONS

### 12.1 General

#### 12.1.1 Work Included

Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards. To insure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the OWNER or ENGINEER.

#### 12.1.2 Related Work Described Elsewhere

Individual submittals required are described in the pertinent sections of these Specifications and in Attachment A after this Section.

### 12.2 Substitutions

#### 12.2.1 ENGINEER Approval Required

The Contract is based on the materials, equipment, and methods described in the Contract Documents. The ENGINEER will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the ENGINEER to evaluate the proposed substitution. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the ENGINEER. No additional time or delay of project deadlines shall be provided to the CONTRACTOR to recompense for time taken by the ENGINEER to review substitutions.

### 12.2.2 “Or Equal”

Where the phrase “or equal” occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the OWNER or ENGINEER unless the item has been specifically approved for this Work. The decision of the OWNER or ENGINEER shall be final.

### 12.2.3 Availability of Specified Items

The CONTRACTOR shall verify prior to Bidding, that all specified items will be available in time for installation during orderly and timely progress of the Work. In the event the specified item or items will not be so available, the CONTRACTOR shall notify the OWNER prior to receipt of Bids.

### 12.3 Identification of Submittals

The CONTRACTOR shall completely identify each submittal and resubmittal by showing at least the following information:

- a. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- b. Name of Project as it appears in these Specifications.
- c. Drawing number and Specification section number to which the submittal applies.
- d. Whether this is an original submittal or resubmittal.

### 12.4 Coordination of Submittals

#### 12.4.1 General

Prior to submittal for OWNER’S review, the CONTRACTOR shall use all means necessary to fully coordinate all material, including the following procedures:

- a. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
- b. Coordinate as required with all trades and with all public agencies involved.
- c. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
- d. Clearly indicate all deviations from the Contract Documents.

#### 12.4.2 Grouping of Submittals

Unless otherwise specifically permitted by the OWNER, the CONTRACTOR shall make all submittals in groups containing all associated items; the OWNER may reject partial submittals as not complying with the provisions of the Contract Documents.

#### 12.5 Timing of Submittals

The CONTRACTOR shall make all submittals in accordance with the applicable specification and far enough in advance of schedule dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow at least 10 full working days for the ENGINEER'S review following his receipt of the submittal.

### 13. INSTALLATION REQUIREMENTS

Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.

### 14. PROOF OF COMPLIANCE

Whenever the Contract Documents require that a product be in accordance with federal specification, ASTM designation, ANSI specification, or other association standard, the CONTRACTOR shall present an affidavit from the manufacturer certifying that the product complies therewith. Where requested or specified, the CONTRACTOR shall submit supporting test data to substantiate compliance.

### 15. PROJECT RECORD DOCUMENTS

- 15.1 As the Work progresses the CONTRACTOR shall keep a complete and accurate record of changes or deviations from the Contract Documents and the shop drawings, indicating the Work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using blackline prints of the drawings affected, or the specifications, with appropriate supplementary notes. This record set of Drawings, shop drawings, and Specifications shall be kept at the job site for inspection by the OWNER.
- 15.2 The records above shall be arranged in order, in accordance with the various sections of the Specifications, and properly indexed. Prior to application for final payment, and as a condition to its approval by the OWNER, deliver the Record Drawings and Specifications, arranged in proper order, indexed, and endorsed as hereinbefore specified.
- 15.3 No review or receipt of such records by the ENGINEER or OWNER shall be a waiver of any deviation from the Contract documents or the shop drawings or in any way relieve the CONTRACTOR from his responsibility to perform the Work in accordance with the Contract Documents and the shop drawings to the extent they are in accordance with the Contract Documents.

## **16. PROJECT MEETINGS**

The CONTRACTOR'S Superintendent for the Work shall attend project meetings as required by the OWNER.

## **17. CONTRACTOR'S FACILITIES**

### **17.1 Sanitary Facilities**

The CONTRACTOR shall provide and maintain all necessary sanitary facilities at the site, in accordance with all applicable regulations, and shall properly remove same at completion of the Project.

### **17.2 Utilities**

The obtaining of all utilities which may be required for construction shall be the responsibility of the CONTRACTOR.

## **18. CONTRACTOR'S FIELD OFFICE**

A CONTRACTOR'S field Office is **not** required for this Project.

## **19. UTILITIES**

The CONTRACTOR is to notify all utility companies prior to beginning construction operations.

It shall be the CONTRACTOR'S responsibility to locate all utilities, make appropriate arrangements regarding relocation, maintain utility service throughout the construction period, and make final relocations at the completion of the Work. The CONTRACTOR shall be responsible for any injury or damage to the existing utilities due to his operations whether shown or not shown in the plans. Where utilities are shown or indicated on the Plans, the information given is in accordance with the best information in possession of the OWNER but is approximate only. The data is not warranted to be either complete or correct, and the CONTRACTOR shall assume all risks resulting from the conditions arising from the approximations shown.

The CONTRACTOR shall confer with the utility companies to inform them of the proposed construction schedule, verify the location and elevation of existing utilities and arrange for the relocation and adjustment of any facilities to avoid interference with the proposed construction. All such activities are to be performed under the direction of and with the approval of the ENGINEER.

When the various utility owners find it necessary to make adjustments to their lines where the CONTRACTOR is presently working, the CONTRACTOR is to move his operations to another area of work so as not to interfere in any way with the utility company's Work.



Any utilities covered up or lost by the construction operations of the CONTRACTOR shall be uncovered and found by the CONTRACTOR and the new construction repaired and/or replaced as directed by the OWNER. No additional compensation will be allowed for such Work nor shall any additional payment be allowed for the relocation and adjusting of any utility but shall be considered incidental to other Work.

The CONTRACTOR shall make a concerted effort to prevent any disruption of utility services, and if an unintended disruption occurs, the CONTRACTOR shall immediately and safely restore service. If disruption of any of the utility services covered in this Section is unavoidable, it will be the responsibility of the CONTRACTOR to notify affected property owners. The CONTRACTOR shall also make every effort to restore said services before quitting Work for the day. In the event this cannot be done, the CONTRACTOR shall provide temporary service to the property owners until permanent service can be restored.

## **20. INSTALLATION REQUIREMENTS**

Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as suggested by the respective manufacturers, unless otherwise specified herein and directed by the ENGINEER.

## **21. DUST CONTROL**

The CONTRACTOR shall be responsible for minimizing the generation of dust resulting from his operations at all times. The CONTRACTOR shall be required to maintain all excavations, embankments, stockpiles, roads, permanent access roads, plant sites, waste areas, and all other Work areas within or without the project boundaries free from dust which would cause a hazard or nuisance to others. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the Work proceeds, and whenever a dust nuisance or hazard occurs.

## **22. REPAIR OR DAMAGE**

Any damage done to structures, fills, roadways, or other areas shall be repaired at the CONTRACTOR'S expense before final payment is made.

## **23. PROJECT EXTENT**

The CONTRACTOR shall be responsible for satisfying himself as to the construction limits for the Project. The CONTRACTOR shall not establish Work, storage, or staging area outside the Project limits, unless otherwise directed or approved by the OWNER.

## **24. WORKING HOURS**

All work on this Project shall be restricted to 7:00 a.m. to 6:00 p.m., Monday through Friday, but may be further restricted by the OWNER if required; except emergency work, such as any necessary pumping, which may require 24-hour operation. Lane closures for all streets with a

functional classification above local shall occur only between the hours of 9:00 a.m. and 3:00 p.m., except as approved by the OWNER.

**25. GUARANTEE**

The CONTRACTOR shall assume responsibility for all workmanship and materials for a period of one year from final payment. Any work found to be defective due to failure to comply with the provision and intent of the Contract Documents, Specifications, and Plans shall be replaced at the CONTRACTOR'S expense.

**26. PROPERTY CONSIDERATION**

Materials having a salvage value shall remain the property of the OWNER. Salvageable material rejected by the OWNER shall become the responsibility of the CONTRACTOR to dispose of in a proper manner and subject to the approval of the OWNER.

**27. STORAGE OF MATERIALS**

Materials ordered prior to use, requiring site or off-site storage, will be the sole responsibility of the CONTRACTOR. Damage to materials shall be repaired and/or replaced in kind, at the CONTRACTOR'S expense, at no additional cost to the OWNER.

**28. BLASTING**

Blasting for rock excavation shall not be permitted. Rock excavation for all areas shall be performed by mechanical means.

**29. HAZARDOUS MATERIAL--GAS LINES**

The CONTRACTOR is advised to exercise caution in his operations on this Project, regardless of whether the Plans indicate or do not indicate the presence of any gas or hazardous materials carrying lines.

**30. DIVERSION OF STORMWATER**

The CONTRACTOR is responsible for developing a plan and implementing measures to divert storm drainage around the construction area. Stormwater diversion measures shall meet the requirements of the LFUCG Stormwater Manual, current edition and shall be approved by the OWNER prior to implementation. Approval by the OWNER shall not relieve the CONTRACTOR of responsibility for the diversion and any flood damage resulting from the CONTRACTOR'S diversion of stormwater shall be the responsibility of the CONTRACTOR to repair to the satisfaction of the affected property owner and at no additional cost to the OWNER.

All materials, labor, and equipment necessary to accomplish the diversion of storm drainage will be considered incidental to the Contract.

### **31. MAINTENANCE OF EXISTING SERVICE**

This Work shall consist of maintaining existing sanitary sewer service to residents in the area during construction. Sewage is to be maintained by whatever means necessary. No surcharge of manholes will be allowed.

No separate payment will be made for sewer service maintenance. Sewer service shall include all materials, equipment, and labor necessary to maintain sewer service to residents during construction.

### **32. PROJECT SIGNS**

Prior to construction, one (1) project sign shall be installed in accordance with the LFUCG Standard Drawings, current edition. The exact location shall be established by the Contractor prior to the beginning of the work and shall remain visible during the entire length of the Project. After all Work is complete and prior to final inspection, the sign shall be removed and disposed of properly. The cost and installation of the project signs is incidental to the Project.

**PROJECT SUBMITTALS**  
**DARTMOUTH DRIVE CULVERT REPLACEMENT**  
**LEXINGTON, KENTUCKY**



Phase of Construction	Submittal	Requirements	Responsibility	FIO/(EA) <sup>1</sup>
Pre-Construction	Schedule	The Contractor shall submit a construction schedule using the critical path method. The schedule shall include all major work tasks and individual activities. The schedule shall consider time for hold points and shall assume that only known areas of damage are to be replaced. If other damaged locations are identified during construction, the schedule shall be updated to reflect the additional work.	CONTRACTOR	OA
	LFUCG Land Disturbance Permit	A LFUCG Land Disturbance permit application shall be submitted and approved prior to mobilization to the Project site. The approved permit/plan shall be kept onsite throughout the construction period. See current LFUCG LDP Application and ESC Plan Checklist for requirements.	CONTRACTOR	OA
	Erosion, Sediment Control (ESC) Plan	The Erosion and Sediment Control (ESC) Plan and applicable checklist shall be submitted and approved prior to mobilization to the Project site. The ESC Plan and checklist shall be completed and describe means, methods, and materials related to site reclamation. The Plan shall adhere to the requirements set in LFUCG's stormwater manual, current revision, and other associated permanent stormwater best management practices (BMPs) identified by the OWNER/ENGINEER.	CONTRACTOR	OA
	Shop Drawings	Shop Drawings for all other applicable materials and products shall be submitted to the ENGINEER/OWNER prior to the CONTRACTOR'S final build submittal to the manufacturer.	CONTRACTOR	EA
	Site Usage Plan	Site Usage and Erosion Control Plan shall show the planned use and erosion protection within the work limits. At minimum, this shall include material stockpiles, equipment laydown areas, parking, silt fence, temporary drainage features, another environmental BMPs, site access improvements, protection of the work site from public access, and routes of equipment within the work limits. See current LFUCG LDP Application and ESC Plan Checklist for requirements.	CONTRACTOR	FIO
	Pre-Construction Site Photographic Log	A photographic log of site conditions and existing features shall be submitted. Areas within, and adjacent to, the work units shall be documented.	CONTRACTOR	FIO
	Materials List, Certifications, Product Data, Equipment, and Vendors	Information including, but not limited to, testing results/records, mix design/trip ticket, GA/QC approvals, on materials, products, equipment, and other supporting documentation shall be submitted. Where applicable, deviations from specified designed components shall be highlighted in the submittal.	CONTRACTOR	OA
	Site Health and Safety Plan	A Site Health and Safety Plan shall be submitted that addresses general site safety, job-specific safety hazards, and methods for safety risk mitigation and management.	CONTRACTOR	FIO
	Off-site Disposal Plan	The Off-site Disposal Plan shall include location of identified landfills or other disposal areas for excess excavated material or other waste/trash. Separate LDP may be required if excess excavation material is disposed of in Fayette County. All excess material to be disposed of legally.	CONTRACTOR	FIO
	Traffic Maintenance Plan	A Traffic Safety Plan shall be submitted to LFUCG Division of Traffic Engineering which will include, but not be limited to, a final detour plan, temporary signage details, and lane closure and reopening schedules.	CONTRACTOR	FIO
During Construction	Aggregate Gradations	Submit all test records demonstrating compliance with the Specifications.	CONTRACTOR	OA/EA
	Pavement (includes all courses)	Submit all gradation test records and/or density verifications demonstrating compliance with the Specifications.	CONTRACTOR	OA/EA
	Concrete (cast-in-place)	Submit all test records/certifications, to include, but not limited to, slump, air content, temperature, unit weight, and compressive-strength, all of which shall demonstrate compliance with the Specification.	CONTRACTOR	OA/EA
	Compaction Tests (soils and roadway subgrade)	Submit all compaction test records and density verification demonstrating compliance with the Specifications.	CONTRACTOR	OA/EA
All Phases of Construction	Quality Control Plan Submittals (includes offsite and onsite and third party testing)	Contractor may be required to perform testing on materials and products used during the course of the Project to establish, maintain, and/or verify QC standards are being met as defined in the LFUCG stormwater manual/standard specifications, or specifications. If testing is required by the OWNER, the CONTRACTOR will perform testing and submit results to OWNER within 24 hours of obtaining results	CONTRACTOR	FIO
End of Construction	Erosion, Sediment Control Plan Checklist	The ESC plan and checklist shall be completed and shall describe means, methods, and materials related to site reclamation. The plan shall adhere to the requirements set in LFUCG'S stormwater manual, current revision, and other associated permanent stormwater best management practices (BMPs). See current LFUCG LDP Application and ESC Plan Checklist for requirements.	CONTRACTOR	OA
	Record Drawings	A set of red-line drawings shall be maintained by the CONTRACTOR throughout construction. The Drawings shall document any deviations from design, or other record information to assist in the development of official record drawings.	CONTRACTOR	OA/EA

<sup>1</sup> FIO=For Information Only  
EA=Engineer Approval  
OA=Owner Acceptance

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**PART IX TECHNICAL SPECIFICATIONS  
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**CONTRACT 557-18-01  
LFUCG BID NO. 63-2019  
DARTMOUTH DRIVE CULVERT REPLACEMENT  
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT  
LEXINGTON, KENTUCKY**

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**END**

557-18-01 (05/19)

**SECTION 01010**  
**SUMMARY OF WORK**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK COVERED BY THE CONTRACT**

- A. These Specifications and the accompanying Drawings describe the work to be done and materials to be furnished for the construction of Contract 557-18-01, LFUCG Bid No. 63-2019, Dartmouth Drive Culvert Replacement.
- B. The Work is located at the intersection of Dartmouth Drive and Wilson Downing Road in Lexington, Kentucky.
- C. Major work items in this Contract include:
  - 1. Remove and replace a deteriorating storm sewer box culvert with new precast concrete box culvert.
  - 2. Restore Dartmouth Drive and affected driveways to existing conditions.
  - 3. Replace 2 curb box inlets.

**1.02 WORK SEQUENCE**

- A. No priorities are assigned to this work.

**PART 2 MATERIALS**

Not used.

**PART 3 EXECUTION**

Not used.

**END OF SECTION**

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01010-1

**SECTION 01580**

**PROJECT IDENTIFICATION AND SIGNS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. The CONTRACTOR shall provide signs near the site of the Work. The sign shall set forth the description of the Work and the names of the OWNER, ENGINEER, and CONTRACTOR.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION SIGN (3-FEET X 6-FEET)**

- A. Basic design shall be as shown in the sample below, and shall include at a minimum the names of the Project, the OWNER, the CONTRACTOR, and the ENGINEER.
- B. Colors shall be as selected by the ENGINEER.
- C. Number Required: 1

**PART 3 EXECUTION**

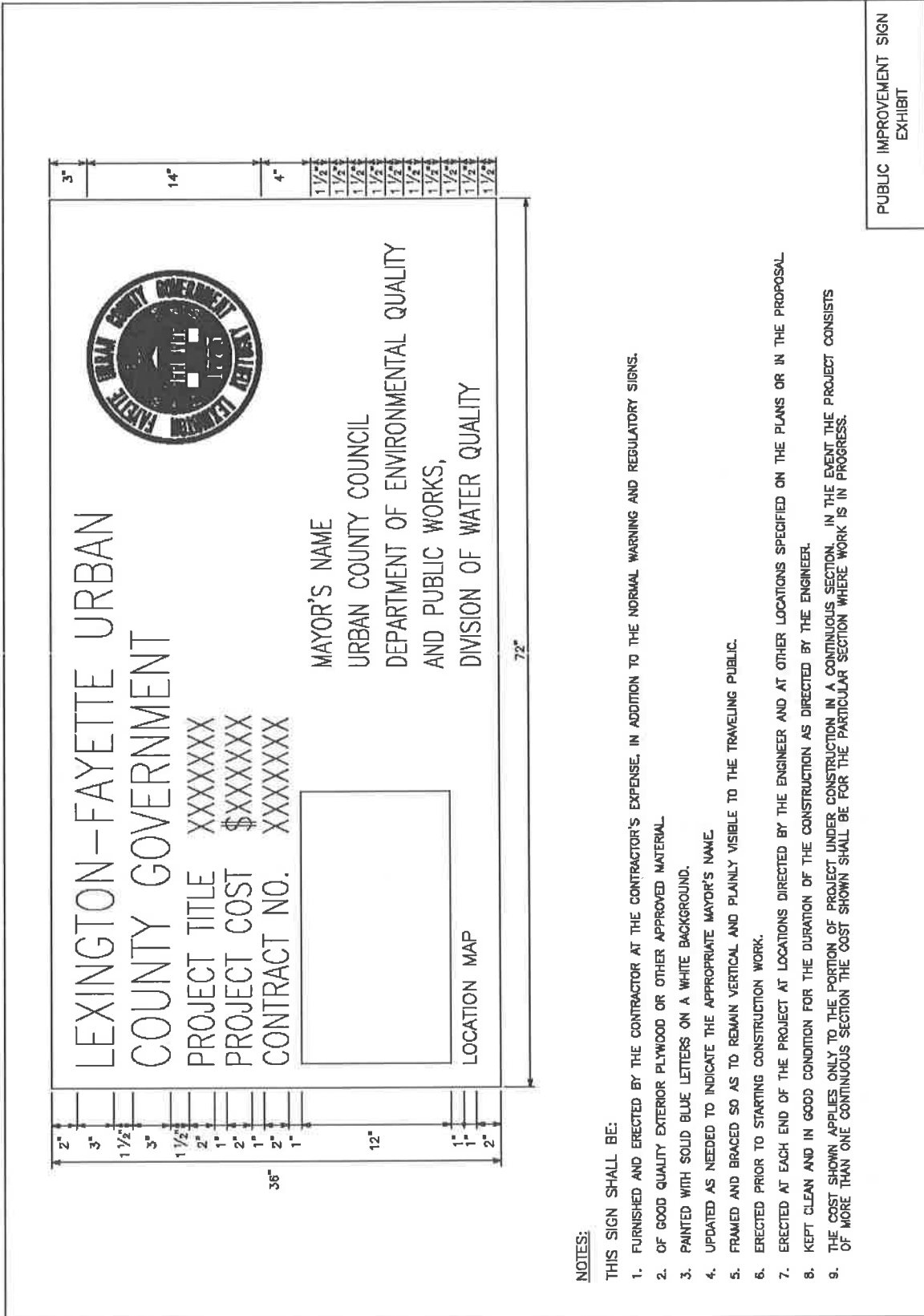
**3.01 INSTALLATIONS**

- A. Signs shall be installed at the project site location by the CONTRACTOR and installed in accordance with the detail below.

**3.02 MAINTENANCE**

- A. The signs shall be maintained in good condition until the completion of the Project and then removed by the CONTRACTOR.





END OF SECTION  
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**NOTES:**

THIS SIGN SHALL BE:

1. FURNISHED AND ERECTED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE, IN ADDITION TO THE NORMAL WARNING AND REGULATORY SIGNS.
2. OF GOOD QUALITY EXTERIOR PLYWOOD OR OTHER APPROVED MATERIAL.
3. PAINTED WITH SOLID BLUE LETTERS ON A WHITE BACKGROUND.
4. UPDATED AS NEEDED TO INDICATE THE APPROPRIATE MAYOR'S NAME.
5. FRAMED AND BRACED SO AS TO REMAIN VERTICAL AND PLAINLY VISIBLE TO THE TRAVELING PUBLIC.
6. ERECTED PRIOR TO STARTING CONSTRUCTION WORK.
7. ERECTED AT EACH END OF THE PROJECT AT LOCATIONS DIRECTED BY THE ENGINEER AND AT OTHER LOCATIONS SPECIFIED ON THE PLANS OR IN THE PROPOSAL.
8. KEPT CLEAN AND IN GOOD CONDITION FOR THE DURATION OF THE CONSTRUCTION AS DIRECTED BY THE ENGINEER.
9. THE COST SHOWN APPLIES ONLY TO THE PORTION OF PROJECT UNDER CONSTRUCTION IN A CONTIGUOUS SECTION. IN THE EVENT THE PROJECT CONSISTS OF MORE THAN ONE CONTIGUOUS SECTION THE COST SHOWN SHALL BE FOR THE PARTICULAR SECTION WHERE WORK IS IN PROGRESS.

PUBLIC IMPROVEMENT SIGN  
EXHIBIT

**SECTION 02110**  
**SITE CLEARING AND GRUBBING**

**PART 1 GENERAL**

1.01 WORK INCLUDED

- A. Furnish all labor and equipment required and perform all clearing, grubbing and stripping of topsoil complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Earth and rock work are included in Section 02200.

1.03 SUBMITTALS

- A. None required for this Section.

**PART 2 PRODUCTS**

None in this Section.

**PART 3 EXECUTION**

3.01 GENERAL

- A. The proposed building sites, paved areas, areas designated for ditches and channel changes, borrow pits, etc., (except any portions thereof that may be reserved) shall be cleared of all trees, timber, brush, stumps, rubbish and other debris. All this material, unless otherwise specified, shall be removed and disposed of away from the site.
- B. Open burning is not allowed in Fayette County except for agricultural operations.
- C. Where clearing is to be done, stumps shall be grubbed where embankments are less than 5 feet in height, where the profile indicates excavation, in all areas designated for the construction of other facilities and in borrow areas. In all other areas the stumps may be cut off even with the ground. In areas to be grubbed, all stumps and roots must be removed.
- D. No debris will be allowed to be left under or in the embankments.
- E. In felling trees near tracks, structures and wire lines, necessary precaution must be exercised in order to prevent damage to wire lines, structures, the facilities of others, or obstruct tracks.
- F. No extra payment for clearing and grubbing shall be included in the lump sum bid.

**END OF SECTION**

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**SECTION 02140**

**DEWATERING**

**PART 1 GENERAL**

1.01 WORK INCLUDED

- A. Furnish all labor and equipment required to dewater all excavations. Dewatering of all excavations shall be the responsibility of the CONTRACTOR, and no additional compensation will be allowed for same unless specifically included as a bid item.
- B. Leaking pipes and structures are to be anticipated on this project. For this reason, no additional payment will be made for dewatering associated with leakage from any existing facility.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. Crushed stone and DGA are included in Section 02235.

1.03 SUBMITTALS

- A. None.

**PART 2 PRODUCTS**

None in this Section.

**PART 3 EXECUTION**

3.01 GENERAL

- A. Dewatering equipment shall be of adequate size and quantity to assure maintaining proper conditions for installing pipe, concrete, backfill or other material or structure in the excavation. Dewatering shall include proper removal of any and all liquid, regardless of source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.
- B. Dewatering methods during construction shall be in accordance with LFUCG Stormwater Manual, latest edition, Chapter 11, Section 11.5.9, Construction Dewatering.

**END OF SECTION**

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**SECTION 02200**  
**EARTH AND ROCK WORK**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Extent of earthwork is indicated on the Drawings.
  - 1. Preparation of subgrade for tanks, basins, building slabs, walks and pavements is included as part of this work.
  - 2. Engineered fill course for support of building or basin slabs is included as part of this work.
  - 3. Backfilling of tanks, basins, basements, and trenches within building lines is included as part of this work.

**1.02 RELATED WORK**

- A. Dewatering is included in Section 02140.
- B. Crushed Stone and DGA is included in Section 02235.
- C. Sewer and Drain Pipe is included in Section 02700.
- D. Sodding and Seeding is included in Section 02930.

**1.03 QUALITY ASSURANCE**

- A. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Employ, at CONTRACTOR'S expense, testing laboratory acceptable to the OWNER to perform soil testing and inspection service for quality control testing during earthwork operations.

**1.04 SUBMITTALS**

- A. Submit following reports directly to the ENGINEER from the testing services, with copy to CONTRACTOR:
  - 1. Test reports on borrow material.
  - 2. Verification of each footing subgrade.
  - 3. Field density test reports.
  - 4. One optimum moisture-maximum density curve for each type of soil encountered.

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5. Report of actual unconfined compressive strength and/or results of bearing tests on each strata tested.

#### 1.05 JOB CONDITIONS

##### A. Site Information

1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that OWNER will not be responsible for interpretation or conclusions drawn therefrom by CONTRACTOR. Data are made available for convenience of CONTRACTOR.
2. Additional test borings and other exploratory operations may be made by CONTRACTOR at no cost to OWNER.

##### B. Existing Utilities

1. Prior to commencement of work, the CONTRACTOR shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

##### C. Use of Explosives

1. The CONTRACTOR (or any of his subcontractors) shall not bring explosives onto site or use in work without prior written permission from the OWNER. All activities involving explosives shall be in compliance with the rules and regulations of the Kentucky Department of Mines and Minerals, Division of Explosives and Blasting. CONTRACTOR is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
2. In all blasting operations, the maximum peak particle velocity of the ground motion in any direction shall not exceed 2 inches per second at the immediate location of any dwelling house, public building, school, church, commercial or institutional building and the particle velocity at such location immediately after a period of 1 second following the peak particle velocity produced by any charge shall not exceed ½ inch per second.

##### D. Protection of Persons and Property

1. Barricade open excavations occurring as part of this work and post with warning lights.
2. Operate warning lights as recommended by authorities having jurisdiction.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

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## **PART 2 PRODUCTS**

### **2.01 SOIL MATERIALS**

#### **A. Definitions**

1. Satisfactory soil materials are defined as those complying with ASTM D2487-85 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
2. Unsatisfactory soil materials are defined as those complying with ASTM D2487-85 soil classification groups MH, CH, OL, OH and PT.
3. Subbase material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
4. Drainage fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
5. Backfill and fill materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.
6. Engineered fill: (Refer to this Section, paragraph 3.07.)

## **PART 3 EXECUTION**

### **3.01 STRIPPING AND TOPSOILING**

- A. Before excavation and grading is commenced for buildings, structures or other work described hereinafter (except pipelines and manholes) or before material is removed from borrow pits, the material meeting the topsoil specification in Section 02930 of these Specifications shall be removed from the areas affected and stockpiled.
- B. When final grading is accomplished, particularly around buildings and other structures, the topsoil shall be spread evenly over the excavated area. Rough grading above excavated areas shall have been carried approximately 6 inches below finished grade (except solid rock, where it shall be carried 12 inches below finished grade) and brought back up to grade with topsoil as set out herein.

### **3.02 EXCAVATION**

- A. Excavation includes excavation to subgrade elevations indicated including excavation of earth, rock, bricks, wood, cinders, and other debris. All excavation of materials in the lump sum portion of the work will be unclassified and no additional payment will be made regardless of type material encountered.
- B. Differing Site Conditions
  1. Refer to Section 00700, paragraph 17.

C. Excavation Classifications

1. The following classifications of excavation will be made when unanticipated material is encountered in work:
  - a. Earth excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
  - b. Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42 inch wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90 Hp flywheel power and 30,000 pound drawbar pull. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.
  - c. Rock excavation in open excavation includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170 Hp flywheel power and developing 40,000 pound break-out force (measured in accordance with SAE J732C).
    - (1) Typical of materials classified as rock are boulders  $\frac{1}{2}$  cubic yard or more in volume, solid rock, rock in ledges and hard cementitious aggregate deposits. Rock material encountered will be classified as rock excavation.
    - (2) Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
- D. Unauthorized excavation consists of removal of materials beyond subgrade elevations or dimensions without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work directed by ENGINEER, shall be at CONTRACTOR's expense.
  1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the ENGINEER.

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2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification.

E. Additional Excavation

1. When excavation has reached required subgrade elevations, notify the ENGINEER who will make an inspection of conditions.
  - a. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed in writing by the ENGINEER.
  - b. Removal of unsuitable material and its replacement as directed will be paid on basis of Contract conditions relative to changes in work.

F. Stability of Excavations

1. Slope sides of excavations to comply with codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

G. Shoring and Bracing

1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.
2. Establish requirements for trench shoring and bracing to comply with codes and authorities having jurisdiction.
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
4. Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place. In the event the OWNER directs the CONTRACTOR to leave shoring materials in place, the OWNER will reimburse the CONTRACTOR for the reasonable cost of leaving such materials in place.

H. Dewatering

1. Refer to Section 02140 for dewatering requirements.



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I. Material Storage

1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
2. Dispose of excess soil material and waste materials as herein specified.

J. Excavation for Structures

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation. All loose material shall be removed from the excavation just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

K. Excavation for Pavements

1. Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.

L. Trench Excavation

1. The CONTRACTOR shall include in his lump sum bid all trenching and backfill necessary for installation of all pipelines as planned and specified unless specific unit prices are set up for specific pipeline. Trenching shall include clearing and grubbing of all trash, weeds, briars, trees and stumps encountered in the trenching. The CONTRACTOR shall dispose of such material at no extra cost to the OWNER. Shrubs shall be removed, maintained and replanted in the same or adjacent location. Trenching also includes such items as railroad, street, road, sidewalk, pipe, and small creek crossings; cutting, moving or repairing damage to fences, posts, gates, and other surface structures regardless of whether shown on the Drawings.
2. All existing facilities shall be protected from danger or damage while pipelines are being constructed and backfilled, and from damage due to settlement of the backfill.
3. In the event any existing structure is damaged, repair and restoration shall be made at once and backfill shall not be replaced until this is done. Restoration and repair shall be such that the damaged structure is equal to or better than its original condition and can serve its purpose as completely as before. All such restoration and repair shall be done without extra cost to the OWNER.
4. Trenches must be dug to lines and grades shown on the Drawings. Hand trenching may be required in areas where machine trenching would result in undue damage to existing structures and facilities.

5. Excavation shall be open trenches, except where otherwise shown on the Drawings, for tunneling, boring, or jacking under structures, railroad, sidewalks and roads.
6. Sheeting and shoring of trenches shall be provided at the expense of the CONTRACTOR where necessary to protect life, property and the new or existing structures from damage or to maintain maximum permissible trench widths at top of pipe. All necessary materials, including, but not limited to, sheeting, sheet piling, trench jacks, braces, shores and stringers, shall be used to hold trench walls. Sheeting and shoring may be withdrawn as the trenches are being backfilled, after backfill has been tamped over top of the pipe at least 18 inches. If removal before backfill is completed to surface endangers adjacent structures, such as buildings, pipelines, street paving, and sidewalks, then the sheeting and shoring shall be left in place until such danger has passed, and then pulled if practical. Voids caused by sheeting withdrawal shall be backfilled and tamped. If not withdrawn, sheeting shall be cut off at least 18 inches below final surface grade, so there is no obstruction at the ground level. In the event the OWNER directs the CONTRACTOR to leave shoring materials in place, the OWNER will reimburse the CONTRACTOR for the reasonable cost of leaving such materials in place.
7. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the ENGINEER may order stabilization by various means. Exclusive of dewatering normally required for construction, and instability caused by neglect of the CONTRACTOR, the necessary stabilization shall be paid for at unit prices established in the Contract. In the event no particular bid price is applicable, then the payment for stabilization will be negotiated.
8. The location of the pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. The OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The OWNER is under no obligation to locate pipelines, so they may be excavated by machine.
9. Tunneling may be used at the CONTRACTOR'S option as an alternate to open-cut trenching, at no extra cost to the OWNER. The annular space between plates and excavation shall be either permanently placed pea gravel or sand, pumped grout (3 parts sand and 1 part Portland cement by volume) or other suitably installed material approved by the ENGINEER. Backfilling shall be kept close to the heading and completed after each day's work. Where grout is used for backfill, injection holes with threaded plugs shall be provided in liner plates at various levels and in sufficient number to effectively grout the void around the tunnel. A minimum of 3 grout holes shall be provided in each 8 feet of tunnel length. Grout shall be injected in the lower holes first, proceeding upward as the void is

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filled. Plugs shall be installed after each hole is filled and grout stops shall be provided behind plates as necessary to ensure complete filling of the void. In tunneling under buildings, the CONTRACTOR will be responsible for all damage resulting from his operations and methods of excavation and backfilling. Boring may also be used at the CONTRACTOR'S option as an alternate to tunneling or open-cut trenching, at no extra cost to the OWNER.

10. Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room. Provide 6-inch to 9-inch clearance on both sides of pipe or conduit.
  - a. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
  - b. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
  - c. For pipes or conduit 4 inches or smaller in nominal size, excavate to subbase depth indicated or, if not otherwise indicated, to 4 inches below bottom of work to be supported.
  - d. For pipes or conduit 6 inches or larger in nominal size, tanks, and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated or, if not otherwise indicated, to 6 inches below bottom of work to be supported.
  - e. Except as otherwise indicated, excavation for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is no less than 2 feet 6 inches below finish grade.
  - f. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
  - g. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.
  - h. Do not backfill trenches until tests and inspections have been made and backfilling authorized by the ENGINEER. Use care in backfilling to avoid damage or displacement of pipe systems.
  - i. For piping or conduit less than 2 feet 6 inches below surface of roadways, furnish and install steel casing pipe, minimum wall thickness of 1/4-inch, of sufficient diameter to carry the pipe or conduit to at least 2 feet beyond outside edge of pavement.

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M. Cold Weather Protection

1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit (1 degree Celsius).

3.03 COMPACTION

A. General

1. Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below:
  - a. Percentage of maximum density requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D698; and not less than the following percentages of relative density, determined in accordance with ASTM D4253 and D4254, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
  - b. Structures, building slabs and steps, pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent standard proctor density at +2 percent to -2 percent optimum moisture content.
  - c. Lawn or unpaved areas: Compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent standard proctor density.
  - d. Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent standard proctor density at +2 percent to -2 percent optimum moisture content.

B. Moisture Control

1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface or subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

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### 3.04 BACKFILL AND FILL

#### A. General

1. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below. Backfill material shall be no larger than the specified depth of the layer to be placed and/or compacted.
  - a. In excavations, use satisfactory excavated or borrow material.
  - b. Under grassed areas, use satisfactory excavated or borrow material.
  - c. Under walks and pavements, use subbase material, or satisfactory excavated or borrow material, or combination of both.
  - d. Under steps, use subbase material.
  - e. Under building slabs, use subbase material for a minimum depth of 6 inches.

#### B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

#### C. Ground Surface Preparation

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

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2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction

1. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Crushed stone shall be installed in accordance with Section 02235.
2. Before compaction, add moisture or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
3. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Backfilling Trenches

1. Refer to Section 02610 or Section 02700 as appropriate for trench backfill requirements.

3.05 GRADING

A. General

1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines

1. All materials used for backfill around structures shall be of a quality acceptable to the ENGINEER and shall be free from large or frozen lumps, wood and other extraneous material. All spaces excavated and not occupied by footings, foundations, walls or other permanent work shall be refilled with earth up to the surface of the surrounding ground, unless otherwise specified, with sufficient allowance for settlement.
2. In making the fills and terraces around the structures, the fill shall be placed in layers not exceeding 12 inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be rolled with

an approved type roller and/or be compacted. When it is not practicable to compact sections of the fill immediately adjacent to buildings or structures by rolling, then such sections shall be thoroughly compacted by means of mechanical tamping or hand tamping as may be required by the conditions encountered.

3. All fills shall be placed so as to load structures symmetrically.
4. As set out hereinbefore, rough grading shall be held below finished grade and then the topsoil which has been stockpiled shall be evenly spread over the surface. The grading shall be brought to the levels shown on the Drawings or to the elevations established by the ENGINEER. Final dressing shall be accomplished by hand work or machine work, or a combination of these methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than 2 inches in diameter. Excavated rock may be placed in the fills, but it shall be thoroughly covered. Rock placed in fills shall not be closer than 12 inches from finished grade.
5. Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
  - a. Finish surfaces to be free from irregular surface changes, and as follows:
    - (1) Lawn or unpaved areas: Finish areas to receive topsoil to within not more than 0.10 feet above or below required subgrade elevations.
    - (2) Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.0 inch above or 1.0 inch below required subgrade elevation.
    - (3) Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 0.0 inch above or 1 inch below required subgrade elevation.

#### C. Grading Surface of Fill Under Building Slabs

1. Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 0.0 inch above or 1 inch below required subgrade elevation when tested with a 10-foot straightedge.

#### D. Compaction

1. After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or standard proctor density for each area classification.

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### 3.06 PAVEMENT SUBBASE COURSE

#### A. General

1. Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

#### B. Grade Control

1. During construction, maintain lines and grades including crown and cross-slope of subbase course.

#### C. Shoulders

1. Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneously with compacting and rolling of each layer of subbase course.

#### D. Placing

1. Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.
2. When a compacted subbase course is shown to be 6 inches thick or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

### 3.07 BUILDING SLAB ENGINEERED FILL COURSE

#### A. General

1. Engineered fill course consists of placement of crushed stone of size and type shown on Drawings, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

#### B. Placing

1. Place fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
2. When a compacted course is shown to be 6 inches or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches in thickness when compacted.



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### 3.08 FIELD QUALITY CONTROL

#### A. Quality Control Testing During Construction

1. Allow testing service to inspect and report to the ENGINEER on findings and approve subgrades and fill layers before further construction work is performed. A minimum of 3 tests per layer shall be performed on compacted soil fill. The placement of rock for the purpose of structure fill shall be observed and approved by testing service.
  2. Perform field density tests in accordance with ASTM D1556 (sand cone method), ASTM D2167-84 (rubber balloon method), or ASTM D2992-87 (nuclear density method), as applicable.
  3. Footing subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to ENGINEER.
  4. Paved areas and building slab subgrade: Make at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 square feet of overlaying building slab or paved area, but in no case less than three tests.
  5. Foundation wall backfill: Take at least 2 field density tests, at locations and elevations as directed.
- B. If in opinion of the ENGINEER, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional cost to the OWNER.

### 3.09 MAINTENANCE

#### A. Protection of Graded Areas

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

#### B. Reconditioning Compacted Areas

1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

#### C. Settling

1. Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment.

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Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.10 DISPOSAL OF EXCESS NON-ORGANIC SOIL AND ROCK

#### A. General

1. The OWNER'S property as designated on the Drawings and/or specified herein shall be used for disposal of all acceptable excess excavated material, including acceptable demolition materials. The CONTRACTOR shall place and compact all acceptable excess excavated and/or demolition material at this location, with the cost of hauling, placing, compacting and covering, included in the CONTRACTOR'S lump sum bid.

#### B. Material Classification and Description

1. Acceptable fill material shall consist of all excess non-organic soil and rock available at the site. The non-organic soil and rock may be composed of earth, shale, limestone, weathered rock, waste crushed aggregate or other approved materials. Excess non-organic soil and rock shall contain no particle whose largest dimension exceeds 12 inches.

#### C. Foundation Preparation

1. The CONTRACTOR shall proof roll the fill area a minimum of 2 passes. Any soft spots found shall be removed prior to fill placement.

#### D. Placement

1. The distribution and gradation of material throughout the fill shall be such that the fill will be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The combined excavation and placing operations shall be such that the materials when compacted in fill will be blended sufficiently to secure the best practicable degree of compaction and stability. Successive loads of material shall be placed on the fill so as to produce the best practicable distribution of the material.
2. The material shall not be dumped into final position but shall be distributed by blading or dozing in a manner that will ensure proper placement in the embankment so that voids, pockets and bridging will not occur.
3. No fills shall be placed upon a frozen surface, nor shall snow, ice or frozen materials be incorporated in the fill.

#### E. Spreading and Compacting

1. The material shall be spread in uncompacted lifts 12 to 16 inches in thickness, depending on the amount of earth, over the entire length and width of the specified area. The material shall then be compacted by a minimum of 6 passes of a smooth drum vibratory roller. The roller shall

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have a total static weight of not less than 20,000 pounds. The diameter of the drum shall be between 5.0 and 5.5 feet and the width between 6.0 and 6.5 feet. The frequency of vibration during operation shall be between 1,200 and 1,500 vibrations per minute and the dynamic force at 1,400 vibrations per minute shall not be less than 16,000 pounds. Rollers shall be operated at speeds not to exceed 1.5 miles per hour.

F. Earth Cover

1. The surface of the waste area shall be covered with a minimum of 12 inches of material suitable for growing grass, trees, shrubs, etc., and shall be relatively free of rocks and other debris, satisfactory to the OWNER. The material shall be placed and spread in accordance with this Specification.

**END OF SECTION**

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**SECTION 02235**

**CRUSHED STONE AND DENSE GRADED AGGREGATE (DGA)**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish and install crushed stone aggregates and DGA as indicated on the Drawings and/or required in the Specifications for such uses as surfaces and/or bases of roads, parking areas and walkways; temporary and permanent traffic bound surfacing over trenches; permanent traffic bound roadway surface maintenance; replacement of unsuitable material; and other miscellaneous applications required in the work.
- B. Various sizes, types and quality of crushed stone aggregates are specified in this Section depending on applicability which may be specified in detail in other sections of these Specifications.
- C. The ENGINEER may require the use of crushed stone aggregates for purposes other than those specified in this or other Specification sections if such use is advisable in his opinion. Payment for crushed stone aggregate shall be by negotiation unless agreed pricing has been previously established.

**1.02 RELATED WORK**

- A. Dewatering is included in Section 02140.
- B. Earthwork is included in Section 02200.

**1.03 SUBMITTALS**

- A. Testing Service shall submit required test reports directly to the ENGINEER with copy to CONTRACTOR.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Crushed stone aggregate shall meet the applicable requirements for the intended use in accordance with Section 805 of the Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction.
- B. Unless otherwise referred to on the Drawings or in these Specifications, crushed stone aggregate shall be graded size No. 57 according to the table below.
- C. When referred to on the Drawings or in these Specifications, dense graded aggregate (DGA) shall have a sand equivalent value of not less than 25 and shall be graded according to the table below.

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D. Coarse aggregate gradations referred to by number size on the Drawings or in these Specifications shall conform to the following table (as copied from the above Kentucky Transportation Cabinet Specifications, Table 805.07, 1994 Edition):

**TABLE I - SIZES OF COARSE AGGREGATES - KENTUCKY**

Size	Max. Size Square Openings (1)	AMOUNTS FINER THAN EACH LABORATORY SIEVE (SQUARE OPENINGS) PERCENTAGE BY WEIGHT																	
		100 (4)	90 (3 1/2)	75 (3)	63 (2 1/2)	50 (2)	37.5 (1-1/2)	25 (1)	19 (3/4)	12.5 (1/2)	9.5 (3/8)	4.75 (No. 4)	2.36 (No. 8)	2 (No. 10)	1.18 (No. 16)	600 (3) (No. 30)	425 (3) (No. 40)	150(3) (No. 100)	75 (3) (No. 200)
1	90 (3 1/2)	100	90-100		25-60		0-15		0-5										
2	63 (2 1/2)			100	90-100	35-70	0-15		0-5										
23	63 (2 1/2)			100		40-90		0-15		0-5									
3	50 (2)				100	90-100	35-70	0-15		0-5									
357	50 (2)				100	95-100		35-70		10-30		0-5							
4	37.5 (1-1/2)					100	90-100	20-55	0-15		0-5								
467	37.5 (1-1/2)					100	95-100		35-70		10-30	0-5							
5	25 (1)						100	90-100	20-55	0-10	0-5								
57	25 (1)						100	95-100		25-60		0-10	0-5						
610	25 (1)						100	85-100		40-75		15-40							
67	19 (3/4)							100	90-100		20-55	0-10	0-5						
68	19 (3/4)							100	90-100		30-65	5-25	0-10		0-5				
710	19 (3/4)							100	80-100		30-75	0-30							
78	12.5 (1/2)								100	90-100	40-75	5-25	0-10		0-5				
8	9.5 (3/8)									100	85-100	10-30	0-10		0-5				
9-M	9.5 (3/8)										100	75-100	0-25	0-5					
10	4.75 (No. 4)										100	85-100							10-30
11	4.75 (No. 4)											100	40-90	10-40					0-5
DGA(2)	19 (3/4)							100	70-100		50-80	30-65				10-40			2-10
GRAVEL BASE(2)	37.5 (1-1/2)					100						25-65					6-30	5-20	
CSB(2)	50 (2)				100		90-100		60-95		30-70	15-55				5-20			0-8

(1) Nominal size in mm (inches), unless otherwise shown

(2) Gradation performed by wet sieve KM 64-420

(3) micrometers

E. Testing

1. Unless otherwise required in this Section, the ENGINEER shall determine the tests required for crushed stone aggregates according to Section 805. The CONTRACTOR shall be responsible, initially and periodically at no cost to the OWNER, to deliver materials proposed for use or being used in the work to a testing laboratory selected by the OWNER. This provision shall apply to any other aggregate tests required in this Section.
2. The OWNER shall be responsible to pay the laboratory testing costs. However, once a material has been tested and accepted for use, the CONTRACTOR shall be responsible throughout the job to use materials which are equal in all respects and from the same source as that accepted material delivered to the testing laboratory.
3. The CONTRACTOR shall pay for additional tests ordered by the ENGINEER after acceptance of tested materials when such tests show the quality of materials has become deficient or when the CONTRACTOR requests a change of material supplier and/or source.

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4. The ENGINEER shall request tests on Form HKB DE-16 "Requisition for Material and Design Mix Tests."

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

##### **A. Compacted Crushed Stone Aggregate**

1. Crushed stone shall be placed in uniform layers not greater than 6 inches deep and shaped by power equipment to required lines, grades, cross connections, and depths. No minimum compacted density, method of compaction, or compaction equipment is required since a nominal amount of compaction effort with vibration can establish the desired intergranular locking of the aggregate under controlled placement depth. Acceptable compaction can be achieved with pneumatic-tired and tracked equipment and rollers.
2. All compaction operations shall be performed to the satisfaction of the ENGINEER.
3. Crushed stone shall be placed in those areas as shown on the Drawings and as may be directed by the ENGINEER.

##### **B. Compacted Dense Graded Aggregate (DGA)**

1. Dense graded aggregate shall be plant mixed with water, transported in such a manner as to deliver the mix to the project without loss or segregation, spread, and compacted to produce a density throughout not less than 84 percent of solid volume. Minimum dry density for compacted limestone DGA shall be 139 pounds per cubic foot when S.G. of limestone is 2.65.
2. Density tests shall be required in such number as determined by the ENGINEER. Density tests shall be made by the sand cone method or by nuclear gauges. The CONTRACTOR shall furnish all necessary labor, equipment and materials for making the density tests under observations of the ENGINEER.
3. In the event compacted material does not meet the required density of an area, the CONTRACTOR shall either continue compaction efforts or rework the entire area until the required density is obtained. If material has to be removed and reworked, the ENGINEER shall determine if removed material can be remixed and used again for fill.
4. All compacted DGA fill shall be included in the CONTRACTOR'S lump sum bid unless otherwise indicated on the Drawings.

**END OF SECTION**

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**SECTION 02270**

**GEOTEXTILES**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to install geotextiles as shown on the Contract Drawings and as specified herein.

**1.02 SUBMITTALS**

- A. The CONTRACTOR shall submit to the ENGINEER in accordance with the Specifications detailed material, performance and installation information on the geotextile fabric proposed for use. The ENGINEER shall review the submittal for acceptability prior to shipment of the fabric to the job site.

**PART 2 PRODUCTS**

**2.01 MATERIAL**

- A. The geotextile fabric shall consist of long chain polymeric filaments of either polyester or polypropylene formed into a stable network. Fabric shall be tear and puncture resistant and maintain the following minimum physical properties, when wet or dry, and be inert to commonly encountered chemicals in the soil.
- B. The geotextile fabric shall meet the following minimum requirements:

<u>Property</u>	<u>Requirement</u>	<u>Specification</u>
Weight	4.0± 0.5 oz./sq.yd.	---
Grab Tensile	110 lbs.	ASTM D 1682-64 (1975)
Modulus	900 lbs.	ASTM D 1682-64 (1975)
Trapezoidal Tear	40 lbs.	ASTM D 2263-68
Mildew, Rot Resistance	100%	---
Coeff. of Permeability (K)	1 x 10 <sup>-3</sup> cm/sec.	EURM-100

- C. The fabric shall be TYPAR Style 3401 as manufactured by DuPont, Wilmington, Delaware; Bidim as manufactured by Monsanto Textiles Co., St. Louis, Missouri, or equal, unless otherwise specified or shown on the Drawings.

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**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. The fabric shall be installed as recommended by the manufacturer for the application specified and/or shown on the Drawings. Manufacturer's printed instructions shall be strictly followed including storage of fabric rolls; subgrade preparation to prevent puncture; unrolling and positioning fabric; installing loosely to allow for settlement without rupture under crushed rock and riprap fills; and fabric lap distances which shall be a minimum of 1 foot unless otherwise required.

**END OF SECTION**

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**SECTION 02326  
STEEL COVER PIPE**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Steel cover pipe shall be furnished and installed as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Sewer and Drain Pipe is specified in Section 02700.

**PART 2 PRODUCTS**

2.01 STEEL COVER PIPE

- A. Steel cover or jack pipe shall be plain end steel pipe with minimum yield strength of 35,000 psi and tensile strength of 60,000 psi per API-5L Grade B material. The steel pipe supplied shall be manufactured by the seamless, electric-weld, submerged arc weld or gas metal-arc weld process as specified in API-5L. Certification of 35,000 psi minimum yield strength shall be furnished by the supplier through the CONTRACTOR to the ENGINEER in sufficient copies before pipe is shipped to job to permit the ENGINEER to retain 3 copies.
- B. Used pipe shall be acceptable if it meets the minimum requirements for size, thickness and strength for new pipe. Supplier shall furnish through the CONTRACTOR to the ENGINEER 3 copies of certification of test results of strength tests conducted on the used pipe prior to shipment to job site. Used pipe with excessive corrosion and pitting present shall not be supplied.
- C. The inside diameter of steel cover pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, except for carrier pipe 6 inches or greater in diameter under railroads, the difference shall be 4 inches instead of 2 inches.
- D. Cover pipe shall have a **minimum** wall thickness as shown in the following table:

Nominal Diameter Inches	Nominal Thickness Inches	Nominal Diameter Inches	Nominal Thickness Inches
Under 10	0.188	24	0.438
10 & 12	0.250	26	0.438
14 & 16	0.281	28 & 30	0.500
18	0.312	32	0.500
20	0.344	34 & 36	0.562
22	0.375	38 & 42	0.562

### **PART 3 EXECUTION**

#### **3.01 TUNNELING, BORING OR JACKING**

- A. Boring or jacking as specified herein will be allowed at locations other than those noted on the Drawings, where advantageous to lay pipe under streets, driveways, and sidewalks, without their monolithic structure being destroyed.
- B. Tunneling under paving, railroads, buildings and underground structures is included as an alternate to boring or repaving required by open cut trenching at no extra cost to the OWNER. Bore and cover pipe is also included as an alternate to tunneling. Backfilling of tunnels shall be mechanically tamped in not more than 3 inch layers and with materials rendered suitable for tamping before being placed in tunnel unless otherwise shown on the Drawings. No payment will be made for tunnels less than 3 feet long.
- C. In tunneling under buildings, the CONTRACTOR will be held responsible for all damage by his operations and methods of excavation and backfilling. No payment will be made for tunnels less than 3 feet in length.
- D. Should the CONTRACTOR elect and receive permission to tunnel or bore, other than at locations designated on the Drawings or required by the ENGINEER to be tunneled or bored, the entire compensation therefor shall be the same as the unit prices bid for installation in open trench, including paving replacement, but not including bore or tunnel unit prices.
- E. At locations where tunneling or boring or jacking is called for on the Drawings, in addition to the unit prices for permanent tunnel, tunnel liner, temporary tunnel, boring or jacking and/or cover pipe, payment will be made for furnishing and laying sewer lines inside the tunnel or cover pipe. No payment will be made for separate trench and backfill unit price items where permanent tunnel, tunnel liner, temporary tunnel, boring or jacking and/or cover pipe unit prices are paid.
- F. Boring or jacking under highways, railroads, sidewalks, pipelines, etc., shall be done at the locations shown on the Drawings. It shall be performed by mechanical means and accurate vertical and horizontal alignment must be maintained. When shown on the Drawings, cover pipe shall be used and shall be installed inside bored holes concurrently with boring, or jacking.

#### **3.02 STEEL COVER PIPE INSTALLATION**

- A. Steel cover pipe shall be of the size and wall thickness as shown on the Drawings.
- B. When cover pipe is jacked, concurrent with boring, all joints shall be solidly welded. The weld shall be such that the joint shall be of such strength to withstand the forces exerted from the boring and jacking operation as well as the vertical loading imposed on the pipe after installation. The weld shall also be such that it provides a smooth, nonobstructing joint in the interior of the pipe

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which will allow easy installation of the carrier pipe without hanging or abrasion to the carrier pipe upon installation.

- C. When cover pipe is installed in open trench or permanent tunnel, it shall be bedded and backfilled per Specifications applying to sewer pipe in such locations. When cover pipe is installed in temporary tunnel, it shall be laid accurately to alignment of proposed sewer and at an elevation below sewer necessary to support it at the planned elevation. Bedding and backfill for cover pipe in temporary tunnel shall be per Specifications for sewer in temporary tunnel.
- D. Cover pipe in open trench, permanent tunnel and temporary tunnel shall be joined in such manner that they will not be moved out of alignment or grade and that will prevent backfill material from entering joint. Where cover pipes are shown on the Drawings to be equipped with vent pipes, vents shall be installed as shown on the Drawings with cost of same included in the price bid for the cover pipe unless otherwise specified.

### 3.03 CARRIER PIPE IN COVER PIPE INSTALLATION

#### A. Pipeline Spacers

- 1. Pipes installed inside cover pipes shall be centered throughout the length of cover pipe. Centering shall be accomplished by the installation of bolt on style spacers with a 2-piece solid shell made from T-304 stainless steel of a minimum 14 gauge thickness. The shell shall be lined with a ribbed PVC sheet of a 0.090 inch thickness that overlaps the edges. Runners, made from UHMW polymer, shall be attached to the pipe in such a manner as to prevent the dislodgement of the spacers as the carrier pipe is pulled or pushed through the cover pipe. Risers shall be made from T-304 stainless steel of a minimum 14 gauge thickness and shall be attached to the shell by MIG welding. All welds shall be fully passivated. All fasteners shall be made from T-304 stainless steel.
- 2. Spacers shall be of such dimensions to provide 1) full supportive load capacity of the pipe and contents; 2) of such thickness to allow installation and/or removal of the pipe; and 3) to allow no greater than 1/2-inch movement of the carrier pipe within the cover pipe after the carrier pipe is installed.
- 3. Spacers shall be located immediately behind each bell and at a maximum spacing distance as shown below unless a lesser maximum spacing distance is recommended by the pipe manufacturer:

<u>Pipeline Diameter (in.)</u>	<u>Maximum Spacing (ft.)</u>
2 - 2-1/2	4
3 - 8	7
10 - 26	10
28	9
30	8
32	7
34	6
36 - 38	5.5
40 - 44	5
46 - 48	4

4. The materials and spacing to be used shall be accepted by the ENGINEER prior to installation. The pipeline spacers shall be manufactured by Cascade Waterworks Manufacturing Co., of Yorkville, Illinois, Pipeline Seal and Insulator, Inc., of Houston, Texas, or equal. Installation shall be in accordance with manufacturer's recommendations.

**B. End Seals for Carrier Pipe**

1. Upon completion of installation of the carrier pipe, the annular space at the ends of the cover pipe shall be sealed to prevent the entrance of groundwater, silt, etc., into the cover pipe. The seal shall be a manufactured product specially made for this purpose. The seal shall be Link Seal, Model "C" or "L," as manufactured by the Thunderline Corporation, or equal.
2. The device (Model "C" or "L") shall have composite pressure plates and modular seals to be corrosion resistant EPDM suitable for use in water, direct ground burial, and atmospheric conditions. In areas where hydrocarbon resistant is specified, the seals shall be of nitrile and rated for the application (Model OS-316). All nuts and bolts for all models shall be 316 stainless steel (ANSI Type 316 per ASTM F695-95, 85,000 psi average tensile strength).
3. Seal sizes shall be per manufacturer's recommendations for each size of cover pipe and installed per manufacturer's recommendations to provide a watertight seal.

**END OF SECTION**

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**SECTION 02500**  
**ASPHALT PAVING**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall be required to supply all materials and equipment and perform all work for the placement of the base, binder, and surface course(s) for restoring to the preconstruction condition the surface of the existing streets, roads, drives and parking areas to the depths as shown in the detailed Drawings and as specified herein.

1.02 REFERENCES

- A. Unless noted, all Specifications designations denoted KTCSSRBC refer to the Kentucky Transportation Cabinet Department of Highways Standard Specification for Road and Bridge Construction. Appropriate technical portions of the referenced sections of the Specifications shall apply, but all work and method of payment shall be as described herein unless otherwise specified or shown on the Drawings.

1.03 RELATED WORK

- A. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- B. Crushed stone surfacing requirements, temporary and permanent replacement, are specified in Section 02235 of these Specifications.

1.04 WORK DESCRIPTION

- A. Asphalt shall be used for surfacing new roads and parking areas, for replacement of city streets, drives, parking areas and state highways of asphalt construction and for resurfacing existing roads and state highways at locations shown on the Drawings or specified.

1.05 QUALIFICATIONS

- A. The pavement design mixture shall be used as determined by local plant mix availability. The design mixture shall have been approved recently by the Kentucky Transportation Cabinet Department of Highways and used recently on a state paving project.
- B. The design mix shall be submitted to the ENGINEER for review and acceptance. The submittal shall include the following:
  - 1. The last date the mixture was approved by the Kentucky Transportation Cabinet Department of Highways for use on a state road project.
  - 2. The location where the mixture was recently used, and the name and address of the paving contractor.

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## 1.06 SUBMITTALS

- A. Shop Drawings, manufacturers' data and other items needed to establish compliance with the Drawings and Specifications shall be submitted to the ENGINEER.

## PART 2 PRODUCTS

### 2.01 ASPHALT PAVING

#### A. Mixture

- 1. The asphaltic paving provided for use on this Contract shall conform to the applicable requirements of KTCSSRBC Section 401, Asphalt Plant Requirements; Section 402, Control and Acceptance of Asphalt Mixtures; and Section 403, Production and Placement of Asphalt Mixtures. The pavement mixture shall meet the requirements of Section 403.03.03.

B. Fine aggregates shall meet the requirements of KTCSSRBC Section 804.

C. Coarse aggregates shall meet the requirements of KTCSSRBC Section 805.

D. Asphaltic materials shall meet the requirements of KTCSSRBC Section 806.

E. Asphaltic materials for tack coat shall be one of the following: SS-1, SS-1h, CSS-1, CSS-1h, AE-60, RS-1, or CRS-1, conforming to Section 406.

### 2.02 FACILITIES ADJUSTMENT MATERIALS

A. Manhole adjusting rings shall be cast iron, Neenah R-1979, J.R. Hoe, or equal. Maximum adjustment shall be 3 inches.

B. Valve box adjusting rings shall be cast iron, Tyler Type MWW riser with 3 inches maximum adjustment.

### 2.03 PAVEMENT STRIPING MATERIALS

A. Pavement striping for all areas to receive asphalt paving, whether full width pavement overlay, trench width pavement replacement, or newly constructed access roads or parking areas, shall meet the requirements of Section 748 of the KTCSSRBC for placement and Section 842 for striping material.

### 2.04 TRAFFIC CONTROL SIGNAL LOOPS

A. Where possible, traffic control signal loops shall be avoided in the location of new or replacement pipelines. Should the traffic control loops be damaged or destroyed by pipeline construction, they shall be replaced to the specification of the requirements of the entity who is the owner and operator of the traffic control facilities.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Construction requirements shall conform to applicable requirements of Section 403 of KTCSSRBC.
- B. A tack coat shall be required to bond new paving to the surface of concrete or brick pavements and bases or existing asphalt surfaces. It shall be applied at the rate of 0.8 pound (0.1 gallon) per square yard at the following range of application temperatures:

SS-1, SS-1h, CSS-1, CSS-1h, AE-60	70-160°F
RS-1	70-140°F
CRS-1	120-185°F

- C. When SS1, SS1h, CSS1, CSS1h, or AE60 is furnished for tack material, it shall be diluted with an equal quantity of water conforming to Section 803, shall be thoroughly mixed prior to application, and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before the asphalt mixture is placed. The application rate shall be 0.8 pound (0.1 gallon) per square yard of the diluted SS1, SS1h, CSS1, CSS1h, or AE60.
- D. Where asphalt paving is placed against vertical surfaces such as curbs, gutters, manhole frames, valve boxes, etc., the vertical face shall be tack coated in order to seal the surface. Where these surfaces are inaccessible to pressure distributor, the tack coat may be brushed or broomed into place. The tack coat shall not be allowed to spill over onto any horizontal surface outside the area to be paved.
- E. Unless otherwise indicated on the Drawings or in these Specifications, the compacted thickness of the asphalt paving shall be a minimum of 1 inch and the minimum ambient temperature for mixing and laying temperatures shall be as follows:

Open Graded Friction Course	60°F
Asphalt Mixture (1-Inch Thick)	45°F
Asphalt Mixture (thicker than 1-inch)	40°F
Asphalt Mixture (Base and Binder)	35°F
Leveling and Wedging	45°F

- F. Trucks for hauling asphaltic mixtures shall have tight, clean, and smooth metal beds that have been sprayed with a minimum amount of soap emulsion, paraffin oil, or other approved material which is not detrimental to the mixture to prevent the mixture from adhering to the beds. All trucks shall be equipped with covers of sufficient size to completely cover the loaded material, and all covers shall be securely fastened in place before the truck leaves the plant. Truck beds shall be insulated, when necessary, to maintain the specified temperature to the point of delivery. Any truck causing excessive segregation of material by its spring suspension or other contributing factors, shall be discharged from the work, until such conditions are corrected.

- G. The CONTRACTOR shall have an accurate thermometer on the job at all times for verifying all temperature requirements and for taking temperature measurements whenever requested by the ENGINEER or OWNER. The CONTRACTOR shall closely control temperature and compaction requirements in order to achieve quality asphalt paving and related work.
- H. Asphalt paving which fails as the result of not meeting the requirements of these Specifications shall be removed and replaced as directed by the ENGINEER at the CONTRACTOR'S expense.
- I. Where manhole frames, valve boxes, drainage grates, etc., are located within the area to receive asphalt paving replacement, those facilities shall be adjusted to final pavement grade prior to the placement of the asphalt surface. Where the facilities to be adjusted are the property of the OWNER, the CONTRACTOR shall adjust the facilities with the cost included in the CONTRACTOR'S bid for asphalt replacement. Where the facilities to be adjusted are the property of other utility companies, i.e., gas, water, electric, telephone, the CONTRACTOR shall notify each utility company of the schedule for repaving of the particular area to allow those companies sufficient time to adjust their facilities prior to beginning the repaving process.
- J. Where pavement striping is destroyed or damaged, it shall be replaced per the requirements stated herein. The cost of all striping, unless stated otherwise in these specifications, shall be included in the price bid for pavement replacement.
- K. Damaged or destroyed traffic control loops shall be replaced per the requirements of the traffic control operator with the cost incorporated into the CONTRACTOR'S bid for pavement replacement.

### 3.02 PAVING OF NEW STREETS, ROADS AND PARKING AREAS

- A. The placement of asphalt paving for new streets, roads and parking areas shall meet the requirements of KTCSSRBC - Section 403.

### 3.03 FULL WIDTH PAVING OF EXISTING STREETS, ROADS AND PARKING AREAS

- A. Where the entire width of the existing asphalt paved street damaged by construction is to be resurfaced, the existing pavement shall be cleaned and tack coated, and asphalt paving shall be hot applied as previously described in Article 3.02 herein.
- B. The preparation of the base shall include removal of unstable material from the disturbed areas, removal of excess crushed rock from the trench to same level as the existing asphalt pavement and addition of compacted crushed rock (DGA) to the trench or where needed. No cutting of edges of existing paving will be required.
- C. The ENGINEER will determine if and where leveling courses are required before application of surface courses. The leveling course shall be hot applied and rolled similarly to the surface course.
- D. The surface course shall be 2 inches thick applied to the entire width of the street, unless otherwise directed by the ENGINEER. The surface course shall be feathered



out to a thickness of 1 inch at the front of existing gutters. The point where feathering shall begin and the amount of feathering shall be controlled by the ENGINEER. Where there are no gutters, feathering of edges will not be done unless otherwise directed by the ENGINEER in order to conform to existing features, such as driveways.

- E. Payment for the surface course shall be by the linear feet of full width pavement replaced.
- F. No extra payment will be allowed for tack coat, removal of unstable material, compacted dense graded aggregate (DGA) used to replace unstable material, removal of excess crushed rock from the trench to the grade of existing pavement, and cleaning of the surface.

3.04 TRENCH WIDTH REPAVING - CITY AND COUNTY STREETS, ROADS AND PARKING AREAS

- A. The cut edges of the existing paving surface shall be trimmed a depth of at least 2 inches to straight lines for uniform appearance and clean surface at joints. The area between the cut edges of the paving shall be removed to a depth of 2 inches (minimum) or to the bottom of the existing paving. All unstable material in the trench shall be removed and replaced with compacted dense graded aggregate and dense graded aggregate added as needed to bring the base surface to the bottom of existing paving or 2 inches below the existing surface, whichever is the lower. Dense graded aggregate required for stabilizing the subgrade will be paid for as an extra, but no extra payment will be allowed for removal of unstable back-fill.
- B. The paving subgrade shall be compacted under the wheel of a roller, until there is no observed settlement of the subgrade.
- C. The sides of existing pavement shall be covered with a tack coat and asphalt paving shall be hot applied as previously described. Final surface shall be finished to 1/4-inch above existing paving surface at edges and crowned to 1/2-inch above existing surface at the center.
- D. Payment for asphalt repaving shall be per linear foot of pipeline covered to any width the CONTRACTOR shall find necessary to remove plus width of cut back to secure clean straight edges, and shall include excavation to subgrade, preparation of subgrade, cleaning edges of existing paving, tack coat, and all operations and materials planned and specified for this type of repaving. The CONTRACTOR shall maintain such repaving up to grade of existing street surface until final completion and acceptance of work under his Contract. During the guarantee period of one year, the CONTRACTOR will be responsible for defective materials or workmanship, and natural settlement.
- E. In case additional asphalt paving is to be added due to settlement, the surface which has experienced settlement shall be cut out, additional dense graded aggregate added if necessary, tack coat applied to the existing sides of existing pavement, and the paving in the settled area(s) replaced. Additional payment will not be allowed for the repair work required.

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3.05 TRENCH WIDTH REPAVING - STATE MAINTAINED STREETS AND HIGHWAYS

- A. Streets, roads and highways maintained by the Kentucky Transportation Cabinet Department of Highways shall be repaved in accordance with details shown on the attached Department of Highways Drawing No. TD 99-13, latest revision.
- B. Concrete base slab shall be cleaned and tack coated, and asphalt paving shall be hot applied as previously described.
- C. Payment for replacement of asphalt paving on state maintained streets and roads, where concrete base slab and asphalt surface are required, shall be per foot of pipeline covered, and shall include excavation, crushed rock or flowable fill backfill, base courses, concrete base slab, tack coat, and asphalt surfacing. Widths, depths, and other details and methods of application shall be as shown on drawing and as required by the Kentucky Transportation Cabinet Department of Highways.
- D. The CONTRACTOR shall maintain the surface of all state highways and state maintained streets to grade during the entire guarantee period of the Contract.

3.06 CROSSWALK MARKINGS

- A. Crosswalk marking shall meet the requirements Section 3B.18 of the Manual of Uniform Traffic Control Devices (MUTCD).

**END OF SECTION**

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**SECTION 02510  
CONCRETE PAVING**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to construct concrete sidewalks, and concrete curbs and gutters as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK

- A. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- B. Crushed stone bases, if required, are as specified in Section 02235.
- C. Concrete drainage structures are specified in Section 03301.
- D. Castings are specified in Section 05540.

1.03 SUBMITTALS

- A. Prebid submittals, if required, are specified in the Special Conditions.
- B. Shop drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER.

**PART 2 PRODUCTS**

2.01 CONCRETE MATERIALS

- A. Concrete and related materials are specified in Section 03301.

**PART 3 EXECUTION**

3.01 CONCRETE ROADWAY PAVING

- A. Concrete surface paving shall meet the requirements of Section 501 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.
- B. Concrete base paving shall meet the requirements of Section 502 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.

3.02 CONCRETE CURBS AND GUTTERS

- A. Cast in place curbs and gutters and pre-cast curbs and gutters shall be as specified in Section 713 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.

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- B. Concrete lip curbs and integral curbs shall be as specified in Section 714 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.

### 3.03 CONCRETE SIDEWALKS AND STEPS

#### A. New Construction

1. Concrete sidewalks and steps shall be dimensioned and reinforced as shown on the Drawings.
2. Sidewalks and steps shall be constructed on a prepared, compacted, smooth subgrade of uniform density formed by trenching or filling to the required elevation. Large boulders and ledge rock found in the subgrade shall be removed to a minimum depth of 6 inches below the subgrade elevation and the space shall be backfilled with suitable material which shall be thoroughly compacted by rolling or tamping. A 3-inch thick course of No. 9 coarse aggregate shall be placed on prepared subgrade prior to placing concrete walks. The CONTRACTOR shall furnish a template and shall check the finished subgrade prior to depositing concrete. The subgrade shall be moistened immediately prior to placement of concrete. Sidewalks may be placed by use of side forms or by use of an acceptable slip-form method.
3. All exposed edges and corners for sidewalks and steps shall be rounded to a 1/4-inch radius.
4. The surfaces of sidewalks shall be divided into rectangular areas by means of a jointer having a radius of 1/4-inch and forming a groove no less than 1 inch in depth for the full width of the walk, or the joints may be sawed if acceptable to the ENGINEER. The length of the rectangles formed shall not exceed the width of the sidewalk being constructed, unless otherwise directed.
5. The CONTRACTOR shall install 1/2-inch premolded expansion joints, specified in Section 03300, extending entirely through the sidewalk at intervals not to exceed 40 feet, unless the sidewalk is constructed integral with the curb, in which case the width of joints and spacing shall conform to that in the curb, or as otherwise directed. The edges of the sidewalk at all expansion joints shall be rounded with an acceptable edging tool to a 1/4-inch radius. One-half inch premolded expansion joint material shall be installed to the full depth of the sidewalk where the walk abuts any rigid structure or fixture such as curbs, columns, castings, buildings, light standard, etc.

#### B. Replacement Construction

1. Replacement construction shall be the same as required above for new construction except as hereinafter set forth.
2. Sidewalks shall be replaced to the same width, grade and thickness (3-1/2 inches minimum) as the original sidewalk, unless otherwise directed by the ENGINEER. In replacing concrete walks against edge of

existing walks, the existing edges shall be sawed to straight edges and thoroughly cleaned. The new and existing walks shall be separated by 1/2-inch premolded expansion joint material cemented to the existing walk.

3. Concrete curb and gutter shall be protected by the CONTRACTOR and shall not be removed except in the event of solid rock excavation and/or conflict with existing utilities. Grass strips between sidewalks and curbs shall be sodded in accordance with Section 02930 of these Specifications.
4. For unit price contracts, sidewalk replacement, including reinforcing and forms, will be paid for by the linear foot measured along the centerline of pipe so covered. The unit price bid shall include excavation to subgrade; preparation of subgrade; required base course, if any, as shown on the Drawings; expansion joints; marking and reseeding of grass strips when required; and replacing concrete to any width which the CONTRACTOR should find necessary to remove.
5. At the unit price bid for sidewalk replacement for unit price contracts, the CONTRACTOR will not be required to replace greater than 4 foot width, 4 inches thick. However, where a 4 foot or less width walk is cut longitudinally, the whole walk shall be replaced. If replacement over 4 foot width is required, the unit price per linear foot shall be increased, the increased width's proportion to 4 feet.

**END OF SECTION**

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**SECTION 02700**  
**SEWER AND DRAIN PIPE**

**PART 1 GENERAL**

1.01 SUMMARY

- A. All pipe and accessories supplied for use on this project shall be as specified herein.
- B. All pipe supplied for this Project shall be of the pipe material called for on the Drawings.

1.02 RELATED WORK

- A. For cover pipe and boring and/or jacking see Section 02326.

1.03 REFERENCES

- A. Where referenced specifications (ASTM, AWWA, etc.), are mentioned, these standards are deemed to be the minimum standard of quality of materials or methods to apply to this project.

1.04 SUBMITTALS

- A. Copies of the manufacturer's directions for handling and installing the particular pipe supplied and accepted by the ENGINEER shall be furnished to the ENGINEER at the first delivery of pipe to the project in numbers that will permit the ENGINEER to retain three copies.
- B. The manufacturer's instructions shall be strictly followed unless a conflict exists between the manufacturer's instructions and those contained herein. In such cases, the ENGINEER shall determine which methods are to be followed and no pipe shall be installed until the CONTRACTOR has received written instruction from the ENGINEER as to which procedure to follow.

1.05 QUALITY ASSURANCE

- A. Where pipe enters manholes, the pipe manufacturer shall certify that their pipe is compatible with the watertight, flexible seal to be used at manhole openings as specified in Section 03480 of these Specifications, and that their combined use will produce a flexible watertight installation.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. All pipe, fittings and jointing materials shall be of one manufacturer unless different types are shown on the Drawings or otherwise accepted by the ENGINEER.

## 2.02 MATERIALS - SEWER AND DRAIN PIPE

### A. Sewer Transition Joints

1. Where sewer pipes of different materials are to be joined, i.e., VC pipe to DI pipe, VC pipe to PVC pipe, or some other combination, an adapter made for this purpose shall be used. The adapter shall be made of polyurethane or polyvinyl chloride with stainless steel clamps and shall be equal to Can-Tex C-T Adapter, Can-Tex Industries, Cannelton, Indiana; or Fernco Adapter by Fernco Joint Sealer Company, Ferndale, Michigan.

### B. PVC (Polyvinyl-Chloride) Sewer Pipe

#### 1. Pipe

- a. PVC pipe 4-inch through 15-inch diameter supplied for use on this project shall be Type PSM Polyvinyl Chloride (PVC) Sewer Pipe as specified per ASTM D 3034. PVC pipe 18-inch through 27-inch diameter shall be as specified in ASTM F 679.
- b. The pipe shall be made of PVC plastic having a cell classification of 12454 as defined in ASTM D 1784. Compounds having different cell classifications due to one or more properties being superior to those of the specified compound are acceptable. Clean rework material, generated from the pipe manufacturer's pipe or fittings production may be used by the same manufacturer provided the reworked products meets the requirements stated herein.
- c. The pipe shall be homogeneous throughout, free of cracks, holes, foreign inclusions or other injurious defects. The pipe shall be uniform in color, wall thickness, density and other physical properties. The maximum laying length for all PVC pipe supplied shall be  $13.0 \pm$  feet. Wall thickness shall be SDR-35 per ASTM D 3034 or ASTM F 679. Marking and identification of pipe shall be per ASTM D 3034 or ASTM F 679 as applicable.
- d. The maximum laying length for all PVC pipe supplied shall be  $13.0 \pm$  feet.
- e. PVC pipe for use on interior piping shall meet the general specification for exterior piping with the socket dimensions conforming to Table 4 of ASTM D 3034.

#### 2. Fittings

- a. PVC fittings supplied for use on this project shall meet all the physical and quality requirements as hereinbefore specified for PVC pipe.
- b. Where 90° bends are used, they shall be the long radius type.

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- c. PVC fittings for 4-inch through 15-inch diameter pipe shall meet the dimensional requirements of the tables as shown in ASTM D 3034 except that saddle type wyes or tee branches shall not be allowed for use on new sewer mains. Where 90° bends are used, they shall be the long radius type. PVC fittings for 15-inch through 27-inch diameter pipe shall conform to the requirements of ASTM F 679.

3. Joints - Exterior Piping

- a. Joints for PVC pipe and fittings for sewer mains and exterior plant gravity sewers shall be of the "Push-On Type" composed of an elastomeric ring gasket compressed in the annular space between a bell end or socket and spigot end of the pipe.
- b. All surfaces of the bell, socket or spigot end of the pipe against which the ring gasket may bear shall be smooth, free of cracks or other imperfections that could adversely affect the sealing capacity of the joint.
- c. Lubricant for use in assembling joints shall be supplied with the pipe or be of the specific manufacturer as recommended by the pipe manufacturer for use with the specific pipe supplied. The lubricant shall not cause deterioration of either the elastomeric ring gasket or pipe material.
- d. Where PVC pipe and fittings are connected to piping of other materials, the manufacturer's standard adapters or transition pieces shall be used. Should manufacturer not produce an adapter for a specific pipe of other material, the adapters or transition fittings as specified in this section of these Specifications shall be used.

4. Joints - Interior Piping

- a. Joints for PVC pipe and fittings for interior piping systems shall be the solvent weld type.
- b. The solvent cement for use with PVC pipe and fittings shall be as specified in ASTM D 2564. The cement shall be provided with the pipe by the pipe manufacturer or be of a specific brand as recommended by the manufacturer of the pipe unless otherwise accepted by the ENGINEER.

C. Polyethylene (PE) Sewer Pipe

1. Pipe

- a. Polyethylene pipe shall be manufactured from virgin polyethylene resins conforming to Type III, Class C, Category 5, Grade P34 polyethylene as defined in ASTM D 1248. Minimum cell



classifications of the polyethylene material shall be 335433C as referenced in ASTM D 3350.

- b. For determination of minimum wall thickness, the maximum allowable deflection is 5 percent, with the pipe installed in accordance with these Specifications. Calculations shall be based on backfill material of 130 pound per cubic foot, H-20 live load plus 50 percent impact and no internal pressure. The live load and impact may be disregarded for trenches with 8 feet or more cover. Hydrostatic loading shall be considered when the pipe is to be installed below permanent water table. The pipe manufacturer shall furnish calculations to verify the pipe wall thickness for these various conditions for the ENGINEER'S review before the materials are sent to the job site.
- c. No cracks, holes, foreign materials, blisters or other deleterious faults are permitted in the polyethylene pipe. It shall be homogeneous throughout including the heat fused joint. Polyethylene pipe will not be installed containing gouges or cuts that penetrate more than 10 percent of the wall thickness.
- d. Each length of polyethylene pipe shall be marked containing the manufacturer's name, pipe size and other data, as required by ASTM D 3350 to enable an accurate tracing of the raw material source.

2. Fittings

- a. Polyethylene fittings for use on this project shall be fabricated from the same materials as specified herein for the pipe. Fittings shall meet the same quality standards as stated herein for the pipe and shall be from the same manufacturer as the pipe unless otherwise accepted by the ENGINEER.
- b. Branch fittings for lateral pipes shall be made using wye or tee branches. Sidewall fused connections using pipe manufacturer's recommended procedures are also acceptable. Saddle type branches for use on new polyethylene sewer lines will not be allowed.

3. Joints

- a. Polyethylene pipe shall be joined by the heat fusion process. The pipe and joint (butt or sidewall fusion) shall be leakproof and all fusion must be performed by personnel trained by the pipe supplier or otherwise equally qualified person, as determined by the ENGINEER.
- b. The fusion equipment shall have hydraulic controls and gauges for monitoring the fusion pressures and temperatures. The equipment shall have a motor powered facing unit to trim the irregularities of

the pipe ends and an electrically or gas-fired heated and thermostatically controlled heater plate capable of producing fusion temperatures as recommended by the pipe manufacturer for the particular polyethylene extrusion used on the project.

- c. Threaded or solvent weld joints and connections are not permitted. The manufacturer's standard adapters shall be used to connect polyethylene pipe to other types of non-pressure pipe.
- d. Where joints must be made in the ditch, and conditions are such that use of the fusion machine is impossible, a stainless steel coupling may be used, if accepted by the ENGINEER.
- e. Where pipe enters manholes, the pipe manufacturer shall certify that their pipe is compatible with the watertight, flexible seal to be used at manhole openings and that their combined use will produce a flexible watertight installation.

D. Ductile Iron Sewer Pipe

1. Pipe

- a. This specification covers 4 to 64-inch ductile iron gravity sewer pipe designated "DI" on the Drawings. Pipe furnished under this Specification shall comply with all provisions of ANSI/ASTM A 746. Maximum design thickness shall be based on depth of cover, trench loadings and other conditions per ANSI/AWWA C150/A21.50.
- b. Metal Design Strength psi (Minimum)

Tensile Strength	60,000
Yield Strength	42,000
Percent Elongation	10
- c. The net weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, the year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or stamped on the pipe.

2. Fittings

- a. Fittings for ductile iron sewer pipe shall be mechanical joint or rubber ring slip joint fittings.
- b. Ductile iron mechanical and rubber ring slip fittings shall conform to ANSI/AWWA C110/A21.10 for gray iron and ductile iron fittings. Mechanical joints and rubber slip ring joints shall also conform in all respects to ANSI/AWWA C111/A21.11 and ANSI/AWWA C 153.

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- c. All fittings shall be manufactured for the size and pressure class of the pipeline in which they are to be used. All fittings shall be furnished complete with all joint accessories.

3. Joints

a. General

- (1) Pipe joints shall be mechanical joint, rubber ring slip joint or restrained joint as shown on the Drawings.
- (2) All items used for jointing pipe shall be furnished with the pipe. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Copies of the instructions shall be delivered to the ENGINEER at start of construction in sufficient numbers that will permit the ENGINEER to retain 3 copies.

b. Mechanical Joints

- (1) Mechanical joints are to be furnished according to ANSI/AWWA C111/A21.11-95. All pipe joints must be furnished complete with all accessories. Mechanical joint bolts and nuts shall be of alloy cast iron or alloy steel (Corten type such as U.S. Alloy) or equal. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 70 to 75 durometer.

c. Rubber Ring Slip Joint (Push On)

- (1) Rubber ring slip joint shall be equal to ANSI/AWWA C111/A21.11-95. The joints shall be of the following materials and assembled in the sequence outlined below:
  - (a) Rubber ring gasket compressed in groove in bell of pipe.
  - (b) Beveled spigot end of pipe for initial centering into rubber gasket in bell.

d. Restrained Joints

- (1) For Pipe
  - (a) Restrained joint for push-on type bell with rubber O-ring shall meet the applicable requirements of ANSI/AWWA C111/A21.11. The bell/spigot configuration for the restrained joint shall be such that restraint shall be provided for the joint based on a sustained pressure equal to the pressure class of the pipe without separation.

- (b) The restrained joint shall allow the same deflection as standard push-on joint pipe.
- (c) Where field welding is required for restrained field cut pipe, the welder shall be properly instructed in the methods and materials for use on ductile iron pipe by the manufacturer, on site.

(2) For Fittings

- (a) Where restrained joint fittings are called for, the bell configuration for the fitting shall be the same as for the pipe.
- (b) Where fittings with restrained joint bell configurations are not available, restraint materials for use with mechanical joint bell configurations shall be as follows:
  - (i) Connect mechanical joint bell assemblies with stainless steel, all thread rods.
  - (ii) Install restraint glands on each side of the fitting. The restraining glands shall be "Meg-A-Lug," as manufactured by EBAA Iron sales, Inc. of Eastland, Texas; "Grip Ring," as manufactured by Romac Industries, Inc. of Seattle, Washington; or equal.

4. Coating and Linings

- a. All ductile iron pipe and fittings for gravity sewer service shall be bituminous coated outside in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- b. All ductile iron pipe and fittings for gravity sewer service shall be cement-mortar lined with seal coat in accordance with ANSI/AWWA C104/A21.4.

E. Reinforced Concrete Drain Pipe

1. Pipe

- a. Reinforced concrete drain pipe shall comply with ASTM Designation C 76. Pipe shall conform to standard strength classification, Classes II, III, IV and V for wall "B" design per ASTM C 76. The coarse aggregate shall be crushed limestone only. The pipe shall be bell and spigot configuration.
- b. The basis for acceptance of the reinforced concrete pipe for use on this Project shall be as stated in ASTM C 76, paragraph 5.1.2.

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- c. Pipe dimensions, wall thickness, variations of dimensions, finish, repairs, rejection and marking shall be per paragraphs 11 through 13 and tables 1 through 5 of ASTM C 76.
2. Fittings
- a. Tee branches shall be furnished with the connection or connections of the size or sizes specified, securely and completely fastened in the process of the manufacture to the barrel of the pipes. Tee branches shall have their axis perpendicular to the longitudinal axis of the pipe. All branches shall terminate in sockets and the barrel of the branch shall be of sufficient length to permit making a proper joint where connecting pie is inserted in the branch socket.
3. Joints
- a. The material used for sealing the joints of reinforced concrete pipe shall be asphalt mastic compound meeting the requirements of Section 807.02.04 of the Kentucky Transportation Cabinet Department of Highways Specifications for Road and Bridge Construction. The sealing material shall be a smooth, uniform mixture of asphalt cement, solvent and mineral filler. The mineral filler shall consist essentially of cellulose fiber. The compound shall be applied by trowel or caulking gun without pulling or drawing and shall not sag or flow when applied to the surface.
  - b. The compound shall be capable of withstanding freezing and shall not exhibit a tendency to separate or deteriorate while in storage. When cured, the compound shall set to a tough, plastic coating without shrinking, cracking or loosening from the surface.
  - c. In addition, the material shall comply with the test conditions and requirements of the following table:

TABLE 1.01

	<u>Min.</u>	<u>Max.</u>
Grease Cone Penetration (ASTM D 217, Unworked, 150 gm, 77°F, 5 Sec.) 0.10mm	175	250
Weight per Gallons, Lbs.	9.75	-
Non-Volatile (10 gm, 221°F - 230°F, 24 hrs.), percent	75	-
Ash (by ignition), percent	25	45

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- d. The CONTRACTOR shall submit sufficient copies of literature of the sealing material proposed for use for the ENGINEER'S review and acceptance to permit the ENGINEER to retain 3 copies.

## 2.03 SOURCE QUALITY CONTROL

### A. PVC Polyvinyl-Chloride Sewer Pipe

1. Pipe shall be tested and inspected at the factory and inspected at the job site. Testing shall be accomplished in conformance with the following ASTM specifications utilizing the test methods specified therein:

Dimensions	ASTM D 3034 or ASTM F 679 and D 2122
Extrusion Quality	ASTM D 2152
Pipe Stiffness (5%)	ASTM D 2412
Impact Resistance	ASTM D 2444

2. In addition, a typical joint assembly, both gasket type joint and solvent weld joint, shall be tested by a qualified independent laboratory per test requirements of ASTM D 3212. The manufacturer shall submit through the CONTRACTOR sufficient copies of certification and test results for each lot of material represented by shipment to the job site that will permit the ENGINEER to retain 3 copies.

### B. Polyethylene (PE) Sewer Pipe

1. All polyethylene pipe and materials shall be tested by the manufacturer of the pipe using the following referenced ASTM methods and procedures:

Density	ASTM D 1505
Flow Rate	ASTM D 1238
Flexural Modules	ASTM D 790
Tensile Strength	ASTM D 638
Stress Crack Resistance	ASTM D 1693
Hydrostatic Design Basis	ASTM D 2837
Thermal Stability	ASTM D 3350
Carbon Black Content	ASTM D 1603

2. Results of tests on the raw materials and the polyethylene pipe shall be furnished along with catalogs and other descriptive literature, in sufficient copies for the ENGINEER'S review before the materials are sent to the job site that will permit the ENGINEER to retain 3 copies.
3. Polyethylene pipe and fittings may be rejected for failure to meet any of the requirements of this specification.

### C. Ductile Iron Pipe (Mechanical Joint and Rubber Slip Joint Type)

1. Hydrostatic and physical acceptance tests shall be in accordance with ANSI/AWWA Specification C151/A21.51-81 for ductile iron pipe

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centrifugally cast in metal molds or sand lined molds for water or other liquids.

2. The ENGINEER shall be provided with sufficient copies of each of the tests for each Contract to permit the ENGINEER to retain 3 copies.
3. All items used for jointing pipe shall be tested before shipment.

### **PART 3 EXECUTION**

#### **3.01 TRENCH EXCAVATION - SEWER AND DRAIN PIPE**

##### **A. General**

1. All excavation shall be open trenches, except where the Drawings call for tunneling, boring or jacking under structures, railroads, sidewalks, roads or highways.

##### **B. Trees and Shrubs**

1. Trenching shall include all clearing and grubbing, including all weeds, briars, trees and stumps encountered in the trenching, regardless of size. The CONTRACTOR shall dispose of any such material by burning, burial or hauling away or as noted on the Drawings, at no extra cost to the OWNER. Ornamental shrubs, hedges and small trees (3 inches in diameter or less) shall be removed, protected and replanted, at no extra cost to the OWNER.
2. Where pipelines run through wooded terrain, cutting of trees within limits of maximum permissible trench widths, as set forth in this article, will be permitted. However, cutting of additional trees on sides of trench to accommodate operating of trenching machine will not be permitted. The CONTRACTOR shall obtain specific permission of the OWNER before cutting any tree larger than 4 inches in diameter.

##### **C. Highways, Streets and Railroads**

1. Trenching also includes such items as railroad, street, road, sidewalk, pipe, small creek crossings, cutting, moving or repairing damage to fences, poles or gates and other surface structures, regardless of whether shown on the Drawings.
2. The CONTRACTOR shall so coordinate his work as to produce a minimum of interference with normal traffic on highways and streets. He may, with the approval of the governing agency, close a street to traffic for such length of time considered necessary, provided persons occupying property abutting the street have an alternate route of access to the property which is suitable for their needs during the time of closure. It shall be the responsibility of the CONTRACTOR to give 24 hours advance notice to fire and police departments and to occupants of a street which will be closed, in a manner approved by the governing body.

3. Where located within city streets and/or roads, the opening of more than 200 feet of trench ahead of pipe laying and more than 100 feet of open ditch left behind pipe laying, before backfilling, will not be permitted, except upon written consent of the OWNER. Where located outside roadway or parking areas, longer distances for opening and closure may be allowed provided the longer distance does not affect the safety of the general public. No trench shall be left open or work stopped on same for a considerable length of time. In case of objectionable delay trench shall be refilled according to backfill specifications.
4. Construction equipment will not be approved for use where treads are injurious to paving encountered. Curbs, sidewalks, and other structures shall be protected by the CONTRACTOR from damage by his construction equipment.
5. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before, and such restoration and repair shall be done without extra charge, except as set forth under the applicable provisions of the General Conditions.
6. Where trenching is cut through paving which does not crumble on the edges, trench edge shall be cut to at least 2 inches deep to straight and neat edges, before excavation is started, and care taken to preserve the edge to facilitate neat repaving.
7. The CONTRACTOR shall maintain road crossings in a passable condition for traffic until the final acceptance of the work, being paid only by unit price for crushed rock used, within limitations as hereinafter specified.
8. Railroad company and Department of Highways requirements in regard to trenching, tunneling, boring and jacking shall take precedence over the foregoing general specifications and the following tunneling and boring or jacking specifications, where they are involved. Where work is within railroad right-of-way, Railroad Protective Insurance shall be carried by the CONTRACTOR in the amounts required by the Railroad Company.
9. The insurance policy shall name the railroad as the insured and the original policy shall be delivered to the railroad after submitting same to the OWNER for review. The cost of flagmen required by the railroad and/or highway departments shall be paid by the CONTRACTOR.

D. Existing Utilities

1. The CONTRACTOR shall determine, as far as possible in advance, the location of all existing sewer, culvert, drain, water, electric, telephone conduits, gas pipes, and other subsurface structures and avoid disturbing same in opening his trenches. In case of sewer, water and gas services and other facilities easily damaged by machine trenching, same shall be



uncovered without damage ahead of trenching machine and left intact or removed without permanent damage ahead of trenching and restored immediately after machine has passed, without extra cost to the OWNER. The CONTRACTOR shall protect such existing facilities, including power and telephone poles and guy wires, against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of his backfill. It shall be the responsibility of the CONTRACTOR to inform the customers of utilities of disruption of any utility service as soon as it is known that it has been or will be cut off.

2. Where there is the possibility of damage to existing utility lines by trenching machine, the CONTRACTOR shall make hand search excavation ahead of machine trenching, to uncover same, at no extra cost to the OWNER. Hand trenching is required, at no extra payment, where undue damage would be caused to existing structures and utilities by machine trenching.
3. The work of uncovering and backfilling required for locating existing sewers, water lines and other existing facilities for connection of improvements or avoidance in location of proposed pipeline, where such uncovering and backfilling is not within trench for improvements, shall be paid for at a price per cubic yard for such excavation actually removed and backfilled under item for "Search or Extra Depth Trench Excavation." Such payment does not include uncovering existing utility lines for their protection during or after trenching operations for the proposed pipeline.

#### E. Pipelines in Same Trench

1. Pipelines, force mains, and sewers laid in same trench shall, in all cases, be bedded on original earth, crushed stone, or other specified bedding materials, regardless of divergence in their elevations, unless otherwise specified. They shall never be laid in unsupported backfill or one above the other. The CONTRACTOR shall receive applicable unit prices for each pipeline, force main, and sewer so laid, the same as if laid in widely separated trenches.

#### F. Location of Proposed Pipelines

1. The location of pipelines and their appurtenances, as shown on the Drawings, are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. Also, development of property traversed may require location changes. In such cases, the OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by the application of the unit prices bid to the quantities actually involved. The OWNER is under no obligation to locate pipelines so they can be excavated by machine.

G. Construction Stake-out

1. The ENGINEER will provide geometric base data for the CONTRACTOR'S use in locating sewers and facilities in the design location. The locations for vertical control (benchmarks) are shown on the Drawings with elevation and description duly noted. Each manhole, pumping station wetwell, or other notable sewage system component shall have the coordinates shown at the individual location or listed with the General Notes of the Drawings. It shall be the CONTRACTOR'S responsibility to locate the new facilities in their intended position using survey grade GPS survey equipment. It should also be the CONTRACTOR'S responsibility to provide offset hubs at each manhole or such reference points as may be required to maintain the location of each new installation.
2. Where the CONTRACTOR elects to use grades (batter) boards for sewer construction, offset line and grade stakes shall be set and cut sheets prepared before trenching work is started. All stake-out work and cut sheet preparation shall be accomplished by the CONTRACTOR, the ENGINEER being responsible for review and checking the finished cut sheets. The CONTRACTOR shall provide all material, equipment, and labor for all stake-out work. Cut sheets, where required, shall be prepared on forms supplied by the ENGINEER (HKB Form RPR-4).
3. The cut sheets shall contain the following minimum information:
  - a. Manhole stations
  - b. Grade between manholes
  - c. Centerline and offset stations
  - d. Amount and direction of offset
  - e. Centerline elevation
  - f. Centerline cut
  - g. Offset elevation
  - h. Offset cut
  - i. Average trench depth
  - j. Utilities information and depths and/or any other pertinent information.
4. Where the CONTRACTOR elects to use grade (batter) boards for sewer construction, offset hubs shall be set perpendicular to each 25 foot centerline station. Where laser beam equipment is to be used, the offset line shall be as required for the specific type of laser equipment used. In either case, the CONTRACTOR shall be required to maintain at least the offsets at manholes until the sewer main has been constructed. The CON-

TRACTOR shall also, in either case, be required to obtain the original ground elevation along centerline, at each 25 foot station, for the purpose of calculation of the average trench depth.

5. Grades shown on the Drawings or as revised in the field are invert of pipe and NOT trench subgrade. The centerline cuts on the cut sheets shall have this calculation made, original ground surface to invert of sewer pipe, which is the depth which shall be used for calculation of the average depth of trench and backfill.

#### H. Trench Requirements

1. All trenches must be dug neatly to lines and grades as shown on the Drawings, as established in the field and/or as established on the cut sheets. Trenches shall be of sufficient width to properly assemble or bolt joints.
2. Trenching shall be completed between one grade control point and the next in advance of the laying of pipe, where pipes, culverts, or other structures may be encountered whose grade cannot reasonably be determined ahead of trenching. Should the CONTRACTOR lay pipe closer to the opening of trench ahead, he shall bear cost of any removal and relaying which may be required to avoid location conflict.
3. The extra cost of trenching in difficult locations, such as stream, railroad or highway crossing, if not covered by other Contract unit prices, shall be included in the unit price for furnishing, laying, trenching and backfilling.
4. Where grade (batter) boards are used to establish finish grade, they shall be set by the CONTRACTOR, with at least 3 boards set at all times where installation is in progress. These will be set each 25 feet or less and will be set perpendicular to and spanning the centerline of the trench, such that the grade string is in the vertical plane of the pipe flow line. Grade boards shall be supported by stakes driven firmly on each side of the trench, unless otherwise acceptable to the ENGINEER. Where laser beam equipment is used, the setup shall be per the laser manufacturer's instructions and/or the permission of the ENGINEER.
5. Grades shown on the Drawings and/or profiles, cut sheets and offset stakes are the elevations of the invert of the pipe in all cases and excavation in open trench or tunnel must be made of sufficient depth to take care of required bedding of pipe and bells below these lines.
6. No additional compensation will be allowed for the extra depth trenching so required below invert.
7. Where bottoms of trench for 6-inch through 16-inch size pipe are in or on solid rock or where concrete cradle or arch is to be used, trenches or tunnels shall be dug to a depth of at least 6 inches below bottom of barrel of pipe. Where in earth, they shall be dug to at least 4 inches below bottoms of pipe barrels and bells.

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8. In pipe sizes 18-inch through 72-inch, the trench shall be dug to a depth of  $\frac{1}{4}$  of the outside diameter of the pipe below the bottom of the pipe barrel in earth or solid rock subgrade, with a maximum of 9 inches, and a minimum of 6 inches. This requirement shall also apply where concrete arch or cradle is used to protect the pipe.
9. When trench or tunnel is dug below required grade, the pipe must be brought to grade by filling with crushed rock for pipe bedding as specified in this Section 02700 of these Specifications, at the CONTRACTOR'S expense. Fill for pipe support shall not be made with material excavated from trench.

I. Excavation Unclassified

1. Excavation for pipelines shall be unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S unit price bid for furnishing, trenching, laying and backfilling the pipe.
2. Excavation for structures such as manholes, pump stations, and vaults is likewise unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S lump sum or unit price bid, as the case may be.
3. Solid rock is defined as materials of one-third cubic yard or more in one location (in a native state or concrete) that rings under the hammer which cannot be removed economically without the use of explosives. Paving removal is excluded; also shale rock.
4. In the event the ENGINEER finds it necessary to specifically order mechanical removal of solid rock, it will be measured by the cubic yard for such materials actually removed limited in depth to required depths of bedding below outside of pipe barrel and in width to the following dimensions:

TABLE 3.01

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For 6" Pipe 2'-6"	For 15" Pipe 2'-10"	For 27" Pipe 4'-0"
For 8" Pipe 2'-9"	For 16" Pipe 2'-11"	For 30" Pipe 4'-4"
For 10" Pipe 2'-9"	For 18" Pipe 3'-2"	For 33" Pipe 4'-7"
For 12" Pipe 2'-9"	For 20" Pipe 3'-5"	For 36" Pipe 5'-6"
For 14" Pipe 2'-9"	For 21" Pipe 3'-6"	For 42" Pipe 6'-0"
	For 24" Pipe 3'-8"	For 48" Pipe 6'-6"
		For 54" Pipe 7'-0"

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5. Mechanical removal of solid rock is defined as solid rock in its native state which is ordered to be fractured and broken up for removal by hand tools and/or hand held power or pneumatic tools to provide protection of utilities, structures, etc. which might otherwise be subject to damage by conventional drilling and shooting or heavy excavating equipment.
6. Payment for mechanical removal will not be authorized for solid rock excavation which is accomplished by drilling and shooting or by crawler or wheel mounted excavators, trenching machine, and similar equipment.

J. Dewatering of Trenches

1. Dewatering of trenches shall be considered a part of trenching, at no extra cost to the OWNER. Dewatering of trenches shall include ground-water and storm or sanitary sewage. Suitable pumping and other dewatering equipment is to be provided by the CONTRACTOR, to insure the installation of the pipeline structure in a dewatered trench and under the proper conditions. Dewatering shall include all practical means available for prevention of surface runoff into trenches and scouring against newly laid pipe.
2. Piles of excavated materials shall be trenched or temporarily piped to prevent, as far as practical, blockage of drainage ditches and gutters, and water carriage of excavated materials over street and highway surfaces.
3. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the ENGINEER may order stabilization by various means. Exclusive of dewatering normally required for construction and instability caused by neglect of the CONTRACTOR, it shall be paid for at unit prices set up in the Contract, such as extra excavation, crushed rock for pipe bedding, concrete cradle or piling.

### 3.02 LAYING SEWER PIPE

#### A. General

##### 1. Checking of Pipe

- a. The selection of pipe strength class shall be based on earth weight of 130 pounds per cubic foot and a safety factor of 1.50.
- b. All pipe and fittings must be tested for uniform diameter, straightness and defects by the CONTRACTOR before being lowered into trench, and rejected pipe marked in a way not to impair its value. Rejected pipe must be separated from accepted pipe and removed from the project. The ENGINEER will make periodic observations of pipe in storage and/or incorporated into the work. Pipe found defective, not meeting Specifications, or improperly installed shall be rejected and replaced.

##### 2. Alignment and Grade

- a. All pipe, after being inspected and accepted, shall be laid to correspond with lines and grades staked out by the CONTRACTOR. All sewer lines shall be laid to constant grades between invert elevations shown on the Drawings. Grades shown on the Drawings are invert of pipe and NOT trench subgrade. The pipe lengths shall be fitted together and matched, so that they will form a sewer with a smooth and uniform invert, visible as a full circle from manhole to manhole, except in special cases where curved sewer lines are planned.

##### 3. Unstable Subgrade

- a. In wet, yielding, and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. If crushed rock fill is necessary, it will be paid for per ton of such material used, except in cases where instability is caused by neglect of the CONTRACTOR.

##### 4. Control of Quantities Laid

- a. Laying of pipe may be held up by the ENGINEER until trench has progressed far enough ahead to remove the possibility of having to change grade or alignment on account of other structures, pipelines or conduits.
- b. Unless permitted or directed, not less than 100 feet of pipe shall be laid at one operation except for the following reasons:
  - (1) Street and railroad crossings.

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- (2) Wet caving trenches.
- (3) Business houses or institutions damaged by prolonged disconnection from street.
- (4) Less than 100 feet distance between manholes or pipe control sections.

5. Bedding of Pipe

- a. Six inch through 16 inch pipe shall be laid with bottom quadrant of barrel and bells of pipe bedded in at least 4-inch depth of crushed stone when on earth subgrade and in at least 6-inch depth of crushed stone, below the bottom of the barrel of pipe when on solid rock subgrade. Stone for bedding of 6 inch through 16-inch pipe shall be Kentucky Department of Highways Size 9 crushed rock as specified in Section 02235 of these Specifications, spaded into place. It shall be included in price for furnishing and laying pipe. Payment for the extra stone required for bedding pipe in solid rock for 6-inch through 16-inch pipe shall be included in the price bid for solid rock excavation in the case of classified excavation and in the price bid for trenching and backfilling in the case of unclassified excavation.
- b. In case of pipe sizes 18-inch through 72-inch in both earth and solid rock trench, the subgrade shall be shaped to provide for a crushed stone pad, Kentucky Department of Highways Size 9, for a depth under the pipe barrel at least 1/4 the outside diameter of the pipe, with a minimum of 6-inch depth and a maximum of 9-inch depth. The bedding material shall be thoroughly spaded into place, in order to give a uniform bearing for at least the bottom quadrant of the pipe. Payment for such bedding shall be included in the price paid for trenching and backfilling or laying, even when in or on solid rock.
- c. For PVC or polyethylene pipe, alternate bedding materials will be allowed with permission of the ENGINEER. In order to qualify for use with sewer pipes of these compositions, the bedding material must be of the type of material delineated as Class IA embedment materials per Table 1 of ASTM D 2321, namely, coral, slag, cinders, crushed stone or crushed shells. The alternate bedding materials must also be of the same gradation of the crushed stone previously specified, namely, Kentucky Department of Highways Size 9. The crushed stone previously specified shall be used for all other piping materials.
- d. No filling of trench with earth to bring pipe to grade will be permitted. If trenches are dug too deep, they must be brought to grade and supported by crushed rock for pipe bedding (No. 9) as specified in Section 02235 of these Specifications at the

CONTRACTOR'S expense. No pipe shall be laid in the trench until the subgrade is inspected and found correct.

6. Laying of Pipe (Mains)

- a. Laying crew foreman shall direct subgrade preparation and plumbing and leveling invert of pipe to grade and line, the pipe layer following his directions in placing the pipe. The pipe layer will be responsible for pipe bedding, cleaning joint, proper placement of joint annular ring or gasket, tight jointing and homing pipe, securing pipe against settlement or other movement, and inspecting and swabbing out any jointing material from inside of pipe.
- b. No joints will be accepted that show leakage and, after backfilling and inspection, any joints are found that are allowing groundwater to enter the sewer must be excavated and repaired.
- c. Plugs in branch fittings to future building sewers shall be protected from excavators by the method as shown on the Drawings for protecting the ends of laterals and shall be so constructed and joined in bell of pipe that they will be watertight, yet removable without breaking the bell or coupling when removed.

7. Laying of Branch Pipes and Laterals

- a. Branch pipes shall be laid to serve the abutting property at points to be designated by the ENGINEER. Such pipes shall be connected to sewer main through tees or Y-branches of size of running sewer barrel and 6-inch side opening, with 6-inch 30 degree or 45 degree bends. Branch fittings in sewer and the connected bend, shall be supported from bottom of trench per standard details shown on Drawings.
- b. At locations where the sewer is within street or road rights-of-way, house lateral pipes shall be laid to the property line or right-of-way line.
- c. At locations where the sewer is within easement obtained by the OWNER, house lateral pipes shall be laid to the permanent easement line.
- d. Branch tees or wyes for house laterals will be located during construction, regardless of where shown on the Drawings. House lateral location shall be at the convenience of the property owner or as directed by the OWNER and/or ENGINEER.
- e. The end openings of house laterals shall be plugged with appropriate watertight plugs of permanent materials in the bell of



the sewer lateral, removable without breakage of the pipe bell. Dead ends of sewers shall be plugged similarly.

- f. Under normal conditions, where elevations are not critical, branch service sewers to customers shall be laid on not less than .01 foot per foot of length grade. Where elevations are critical, minimum grade shall be .005 foot per foot laid with batter boards or laser, same as specified for street sewers.
  - g. In the case of deep sewers, branch pipes may be brought up to a depth of approximately 5 feet below ground level with suitable bends and sewer pipe. These pipes shall be laid on a slant outside sewer trench, so they will be supported on original earth and not dragged down and cracked by backfill settlement.
  - h. In case of deep sewers in rock or narrow places, branch pipes shall be of cast iron soil pipe installed vertically per standard details of Drawings, with branch fittings in sewer main encased in Class 2,500 concrete. Payment for such concrete and forms above wye or tee branch shall be at the price bid per encasement.
  - i. All lateral sewers and branch pipes installed on this Contract shall have a detectable mylar tape placed in the backfill over and running with the lateral sewer. The tape shall be readily detectable employing the same type metal locators as used for the location of metal pipelines. The tape shall be bright orange in color and have the words, "Caution, Sewer Line Below" printed on it. The tape shall be installed as shown on the standard details of the Drawings.
  - j. The tape shall be Type II, Detectable Mylar Marking Tape as manufactured by Line Guard, Inc. or equal. The cost of purchase and placement of the marking tape shall be included in the CONTRACTOR'S unit price bid for the lateral pipe and fittings.
8. Piping Connections at Structures
- a. Lines
    - (1) Pipes shall be laid free from all structures other than manholes. Any pipe entering structures underground unsupported by original earth shall be supported by Class 2500 concrete, brick and mortar masonry, or Class 4000 concrete beams and columns as shown on detailed Drawings.
    - (2) Pipe shall be connected to manholes by fabricated manhole entry seals, specified in Section 03480 of these Specifications.

- (3) Pipe stubbed out of manholes for future connections shall be plugged and tightly sealed with same jointing material used to plug laterals.
- 9. Installing Sewer Pipe in Cover Pipe
  - a. The installation of sewer pipe inside steel cover pipe is detailed in Section 02326 of these Specifications.
- 10. Protection of Pipe in Trench
  - a. No walking upon the completed pipelines will be permitted until trench has been backfilled to a depth of at least 6 inches over the top of the pipe. The interior of the pipe shall, as the work progresses, be cleaned of all dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a suitable plug fitted into the pipe bell, so as to exclude earth and other material, precautions being taken to prevent flotation of pipe by runoff into trench.
- 11. Observation of Pipeline
  - a. No backfilling (except for securing pipe in place) over pipe will be allowed until the ENGINEER has had an opportunity to observe the joints, alignment and grade, in the section laid, but such observation shall not relieve the CONTRACTOR of further liability in case of defects occurring during or after placement of backfill.

B. Laying Sewer Pipe

- 1. PVC Pipe
  - a. PVC sewer pipe laying shall comply with the requirements of ASTM D 2321 and the additional requirements of these Specifications and standard details of the Contract Drawings.
  - b. Article 3.02.A of this Section 02700 shall apply to the installation of PVC sewer pipe. The pipe shall be bedded true to line and grade with uniform and continuous support from a firm base. The bedding material shall conform to that specified in Article 3.02.A of this Section 02700.
  - c. All PVC sewer pipe shall be installed in a manner to limit deflection of the pipe to 5 percent. A deflection test shall be performed on all flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5 percent. If the deflection test is to be conducted using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

- d. When laser equipment is being used for laying PVC sewer pipe, the CONTRACTOR shall provide adequate ventilation through the pipe to prevent distortion of the beams.

2. Polyethylene (PE) Sewer Pipe

- a. PE sewer pipe laying shall comply with the requirements of these Specifications and standard details of the Contract Drawings.
- b. Article 3.02.A of this Section 02700 shall apply to the installation of PE sewer pipe. The pipe shall be bedded true to line and grade with uniform and continuous support from a firm base. The bedding material shall conform to that specified in Article 3.02.A of this Section 02700.
- c. All PE sewer pipe shall be installed in a manner to limit deflection of the pipe to 5 percent. A deflection test shall be performed on all flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5 percent. If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.
- d. When laser equipment is being used for laying PE sewer pipe, the CONTRACTOR shall provide adequate ventilation through the pipe to prevent distortion of the beams.
- e. One additional step in the installation of PE sewer pipe is required as the result of the fusion of the long lengths of pipe on the trench bank which produces a continuous pipeline without an open end where the invert elevation can be confirmed. Thus, it shall be necessary for the CONTRACTOR to carefully check the subgrade for the PE pipe, both for elevation and firmness at 5 foot intervals before installing the pipe in the trench.
- f. Because of the high coefficient of expansion of polyethylene, this pipe shall not be sealed into manholes or walls of other structures until at least 48 hours have elapsed after backfilling the pipe to allow adequate time for the pipe temperature to stabilize.

3. Ductile Iron Sewer Pipe

- a. Ductile iron sewers shall be laid in compliance with the requirements of these Specifications and standard details of Contract Drawings. Restrictions on depth of cover shall follow ANSI/AWWA C150/A21.50 requirements in Section 02610 for the various classes of ductile iron pipe. Joints shall be made with mechanical, restrained or rubber ring slip joint, according to the manufacturer's specifications and with tools recommended by them. A copy of the manufacturer's instructions shall be available

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- at the site of work at all times when pipe is being laid. Joints shall be thoroughly cleaned and dry before pipes are laid in place.
- b. Cutting of pipe may be done using methods as the CONTRACTOR may elect, but the CONTRACTOR will be held responsible for breakage or damage caused by careless cutting or handling.
  - c. No pipe shall be laid resting on rock, blocking or other unyielding objects, except where laid above ground on piers or in permanent tunnels. Exact lines and grades will be required on exposed pipelines placed on piers. Attachment of pipe to piers shall be as shown on the Standard Detail Drawings.
  - d. In permanent tunnels pipe shall be laid with bells resting on tunnel liner or on blocks just behind bells. After pipe has been adjusted to proper line and grade, a bedding of Class 2500 concrete shall be poured under pipe to support the entire bottom quadrant. Payment for such bedding shall be included in the unit price for tunnel liner.

### 3.03 LAYING DRAIN PIPE

#### A. General

1. All general requirements hereinbefore stated pertaining to the installation of sewer pipe Article 3.02 of this Section 02700 shall also apply to the installation of drain pipe and storm sewers. Exceptions to these general requirements are as follows:
  - a. Article 3.02.A.7, pertaining to branch pipes and laterals.
  - b. Article 3.02.A.8, pertaining to connection of pipe to manholes or structures - the fabricated boot for connection of sewer pipe to manholes will not be required for connection of drain pipe to manholes or other drainage structures.

#### B. Reinforced Concrete Drain Pipe

1. Installation of reinforced concrete drain pipe shall be per the previously stated instructions for installation of large diameter ductile iron or PVC sewer pipe, except that joints shall be sealed with mastic joint compound. Where reinforced concrete drain pipe is to be installed in an embankment area with "negative projection" trench condition, class of pipe, bedding and reinforcement shall be as shown on the Drawings.
2. Prior to applying the mastic joint compound, the complete surfaces of the bell and spigot shall be cleaned and primed with a primer recommended by the manufacturer of the mastic joint compound or with an approved emulsified asphalt. The mastic material shall then be applied to the bottom half of the bell and top half of the spigot ends of the pipes to be joined in such volume that when the joints are pulled tight, the joint

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compound will be extruded from the joint on both the inside and outside of the pipe. The excess material shall then be wiped or scraped away to provide a smooth, flush joint.

### 3.04 TRENCH BACKFILL - SEWER AND DRAIN PIPE

#### A. General

1. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the CONTRACTOR. It shall be the responsibility of the CONTRACTOR to obtain location or permits for its disposal. Unit prices for furnishing and laying pipe, which includes trench excavation, tunneling, and backfill, shall include the cost of disposition of excess excavated materials, as set forth herein, with no additional compensation being allowed for hauling.
2. No extra charge shall be made for backfilling of any kind, except as herein specified. Backfilling shall be included as a part of the price for furnishing, laying, trenching, and backfilling. No extra charge shall be made for supplying outside materials for backfill except where fills above existing ground are necessary and payment is designated on the Drawings or in the Specifications. If backfilling of the trench or surface restoration is not properly completed, a proportionate part of the unit price for furnishing, laying, trenching, and backfilling shall be retained from payment estimates.
3. Railroad company and Department of Highways requirements in regard to backfilling will take precedence over the above general Specifications where they are involved.
4. Mechanical tamping, where required by the ENGINEER in locations other than those specifically designated herein, shall be paid for per unit price bid for mechanical tamping.
5. Before completion of the Contract, all backfills shall be reshaped, holes filled, surplus materials hauled away, all permanent walks, street, driveways, highway paving replaced, and all sodding, seeding, and planting work performed.

#### B. Haunching

1. Upon completion of bedding and laying the sewer or drain pipe, the CONTRACTOR shall place crushed rock, Kentucky Department of Highways Size 9 dependent on size of pipe, or the same material used for pipe bedding on both sides simultaneously to the top of the pipe. This material shall be hand placed using shovel or other satisfactory tool to work the haunching material completely under the bottom quadrant and around the sides of the pipe to assure the maintenance of alignment of the pipe. No compaction of this material is required other than that obtained by the workmen walking on the material during placement.

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2. The haunching material is required for all sewer or drain pipe installed in open trenches except where concrete pipe arch is required, in which case the haunching material is required to the bottom of the arch. Where concrete cradle is required, the haunching material shall be placed from top of cradle to top of pipe.
3. The cost of furnishing and placement of the haunching material shall be included in the CONTRACTOR'S bid for furnishing and laying the pipe.

C. Initial Backfill

1. Upon completion of the haunching material to the top of the pipe, initial backfill shall be placed as hereby specified. This material shall serve as protection for the top of pipe reducing the possibility of damage to the pipe during the placement of backfill for the remainder of the trench depth.
2. When sewer or drain pipe is located outside traffic areas, the initial backfill material shall be crushed rock (Kentucky Department of Highways No. 9) placed above the pipe to the level hereinafter stated.
3. When the sewer or drain pipe is located within traffic areas, the initial backfill shall be crushed rock, or the material used for bedding and haunching the pipe, of the same gradation of the pipe bedding material. Other alternate materials may be used only with the specific written permission of the ENGINEER when the work is located inside traffic areas.
4. In the case of steel, cast iron, ductile iron pipe the initial backfill shall be hand placed to a point 6 inches above the barrel of the pipe. In case of plastic pipe, the initial backfill shall be hand placed and evenly spread to a point 12 inches above the pipe barrel for up to 4 feet cover, to a point 18 inches above the barrel for 4 feet to 10 feet cover, and 24 inches for over 10 feet cover.
5. The initial backfill material is required over sewer and drain pipe in all open trenches. The cost of the initial backfill material and placement of same shall be included in the CONTRACTOR'S bid for furnishing, laying, trenching and backfilling.

D. Final Backfill

1. Outside Traffic Areas
  - a. After the above specified initial backfill is hand placed, rock may be used in machine placed backfill in pieces no larger than 8 inches in any dimension and to an extent not greater than one-half the volume of the backfill materials required to backfill trench. Larger rock fill will be allowed in wide trenches where side slopes are low enough to prevent rock from dropping over pipe-line. If additional earth is required, it must be obtained and placed by the CONTRACTOR. Filling with rock and earth shall proceed

simultaneously, in order that all voids or pockets, created by rock backfill, may be filled with earth. Machine backfilling may be employed with tamping, except as hereinafter restricted, provided caution is used in quantity per dump and in uniformity of level of backfilling. Backfill material must be uniformly ridged over trench, and excess hauled away, with no excavated rock over 1/2-inch diameter or pockets of crushed rock or gravel in top 12 inches of backfill, the top 12 inches reserved for topsoil or material more suited to sustain surface growth. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth, and its height shall not be in excess of that required to provide for settlement of backfill.

2. Inside Traffic Areas

- a. Where sewer and drain pipe is located in street, highway, railroad, sidewalk and driveway crossings or within any roadway paving, or about manholes, valve and meter boxes located in such paving, fill trench to within 6 inches of the surface with Kentucky Department of Highways No. 9 crushed stone, or other gradation acceptable to the ENGINEER. In order to accommodate compacted temporary surfacing it may be necessary to bulkhead or otherwise confine the stone fill at the open end of the trench.

E. Cleanup and Temporary Surfacing

1. General

- a. Immediately following the placement of final backfill, all rock and debris, including crushed rock or gravel from construction operations, shall be removed from yards and fields. Streets, drives and walks shall be broomed to remove all earth and loose rock. The cleaning of streets, drives, and walks shall be of such extent to hold dust to a minimum. Loose earth and rock shall in no case be swept or washed into storm sewers or drains as a method of removal, all such material being loaded and hauled away from the site.
- b. If acceptable cleanup operations are not completed within an acceptable period of time after the completion of final backfilling, a proportionate part of the price bid for trenching and backfilling shall be retained from partial payment estimates until acceptable cleanup is completed.

2. Temporary Surface Cover - Unpaved Areas

- a. Upon completion of acceptable cleanup work, the ground surface shall be prepared for temporary seed, permanent seed or sod per the requirements of Section 02930 of these Specifications.

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3. Temporary Surface Replacement - Paved Areas

- a. Temporary surfacing of street, highway, railroad, sidewalk and driveway crossings, or within any roadway paving, or about manholes, valve and meter boxes located in such paving, shall consist of 6 inches compacted dense graded aggregate as specified under Section 02235 for temporary walkway or road surfacing, placed and compacted in the trench. Compaction shall be accomplished by methods which shall be sufficient to confine stone to the trench under normal traffic. Backfills shall be maintained easily passable to traffic at original paving level until acceptance of project or replacement of paving or sidewalks. The amount of crushed stone placed shall be paid for at the unit price per ton as shown in Section 02700 herein, titled "BASIS OF PAYMENT." No payment will be made for crushed rock surfacing required as a result of unnecessarily wide trenches, omission of sheeting and shoring, or damage by the CONTRACTOR'S equipment, or for maintenance of surface level.
- b. After the initial placement of the 6-inch depth of temporary surfacing, the CONTRACTOR shall be required to maintain the temporary surfacing to street or road surface level at no additional cost to the OWNER. This requirement shall continue until the replacement of permanent surfacing.

3.05 FIELD QUALITY CONTROL - TESTING SEWERS FOR LEAKS, INFILTRATION, AND DEFLECTION

A. Sewers

1. General

- a. All sewers constructed under this Contract shall be tested for leaks and infiltration using methods as hereinafter specified.
- b. The cost of all testing of sewer lines and manholes shall be included in the unit price bid for pipe and manholes. The CONTRACTOR shall furnish all materials, equipment and labor required for all types of tests, the ENGINEER being responsible only for directions, recording data and calculating air losses and/or infiltration rates.

2. Sequence

a. Initial Testing

- (1) The first manhole to manhole section of sewer laid under this Contract, for each size of pipe and type of joint, shall be given a smoke test prior to the sewer being backfilled and while the sewer trench is dewatered to bottom of the pipe being tested.



- (2) Should, based on the results of the test of the first section of pipe laid, the materials being used and the CONTRACTOR'S installation procedures prove to be satisfactory, subsequent smoke testing may, at the discretion of the ENGINEER, be waived. Should, however, based on the results of the test of the first section of pipe laid, the material being used and/or the CONTRACTOR'S installation procedures prove to be unsatisfactory, subsequent smoke testing shall, at the discretion of the ENGINEER, be continued until such time that, in the opinion of the ENGINEER, problems with materials and/or installation procedures have been corrected.
- (3) Such subsequent testing shall likewise be done while trenches are dewatered to bottom of pipe to be tested and immediately after completion of either the public sewer lines or laterals, in not more than 2 sections between manholes at a time. All defective work, as so proven by the smoke test, shall be immediately repaired and retested until proven to be satisfactory.
- (4) Observation of pipe laying and smoke testing shall in no way relieve the CONTRACTOR of the responsibility of conducting the required low pressure air test, infiltration tests, or correcting poor workmanship.

b. Subsequent Testing

- (1) As soon as it is practicable after installing and backfilling sewers, and before putting new sewers into service, low pressure air tests shall be made from manhole to manhole, or up to a maximum of 500 feet of sewer main and 500 feet of sewer laterals at a time, as directed by the ENGINEER. The maximum allowance for air loss during testing shall be determined by tables of minimum holding time for a pressure drop of 1.0 psi and are based on an average loss of 0.0015 cubic feet of air per minute per square foot of internal pipe surface, when tested at an average pressure of 3.0 psi greater than the average back pressure of any groundwater present.
- (2) Upon completion of installation and backfilling of all sewers constructed under this Contract, the low pressure air test is required for all sewers so constructed.

c. Additional Testing

- (1) Upon completion of the required initial (smoke) testing and required subsequent (low pressure air) testing, and prior to placing the sewer into operation, if ground and/or surface water flow is observed in the completed sewer, the

ENGINEER may order infiltration tests be accomplished to determine whether the flow is within acceptable and allowable limits. This additional testing may be required even though the results of the initial smoke testing and subsequent low pressure air testing indicate the sewers are substantially watertight. The infiltration tests shall be conducted, on order of the ENGINEER, as hereinafter specified.

3. Equipment

a. Smoke Testing

- (1) The smoke testing blower shall have a capacity of at least 1,200 cfm.
- (2) The smoke bombs shall produce a chemical reaction generated, white to gray smoke, leaving no residue, and be nontoxic and nonexplosive. Each bomb shall be capable of producing 25,000 cubic feet of smoke per 3 minutes.

b. Low Pressure Air Testing

- (1) The air test equipment used shall meet the following minimum requirements:
  - (a) Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
  - (b) Pneumatic plugs shall resist internal test pressures without requiring internal bracing or blocking.
  - (c) All air used shall pass through a single control panel.
  - (d) Three individual hoses shall be used for the following connections:
    - (i) From control panel to pneumatic plugs for inflation.
    - (ii) From control panel to sealed line for introducing the low pressure air.
    - (iii) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

4. Procedures

a. Safety Precautions

- (1) The air test may be dangerous if a line is improperly prepared. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Inasmuch as a force of 25 lbs is exerted on an 8-inch plug by expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.
- (2) As a safety precaution, pressurizing equipment shall include a regulator set at 10 psi to avoid overpressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

b. Low Pressure Air Test

- (1) All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
- (2) Clean pipe to be tested by propelling snug fitting inflated rubber ball through the pipe with water.
- (3) Plug all pipe outlets with suitable test plugs. Brace each plug securely.
- (4) If the pipe to be tested is submerged in groundwater, insert a pipe probe by boring or jetting into the backfill material adjacent to the center of the pipe, and determine the pressure in the probe when the air passes slowly through it. This is the backpressure due to groundwater submergence over the end of the probe. All gauge pressures in the test shall be increased by this amount.
- (5) Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig.
- (6) After an internal pressure of 4.0 psig is obtained, allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
- (7) When pressure decreases to 3.5 psig, start stopwatch. Determine the time required for the internal air pressure to reach 2.5 psig. Minimum permissible pressure holding

times for runs of single pipe diameter and for systems of 4-inch, 6-inch, or 8-inch laterals in combination with trunklines are indicated in the following table based on air loss calculations per ASTM F-1417.

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) shown, min:s								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	7:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:42	10:08	11:24	
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:36	
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692 L	17:00	19:13	35:38	32:03	38:27	44:52	51:16	57:41	
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	35:30	88	17.306 L	28:51	43:16	57:41	72:07	81:32	100:57	115:22	129:48	
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	134:38	142:26	160:15	
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	

c. Infiltration Test

- (1) Before putting new sewer lines into service, weir test shall be made of flow of water in the sewers from manhole to manhole or up to a maximum of 3,000 foot sections at a time, as directed by the ENGINEER. These tests shall be made when, in the ENGINEER'S judgment, groundwater level is equal to the highest groundwater condition in a normal year.
- (2) The maximum allowance for all sewer pipe materials shall be 100 gallons per 24 hours per inch diameter per mile of sewer pipe and manholes.

d. Deflection Test

- (1) A deflection test shall be performed on all flexible sewer pipe. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5 percent. If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices. Pipe deflection shall be measured and recorded by the CONTRACTOR in the presence of the ENGINEER using appropriate methods approved by the pipe manufacturer and acceptable to the ENGINEER.

5. Repairs and Acceptance

- a. If the sewer fails to meet the requirements of the leakage and/or infiltration tests, the CONTRACTOR shall, at his own expense, determine the source of leakage and/or infiltration and make the necessary repairs or replacements.
- b. If any sewer fails to meet the requirements of the deflection test, the CONTRACTOR shall, at his own expense, replace all failed pipe as necessary to comply with the deflection requirements. All replacement pipe shall also be tested for deflection.
- c. On completion of sewer lines, all sewers and manholes will be inspected for foreign matter, including sand brought in by infiltration, and any such matter shall be removed before final acceptance of the lines. Any visible leakage at manholes or into lines shall be corrected regardless of the results of the required tests.

B. Drains and Storm Sewers

1. It is not the intent herein that drains and storm sewers shall be constructed watertight. If, however, groundwater flows are observed in the pipeline in fairly large quantities, the ENGINEER may require infiltration tests, as herein specified, to be completed in order to determine the amount of groundwater entering the completed pipeline. Should leakage result in a volume flow exceeding 500 gallons per inch diameter per mile of pipe per 24 hours, the CONTRACTOR shall be required to locate and repair leaks occurring in the system.
2. Culverts and cross drains shall be inspected visually for groundwater leakage.

3.06 BASIS OF PAYMENT

A. Excavation and Backfilling

1. Trenching and Backfilling

a. Unit Price Contracts

- (1) On unit price Contracts, payment for trenching and backfilling shall be included in the price bid for furnishing, laying, trenching and backfilling sewer and/or drain pipe.
- (2) Where sewer lines and/or drain pipes are installed in bores or tunnels, no payment will be made for separate trench and backfill unit price items for the length of pipe installed in the tunnel or bore.

- (3) Where pipe is installed on piers no payment will be made for separate trench and backfill unit price items for the length of pipe exposed and supported by piers.
- 2. Solid Rock Excavation
  - a. Unclassified Excavation
    - (1) Excavation shall be unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S unit price bid for each item of construction requiring excavation.
- 3. Search and Extra Depth Trench Excavation
  - a. "Search" trench excavation shall be the actual measured excavation within limits as acceptable to the ENGINEER.
  - b. "Extra Depth" trench excavation shall be the calculated yardage below the lowest point of excavation which would normally have been required for construction.
  - c. Trench width limitations for either condition shall be as listed in the following table:

For 6" Pipe 2'-6"	For 15" Pipe 2'-10"	For 27" Pipe 4'-0"
For 8" Pipe 2'-9"	For 16" Pipe 2'-11"	For 30" Pipe 4'-4"
For 10" Pipe 2'-9"	For 18" Pipe 3'-2"	For 33" Pipe 4'-9"
For 12" Pipe 2'-9"	For 20" Pipe 3'-5"	For 36" Pipe 5'-6"
For 14" Pipe 2'-9"	For 21" Pipe 3'-6"	For 42" Pipe 6'-0"
	For 24" Pipe 3'-8"	For 48" Pipe 6'-6"
		For 54" Pipe 7'-0"
  - d. Payment shall be by the cubic yard removed, including backfilling.
- 4. Mechanical Tamping
  - a. Mechanical tamping is defined as backfill placed and compacted by power driven mechanical equipment to a greater density than can be achieved by natural settlement or hand tamping methods. Mechanical tamping will be required when ordered by the ENGINEER with payment by the cubic yard so compacted. Measurement, but not actual extent of the mechanical tamping, shall be limited by the numerical maximum allowable trench width (for each size pipe) as shown in the table listed under "Search and

Extra Depth Trench." Payment for mechanical tamping shall not include the specified haunching or initial backfill required above and below the top of pipe.

5. Crushed Rock Trench Backfill

a. When crushed rock trench backfill is listed as a pay item on the Form of Proposal, payment for the crushed stone or accepted granular material will be made by the ton so placed limited to the following calculation:

(1) Maximum trench widths as shown in the following table:

For 6" Pipe 2'-6"	For 15" Pipe 2'-10"	For 27" Pipe 4'-0"
For 8" Pipe 2'-9"	For 16" Pipe 2'-11"	For 30" Pipe 4'-4"
For 10" Pipe 2'-9"	For 18" Pipe 3'-2"	For 33" Pipe 4'-9"
For 12" Pipe 2'-9"	For 20" Pipe 3'-5"	For 36" Pipe 5'-6"
For 14" Pipe 2'-9"	For 21" Pipe 3'-6"	For 42" Pipe 6'-0"
	For 24" Pipe 3'-8"	For 48" Pipe 6'-6"
		For 54" Pipe 7'-0"

(2) Additional backfill, excluding depth of cover less the previously specified initial backfill and less the top 6 inches of trench.

(3) Weight of crushed stone or approved granular material not to exceed 100 lbs/cu ft.

(4) Length limited to 1 foot beyond edge of traffic area.

b. When crushed rock trench backfill is NOT listed as a pay item on the Form of Proposal, the cost of same shall be incorporated in the CONTRACTOR'S bid for trenching and backfilling.

B. Tunneling, Boring or Jacking

1. Permanent Tunnels

a. The payment for permanent tunnels shall be the length measured along its centerline from the entrance face on one side to the exit face on the other side. Payment per linear foot for each size tunnel shall include excavation, tunnel liner, pressure grouting, tunnel subgrade, closure plates and backfilling, complete.

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2. Temporary Tunnels

- a. Payment for temporary tunnels shall be made per linear foot based on the measured distance along the centerline of tunnel from the inlet face on one side to the outlet face on the other. Payment shall include all excavation, backfilling and all sheeting and shoring of tunnel, regardless of whether removed.

3. Boring or Jacking

- a. In unit price Contracts, usable holes either bored or jacked shall be paid for per linear foot of hole actually bored or jacked, according to the diameter of the hole required, measured along the centerline from the point of entrance on one side to the point of exit on the other side. When cover pipe is installed inside the bore, boring or jacking and cover pipe shall be paid per linear foot based on the length of the cover pipe installed, according to the diameter of the cover pipe required.

C. Trench and Pipe Stabilization

1. Extra Excavation

- a. Extra excavation required for trench or pipe stabilization shall be paid by the cubic yard so excavated under the item "Search and/or Extra Depth Trench Excavation" based on the limitations for that item.

2. Crushed Stone for Trench Stabilization

- a. Crushed stone ordered by the ENGINEER for trench stabilization shall be paid by the ton so placed.

3. Crushed Stone for Pipe Bedding

- a. Additional crushed stone bedding ordered by the ENGINEER for pipe stabilization shall be paid by the ton so placed.

4. Plain or Reinforced Concrete Arch

- a. Plain or reinforced concrete arch called for on the Drawings and/or ordered by the ENGINEER shall be paid for by the linear foot of pipeline upon which it is placed. The Form of Proposal will indicate which method is to be used.

5. Plain or Reinforced Concrete Cradle

- a. Plain or reinforced concrete cradle called for on the Drawings and/or ordered by the ENGINEER shall be paid for by the linear foot so placed.



D. Sewer and Drain Pipe and Accessories

1. Unit Price Contracts

a. Sewer and Drain Pipe

- (1) Except where otherwise specified hereinafter, sewer and drain pipe laid shall include furnishing, laying, trenching and backfilling (all depths), and shall be paid for by the linear foot of sewer or drain line measured from center to center of manholes, transition in type of pipe, or junction fittings to ends of pipe. In case of transition of type of pipe at manhole, transition in pay will be at center of manhole.
- (2) Where sewer lines and/or drain pipes are installed in bores or tunnels, pipe shall be paid for by the linear foot of sewer and/or drain pipe furnished and installed, in permanent tunnel, tunnel liner, temporary tunnel, boring or jacking, and/or cover pipe.
- (3) Sewer lines and/or drain pipes installed on piers shall be paid for by the linear foot of sewer and drain pipe furnished and installed on piers.
- (4) In case of drainage structures other than manholes, measurement of pipe will end at the inside wall of the structure.

b. Sewer Laterals

- (1) Payment for sewer laterals, including furnishing, laying, trenching, and backfilling (all depths), shall be per linear foot measured from the branch fitting to end of pipe and shall include the cost of furnishing, laying, and plugging the end of the lateral and the required detectable mylar tape.
- (2) Laterals consisting of fittings only and in the case of connecting to existing sewers with not more than 6 feet of pipe, no furnishing, laying, trenching, and backfilling payment for sewer pipe will be included.

c. Sewer Branch Fittings

- (1) Wye or tee branches for sewer laterals will be paid per each unit installed.

d. Concrete Encasement of Wye or Tee Branches

- (1) At locations where a vertical stack is to be installed on the sewer lateral, the wye or tee branch shall be encased in concrete with payment for same made for each branch encased.

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2. Lump Sum Contracts

- a. All work shall be included in the CONTRACTOR'S lump sum bid.

E. Temporary Surface Replacement

1. The amount of crushed stone placed shall be paid for at the unit price per ton up to the maximum limits of 225 pounds per linear foot of trench over which it is placed for pipe sizes through 16 inches, 300 pounds per linear foot for pipe sizes 18 through 24 inches and 400 pounds per linear foot for sizes 27 inches through 48 inches. The ENGINEER shall have control of thickness and width to be placed and paid for, and may order changes in depth and width as conditions dictate. No payment will be made for crushed rock surfacing required as a result of unnecessarily wide trenches, omission of sheeting and shoring, or damage by the CONTRACTOR'S equipment, or for maintenance of surface level.

**END OF SECTION**

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**SECTION 02761**

**INTERNAL INSPECTION OF SEWER PIPE: CCTV  
(FROM LFUCG STANDARD SPECIFICATION, SECTION 26)**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. A closed circuit television (CCTV) survey is required for all newly installed sewer pipe, whether PVC, DIP, RCP, HDPE and/or any designated existing pipe. The television survey shall be performed by an experienced CCTV contractor approved by the LFUCG Division of Engineering.
- B. The CCTV inspections should be performed by the approved contractor a minimum of 30 days after any new pipe has been backfilled, unless otherwise approved by the ENGINEER.

**1.02 GENERAL**

- A. All lines designated and/or designed by the ENGINEER shall be internally inspected. The purpose of the inspection is to locate structural damage that may be present in the collection pipe.
- B. Any structural damage found in the pipe impairing the CCTV inspection, shall be documented and the Engineer should be notified immediately. The ENGINEER and OWNER will evaluate the damage and, if cost-effective, the ENGINEER will notify the CONTRACTOR in writing to proceed with cleaning or additional repairs. These repairs will be made at the unit prices shown on the CONTRACTOR'S Bid Proposal.
- C. The OWNER makes no guarantee that all of the sewers to be entered are clear for the passage of a camera. The methods used for securing passage of the camera are to be at the option of the CONTRACTOR, and the costs must be included in the bid price for television inspection. The cost of retrieving the television camera, under all circumstances, when it becomes lodged during inspection, shall be incidental to this portion of the work.

**PART 2 PRODUCTS**

**2.01 EQUIPMENT**

- A. The CCTV mainline inspection system television shall be one specifically designed and constructed for such inspection. The inspection system shall be able to perform pan/tilt or pan/rotate operations. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The system shall be operable in 100 percent humidity conditions. The camera, television monitor and other components of the CCTV system shall be capable of producing a minimum 500-line resolution video picture. Picture quality and definition shall be to the satisfaction of the ENGINEER and if unsatisfactory, equipment shall be removed and no payment made for unsatisfactory inspection.

### **PART 3 EXECUTION**

#### **3.01 RECOMMENDED METHOD FOR INTERNAL INSPECTION**

- A. After thoroughly cleaning the pipe, the camera shall be moved through the sewers in the downstream direction at a uniform rate not to exceed 30 feet/minute, stopping when necessary to insure proper documentation of the sewer's condition. Manual winches, power winches, TV cable and power rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions may be used to move the camera through the sewer line.
- B. If during the inspection operation, the television camera will not pass through the entire manhole section, the contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If the camera again fails to pass through the entire manhole section, the contractor shall notify the Engineer of the situation.

#### **3.02 INSPECTION LOGS AND CD/DVDS**

- A. All CD/DVDS, and logs shall be labeled with the CONTRACTOR'S name, contract number, DVD number (logs must match that number) and with each contractor the DVD/ logs must start at number 1 and progress upward till the end of this contract.
- B. A log approved by the ENGINEER shall be provided for all line inspections listing the watershed, line segment ID, line segment location, upstream manhole depth, downstream manhole depth, lateral connection distance and position, pipe diameter, pipe material, defects and defect ratings, also see notes above. Printed and digital records shall be kept by the CONTRACTOR and will clearly show the location of each infiltration point observed during inspection. In addition, other points of significance such as locations of service connections, unusual conditions, roots, storm sewer connections, damaged pipe, presence of scale and corrosion and other discernable features will be recorded and a copy of such records in both hard copy and digital format will be supplied to the Engineer. The digital records must be in a Microsoft Database format (.mdb file extension) or other format approved by the ENGINEER. A key to all observations used shall be included on each log sheet.
- C. The locations of all the defective areas to be repaired will be identified by logging the distance frame at each defect or point of interest measured from the center of the starting manhole to the plane of focus of the camera. The importance of accurate distance measurements is emphasized. Confirmation of measurement for location of defects shall be above ground by means of a meter device. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape or other suitable device, and the accuracy shall be satisfactory to the ENGINEER. Marking on the cable or the like, which would require interpolation for depth of manhole, will not be allowed.
- D. The purpose of DVD recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. DVD recording playback shall

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be at the same speed that it was recorded. DVDs shall be considered property of the OWNER and the CONTRACTOR shall possess backup copy of all DVDs until completion of the Contract. All CCTV work done must be recorded on DVD's using the software Visual Pipes, or other approved software. The CONTRACTOR shall supply the LFUCG a licensed (if applicable) copy of said software to view these DVD's.

### 3.03 FINAL ACCEPTANCE

- A. Acceptance of this portion of work shall be made upon the successful review of the DVD submitted to the LFUCG. If the DVDs are of such poor quality and/or the sewer line needs additional cleaning that the OWNER is unable to evaluate the condition of the sewer line or to locate service connections, the CONTRACTOR shall be required to re-televis and provide a suitable DVD of the line at no additional cost. If a suitable DVD cannot be provided of such quality that the OWNER can review it, no payment shall be made for additional cleaning and/or closed circuit television (CCTV). Also, no payment shall be made for portions of lines not televised or portions where manholes cannot be negotiated with the television camera.

### 3.04 BASIS OF PAYMENT

- A. Accepted quantities for Internal Inspection of Storm Sewer Pipe: CCTV will be paid for at the contract unit price as quoted per linear foot (which shall be full compensation for all Work required under this Section) and paid per foot satisfactorily inspected. All labor, cleaning, materials, equipment, and excavation shall be incidental to the Internal Inspection of Storm Sewer Pipe: CCTV.

**END OF SECTION**

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**SECTION 02930**  
**SODDING AND SEEDING**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to perform sodding and seeding as shown on the Contract Drawings and as specified herein.
- B. All areas disturbed by construction operations shall receive a protective cover of vegetation. The work shall consist of preparing the area for treatment, furnishing and placing soil amendments, fertilizer, sod, seed, inoculants, mulch and plantings as specified in the designated areas.

1.02 RELATED WORK

- A. Special requirements for materials and equipment are given in Sections 00700 (00710) and 01600.
- B. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.

1.03 QUALIFICATIONS

- A. The work shall be done by a provider who is experienced, reputable, and qualified in the tasks required.

1.04 SUBMITTALS

- A. Shop Drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER.
- B. Where fertilizer is furnished from bulk storage, the CONTRACTOR shall furnish a supplier's certification of analysis and weight. When required by the Contract, a representative sample of the fertilizer shall be furnished the OWNER for chemical analysis.

1.05 WARRANTY

- A. Refer to Division 0 and 1 for warranty requirements.

**PART 2 PRODUCTS**

2.01 SOD

- A. The sod to be used shall be KY 31 tall fescue, comparatively free from weeds or heavy root structure, cut in strips of 10 inches to 12 inches wide, 18 inches to 24 inches long, with a thickness of 1-1/2 inches to 2 inches.

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2.02 SEED

- A. All seed shall conform to the current rules and regulations of the state where it is being used and from the latest crop available. It shall meet or exceed the standards for purity and germination listed herein.
- B. Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures will be evidence of purity and germination. No seed will be accepted with a date of test of more than 9 months prior to the date of delivery to the site.
- C. The seed for use on this project shall be of the type as listed below with the listed germination and purity qualifications.

<u>Species</u>	<u>% Purity</u>	<u>% Germination</u>
Tall fescue (KY-31) ( <u>Festuca arundinacea</u> )	98.5	80
Ryegrass ( <u>Lolium multiflorum</u> )	98.0	90
Oats ( <u>Avena sativa</u> )	98.0	90
Rye, grain ( <u>Secale cereale</u> )	97.0	85
Redtop ( <u>Agrostis alba</u> )	90.0	80
Ky. Bluegrass ( <u>Poa pratensis</u> )	81.0	70

2.03 FERTILIZER

- A. Unless otherwise specified the fertilizer shall be a commercial grade fertilizer or as specified herein. The fertilizer shall meet the standard for grade and quality specified by state law.

2.04 INOCULANTS

- A. The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used, except when seed is applied by use of hydraulic seeder, in which case 4 times the amount of inoculant recommended by the manufacturer shall be used. Seed shall be sown within 24 hours of treatment and shall not remain in the hydraulic seeder longer than 4 hours.

2.05 SOIL AMENDMENTS

- A. Lime shall consist of standard ground agricultural limestone, or equal. Standard ground agricultural limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Agricultural lime or other needed soil amendments will be uniformly applied at the rate specified herein.

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## 2.06 ASPHALT EMULSION

- A. Asphalt emulsion shall conform to the requirements of ASTM D 977-80, "Emulsified Asphalt." The emulsified asphalt may be rapid, medium, or slow cure materials.

## 2.07 STRAW MULCH MATERIALS

- A. Straw mulch materials shall consist of wheat, oat, or rye straw, hay, grass clippings cut from any native grasses or other plants acceptable to the ENGINEER. The mulch material shall be air dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds will not be permitted. The CONTRACTOR shall provide a method satisfactory to the ENGINEER for determining weight of mulch furnished.

## 2.08 OTHER MULCH MATERIALS

- A. Mulching materials, such as wood cellulose fiber mulch, emulsion type, synthetic fiber mulch, netting, mesh, and other mulching materials that may be required for specialized locations and conditions, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

# PART 3 EXECUTION

## 3.01 EXTENT

### A. Lump Sum Contracts

#### 1. Sodding

- a. All sodded areas within the construction site steeper than 1 foot vertical to 4 feet horizontal, and berms less than 4 feet wide at all structures shall be sodded, unless otherwise shown on the Drawings or herein specified.

#### 2. Seeding

- a. Except for areas occupied by structures, roadways, walkways, and sodded areas specified above, the entire area disturbed by construction operations shall be seeded.

### B. Unit Price Contracts

#### 1. Sodding

- a. Where sod is destroyed in areas maintained equivalent to residence yards, it shall be replaced on slightly ridged backfill on trench, and where destroyed in areas adjacent to the trench, it shall be replaced by the CONTRACTOR with fresh sod. Sodding will be required only on those Contracts where specifically shown on



the Drawings or called for in the Specifications or Form of Proposal.

2. Seeding

- a. Where lawns, pastures, thin grass or cover crops are destroyed by trenching, laying, backfilling, or tunneling operations, surface shall be prepared by disking, fertilizing and seeding. Seeding, fertilizing, and mulching shall be included in the price for trenching and backfilling. The timing of this operation shall be controlled by the ENGINEER. Requirements of the Department of Highways for reseeded shall take precedence over these Specifications where they are involved.
- b. When the construction project is located on privately owned property on easements acquired by the OWNER and the individual landowner requires the cover grass to be the same as present at the beginning of construction, the CONTRACTOR shall supply the seed required by the landowner. Seeding and fertilizing in such instances, shall be at the rate as recommended by the seed producer with soil preparation and mulching as stated herein.
- c. When the construction project encroaches within the rights-of-way of the Department of Highways, the seed mixture, application rate and method of mulching shall be as required by the Department of Highways.

3. CONTRACTOR'S Options

- a. Where surface grasses and cover are similar in nature throughout the length of the project, the CONTRACTOR may provide seed of one type or mixture for the entire project provided there are no objections by individual landowners involved and with permission of the OWNER and ENGINEER. In such cases, the seed type and/or mixture shall be that specified for lawn areas. Pasture and/or cover crop mixtures shall not be used for lawn application for any reason.
- b. When construction facilities or construction operations are located on or encroach on privately owned properties, the CONTRACTOR may, at his election, negotiate with the individual landowners for restoration of the surface. This negotiation and settlement may be for materials or labor or both as agreeable to the individual property owner. In such cases, the CONTRACTOR shall obtain from the individual landowner a "Release of Claims" releasing the OWNER from any further liability for surface restoration, a copy of which shall be provided for the OWNER and ENGINEER. This option shall apply to surface restoration only. The CONTRACTOR shall be responsible for cleanup and regrading work and for any settlement of the trench or graded area within the one year guarantee period.

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### 3.02 SOIL PREPARATION

- A. All areas to be seeded or sodded shall be thoroughly cleaned, removing all debris of whatever nature. After the area has been cleaned, the soil for seeding and sodding shall be prepared as follows:
  - 1. Loosen the soil to a depth of not less than 4 inches.
  - 2. Work the soil until it is in good condition, raking with hand rake to complete the soil preparation and make final finished grade.
  - 3. Broadcast 15 pounds of 8-8-8 or better fertilizer on each 1,000 square feet of area (for sodded areas only).
  - 4. Rake area to receive sod, to spread fertilizer and work into soil.
  - 5. On areas to be seeded, the raking in of fertilizer may be done concurrently with raking in of seed as hereinafter specified.

### 3.03 SODDING

- A. The timing of resodding shall be controlled by the ENGINEER. Ground shall be prepared and fertilized as previously specified under Article 3.02 of this Specification Section. In small patches, supplying of 3 inches of topsoil and raking may be substituted for disking.
- B. The strips of sod are to be laid so the joints will be broken. After the sod has been laid, it is to be watered thoroughly then rolled with a roller weighing 300 to 400 pounds, supplemented by hand tamping of sections inaccessible by roller.
- C. After the sod has been put down, as described above, each piece is to have a minimum of 2 stakes to hold it in place, the stakes to be 1/2-inch square, 10 inches long, and driven into the ground with 2 inches of the stake left above the sod.
- D. Sod shall be kept moist by watering for at least one month or until the Contract is completed and the facilities accepted by the OWNER for operation.

### 3.04 SEEDING

- A. Temporary Cover (All Areas)
  - 1. This item shall consist of seeding a temporary cover of grass, or grass and small grain, on areas disturbed on the construction site which will not be redisturbed within a 60 day period. The determination of the area to be temporarily seeded and the time of seeding shall be controlled by the ENGINEER.
  - 2. The seed mixtures to be used for temporary cover will be governed by the time of year the seeding is accomplished. The mixtures and time of seeding shall be as follows:

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- a. Time of Seeding - 2/15 to 6/1
  - (1) Rye 1-1/2 bushels and ryegrass 25 pounds per acre; or tall fescue 30 pounds and ryegrass 20 pounds per acre.
- b. Time of Seeding - 6/2 to 8/15
  - (1) Tall fescue 30 pounds and ryegrass 20 pounds per acre; or, spring oats 2 bushels and ryegrass 30 pounds per acre.
- c. Time of Seeding - 8/16 to 2/14
  - (1) Rye 2 bushels and ryegrass 20 pounds per acre; or, tall fescue 30 pounds and ryegrass 20 pounds per acre.
- d. Lime will not be required for temporary seeding.
- e. Fertilize at the rate of 400 pounds per acre of 10-10-10 fertilizer, or equivalent, broadcast uniformly on the area to be seeded.
- f. All seed shall be broadcast evenly over the area to be seeded and cultipacked or otherwise pressed into the soil. Seed and fertilizer may be mixed together and applied after the seed bed has been prepared.
- g. Mulch for temporary seeding will not be required except on those areas, in the ENGINEER'S opinion, too steep to hold the seed without protective cover.

B. Seeding (Permanent Cover)

1. This item consists of seeding all areas disturbed during construction. All grading and/or filling of rills and gullies to a cross section acceptable to the ENGINEER shall be included in the seed bed preparation.
  - a. Pastures and Cover Crops
    - (1) All areas to be seeded shall be seeded with 50 pounds of tall fescue (KY-31) per acre, subject to the provisions hereinbefore stated in this Specification group.
    - (2) Prepare seed bed as specified in Article 3.02 of this Specification Section unless instructed otherwise by the ENGINEER. Apply 2 tons of lime per acre.
    - (3) No mulch will be required except when seeding is done during the period October 16 through January 31, or May 2 through July 31, tall fescue straw shall be used at the rate of 2 tons per acre.

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b. Lawns and Yards

- (1) This item consists of seeding all areas equivalent to residence lawns or yards disturbed during construction. All grading and filling shall be accomplished in a manner acceptable to the ENGINEER prior to the placement of seed and materials. Seed shall consist of a mixture of one part Red Top and 3 parts high grade Kentucky Bluegrass seed mixed together and broadcast at the rate of 2 lbs to each 1,000 square feet of surface, to be seeded. Apply 2 tons of lime per acre. Apply 1500 pounds of 10-20-20 fertilizer per acre. Apply mulch at the rate of 2 tons per acre. Mulch shall be applied to all lawn areas regardless of the time seeded.

3.05 MULCHING

- A. Mulch materials, meeting the requirements of Part 2 of this Specification Section, shall be applied at the rate of 2 tons per acre.
- B. The mulch shall be stabilized by running a "weighted" disk harrow with disks set straight, over the area on the contour, after the mulch has been applied, so as to imbed or press a part of the straw into the soil sufficiently to hold it in place. On earth embankments or areas too steep for use of mechanized equipment, the mulch shall be held in place by using small stakes and twine or other method acceptable to the ENGINEER. The blown-on bituminous-treated straw mulch method of placing the mulch, as specified in Section 212.06.03, Method 2 of the Standard Specifications for Road and Bridge Construction of the Kentucky Transportation Cabinet Department of Highways, will be an acceptable placing method.
- C. Mesh, netting or other special protective cover shall be at locations as shown on the Drawings and shall be installed according to the manufacturer's recommendations.

**END OF SECTION**

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**SECTION 03301**  
**CAST-IN PLACE CONCRETE**  
**(MINOR STRUCTURES)**

**PART 1 GENERAL**

1.01 SUMMARY

- A. This specification delineates the requirements for cast-in place concrete for minor structures including concrete kickers for pipe blocking, sidewalks, collars, manholes, manhole bottoms, pipe cradles, piers and other areas where small quantities of concrete are required. It shall not be used for major structures such as floor slabs, structure or basin walls, roof slabs, or other structural components.

1.02 SCOPE OF WORK

- A. Provide all labor, material, equipment and services to complete all cast-in-place concrete work required by the Project as shown on the Drawings or specified herein.

1.03 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	Specification for Steel, Welded Wire, Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
ASTM A 615/A615M	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 616/A616M	Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 617/A617M	Specification for Axle-Steel Deformed and Plain End Bars for Concrete Reinforcement
ASTM A 706/A706M	Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement
ASTM C 33	Specification for Concrete Aggregates
ASTM C 150	Specification for Portland Cement

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ASTM C 260 Specification for Air-Entraining Admixtures for Concrete

ASTM C 494 Specification for Chemical Admixtures for Concrete

#### 1.04 SUBMITTALS

- A. Copies of all materials required to establish compliance with these Specifications shall be submitted in accordance with the provisions of the General Conditions.

#### 1.05 QUALITY ASSURANCE

- A. All work shall be performed to secure for the entire job homogeneous concrete having required strength, durability and weathering resistance, without planes of weakness and other structural defects and free of pronounced honeycombs, air pockets, voids, projections, offsets of plane and other defacements on exposed surfaces.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver ready-mixed concrete to job site until ready for placement.
- B. All materials used for on-site mixed concrete shall be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer.
- C. Store concrete aggregates to prevent contamination or segregation. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting.
- D. Protect from contaminants such as grease, oil and dirt. Provide for accurate identification after bundles have been broken and tags removed.

#### 1.07 PROJECT/SITE CONDITIONS

##### A. Cold Weather

- 1. Provide and maintain 50 degrees Fahrenheit minimum concrete temperature. Do not place concrete when ambient temperature is below 40 degrees Fahrenheit. Cover concrete and provide with a source of heat sufficient to maintain 50 degrees Fahrenheit minimum while curing.

##### B. Hot Weather

- 1. Concrete temperature from initial mixing through final cure shall not exceed 90 degrees Fahrenheit. Cool ingredients before mixing, or substitute chip ice for part of required mixing water or use other suitable means to control concrete temperature to prevent rapid drying of newly placed concrete. Shade the fresh concrete and start curing as soon as the surface is sufficiently hard to permit curing without damage.

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## PART 2 PRODUCTS

### 2.01 CONCRETE

#### A. Mix Design

1. The concrete mix shall conform to the requirements of the following table according to the class of concrete required. The number in the "Class" column refers to the 28-day compressive strength of the concrete in pounds per square inch (psi).

Class	Minimum Cement Content (Lbs./Cu. Yd.)	*Maximum Slump (Inches)
3000	470	3 to 4
3500	520	3 to 4
4000	550	3 to 4

\* Maximum slump unless high range water reducing admixture is used.

#### B. Area of Application

1. Unless otherwise noted on the Drawings, concrete mixes shall be used as follows:

Class 3000 - kickers for pipe, fittings

Class 3500 - non-reinforced portions of manholes, pipe cradles

Class 4000 - reinforced portions of manholes, sidewalks, piers,  
miscellaneous structures

### 2.02 MATERIALS

#### A. Cement

1. Portland cement for concrete and mortar shall conform to ASTM C 150, Type I or II.

#### B. Water

1. Water shall be potable.

#### C. Aggregates

1. Aggregates shall conform to ASTM C 33. Obtain aggregates from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement.

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D. Admixtures

1. Admixtures for air-entrained concrete shall conform to ASTM C 260, for water reducing (Type A, D or E) accelerating (Type C) and retarding (Type B or D) ASTM C 494. Calcium chloride shall not be used as an admixture. Admixtures shall not be used without prior written approval of the ENGINEER.

E. Reinforcement

1. Reinforcing Bars

- a. Reinforcing bars shall conform to ASTM A 615/A615M Grade 60, ASTM A 616/A616M Grade 60, ASTM A 617/A617M Grade 60 or ASTM A 706/A706M Grade 60 as applicable.

2. Welded Wire Fabric

- a. Welded wire fabric shall conform to ASTM A 497 or ASTM A 185.

**PART 3 EXECUTION**

3.01 FORMS

- A. Forms shall be used to confine concrete and shape it to the required dimensions. Set forms true to line and grade and make mortar tight. Chamfer above grade exposed joints, edges and external corners 3/4-inch, unless otherwise indicated. Earth cuts may be used as forms for footing vertical surfaces, if sides are sharp and true, and not exposed in finished structure.

3.02 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

- A. Provide bars, wire fabric and other reinforcing materials, including wire ties, supports and other devices necessary to install and secure the reinforcement.

3.03 CONTROL AND CONSTRUCTION JOINTS

- A. For sidewalks, provide control joints spaced at an interval equal to the width of the sidewalk, the minimum spacing of 5 feet. Cut joints 1 inch deep with a jointing tool after the surface has been finished. Provide 0.5-inch thick transverse expansion joints at changes in direction, where sidewalk abuts curb, steps, rigid pavement or other similar structures; space joints not more than 40 feet apart. Limit variation in cross section to 1/4-inch in 5 feet.

3.04 CURING AND PROTECTION

- A. Protect concrete from injurious action by sun, wind, rain, flowing water or mechanical injury. Do not allow concrete to dry out from time of placement until the expiration of the curing period. Forms may be removed 48 hours after concrete placement.

**END OF SECTION**

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**SECTION 03302**

**PRECAST REINFORCED CONCRETE BOX CULVERT  
(from LFUCG Standard Specifications, Section 54)**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Work under this Section shall include all labor, excavation, materials, equipment, bedding, backfilling, and legally disposing of unneeded and unsatisfactory material at site obtained by the CONTRACTOR in accordance to the Lexington-Fayette Urban County Government Standard Drawings and all incidentals necessary to construct precast reinforced concrete box culvert (RCBC) to the sizes and types indicated. The work for this Section shall also conform to the Kentucky Department of Highways Standard Specifications for Road and Bridges Section 611, current edition.

**1.02 LAYING**

- A. The precast RCBC shall be laid in sections to the line and grade shown on the drawings on a compacted bedding of crushed aggregate up to 3/4-inch maximum size. The compacted bedding shall be leveled with a template or straightedge to ensure uniform support throughout the entire length and width of the structure.
- B. The precast RCBC shall be laid by placing the sections starting at the outlet end of the culvert with the bell or groove end being laid upgrade.
- C. Provide drainage with 4-inch weep holes, except that for side-by-side installations separated by grout, the weep holes shall be placed on the extreme outside walls only.
- D. Openings formed between the precast sections and any side entry of pipes or top entry of manholes shall be grouted to form a watertight joint. When manholes are to be placed directly on the top slab of the precast sections, additional steel reinforcement in the top slab shall be provided to sufficiently compensate for the section removed.

**1.03 JOINTS**

- A. The CONTRACTOR shall make sure that the joints of each unit are properly fitted. The CONTRACTOR shall use rubber, flexible plastic gaskets or asphalt mastic joint sealing compound in joints between the precast box sections. Regardless of the type of sealant to be used, the CONTRACTOR shall ensure proper meshing of the joints.
- B. No sand or foreign material of any kind shall be allowed to intrude into the joints. If sand or foreign material has intruded into the joints upon joining the sections, the joints shall be thoroughly cleaned until no sand or foreign material is present, then the joints shall be resealed.

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- C. The exterior joint gap on the top of the precast RCBC shall be filled with mortar and shall be covered with a minimum of a 15-inch double layer geotextile fabric joint wrap. The joint wrap shall be applied to all joint sections.

1.04 BACKFILLING

- A. Backfilling of the trench for the precast reinforced concrete box culvert shall be done in accordance to the Plans, Standards and Specifications of the Lexington - Fayette Urban County Government and in accordance to Subsection 603.03 of the Kentucky Department of Highways Standards and Specifications for Highways and Bridges.

**END OF SECTION**

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**SECTION 05540**

**CASTINGS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Provide all labor, materials, and equipment required to install castings as shown on the Drawings and specified herein. Included in this section are manhole covers, steps, valve boxes, hatch covers, and commemorative plaques.

**1.02 RELATED WORK NOT INCLUDED**

- A. Concrete work is included in Division 3.

**1.03 SUBMITTALS**

- A. The CONTRACTOR shall submit to the ENGINEER, in accordance with Division 1, Section 00700, copies of construction details of castings proposed for use.

**PART 2 MATERIALS**

**2.01 GENERAL**

- A. All castings shall be gray iron, conforming to the requirements of the ASTM Standards, Designation A 48-83, Class 35-B for manhole casting and class 20 for valve boxes.

**2.02 MANHOLE CASTINGS**

**A. Frames and Covers**

- 1. Manhole castings shall consist of cast iron frames and 22-3/4 inch diameter covers. All manhole castings shall be designed for H-20 traffic loading. The frame shall be at least 7 inches high overall. Manhole covers must set neatly in the frame, with contact surfaces machined smooth for even bearing. The top of the cover shall be flush with the frame edge. The top of the cover shall have sufficient corrugations to prevent slipperiness and be marked in large letters "SANITARY SEWER" or "STORM SEWER" as applies. Covers shall have one or 2 pick holes only, about 1-1/2 inches wide and 1/2-inch deep with 3/8-inch square undercut at rear and 3/4-inch square undercut on sides. Covers on sanitary sewer manholes must not be perforated.

**B. Steps**

- 1. Polypropylene plastic encapsulated steel manhole steps shall be of patterns shown on the detail Drawings, and have corrugated treads. In case of need for nonprotruding steps, shop drawings of special inset cast iron steps shall be reviewed by and be acceptable to the ENGINEER prior to use.

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2. It is intended that the polypropylene plastic encapsulated steel step be M.A. Industries PS-1, PS-1PF or equal.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION OF CASTINGS**

##### **A. Installation In or On Structures**

1. The installation of castings is generally covered under specifications for pipe work and manholes. Castings shall be leveled, plumbed and secured before pouring concrete or attaching to masonry with solid, watertight, cement mortar joints.

**END OF SECTION**

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