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Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.transportation.ky.gov/

Greg Thomas
Secretary

August 9, 2019

CONTRACT ID NO. 19-9001 ADDENDUM #6

Subject: Boone County
Letting August 16, 2019

- (1) Replace Instructions to Proposers - Pages 28, 57, 60-62, 64, 66, and 81**
- (2) Replace Appendix J**
- (3) Replace Appendix O**
- (4) Add Appendix U**

Proposal revisions are available at

<http://transportation.ky.gov/Construction-Procurement/Pages/Design-Build-Projects.aspx>.

If you have any questions, please contact us at 502-564-3500.

A handwritten signature in black ink that reads "Rachel Mills".

Rachel Mills, P.E.
Director
Division of Construction Procurement

RM:mr
Enclosures



An Equal Opportunity Employer M/F/D

The DBT shall provide supplemental cost information and supporting documentation of those costs for each of the components listed. The sum of the individual component costs shall equal the value of the “all-inclusive” single lump sum bid item for the project. Certain aspects and requirements for each of these items are discussed in the following sections. Some components are discussed in multiple sections due to the nature of the work involved. As stated previously, the intent of this “all-inclusive” single lump sum bid item is to incorporate all features of the project into this bid item. **Please be advised that Mobilization and Demobilization cost for this project shall be included according to Section 110 of the Standard Specifications.**

In addition, the DBT shall be required to furnish the Department with a Schedule of Values showing a complete breakdown of the lump sum bid item established for this project at the time of submittal of the DBT price proposal. In order to document how the lump sum bid price was determined, the DBT shall supply, using standard KYTC bid item codes whenever possible, all work items, quantities, units, and prices to support the lump sum bid submitted. Any non-standard bid items used shall be thoroughly explained in the bid proposal. The breakdown shall include all materials to be used in the work, and shall be in sufficient detail to provide KYTC with a means to check partial payment requests. The Schedule of Values shall be developed using the current version of Estimator software by Info Tech Inc., Gainesville, FL, 32608, or an equivalent program approved by the Engineer. The DBT shall provide any necessary training and license needed for KYTC to use the software. Submit the Estimator file in the Version required by KYTC. The successful DBT shall be required to update the schedule of values when final designs, or portions of the design, are approved.

The DBT shall also provide a separate estimated cost of the right-of-way acquisition and relocation costs that KYTC will pay to the property owners disturbed by the project. (This estimate will not be utilized in determining overall cost of the project but it will be used for KYTC budgeting purposes). This estimate should not include services for right-of-way acquisition as these services as described in Section 10 are to be included in the lump sum bid as described above.

7.3 BASIS OF PAYMENT

All items covered by Construction and Material Specifications, Supplemental Specifications, Proposal and Special Provision notes with unit price as a basis of payment shall be included in the Lump Sum bid item established for the project. All costs for work and services shall be included in the lump sum item for the Project.

“In progress” payments for the project shall be made utilizing the supplemental cost information included in the schedule of values supplied for each of the components identified as parts of the “all inclusive” single Lump Sum bid item. KYTC personnel shall track and measure the completed individual items within the schedule of values to determine the amounts of the actual “in progress” payments.

7.4 FINAL PAYMENT

In addition to the normal requirements in Sections 105.12 and 109 of the Standard Specifications, the DBT shall prepare and submit the following prior to the request for final payment:

- A. All original project files and notes utilized in the preparation of the survey, design and construction of the project.
- B. As-Built Plans in PDF and ArcGIS format previously approved by an engineer.

factors needed to reasonably determine the status of each utility to be relocated as part of the project. The DBT shall submit the utility tracking report to KYTC and update it monthly. The DBT shall facilitate, at a minimum, monthly utility company status meetings to discuss any project issues and to update KYTC on the progress being made on the project.

11.5.2 UTILITY COMPANY CONTACTS

See Appendix J

12. DESIGN AND CONSTRUCTION REQUIREMENTS

12.1 MAINTENANCE OF TRAFFIC (MOT)

Maintenance of Traffic Special Provisions in addition to the Governing Regulations listed in Section 7.1 of this document: The DBT shall submit an approach for MOT for the project that incorporates the elements listed as well as propose any innovative ideas that may expedite the work. A Traffic Management Plan shall need to be submitted and approved (form can be found on the KYTC Highway Design Web Page).

12.1.1 GENERAL

All MOT procedures shall be in accordance with Manual on Traffic Control Devices (MUTCD) except when the KYTC standard drawings or standard specifications are more restrictive the KYTC documents shall govern. The speed limit on any road within the project be reduced by 10 MPH with approval from the engineer.

12.1.2 MOT RESTRICTIONS

No lane closures shall be allowed on I-275, KY-237 and Worldwide Drive during observance of any National Holidays identified in Section 101 of the Standard Specifications and between the dates of November 1st and January 15th. Under special circumstances, KYTC reserves the right to restrict the use of lane closures due to unforeseen special events. In principle, the DBT shall maintain the current lane configuration (or better), for the life of the project (except for the closure of Graves Road over I-275 and a one week closure of Worldwide Drive at the intersection with Graves Road) including access to all adjoining properties. Williams road shall remain open and connected to either existing or proposed Graves Road at all times. Suggestions for additional working hours may be proposed by the DBT to KYTC as a part of the DBT project proposal.

Interstate lane closures shall only be permitted between the hours of 8:00 PM and 6:00 AM. All work on I-275, except traffic control operations and final pavement markings shall be conducted behind temporary concrete barrier wall as identified in the Standard Drawings. A lane closure for separation must be in place during barrier wall placement. Access to and from the work zone adjacent to the interstate shall be at the beginning or end of the string of barrier wall or at one approved entrance / exit point to be designed and submitted by the DBT for approval. Construction operations on I-275 using shoulder closures without barrier wall are prohibited unless they are less than one work shift and positive separation of at least 11 feet is provided. Any time active traffic pattern rearrangement or non-long term closures are taking place on I-275, at least 2 Law Enforcement Officers (LEOs) must be on site. 1 LEO shall be sufficient for these operations on roads other than I-275.

Temporary Raised Pavement Markers, Type IVA as identified in section 112 of the Standard specifications shall be required when I-275 traffic lanes are situated outside their normal position. Lanes on I-275 outside of their normal position must be 11 feet in width and minimum 1 foot wide shoulders must be provided.

12.2.3 DESIGN SPEED CRITERIA

65 mph (I-275)
35 mph (Graves Road & KY 237)

12.2.4 GEOMETRIC CRITERIA

Geometric Criteria for the preliminary design information completed by KYTC is included in Appendix R. The DBT's final designs shall be equivalent to these criteria or should offer an improvement to these criteria. The entrance grades provided in Appendix R are for information only. Further design may require the grades to be adjusted, however, the grades proposed should be utilized as the maximum grade for that particular entrance. If DBT proposes to utilize a greater grade, then it must be approved by the Engineer.

12.2.5 PAVEMENT

See Appendix E for thickness details. Asphalt Pavements shall be constructed under Option A compaction and Section 502 of the KY Standard Specifications shall apply to JPC paving.

Material Transfer Vehicle Required: Yes X No

See Special Note for Materials Transfer Vehicle in the Standard Specifications.

Pavement Ride Quality Required: Yes X No

See Section 410 of the Standard Specifications for Asphalt Pavement. Category B shall apply for Asphalt Pavement.

See Section 501 of the Standard Specifications for Concrete Pavement. Category B shall apply for Concrete Pavement.

12.2.6 TYPICAL SECTION

See Appendix E (No variations of typical section dimensions permitted).

12.2.7 DRAINAGE FOLDER REQUIRED

Yes X No In addition to standard guidance within the KYTC Drainage Manual, the DBT shall ensure that the post-development discharge and velocity does not exceed the pre-development discharge and velocity at each final point of discharge from the project. In some instances this will require the use of energy dissipaters and/or detention basin storage before disposal. Also, at any location, on any roadway, where the final design prescribes an existing pipe to be left in place as part of the active storm drainage system and new pavement is to be constructed over the existing pipe or over an extension of the existing pipe, the entire length of the existing pipe shall be lined according to the Cured-In-Place Rehabilitation method defined in Appendix T, or an approved equal.

12.2.8 DESIGN EXCEPTIONS

The current edition of AASHTO's A Policy on Geometric Design of Highways and Streets Section 6.2.1 and Section 5.2.1 recommends that in rolling terrain, a design speed of 50 mph (rural collectors) and 40 mph (rural locals) respectively should be utilized with average daily traffic (ADT) greater than 2,000. KY 20 and Bullittsville Rd both have a posted speed limit of 35 mph. The horizontal curves and minimum grades required to accommodate these design speeds would have detrimental impacts to the residences surrounding the project. Both roads are also coming to an intersection and shall be required to slow down or stop. The project team has requested a design exception to utilize a 35 mph design speed to minimize impacts and match the conditions of the existing roadway.

The DBT shall advise of any proposed design features that do not meet the minimum design criteria. Due to the sensitive nature of the approval process for a Design Exception, it is a requirement that all design exceptions be submitted for consideration by the KYTC in writing no less than 45 days prior to submittal of the technical proposal. A detailed explanation of the justification for this exception shall be provided with this request. All DBTs shall be made aware of the request as well as approval or disapproval in writing. KYTC does not intend to approve design exceptions after the contract is awarded unless extreme and unforeseen

circumstances may be demonstrated. The safety of the traveling public shall not be compromised by a design exception.

The following items need to be individually discussed for any requested design exception:

- A. Amount and character of traffic
- B. Type of project (e.g. new construction, 3R)
- C. Accident history relevant to the exception request
- D. Specific information pertinent to the type of exception being requested (i.e. deferral of bridge widening requests should address structural and function adequacy of existing bridge and project a future time for widening and etc.)
- E. Underlying reason for requesting exception
- F. Effect, if any, exception shall have on other standards (i.e. design speed exception would affect requirements for grade, curvature, sight distance, etc.)
- G. Effect of the exception on the safety and operation of the facility
- H. Cost of attaining full standards (phrases such as obtaining the standard would be too “costly” or beyond the scope of the project are of little value in making a decision)
- I. Future improvements and their relation to the requested exception
- J. Any features which would tend to mitigate the deviation

12.2.9 FUEL AND ASPHALT ADJUSTMENTS

Fuel and asphalt price adjustments, as detailed in the specifications, shall be applicable for this project. Payments are based on actual quantities placed per day rather than estimated values and the base “index” values used to determine price adjustments shall be based on the values for the first of the month for when the price proposals are submitted to KYTC.

12.2.10 FENCING

Right of Way fencing is required. Right of Way fencing locations shall be designed according to any design or permitting manual. The DBT shall be responsible for removing existing Right of Way fencing when it is in conflict with the design developed by the DBT.

Pedestrian fencing for the Graves Road Bridge over I-275 shall be black vinyl coated fence according to section 817 of the Standard Specifications.

12.2.11 ADDITIONAL DESCRIPTION OF REQUIRED WORK AND SPECIAL PROVISIONS

All areas disturbed along residential properties shall be restored using sod as the seeding and protection. Vertical concrete surfaces in excess of 30 inches in height and 48 inches in width shall receive an architectural treatment. The architectural treatment shall approved by the engineer, but generally be of the “stacked stone” variety with at least $\frac{3}{4}$ inch reveal. The architectural treatment shall be surrounded by a 4 inch chamfered smooth border. Approach roads and commercial entrances may require reconstruction, as a part of this reconstruction, existing widths and profile grades shall be maintained or improved upon. This may require work off the existing Right of Way and in accordance with Section 10 of this document. Intelligent compaction of soils, aggregates and asphalt mixtures shall be used in

along with paver mounted temperature profiles and E-ticketing as described in Appendix S.

12.2.12 ADDITIONAL CONSIDERATIONS

In developing the roadway design, gravity retaining walls should be used as a last resort to minimize ROW impacts. Each raised median island shall have two empty 4 inch conduits for future municipal use, leading from the island to outside the roadway on one side. Large islands may require additional sets on 2,000 LF spacing. Abandoned pavements shall be removed and underlying soils should be scarified and stabilized according to specifications. At the conclusion of the project, cable barriers shall exist on I-275 in locations that they currently exist.

12.3 STRUCTURES

12.3.1 STRUCTURE DESIGN/ADVANCE SITUATION FOLDER

The DBT shall have a consultant DBT member pre-qualified in Structure Design, Bridges under 500 feet. The DBT shall be responsible for preparing any structure plans required. The structure plans shall be developed in accordance with Division of Structure Design Guidance Manual (<http://transportation.ky.gov/bridges/GuidanceManual.htm>). Review times shown in the Guidance Manual shall begin when a submittal is received. Submittals required shall be Advance Situation Folder, Stage 1 Preliminary Plans, Stage 2 Preliminary Plans, Stage 1 Final Plans and Stage 2 Final Plans. The structure plans shall be signed and sealed by a Licensed Professional Engineer. Structures may be submitted individually. The Division of Structural Design shall provide drawing numbers for each structure. The DBT shall present electronic copies in PDF format of plans and calculations for all submittals to the Division of Structural Design. This shall be in addition to any required hard copies.

12.3.2 EXISTING STRUCTURES IDENTIFICATION AND DATA

Plans are available for the existing Graves Road overpass at:

<https://transportation.ky.gov/Construction-Procurement/Pages/Design-Build-Projects.aspx>

The DBT should verify all pertinent information needed to facilitate the design and construction.

12.3.3 DESIGN AND CONSTRUCTION REQUIREMENTS OF STRUCTURE

All design and structure construction shall be in compliance with all applicable AASHTO design criteria as well as current KYTC standards. In addition, the DBT shall ensure and provide evidence that all structure elements are situated outside of the clear zone requirements established by the AASHTO Roadside Design Guide; however, the minimum offset of structure elements shall be 38' from the edge of mainline or ramp driving lanes to the face of the structure element on the outsides of the roadway.

All Shop Drawings shall be approved by DBT. PDF copies shall be provided to the Division of Structural Design.

12.3.4 FOUNDATION INVESTIGATION AND GEOTECHNICAL INVESTIGATIONS

All geotechnical information needed by the DBT for foundation investigation and all geotechnical investigations necessary to prepare the DBT's technical and price proposals shall be the responsibility of the DBT. The subsequent reports shall be submitted for review and approval by KYTC Geotechnical Branch. Please allow 14 calendar days for this review. Existing Geotechnical Information is for information purposes only.

12.3.5 GEOTECHNICAL, FOUNDATIONS, SLOPES, AND WALLS

All geotechnical information needed by the DBT for roadway and foundation investigation and all geotechnical investigations necessary to prepare the DBT's bid

Drawing RGX-002. The geometry of the gravity walls may vary from the Standard Drawing only if approved by the Department.

2. Gabion basket retaining walls shall not be permitted for permanent construction.
 3. Metal “Bin” type retaining walls shall not be permitted for permanent construction.
 4. Only preapproved Mechanically Stabilized Earth (MSE) wall systems shall be used on this Project. See the Special Note for MSE retaining walls located in Appendix K for preapproved systems. Only inextensible reinforcement shall be allowed.
- G. Reinforced soil slopes shall not be designed at a slope ratio steeper than one (1) Horizontal to one (1) Vertical. Reinforced soil slopes shall be designed in accordance with design procedures presented in the latest version of Publication No. FHWA NHI-00-043, “Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.”
- H. The DBT shall be responsible for analysis and design of soil slopes. Embankment slopes steeper than three to one (3H:1V) shall be reinforced according to the Special Note for Reinforced Soil Slopes in Appendix U. Embankment slopes three to one (3H:1V) or flatter may require reinforcement or other remediation measures depending on soil conditions.
1. Where embankment settlement is anticipated to exceed 3 inches in total settlement, the DBT shall submit an instrumentation plan for review to monitor settlement and determine when the pavement section can be placed.
 2. All geotechnical instrumentation shall be left in place for future readings after the project has been completed. Instrumentation destroyed by the DBT shall be replaced at the DBT’s expense.
 3. Shale cannot be used in the upper two feet of the subgrade.
 4. If shale that has a possibility of being acidic producing is used on the project, testing shall be required to determine the acidic producing potential. Acidic producing shale cannot be left exposed. The acidic producing shale shall be encased with a minimum 2.5-foot layer of compacted clay soil. A minimum of 4 feet of clay shall be required on top of the embankment to control the corrosion of guardrail and/or sign post, etc. from the acidic shale. Sulfate resistant cement (ASTM C-150 Type II) shall be used for subsurface structures such as pipes, culverts, bridges, etc.
 5. The subgrade should be constructed in accordance with the pavement design specifications. For a chemically stabilized subgrade a minimum preliminary CBR design value of 3.0 (**CBR**

utilities is the responsibility of the DBT. The DBT shall be responsible for any damage to the existing infrastructure. Any damage shall be repaired immediately.

12.4 PERMANENT TRAFFIC CONTROL

12.4.1 PAVEMENT MARKINGS AND DELINEATORS

The DBT shall provide all pavement striping, intersection markings, lane markings, and delineator posts in accordance with the MUTCD and applicable KYTC standards. The DBT shall provide striping plans no later than the final plan submittal stage for review and approval by KYTC. The DBT shall also provide inlaid pavement markers on I-275 and Graves road according to the specification in Appendix M. The DBT shall be aware that removal of existing pavement marker castings and permanent patching of the resultant hole with Fibercrete, or an approved equal, is required.

Other special provisions in addition to the Governing Regulations are listed in Section 7.1 of this document.

12.4.2 SIGNING SPECIAL PROVISIONS

All temporary signing shall be provided by the DBT for this project. Detour signage shall be submitted, approved and erected for the Graves Road Closure and any other closure deemed necessary by the Engineer. The DBT shall expect that up to 6 variable message boards may be required at a single time.

The DBT shall provide permanent sign plans as early as possible for KYTC approval. Review of the permanent signing plans may take up to 21 days. The IJS provided in Appendix D provides permanent signing details. The DBT shall design, fabricate and install all permanent signage for the project.

Other special provisions in addition to the Governing Regulations are listed in Section 7.1 of this document.

12.4.3 TRAFFIC SIGNALS SPECIAL PROVISIONS

Design, Construction and implementation of new traffic signals for the project shall be addressed as part of the DBT bid proposal. Traffic signals shall be completed at the Graves Road intersections with KY 20, both exit ramp termini and Worldwide Boulevard. Traffic data to for use in the design of the signalized interstections has been provided in Appendix N. The DBT shall provide plans for review and approval of the new traffic signals. Review of the traffic signal plans may take up to 21 days.

Other special provisions in addition to the Governing Regulations are listed in Section 7.1 of this document

12.4.4 ROADWAY LIGHTING SPECIAL PROVISIONS

Design, Construction and implementation of new lighting for the project shall be addressed as part of the DBT bid proposal. New Roadway Lighting shall be completed at the Graves Road interchange and existing lighting at the KY 237 interchange and roundabout at Graves Road shall be modified and updated. All luminaires in the existing systems at the KY 237 / I-275 interchange and the KY 237 / Graves Road round-about shall be replaced with appropriate LED luminaires. High-Mast lighting shall not be permitted at any location on the project. The DBT shall provide plans for review and approval of the new lighting. Review of the lighting plans may take up to 21 days.

INDEX OF ATTACHMENTS

Appendix A:	Form A for SOQ Submittal
Appendix B:	DBE Conditions
Appendix C:	EEO / Wage Rates / Insurance / FHWA 1273 / Ethics
Appendix D:	Interchange Justification Study
Appendix E:	Typical Sections
Appendix F:	CPM Note
Appendix G:	Environmental Document (CE-3)
Appendix H:	Special Note for Erosion Control
Appendix I:	Right of Way Project Report (Form TC 62-75)
Appendix J:	Utility Company Contacts
Appendix K:	MSE Wall Special Note
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Appendix O:	Form “PP” – Price Proposal
Appendix P:	Documents for Bid
Appendix Q:	Acknowledgement of Receipt of Proposal Addenda (Form “AOR”)
Appendix R:	Geometric Criteria
Appendix S:	Construction Special Notes
Appendix T:	Gravity Sewer Pipe Rehabilitation by Cured-In-Place Pipe Method
Appendix U:	Special Note for Reinforced Soil Slopes

Appendix J -- Utility Company Contacts

AREA FACILITY OWNER CONTACT LIST

<u>Facility Owner</u>	<u>Address</u>	<u>Contact Name</u>	<u>Phone</u>	<u>Email</u>
Boone County Water District	PO Box 18 Burlington KY 41005	Keith Feldhaus	(859) 586-7270	kfeldhaus@fuse.net
Boone Florence Water Commission	2475 Burlington Pike PO Box 998 Burlington, KY 41005	Carl Cassell	(859) 586-5190	ccassell@fuse.net
Cincinnati Bell Telephone - Overhead	221 E Fourth Street Building 121-900 Cincinnati, OH 45201	Dan Springelmeyer	(513) 397-7165	dan.springelmeyer@cinbell.com
Cincinnati Bell Telephone - Underground	221 E Fourth Street Building 121-900 Cincinnati OH 45201	Mark Conner	(513) 565-7043	mark.conner@cinbell.com
Duke Energy Kentucky (Gas) - Natural Gas Distribution	1262 Cox Avenue Erlanger, KY 41018	Gerry Helm	(859) 534-4405	Gerry.Helm@duke-energy.com
Duke Energy Kentucky (Electric) - Distribution	2010 Dana Avenue Cincinnati, OH 45207	Wes Needham	(513) 458-3857	Wes.Needham@duke-energy.com
East Kentucky Power Cooperative	4775 Lexington Road PO Box 707 Winchester, KY 40391	Garry Harvey	(859) 745-9601	garry.harvey@ekpc.coop
Owen Electric Cooperative - Electric	8205 Highway 127 N PO Box 400 Owenton KY 40359	Lucas McNally	(859) 393-9450	lmcnally@owenelectric.com
Sanitation District No. 1 - Sewer	1045 Eaton Drive Fort Wright KY 41017	Andy Aman	(859) 578-6880	aaman@sd1.org
Spectrum Communications	100 Barnwood Drive Edgewood, KY 41017	Neal Hensley	(513) 386-5907	Neal.Hensley@charter.com
		Joseph Angel	(513) 233-5705	Joseph.Angel@charter.com
Zayo Communications		Ryan Burns	(812) 589-9314	ryan.burns@zayo.com

Appendix O -- Form “PP” – Price Proposal

Price Proposal

List cost information in the appropriate column for the paving alternate selected by the DBT.

Item Description	Unit	Asphalt Paving Alternate	Concrete Paving Alternate
Project Development Services	Lump Sum		
Right of Way Acquisition Services	Lump Sum		
Utility Relocation	Lump Sum		
Grade & Drain	Lump Sum		
Asphalt Paving	Lump Sum		
Concrete Paving	Lump Sum		
Traffic Signals	Lump Sum		
Signing	Lump Sum		
Lighting	Lump Sum		
Structures	Lump Sum		
Subtotal:			
Mobilization (5% maximum):			
Demobilization (1.5% minimum):			
Life Cycle Cost Adjustment:		\$798,296.00	\$438,446.00
ALL INCLUSIVE PROJECT COST	Lump Sum		

The following Alternative Technical Concepts are included in this price proposal:

Name: _____

Approval Date: _____

DESIGN BUILD TEAM SIGNATURE

By: _____

Name: _____

Title: _____

Date: _____

KYTC Vendor ID: _____

Federal ID Number: _____

Right of Way Cost Estimate

Summary of costs that KYTC will pay to the property owners disturbed by the project. This estimate will not be utilized in determining overall cost of the project but it will be used for KYTC budgeting purposes.

Item Description	Unit		
Right of Way (Roadway)	Lump Sum		
Easements (Roadway)	Lump Sum		
Right of Way (Utilities)	Lump Sum		
Easements (Utilities)	Lump Sum		
Relocations (Residential)	Lump Sum		
Relocations (Non-Residential)	Lump Sum		
Relocations (Miscellaneous)	Lump Sum		
Estimated Right of Way Cost	Lump Sum		

The DBT has included herewith _____ pages, consisting of a schedule of values showing a complete breakdown of the All Inclusive Project cost shown on page 1 of Form PP.

Please check one of the following:

- ☐ The DBT has not violated any of the provisions included in section 5.15 of the Instructions to Proposers within the previous five (5) year period.
- ☐ The DBT has violated the provisions of one or more of the statutes included in section 5.15 of the Instructions to Proposers within the previous five (5) year period and has revealed such final determination(s) of violation(s). A list of such determination(s) is attached.

DESIGN BUILD TEAM SIGNATURE

By: _____

Name: _____

Title: _____

Date: _____

KYTC Vendor ID: _____

Federal ID Number: _____

Appendix U -- Special Note for Reinforced Soil Slopes

SPECIAL NOTE FOR REINFORCED SOIL SLOPES

1) REFERENCES:

All references to the Standard Specifications are to the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, Current Edition with all Supplemental Specifications.

All references to AASHTO are to the AASHTO LRFD Bridge Design Specifications, Current Edition with applicable Interim Revisions. All references for FHWA GEC No. 11 are to the Federal Highway Administration's Geotechnical Engineering Circular (GEC) No. 11: Design & Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Volumes I and II.

The requirements in the Standard Specifications or AASHTO shall be used for information not provided. Where there are conflicts between the Standard Specifications and AASHTO, the Standard Specifications shall govern.

The Contractor shall provide the Reinforced Soil Slope (RSS) Designer with a complete set of project plans and specifications and shall ensure that the RSS design is compatible with all other project features that can impact the design and construction of the slope. Various terms of interest for this special note are defined below.

1.1 Definitions:

Structural Geogrid - A structural geogrid is formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and functions primarily as reinforcement.

Department/Engineer - Refers to the Kentucky Transportation Cabinet representative and/or a designated consultant acting on behalf of KYTC.

Supplier - The entity contractually retained by the Contractor to provide approved Structural Geogrid.

Designer - The entity that provides specific design of an accepted RSS system as described in the special note. The "Supplier" and "Designer" may be the same entity or separate entities retained by the Contractor.

Manufacturer - The entity that oversees and facilitates production of the geogrid from its component materials.

Working Drawings - A detailed plan set for the RSS, providing all information required to complete RSS construction.

2) SCOPE OF WORK:

Furnishing and testing materials, and the design and construction of a Reinforced Soil Slope retention system. Work consists of:

1. Furnishing structural geogrid reinforcement, drainage composite, and erosion control vegetative facing system (or other facing alternate) as shown on the construction drawings.

2. Storing, cutting, and placing structural geogrid reinforcement, drainage composite, and erosion control system as specified herein and as shown on the construction drawings.
3. Furnishing sealed design calculations and construction drawings for the RSS.
4. Providing Supplier and Designer representatives for on-site pre-construction meeting with Contractor and Engineer and as-needed during construction. The Representatives shall be onsite for a minimum of the first five (5) days of RSS construction.
5. Excavation, placement, and compaction of reinforced fill and backfill material as specified herein and as shown on the construction drawings.

Acceptance of the Contractor's design calculations and construction plans does not constitute endorsement or approval of the work submitted. The acceptance is an acknowledgment of the work performed and authorization for the Contractor to proceed with the project.

3) DESIGNER QUALIFICATIONS:

The RSS Designer will need to meet the following minimum qualifications:

1. The selected geogrid reinforcement has been previously reviewed and approved for use by the Department District Materials personnel, Division of Materials, and Division of Structural Design, Geotechnical Branch.
2. The Designer has the operational capacity and necessary experience to provide expert support to the Contractor on a timely basis.
3. At least 3 years of experience in the design of Reinforced Soil Slopes.
4. Past documented experience in the design of at least 3 projects of a similar magnitude to the proposed RSS, that have been constructed successfully.
5. All calculations and RSS construction plans shall be dated, sealed, and signed by a registered professional engineer licensed to practice in Kentucky.

4) CALCULATIONS AND PLANS:

A materials list, draft working drawings, and design calculations clearly showing conformance with the Standard Specifications, AASHTO, and contract plans shall be submitted for review. The format for the construction plans shall be in accordance with the Division of Structural Design's Guidance Manual. The first sheet shall be a title sheet.

All review submittals shall be submitted electronically in .PDF format through the Contractor to the Engineer. Half-sized prints are preferred. The Engineer may request full size (22" X 36") PDF sheets if necessary. The Engineer shall forward the submissions to the Geotechnical Branch.

The Contractor shall allow 30 calendar days for the Department to review each submission. While this process does not require submission of paper copies, the Department reserves the right to require such copies on a case-by-case basis. The thirty-day period begins when submissions are received in the Geotechnical Branch. Revisions may be required by the Department. The revised package shall be resubmitted to the Engineer for review. The Engineer shall have 15 calendar days to complete review of the revised package. This review process shall be repeated until the entire submittal is accepted by the Engineer. Additional time required by the Department to review resubmissions shall not be cause for increasing the number of contract working days. The additional work required by the Contractor to provide resubmissions shall be at no cost to the

Department and with no extension of contract time. The Working Drawings shall include the following items:

- A. A plan view showing the RSS disturbed limits
- B. Cross-sections showing RSS extents and slope steepness
- C. All design parameters and assumptions, including design life
- D. Clear and detailed descriptions of selected geosynthetic reduction factors for design, including test results that verify the chosen reduction factors. This also includes backfill properties, where applicable.
- E. Accommodations for roadway drainage systems, subgrades, etc.
- F. Show utilities impacted by slope
- G. Primary and secondary reinforcement lengths and spacing
- H. Selected facing system and justification, with specific construction methods
- I. Overlap / seam requirements; include detailed overlap requirements for horizontal curves
- J. Special design considerations, if applicable
(May include but not limited to guardrail/sign post installation, reinforcement placement around deep foundations or other obstructions, drainage systems, foundation modifications, scour protection, etc.)

Working drawings shall not be produced until after the Department has approved all submittals. Final design calculations and construction plans shall be dated, sealed, and signed by a registered professional engineer licensed to practice in Kentucky. The Designer shall submit reviewed and approved shop drawings. The Designer shall provide the Department with a statement of assurance that the Working Drawings are accurate and satisfy project requirements. Each sheet of the drawings shall be dated, sealed, and signed by the RSS design engineer providing the design.

A Certificate of Analysis for the Internal RSS Fill Material (See Sections 5.02 and 5.3 herein) may be required prior to final acceptance of the RSS design.

The Department assumes no responsibility for errors or omissions in the working drawings. Acceptance of the final working drawings submitted by the Contractor shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work. Construction of the RSS shall not commence until the Contractor receives a written Notification to Begin RSS Construction from the Engineer, which will be issued once the complete package (drawings, calculations and construction procedures) is accepted. Fabrication of any RSS components before the written Notification to Begin RSS Construction shall be at the sole risk of the Contractor.

5) DESIGN:

The RSS design shall be in general accordance FHWA GEC No. 11 and AASHTO. Exceptions to these requirements are listed in this note or shown elsewhere in the contract documents.

- Earth reinforcement elements in Reinforced Slope Systems shall be designed to have a corrosion resistance/durability to ensure a minimum design life of 75 years, or 100 years for bridge abutments or when supporting utilities. Requirements may vary on a project-specific basis, and if so will be provided in the geotechnical notes.
- The length of primary reinforcement shall be the same throughout the RSS Structure.

- Construction and Traffic loading shall be considered equivalent to an additional two feet of earth surcharge. The internal RSS fill material shall extend 1 foot, minimum, beyond the ends of the reinforcement. The internal RSS fill should be separated from the non-reinforced embankment (where present) with Geotextile Fabric meeting requirements of current Standard Specifications Section 843 for Slope Protection, Channel Lining and Stabilization. Fabric placement shall be in accordance with current Standard Specifications Section 214.
- The following minimum factors of safety will be used for slope design.
 - Grid Pullout 2.0
 - Internal Stability 1.3
 - Global Stability 1.4
 - Sliding 1.4
- Minimum geogrid anchorage length = 3 ft.

6) **MATERIALS:**

6.1 **Internal RSS Volume:**

Provide internally reinforced fill material consisting of either A) Quarry-processed limestone or sandstone from a Department-approved quarry or B) Durable Limestone/Sandstone from Roadway Excavation meeting all applicable general requirements of Section 805 of the Standard Specifications, current edition, and requirements herein. Approval of the material source by the Department is required prior to beginning RSS construction. The required gradation of internal RSS fill is below. (If optional product-specific construction damage testing is successfully performed, the gradation may be adjusted to that used for the testing. See Section 6.2.2.)

Table 1: Gradation of Internal RSS Fill	
Sieve Size	Percent Passing
1"	100
3/4 "	80-100
3/8 "	20-80
No. 4	0-30
No. 8	0-10
Sizes No. 67, 68, 710, and 78 in the Department's Standard Specifications fall within these gradation limits. Sizes No. 57 and 610 may fall with these limits, depending on the specific gradation used.	

Gradations for the RSS volume should be attained and verified twice per week in order to meet the above requirements. Material having an internal friction angle greater than or equal to 34 degrees shall be used. Project-specific shear strength testing is not required if a design value of 34 degrees is used. (See Section 6.0). Uniform fine sands are not permitted in the RSS Volume. The Designer is responsible for establishing and maintaining a quality control program to ensure compliance with this section.

6.2 **Geogrid:**

Use only geogrid products placed on the Department's Kentucky Product Evaluation List (KYPEL) and accepted for use on a project basis. Geogrid Manufacturers are required to

participate in the National Transportation Product Evaluation Program (NTPEP) for Geosynthetic Reinforcement Products and the product must have current test data posted in NTPEP DataMine.

Use a polymer geogrid consisting of High Density Polyethylene (HDPE) or high tenacity Polyester (PET) formed into a uniform regular network of integrally connected elements with apertures greater than one-fourth (1/4) inch (6.35 mm) to allow interlocking with surrounding soil, rock, earth, or other specified materials to function primarily as reinforcement. Use a geogrid that is generally inert to biological degradation and commonly encountered chemicals and is free of defects or flaws significantly affecting its physical properties.

Ensure the geogrid has a minimum width of four (4) feet (1.22 meter) and that each roll is labeled with the manufacturers' name, product type, lot number, roll number, manufactured date, and roll dimension.

6.2.1 Packaging:

Protect the reinforcement from direct sunlight, ultraviolet rays, temperatures greater than 48°C, mud, dirt, dust, and debris during all periods of shipment and storage. Keep geogrids dry until installation, and do not store directly on the ground.

6.2.2 Physical Requirements:

Furnish geogrid suitable to the final design. The minimum weight should be 8 oz/yd² to minimize construction damage.

Determine Long Term Design Tensile Strength based on the following:

$$TD = TULT \div RF$$

Where:

TD = Long Term Design Strength

TULT = Ultimate Tensile Strength determined in primary strength direction in accordance with ASTM D 6637 conducted at a strain rate of 10 % per minute. Tensile strength shall be reported without artificially deforming, manipulating, or massaging the test specimen under load before measuring such resistance or employing an artificial secant or offset tangent.

RF = Total Reduction Factor = RFCR x RFCD x RFDU

Minimum RF with product specific testing: 3.15 for HDPE and 2.0 for PET

Minimum RF without test data: 10

RFCR = Reduction Factor for Creep Deformation for 100-year Design Life calculated in accordance with *GRI-GG4 using ASTM D 5262 for Long Term Strength.

Minimum RFCR with product specific testing: 2.60 for HDPE and 1.60 for PET

Minimum RFCR without test data: 5.0 for HDPE and 3.0 for PET

*Either GRI-GG4 (a) or GRI-GG4 (b), depending on Flexural Rigidity value from ASTM D 1388.

RFCD = Reduction Factor for Construction Damage calculated in accordance with ASTM D 5818.

Minimum RFCD with product-specific testing with appropriate backfill:

PET: 1.1

HDPE: 1.2

Minimum RFCD without test data:

PET: 1.7

HDPE: 2.0

Note 1: Product-specific testing may allow adjustment of the gradation in Table 1, to that used in the construction damage testing, provided all other internal fill requirements are met.

Note 2: When product-specific testing is conducted, if $RFCD > 1.7$, the particular combination of geogrid, internal RSS fill, gradation, and placement method shall not be used.

RFDU = Reduction Factor for Durability based on index properties in Table 2.

If index properties satisfied and $RFCD \leq 1.7$, RFDU = 1.3 (Default)

Minimum RFDU with product specific durability testing: 1.10

Minimum RFDU without durability or index test data: 2.0

Table 2: Required Values for Use of Default Durability Reduction Factor			
Type	Index Test	Method	Value
HDPE	UV	ASTM D 4355	Min. 70% strength after 500 hours
PET	UV	ASTM D 4355	Min. 50% strength after 500 hours*
HDPE	Thermo-oxidation Resistance	ENV ISO 13438:1999, Method B	Min 50% strength after 56 days
PET	Hydrolysis Resistance	Inherent Viscosity Method (ASTM D 4603, GRI-GG8)	Min. Number (Mn) Molecular Weight of 25,000
PET	Hydrolysis Resistance	GRI GG7	Max. Carboxyl End Group Number of 30
HDPE & PET	Survivability	Weight per Unit Area (ASTM D 5261)	Min. 8 oz/yd ²
HDPE & PET	% Post-Consumer Recycled Material (by weight)	Certification	Max. 0%

* If buried in one week. If not, must meet minimum 70% strength after 500 hours.

6.3 Sampling & Testing:

6.3.1 Internal RSS Fill:

To obtain source approval, the Contractor shall furnish the Engineer with an 80-pound representative sample of the internal RSS fill material and a Certificate of Analysis containing results of all tests referenced in Table 3 at least four weeks prior to beginning construction of the Reinforced Soil Slope.

During construction, the internal RSS fill material shall be sampled by the Engineer for acceptance and quality control testing, performed by the Department and/or an independent approved, third party laboratory. A new sample and Certificate of Analysis shall be provided any time the material and/or source changes.

The RSS Designer will review all fill material tests and certify compliance with the design parameters. RSS Designer shall evaluate any failed material placed in the RSS and will provide a signed, stamped recommendation for modification and/or repair of the RSS system to adjust for the failed material.

Table 3: Sampling Frequency for Internal RSS Fill

Function	Tests	Frequency
Source Approval: (Testing by Contractor and/or its Consultant)	Soundness (AASHTO T 104)* Gradation (AASHTO T 27)*	At least four (4) weeks prior to beginning RSS construction and once per material change and/or change in source. One test is valid for up to 10,000 ft ² of RSS area if there is no material change or change in source. **
Acceptance and Quality Control (Testing by Department)	Gradation (AASHTO T 27)* Any other applicable requirements of Section 805 of the current Standard Specifications	One per 2,000 cubic yards at job site. (A change of more than +/- 5.0 percent passing any sieve size <u>may</u> require additional Gradation testing by the Contractor.) As required by the current Materials Field Sampling and Testing Manual, Standard Specifications, and/or other Department policy.
* The laboratory performing these tests must be accredited by the AASHTO Materials Reference Laboratory (AMRL) for the tests they perform. The Contractor may consult the Geotechnical Branch to ensure that a lab is accredited or certified. ** e.g. 1 to 10,000 ft ² of RSS requires 1 test, 10,001 to 20,000 ft ² requires 2 tests, etc.		

6.3.2 Geogrid:

No project-specific geogrid testing will be required during construction, however the Department reserves the right to require such testing of geogrid at any time.

7) GEOTECHNICAL DESIGN PARAMETERS:

Granular Embankment (if required) - See Subsection 805 of the Standard Specifications

$$\gamma = 115 \text{ lb/ft}^3$$

$$\phi = 38^\circ$$

$$C = 0 \text{ psf}$$

Internal RSS Fill -

$$\gamma = 120 \text{ lb/ft}^3$$

$$*\phi = 34^\circ$$

$$C = 0 \text{ psf}$$

In-Situ Soil – See Geotechnical Notes & Drawings

The coefficient of friction for sliding resistance for cohesionless soils shall be no greater than tangent ϕ of the weaker material. The coefficient of friction for sliding resistance for cohesive soils shall be no greater than the adhesion value for the in-situ soil.

In no case shall the geotechnical strength parameters used for design exceed the values allowed by the AASHTO Specifications.

*If a design friction angle of greater than 34 degrees is used, the value must be substantiated by Direct Shear Test (AASHTO T236) or CU Triaxial Test (AASHTO T 297) on project specific material. The design friction angle may be increased up to a maximum of 40 degrees based on laboratory testing. Generally, only one Direct Shear or CU Triaxial Test is required unless there is a change in material, source, or gradation.

8) GENERAL:

8.1 General requirements:

Comply with all dimensions shown on the contract plans and accommodate all other project features as shown on the contract plans.

Section 107 of the current specifications shall apply to the use of patented devices, materials, slope systems, and processes.

Geogrid shall be installed at the proper elevation and orientation as shown on the construction drawings or as directed by the Engineer. Correct orientation (roll direction) of the geogrid shall be verified by the Contractor. Geogrid may be temporarily secured in place with staples, pins, sand bags, or backfill as required by fill properties, fill placement procedures, or weather conditions, or as directed by the Engineer. All connections shall be in accordance with the Designer's recommendations and drawings.

When wrapped-face slopes are required (see below), a minimum overlap of 6 inches is recommended along edges perpendicular to slope. Alternatively, the edges of the grid may be clipped or tied together. When wrapped-face slopes are not necessary, no overlap is required and edges may be butted.

The non-reinforced embankment material (where present) shall be built concurrently with the Reinforced Soil Slope. The core cannot be constructed prior to the RSS.

Tracked construction equipment shall not be operated directly on the geogrid. A minimum fill thickness of 6 inches is required prior to operation of rubber-tired and tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

Any geogrid damaged during installation shall be replaced by the Contractor at no additional cost.

8.2 Slope Facing Requirements:

Treatment of slope faces shall be in accordance with Table 4 below, based on specific project conditions.

Table 4: RSS slope facing options (after Collin, 1996)				
Slope Face Angle and Soil Type	Type of Facing			
	When Geosynthetic is not Wrapped at Face		When Geosynthetic is Wrapped at Face	
	Vegetated Face ¹	Hard Facing ²	Vegetated Face ¹	Hard Facing ²
> 50°(> ~0.9H:1V) All Soil Types	Not Recommended	Gabions	Sod, Permanent Erosion Blanket w/ seed	Wire Baskets, ³ Stone, Shotcrete
35° to 50° (~ 1.4H:1V to 0.9H:1V) Clean Sands (SP) ⁴ Rounded Gravel (GP)	Not Recommended	Gabions, Soil-Cement	Sod, Permanent Erosion Blanket w/ seed	Wire Baskets, ³ Stone, Shotcrete
35° to 50° (~ 1.4H:1V to 0.9H:1V) Silts (ML) Sandy Silts (ML)	Soil Bio reinforcement, Drainage Composites ⁵	Gabions, Soil-Cement, Stone Veneer	Sod, Permanent Erosion Blanket w/ seed	Wire Baskets, ³ Stone, Shotcrete
35° to 50° (~ 1.4H:1V to 0.9H:1V) Silty Sands (SM) Clayey Sands (SC) Well graded sands and gravels (SW & GW)	Temporary Erosion Blanket w/ Seed or Sod, Permanent Erosion Mat w/ Seed or Sod	Hard Facing, Not Needed	Geosynthetic Wrap Not Needed	Geosynthetic Wrap Not Needed
25° to 35° (~ 2H:1V to 1.4H:1V) All Soil Types	Temporary Erosion Blanket w/ Seed or Sod, Permanent Erosion Mat w/ Seed or Sod	Hard Facing Not Needed	Geosynthetic Wrap Not Needed	Geosynthetic Wrap Not Needed
Notes: 1. Vertical spacing of reinforcement (primary/secondary) shall be no greater than 16 in. (400 mm) with primary reinforcements spaced no greater than 32 in. (800 mm) when secondary reinforcement is used. 2. Vertical spacing of primary reinforcement shall be no greater than 32 in. (800 mm). 3. 18 in. (450 mm) high wire baskets are recommended. 4. Unified Soil Classification 5. Geosynthetic or natural horizontal drainage layers to intercept and drain the saturated soil at the face of the slope.				

(Table from FHWA GEC 011 – Volume II)

8.3 Compaction Requirements:

Backfill material shall be placed in lifts and compacted according to Section 206 of the current Specifications, unless thinner lift thicknesses are required by the Designer. Backfill shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in and/or movement of the geogrid. In addition, the Department shall monitor density with Plate Compaction Testing in accordance with the procedure outlined below in Section 8.3.1.

8.3.1 Plate Compaction Test Procedure:

Trial fill sections shall be constructed with Department personnel present to determine appropriate criteria to achieve adequate compaction. The trial fill sections shall be performed as follows:

- One trial fill section is valid for up to 10,000 ft² of RSS area (e.g. 1 to 10,000 ft² requires 1 trial fill section, 10,001 to 20,000 ft² requires 2, etc.) and for no more than one individual RSS.
- The minimum dimensions of the test pad shall be 15 ft. wide by 50 ft. long.
- The lift thickness shall not exceed one (1) foot.
- Compaction shall be determined by using a level to measure the settlement of the trial section at a number of locations after each pass (e.g., a minimum of 5 locations measured at the center of a 1 ft. square metal plates or other methods approved by the Engineer).
- After constructing a total thickness of approximately 3 feet, the third lift shall be used to determine the appropriate number of passes for production, which will maximize compaction without excessively crushing the rock at the surface.
- The number of passes to achieve at least 80 percent of the maximum settlement will be required for production work.
- Only those methods and equipment used to establish compaction compliance in the trial fill section shall be used for production work.
- A material change, change in source, a difference of more than +/- 5.0 percent passing any sieve size, and/or change in the approved equipment shall require the Contractor to conduct a new trial fill section and obtain re-approval by the Engineer of the minimum number of passes and rolling pattern.
- The Department reserves the right to use other test methods to evaluate the adequacy of the compaction criteria.
- The trial fill sections are incidental to the bid price for Reinforced Soil Slope.

Within three (3) feet of the slope face, compaction criteria shall be determined using test pad sections with Department personnel present to determine appropriate criteria to achieve adequate compaction. The test pad sections shall be performed as follows:

- The minimum dimensions of the test pad shall be 5 ft. wide by 15 ft. long.
- The lift thickness shall not exceed one (1) foot.
- Compaction shall be determined by using a level to measure the settlement of the test pad section at a number of locations after each pass (e.g., a minimum of 3 locations measured at the center of 1-foot square plates or other methods approved by the Engineer).
- After constructing a total thickness of approximately 3 feet, the third lift shall be used to determine the appropriate number of passes for production, which will maximize compaction without excessively crushing the rock at the surface.
- The number of passes to achieve at least 80 percent of the maximum settlement will be required for production work.
- Only those methods and equipment used to establish compaction compliance in the trial fill section shall be used for production work.
- A material change, change in source, a difference of more than +/- 5.0 percent passing any sieve size, and/or change in the approved equipment shall require the Contractor to conduct a new test pad section.
- The test pad sections are incidental to the bid price for Reinforced Soil Slope.

8.4 Project Plans Changes:

Design data is based on subsurface conditions and original project parameters. If project plans are changed subsequently, an additional subsurface investigation may be needed to verify the design parameters of the in-situ soils and embankment materials. The Engineer should notify the Division of Structural Design, Geotechnical Branch, of any plan changes as soon as possible. It is estimated that it will take approximately three (3) months for the Geotechnical Branch to complete its investigation and make any necessary geotechnical recommendations that may affect design prior to any construction. The Contractor will be responsible for providing access for drilling equipment to this area.

In the event the Contractor or Designer requires additional geotechnical investigation, those costs are incidental to the RSS bid item and no additional time will be allowed.

9) METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

All work associated with providing the design, details and construction for the facing shall be incidental to the unit price bid for Reinforced Soil Slope.