

CALL NO. ###

CONTRACT ID. 201015

LIVINGSTON COUNTY

FED/STATE PROJECT NUMBER STP BRO 0601 (196)

DESCRIPTION US-60

WORK TYPE BRIDGE WITH GRADE, DRAIN & SURFACE

PRIMARY COMPLETION DATE 12/1/2023

## LETTING DATE: MMMM DD, YYYY

Sealed Bids will be received electronically through the Bid Express bidding service until ##:## XM TIMEZONE MMMM DD, YYYY. Bids will be publicly announced at ##:## XM TIMEZONE.

PLANS AVAILABLE FOR THIS PROJECT.

**DBE CERTIFICATION REQUIRED - To Be Determined** 

**REQUIRED BID PROPOSAL GUARANTY:** Not less than 5% of the total bid.

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# PART I SCOPE OF WORK



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#### **TRAINEES**

In Compliance with the "TRAINING SPECIAL PROVISION" included in Part III of the Proposal, the Contractor will be required to employ a trainee(s) for this contract.

#### **ASPHALT MIXTURE**

Unless otherwise noted, the Department estimates the rate of application for all asphalt mixtures to be 110 lbs/sy per inch of depth.

#### INCIDENTAL SURFACING

The Department has included in the quantities of asphalt mixtures established in the proposal estimated quantities required for resurfacing or surfacing mailbox turnouts, farm field entrances, residential and commercial entrances, curve widening, ramp gores and tapers, and road and street approaches, as applicable. Pave these areas to the limits as shown on Standard Drawing RPM-110-06 or as directed by the Engineer. In the event signal detectors are present in the intersecting streets or roads, pave the crossroads to the right of way limit or back of the signal detector, whichever is the farthest back of the mainline. Surface or resurface these areas as directed by the Engineer. The Department will not measure placing and compacting for separate payment but shall be incidental to the Contract unit price for the asphalt mixtures.

## FUEL AND ASPHALT PAY ADJUSTMENT

The Department has included the Contract items Asphalt Adjustment and Fuel Adjustment for possible future payments at an established Contract unit price of \$1.00. The Department will calculate actual adjustment quantities after work is completed. If existing Contract amount is insufficient to pay all items on the contract with the adjustments, the Department will establish additional monies with a change order.

#### ASPHALT PAVEMENT RIDE QUALITY CATEGORY A

The Department will apply Pavement Rideability Requirements on this project in accordance with Section 410, Category A.

#### **OPTION A**

Be advised that the Department will accept compaction of asphalt mixtures furnished for driving lanes and ramps, at 1 inch (25mm) or greater, on this project according to OPTION A in accordance with Section 402 and Section 403 of the current Standard Specifications. The Department will require joint cores as described in Section 402.03.02 for surface mixtures only. The Department will accept compaction of all other asphalt mixtures according to OPTION B.

## MATERIAL TRANSFER VEHICLE (MTV)

Provide and use a MTV in accordance with Sections 403.02.10 and 403.03.05.

# US-60 over CUMBERLAND RIVER - EXISTING BRIDGE REPAIRS PROPOSAL BID ITEMS

Line	Bid Code	Description	Quantity	Unit
001	22146EN	CONCRETE PATCHING REPAIR	400	SF
002	25015EC	FRP WRAP	2234	SF
003	23853EC	BEARING REPAIRS	6	EA
004	02671	PORTABLE CHANGEABLE MESSAGE SIGN	2	EA
005	02650	MAINTAIN AND CONTROL TRAFFIC	1	LS



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# SPECIAL NOTE FOR MILESTONE COMPLETION DATE AND LIQUIDATED DAMAGES ON EXISTING BRIDGE REPAIRS

- I. COMPLETION DATE. All work described in the existing bridge repair notes and details is to be completed by August 1, 2020. The Contractor must notify the Department seven (14) calendar days before contract work begins on the existing bridge repairs.
- II. LIQUIDATED DAMAGES. Liquidated damages will be assessed on the Contractor in accordance with the Transportation Cabinet, Department of Highway's 2019 Standard Specifications for Road and Bridge Construction, Section 108.09, at a rate of \$2,500 per calendar day, when the August 1, 2020 date is exceeded.

All construction must be completed in accordance with the weather limitations specified in Section 606 and/or Section 601 as applicable. No extension of Contract time will be granted due to inclement weather or temperature limitations.



## SPECIAL NOTE FOR TRAFFIC CONTROL ON BRIDGE REPAIR CONTRACTS

### I. TRAFFIC CONTROL GENERAL

Except as provided herein, traffic shall be maintained in accordance with the current standard specifications, section 112. The contractor will be responsible for developing and implementing the maintenance of traffic details with guidance through standard drawings and the MUTCD current editions. The developed traffic control plan must be approved by the Engineer prior to implementation. The contractor is expected to provide at a minimum the items listed in this note, however this note does not relieve the contractor of other items that may be necessary to comply with current standards. Except for the roadway and traffic control bid items listed, all items of work necessary to maintain and control traffic will be paid at the lump sum bid price to "Maintain and Control Traffic".

Contrary to section 106.01, traffic control devices used on this project may be new or used in new condition, at the beginning of the work and maintained in like new condition until completion of the work.

The contractor must notify the engineer and public information officer at least 14 calendar days prior to the beginning work. Please see the Special Note for Existing Bridge Repairs Completion Date for additional information.

#### II. TRAFFIC COORDINATOR

Furnish a traffic coordinator as per section 112. The traffic coordinator shall inspect the project maintenance of traffic, at least three times daily, or as directed by the engineer, during the contractor's operations and at any time a bi-directional lane closure or road closure is in place. The personnel shall have access on the project to a radio or telephone to be used in case of emergencies or accidents. The traffic coordinator shall report all incidents throughout the work zone to the engineer on the project. The contractor shall furnish the name and telephone number where the traffic coordinator can be contacted at all times.

#### III. SIGNS

The contractor is responsible for all signage during construction. The contractor shall adhere to the standard drawings and manual on uniform traffic control devices (MUTCD) for guidance. If, at any time, the engineer requests a change in the maintenance of traffic signage, the contractor shall implement the change within 8 hours. Failure to implement these changes within the required eight hours will result in liquidated damages of \$5,000 per day.

The department will not measure installation, maintenance, or removal for payment of any detour signage or standard construction signage, and will consider these incidental to "Maintain and Control Traffic"

Closure signs, detour signs, and bi-directional lane closure signs should be placed no sooner than two weeks prior to the closing of the bridge (when applicable) or placing lane closures.

#### IV. Lane Closure

Full Closure of the bridge shall not be permitted. The Contractor may utilize bi-directional lane closures if deemed necessary provided that a minimum 10-foot driving lane is maintained.

## V. PROJECT PHASING & CONSTRUCTION PROCEDURES

Project phasing shall be as directed by the plans, special notes, and the approved Traffic Control Plan prepared by the contractor. Maintain traffic over the bridge as long as possible. Once work on the structure begins that impacts traffic, ensure work progresses to minimize the effected time to the public.

# VI. VARIABLE MESSAGE SIGNS AND TEMPORARY TRAFFIC SIGNALS

At the direction of the Engineer, the contractor is expected to provide up to two (2) message boards for use at locations determined by the Engineer. These message boards are expected to be in place one week prior to any lane closures and remain in place for the duration of the closure. The message boards will be paid for as per the standard specifications.

For projects that involve the use of lane closures, all lane closures shall be bi-directional. The contractor shall provide temporary traffic signals and all labor, materials, and incidentals needed to maintain bi-directional traffic for the project. For short term bi-directional lane closures, the use of flaggers in lieu of temporary traffic signals may be acceptable if approved by the Engineer.

#### VIII. PAYMENT

Unless listed as a bid item in the contract documents, payment will only be made for the following items:

- 1. Portable Changeable Message Boards Each
- 2. Maintain and Control Traffic Lump Sum

All other items needed to maintain traffic in accordance with these contract documents and the approved traffic control plan shall be considered incidental to Maintain and Control Traffic. These items include but are not limited to traffic signals, signs, barrier wall, crash cushions, temporary guardrail, temporary and permanent pavement striping, cones, barrels, flaggers, etc.

### SPECIAL NOTE FOR CONCRETE PATCHING REPAIR

These Notes or designated portions thereof, apply where so indicated on the plans, proposals or bidding instruction.

## I. DESCRIPTION.

Perform all work in accordance with the Department's current Standard Specifications for Roads and Bridges, and applicable Supplemental Specifications, the attached sketches, and these Notes. Section references are to the Standard Specifications.

This work consists of: (1) Furnish all labor, materials, tools, and equipment; (2) Remove existing spalled/delaminated concrete; (3) Prepare the existing surface for concrete patching; (4) Place hook fasteners and welded wire fabric over surfaces to be repaired (where applicable); (5) Apply concrete patching as specified by this note and as shown on the attached detail drawings; (6) Finish and cure the new Concrete Patches; (7) Maintain & control traffic; and, (8) Any other work specified as part of this contract.

#### II. MATERIALS.

- **A. Self-Consolidating Concrete.** Refer to list of approved materials or Kentucky Product Evaluation List.
- **B.** Vertical and Overhead Patch Material. From approved KYTC Division of Materials List.
- **C. Steel Reinforcement.** Use Grade 60. See Section 602
- D. Welded Steel Wire Fabric (WWF). Conform to Section 811
- **E. Hook Fasteners.** Use commercial grade galvanized hook fasteners. Minimum 3/16" diameter.

## III. CONSTRUCTION.

A. Concrete Removal and Preparation. The Contractor, as directed by the Engineer shall locate and remove all loose, spalled, deteriorated and delaminated concrete. Sounding shall be used to locate delaminated areas. Care shall be exercised not to damage areas of sound concrete or reinforcing steel during concrete removal operations. Concrete removal shall be in accordance with a sequence approved by the Engineer.

Concrete removal shall be accomplished by chipping with hand picks, chisels or light duty pneumatic or electric chipping hammers (not to exceed 15 lbs.). Remove all deteriorated loose concrete a minimum depth of ¾" behind bar, and at least ¼" greater than the largest size of aggregate in the repair mix., Care shall be taken to not damage bond to adjacent non-exposed reinforcing steel during concrete

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removal processes. Unless specifically *directed by the Engineer*, depth of removal shall not exceed 6 inches. The outer edges of all chipped areas shall be saw cut to a minimum depth of 1 inch to prevent featheredging unless otherwise approved by the Engineer.

The perimeter of all areas where concrete is removed shall be sawcut at a 90° angle.

After all deteriorated concrete has been removed; the repair surface to receive concrete patching shall be prepared by abrasive blast cleaning or water blast cleaning (greater than 5,000 psi). Abrasive blast cleaning shall remove all fractured surface concrete and all traces of any unsound material or contaminants such as oil, grease, dirt, slurry, or any materials which could interfere with the bond of freshly placed concrete. The abrasive blast cleaning shall produce a Concrete Surface Profile (CSP) of a 6 or greater as per the current guidelines established by the International Concrete Repair Institute (ICRI), Technical Guideline 310.2R-2013.

The Contractor shall dispose all removed material in an approved site.

**B. Steel Reinforcement.** All corroded reinforcing steel exposed during concrete removal shall have corrosion products removed by abrasive grit blasting or wire brush whichever is more appropriate. Furnish for replacement, as directed by the Engineer, additional linear feet of steel reinforcing bars ½" diameter by 20-foot lengths. Place these bars in areas deemed by the Engineer to require additional reinforcement. Field cutting and bending is permitted. Deliver unused bars to the nearest County Maintenance Barn.

Reinforcing steel displaying deep pitting or loss of more than 20 percent of cross-sectional area shall be removed and replaced. Reinforcement shall be placed such that the minimum spacing around each bar is three times the maximum aggregate size to allow for proper encapsulation with concrete patching.

Intersecting reinforcing bars shall be tightly secured to each other using tie wire and adequately supported to minimize movement during concrete placement.

C. Concrete Repairs. Place and finish the new concrete for the patching area in accordance with the manufacturer's recommendations, as shown on the attached detail drawings, and as directed by the Engineer. For repairs greater than 1 square foot in surface area, the contractor must use self-consolidating repairs and use a form-and-pour technique (hand application is not allowed). Vertical and Overhead Patching material may be applied by hand troweling for repairs less than one square foot. The Engineer shall approve the Contractor's method of placing and consolidating the concrete prior to the beginning of this operation.

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- **D.** Curing. On completion of finishing operation, patching concrete shall immediately be prevented from drying out and cracking by fogging, wetting, and/or any appropriate method approved by the Engineer. Curing shall continue for the duration recommended by the product manufacturer.
- F. Quality Control/Testing. After completion of the curing, tensile bond testing shall be performed. The testing shall be in accordance with ICRI Technical Guideline 210.3R and ASTM C1583/C1583M. Up to one location per substructure unit and one location per span shall be performed, as directed by the Engineer. Repair of the test areas is to follow the guidance in this note. No additional payment will be made for testing or for the repair of testing locations.

Each Contractor submitting a bid for this work shall make a thorough inspection of the site prior to submitting his bid and shall thoroughly familiarize himself with existing conditions so that the work can be expeditiously performed after a contract is awarded. Submission of a bid will be considered evidence of this inspection having been made. Any claims resulting from site conditions will not be honored by the Department. Quantities given are approximate. The quantity for "Concrete Patching Repair" shall be bid with the contingency that quantities may be increased, decreased, or eliminated by the Engineer. Dispose of all removed material entirely away from the job site as approved by the Engineer. This work is incidental to the contract unit price for "Concrete Patching Repair".

## IV. MEASUREMENT

- **A.** Concrete Patching Repair. The Department will measure the quantity per square feet of each area restored. Double payment will not be made on both faces of corner repairs.
- **B.** Steel Reinforcement. See Section 602. Steel reinforcement will not be measured for payment but shall be considered incidental to "Concrete Patching Repair".

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# V. PAYMENT

- A. Concrete Patching Repair. Payment at the contract unit price per square feet is full compensation for the following: (1) Furnish all labor, materials, tools, equipment; (2) preparation of specified areas including removing and disposing of specified existing materials; (3) place, finish and cure new concrete patches; and (4) all incidentals necessary to complete the work as specified by this note and as shown on the attached detail drawings.
- **B.** Steel Reinforcement. See Section 602.

The Department will consider payment as full compensation for all work required by these notes and detail drawings.



## SPECIAL NOTE FOR STRUCTURES WITH FIBER REINFORCED POLYMER WRAP

#### I. DESCRIPTION

Perform all work in accordance with the Department's current Standard Specifications for Roads and Bridges, and applicable Supplemental Specifications, the attached sketches, and these Notes. Section references are to the Standard Specifications.

This work consists of the following:

- 1. Furnish all labor, materials, tools, equipment, and incidental items necessary to complete the work.
- 2. Provide safe access to the bridge, in accordance with Section 107.01.01, for the Engineer to sound possible repair areas and for workers to complete the construction.
- 3. Repair cracks on pier strut as applicable in accordance with the Special Note for Epoxy Injection Crack Repair.
- 4. Repair delaminated or spalled areas of pier strut as applicable in accordance with the Special Note for Concrete Patching.
- 5. Design and install a carbon fiber reinforced polymer (CFRP) strengthening and protection system.
- 6. Any other work as specified as part of this contract.

#### II. MATERIALS

One manufacturer shall supply all materials required for the CFRP system. The manufacturer shall be one of three listed below or approved equal for the carbon fiber reinforced polymer (CFRP) strengthening and protection system.

Tyfo Fiberwrap System Fyfe Company, LLC 4995 Murphy Canyon Road Suite 110 San Diego, CA 92123

MasterBrace System BASF Corporation 889 Valley Park Drive Shakopee, MN 55379

QuakeWrap 6840 S Tucson Blvd Tucson, AZ 85756

To be an approved equal CFRP material manufacturer, the manufacturer of the material shall have a history of at least 5 years for supplying the specified materials to highway or

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similar structural projects. The CFRP manufacturer must provide a history of a minimum of 15 installations completed in the last 2 years, durability testing, independent laboratory testing for corroded concrete repairs, design equivalence to the specified system, and all proposed material data.

CFRP materials shall have a current international code council evaluation service report (ICC ESR #) compliant with the 2018 IBC. Materials must provide structural and durability testing as defined in ICC AC125.

Polyester or other resins will not be allowed as a substitute to epoxy resins. Glass composite systems will not be allowed as a substitute to carbon composite systems.

#### III. CONSTRUCTION

- A. Design CFRP System. The CFRP system shall be designed for the resistance(s) shown in the attached detail drawings and according to AASHTO FRPS-1 and ACI 440. Design calculations and details must be sealed by a Professional Engineer licensed in the State of Kentucky and must be submitted and approved by the Engineer prior to installation. Submittal information shall include:
  - a. Manufacturer's product data sheets and material test data.
  - b. Installation and maintenance instructions.
  - c. Drawings detailing the type, locations, dimensions, number of layers, and orientations of all FRP materials to be installed.
  - d. Calculations to determine the layout of the FRP materials to be installed.
  - e. Quality control plan.
- **B.** Surface Preparation Pier Strut. Concrete sealer is to be removed from the existing surfaces to the installer's satisfaction prior to the concrete cleaning and spall repair. Any deteriorated concrete located on the pier strut is to be patched per the Special Note for Concrete Patching, then cleaned and prepared to the installer's satisfaction prior to the installation of the CFRP system. The repaired concrete surfaces shall be allowed to cure a minimum of 14 days. The surfaces shall be clean and free of fins, depressions, or other conditions that may affect the intended performance of the CFRP system. Corners perpendicular to the strong fiber direction shall be rounded to a minimum radius of 3/4". The certified and experienced installer responsible shall verify that all required surface preparation has been completed properly and that the CFRP system is cleared for installation.
- C. Surface Preparation Pier Column. Concrete sealer is to be removed from the existing surfaces to the installer's satisfaction prior to the concrete cleaning. The surfaces shall be clean and free of fins, depressions, or other conditions that may affect the intended performance of the CFRP system. Corners perpendicular to the strong fiber direction shall be rounded to a minimum radius of 3/4". The certified and experienced installer responsible shall verify that all required surface preparation has been completed properly and that the CFRP system is cleared for installation.
- **D.** Composite Application. The CFRP system shall only be installed by individuals certified in writing by the material supplier. To be an approved installer for the CFRP material, the installer must provide a history of a minimum of 15 installations

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completed in the last 2 years using the proposed CFRP material or an approved equal. The manufacturer shall be required to provide training to the crew that does the actual installation as well as construction oversight throughout the duration of the CFRP installations to ensure the materials are applied according to their design and specific material requirements. The manufacturer must submit the name of the installer's company and provide certification the installer meets the quality and experience requirements to perform the work with the bid documents. References of these installations including descriptions and contact information will be reviewed by the Engineer. Installers without the proper certifications, experience, and references will not be allowed to complete this work.

Temperatures of the substrate to receive the composite, ambient temperatures, and the temperature of the CFRP materials shall be between 50°F and 95°F at the time of mixing of epoxy. The CFRP system shall be applied when the relative humidity is less than 85% and the substrate temperature is more than 5°F above the dew point. Applications of the CFRP shall begin within one hour of the mixing of epoxies.

The manufacturer shall designate the proper mixing procedure for the epoxy resins. Apply a primer coating of epoxy to surfaces of the substrate to receive the CFRP system. Saturate the carbon fiber in a documented successful manner that ensures full saturation of the carbon fiber prior to the installation of the CFRP. Saturation of the carbon fiber in place is not allowed. Apply the CFRP to the prepared and primered substrate using methods that proved a uniform tensile force over the width of the saturated carbon fabric. Strong fibers shall not deviate from the intended fiber direction more than 1/2" per 12" length of composite. Inspection of the installed composite shall be completed prior to the curing of the CFRP to ensure that all edges, seams, and other areas are properly adhered. During this inspection process, releasing of entrapped air and other identified deficiencies shall be addressed.

After the CFRP system has been installed, use thickened epoxy to detail all edges and seams to provide a smooth finish. Apply a final layer of thickened epoxy to the installed CFRP system for protection.

- **E. Coating System Application.** After the epoxy sets, yet prior to the application of the urethane top coat, all defects (including bubbles, delaminations, and fabric tears) more than 1 square inch of the surface area, or as specified by the Engineer, shall be repaired as such:
  - a. Small defects (on the order of 6" diameter) shall be injected or back filled with epoxy.
  - b. Bubbles less than 12" in diameter shall be repaired by injecting the epoxy. Two holes shall be drilled into the bubble to allow injection of the epoxy and escape of the entrapped air.
  - c. Bubbles, delaminations, and fabric tears greater than 12" in diameter shall be repaired by removing and reapplying the required number of layers of the composite and the required finish coatings. All repairs shall be approved by the Engineer.

The urethane top coat shall then be applied to the final epoxy coat, as determined by manufacturer.

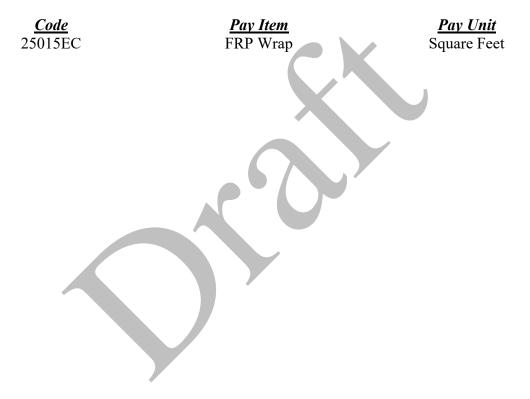
**F. Quality Control.** Installer must follow the quality control manual for the installation of the CFRP Systems, produced by the manufacturer.

# IV. MEASUREMENT

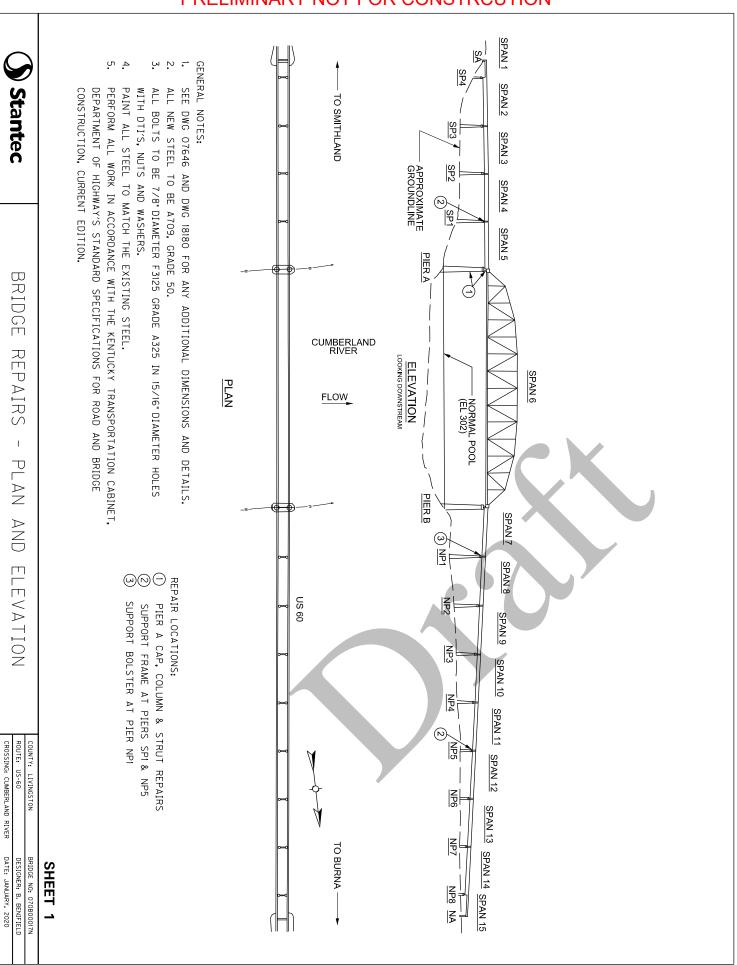
The Department will measure the quantity by square footage covered. The number of layers will not be counted.

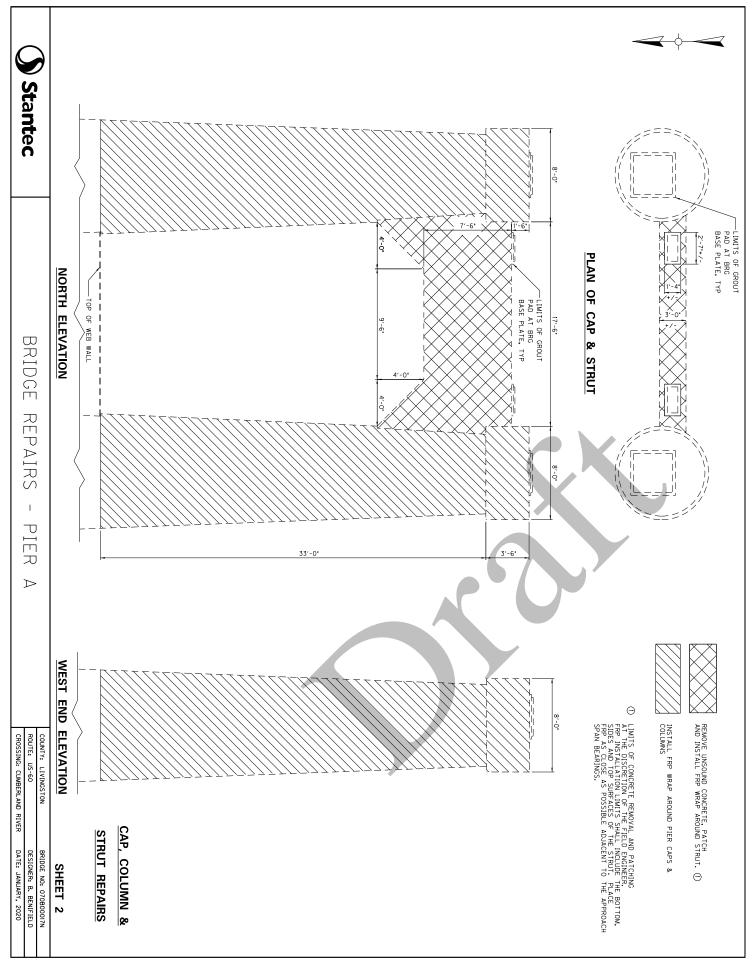
## V. PAYMENT

Payment at the contract unit price per square feet is full compensation for CFRP design, materials and installation, and all incidental items necessary to complete the work in accordance with this Special Note and as shown on the attached detail drawing(s).

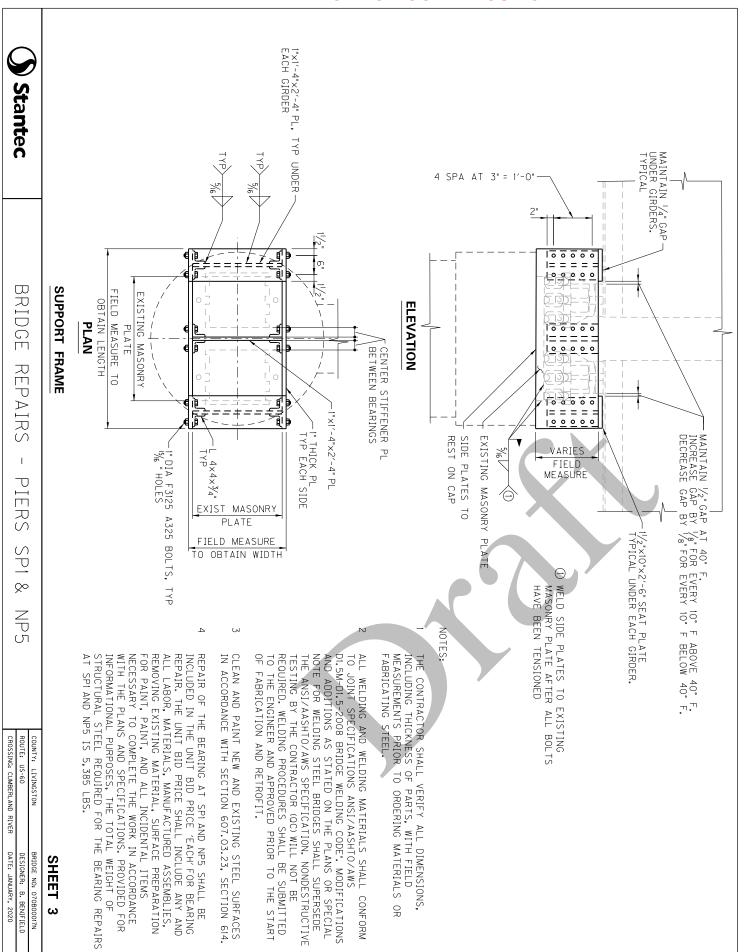


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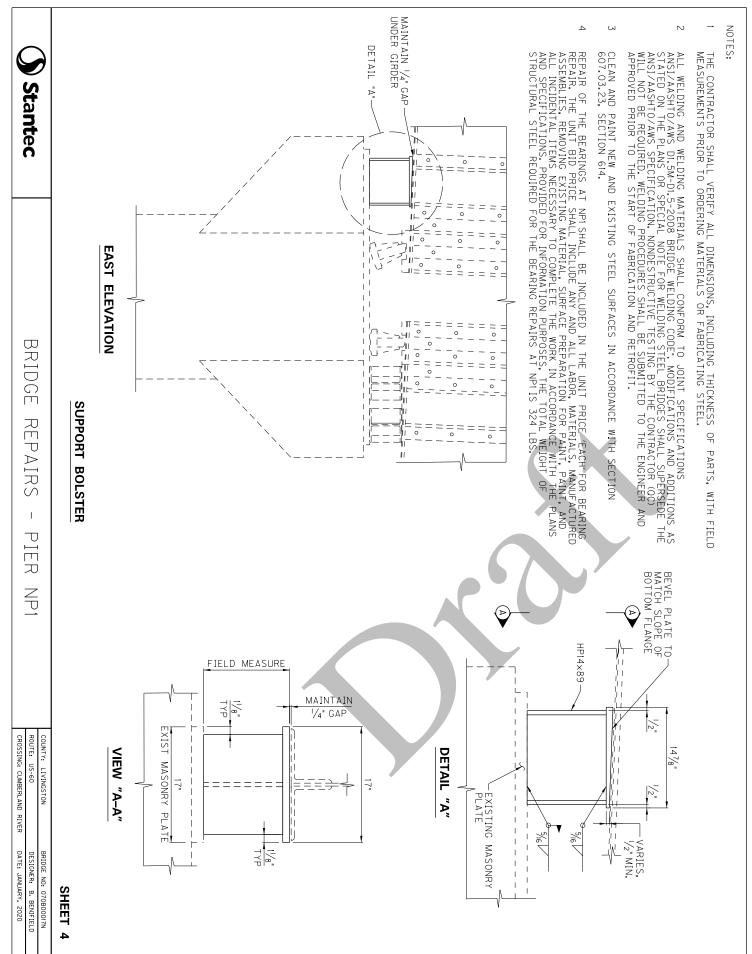




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# SPECIAL NOTE

# **For Construction Activities**

# Livingston County US 60 Smithland Bridge Replacement Item No. 01-1142

STANDARD GRAY BAT EROSION CONTROL IS TO BE FOLLOWED.

If there are any questions regarding this note, please contact Danny Peake, Director, Division of Environmental Analysis, 200 Mero Street, Frankfort, KY 40601; Phone: (502) 564-7250.



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## **DRAFT DOCUMENT - FOR INTERNAL REVIEW ONLY**

# **MEMORANDUM**

**TO:** All KYTC Prequalified Contractors

**FROM:** Rachel Mills, P.E.

Director

**Division of Construction Procurement** 

**DATE:** January 28, 2020

**SUBJECT:** Livingston County

US 60 over Cumberland River (Smithland Bridge Replacement)

Item No. 1-1142

The Kentucky Transportation Cabinet (KYTC) intends to advertise for the replacement of the US 60 bridge over the Cumberland River in Smithland, KY on February 14, 2020. The project involves the replacement and demolition of the existing Lucy Jefferson Memorial bridge, roadway approach construction, intermediate repairs to the existing bridge, and utility relocations. Official bids will be received in accordance with the Cabinet's normal bidding process, allowing for a 5-week advertisement period, which is scheduled for March 20th, 2020.

The Department has elected to post preliminary project plans prior to the beginning of the official advertisement period. The preliminary plans are available on the Division of Construction Procurement's website and are subject to change:

https://transportation.ky.gov/Construction-Procurement/Pages/default.aspx

A mandatory pre-bid meeting is scheduled for February 21, 2020 at 9:00 pm (CST) at:

Kentucky Transportation Cabinet Central Office
District One Office
5501 Kentucky Dam Road
Paducah, KY 42003

The meeting is mandatory for contractors who intend to be submit bids as Prime Contractors.

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

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# SPECIAL NOTE FOR CONE PENETRATION TEST DATA

# Livingston County – US 60 Bridge over the Cumberland River Item No. 1-1142.0

Cone Penetration Testing (CPT) was performed on the project. This special note includes the following:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

A report entitled "Presentation of Site Investigation Results", prepared by ConeTec Inc., contains a comprehensive report of the cone penetration testing performed for this project and is included in an Appendix of the Geotechnical Engineering Report prepared by Stantec Consulting Services, Inc. The geotechnical report is or will be available to bidders.

CPT	Sounding ID	Station	Offset	Final Depth
Sounding No. on	in ConeTec	(ft.)	(ft.)	(ft.)
Subsurface	Report			
Data Sheets				
CPT-2	CPT19-02	116+13	CL	5.58
CPT-2A	CPT19-02A	116+13	2 Lt.	7.05
CPT-2B	CPT19-02B	116+13	3 Rt.	14.60
CPT-3	SCPT19-03	117+37	CL	26.25
CPT-4	SCPT19-04	118+50	CL	50.03
CPT-5	SCPT19-05	125+70	CL	100.89
CPT-6	SCPT19-06	127+00	CL	94.82
CPT-7	SCPT19-07	128+40	CL	109.74
CPT-8	SCPT19-08	129+00	CL	116.14
CPT-9	SCPT19-09	131+50	CL	79.56
CPT-10	SCPT19-10	132+60	CL	126.80
CPT-11	SCPT19-11	134+00	CL	93.50

Cone Penetration Test Summary and Standard Cone Penetration Test Plots





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19-61032 Stantec Project:

Job No: Client: US60 Bridge, Livingston County, KY

20-Aug-2019 23-Aug-2019

Start Date: End Date:

CONE PENETRATION TEST SUMMARY	CONE PENETRATI	ONE PENETRATI		ON TEST S	UMMARY				
File Name Date	Date		Cone	Assumed Phreatic Surface <sup>1</sup> (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing <sup>2</sup> (m)	Easting <sup>2</sup> (m)	Refer to Notation Number
19-61032_CP02 22-Aug-2019			513:T1500F15U500	31.0	5.58		4112078	375659	4
19-61032_CP02A 22-Aug-2019 5		Δ,	513:T1500F15U500	31.0	7.05		4112078	375656	4
19-61032_CP02B 22-Aug-2019 5		L)	513:T1500F15U500	31.0	14.60		4112078	375661	4
19-61032_SP03 23-Aug-2019 5:		5.	513:T1500F15U500	31.0	26.25	2	4112118	375665	4
19-61032_SP04 23-Aug-2019 51		51	513:T1500F15U500	31.0	50.03	4	4112156	375670	
19-61032_SP05 20-Aug-2019 513		513	513:T1500F15U500	13.8	100.89	7	4112378	375709	3
19-61032_SP06 20-Aug-2019 513		513	513:T1500F15U500	8.2	94.82	7	4112426	375716	
19-61032_SP07 21-Aug-2019 51		51	513:T1500F15U500	3.7	109.74	8	4112461	375709	3
19-61032_SP08 21-Aug-2019 5:		5.	513:T1500F15U500	9.3	116.14	8	4112444	375723	
19-61032_SP09 21-Aug-2019 5		2	513:T1500F15U500	9.6	79.56	9	4112545	375744	
19-61032_SP10 21-Aug-2019 5	-	2	513:T1500F15U500	13.5	126.80	6	4112576	375747	3
19-61032_SP11 22-Aug-2019	-		513:T1500F15U500	14.5	93.50	7	4112619	375756	
12 soundings					824.96	28			

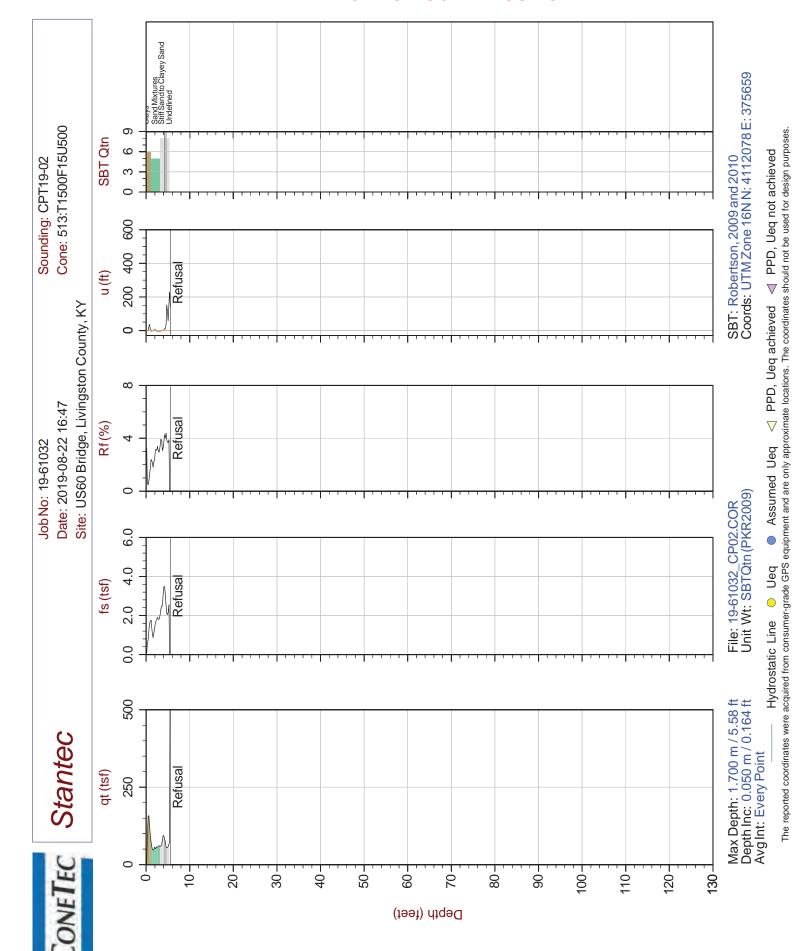
1. The assumed phreatic surface was based on pore pressure dissipation tests. Equilibrium pore pressure profiles were assumed for the calculated parameters.

2. Coordinates were acquired using a MR-350 GlobalSat GPS Receiver in datum: WGS84 / UTM Zone 16 North.

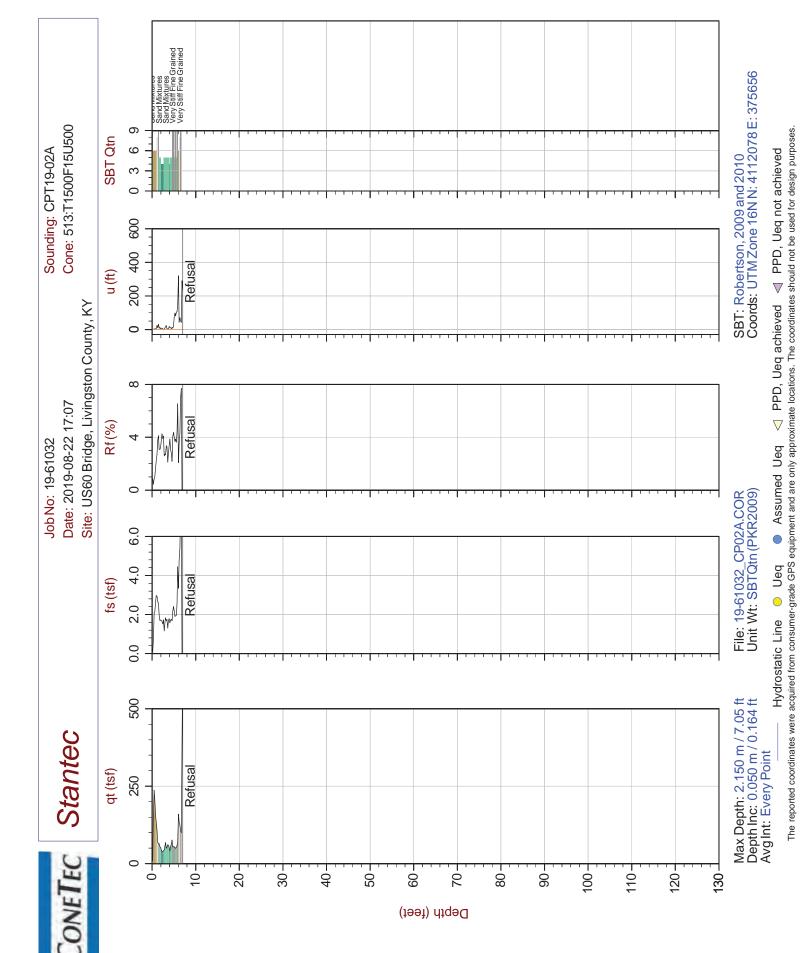
3. Assumed phreatic surface depth was based on a single static pore pressure dissipation test.

4. No phreatic surface detected

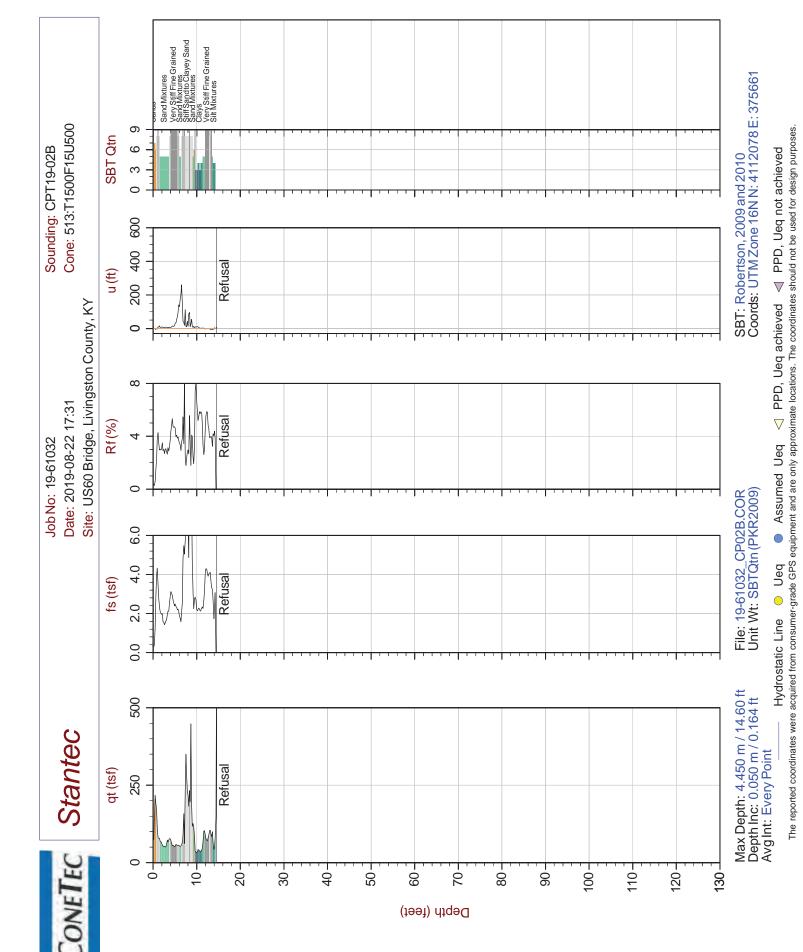
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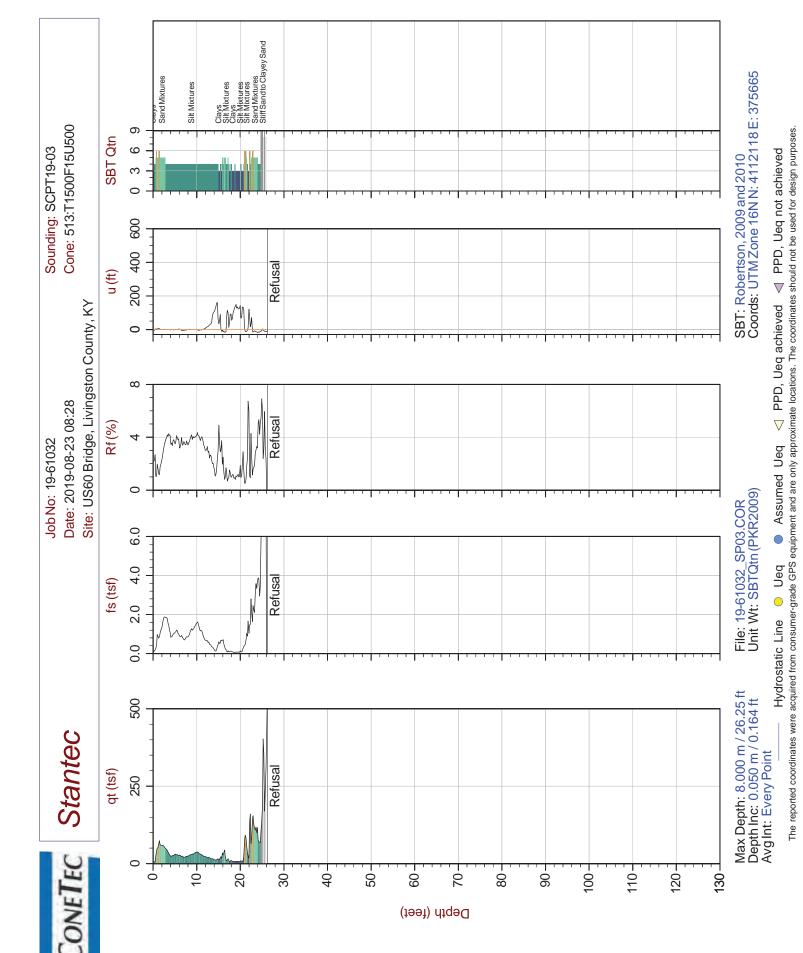
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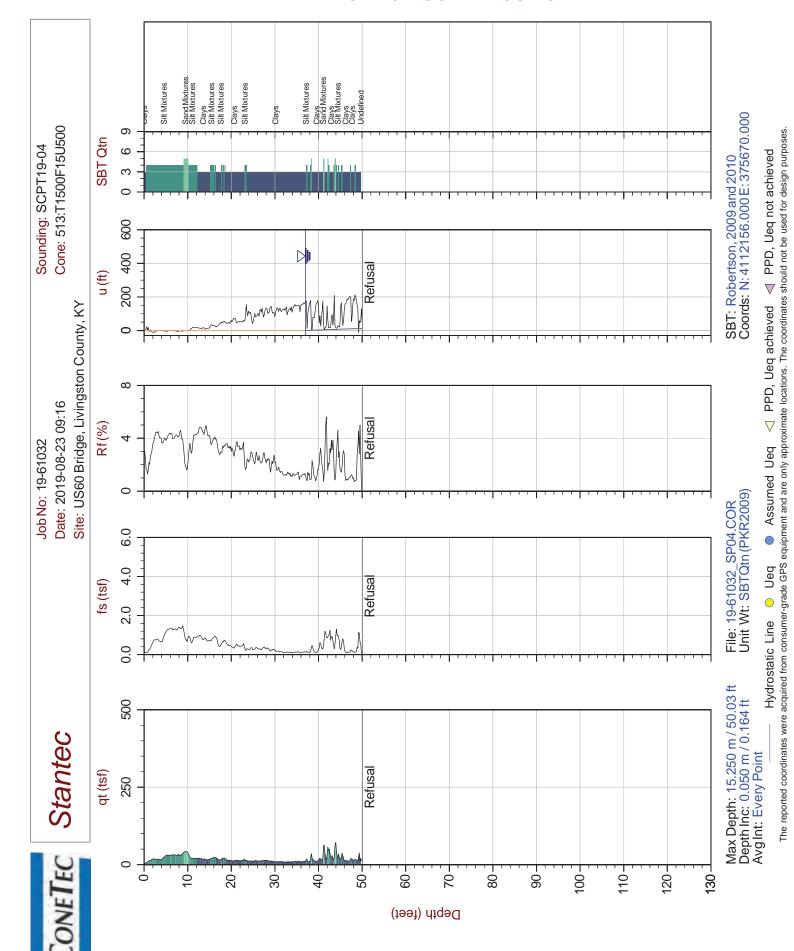
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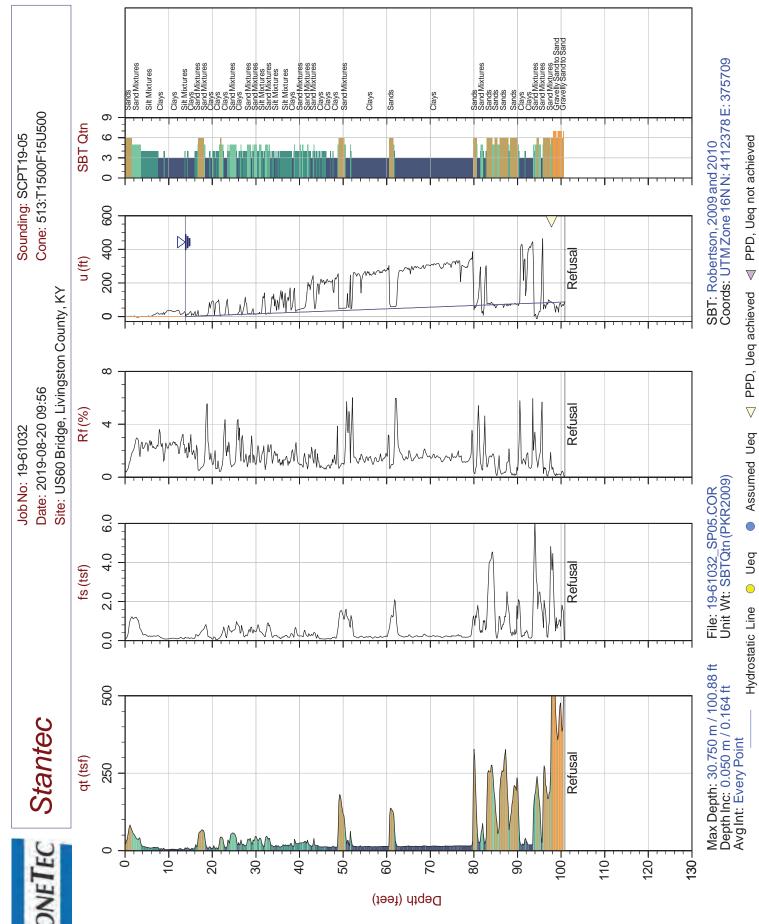
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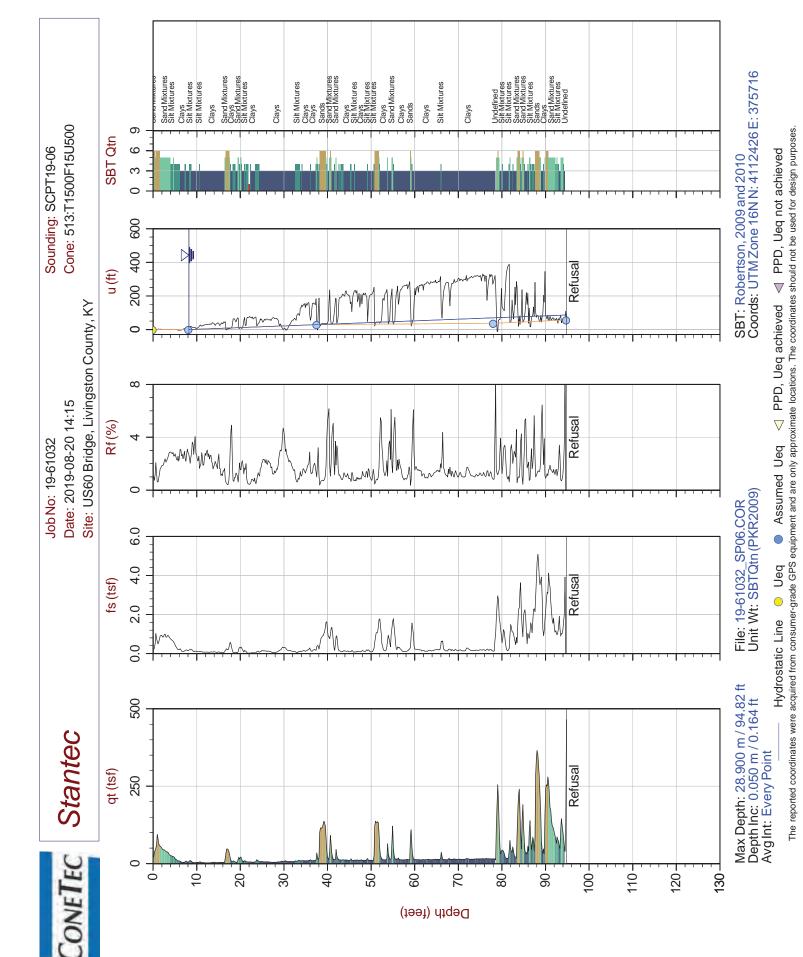


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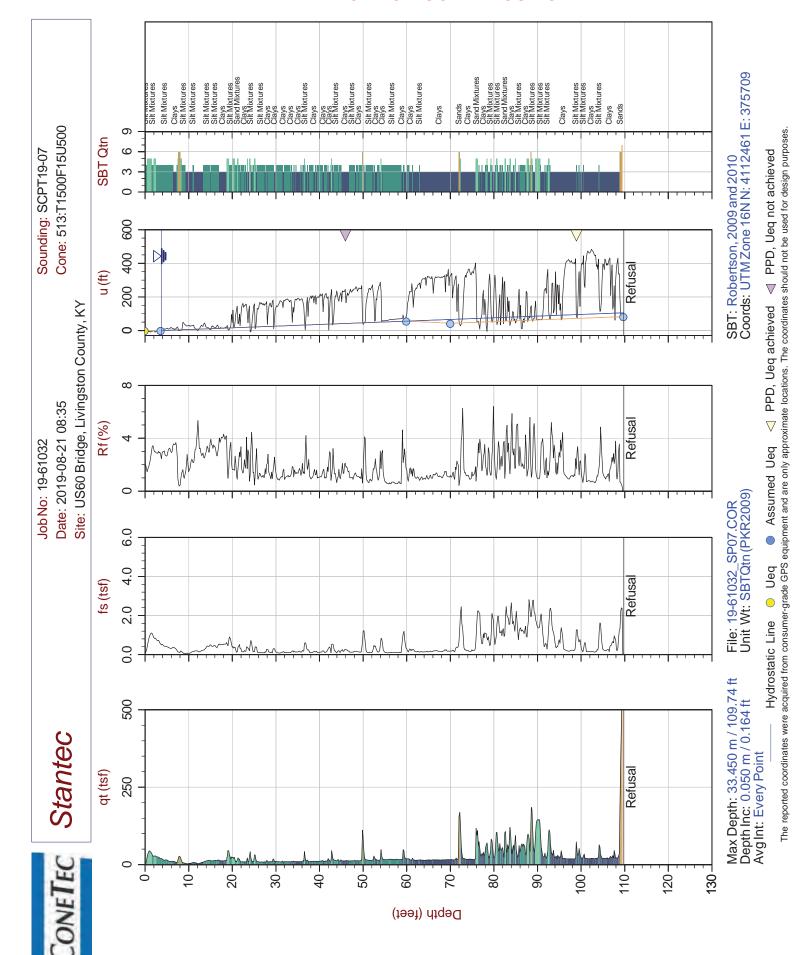


The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

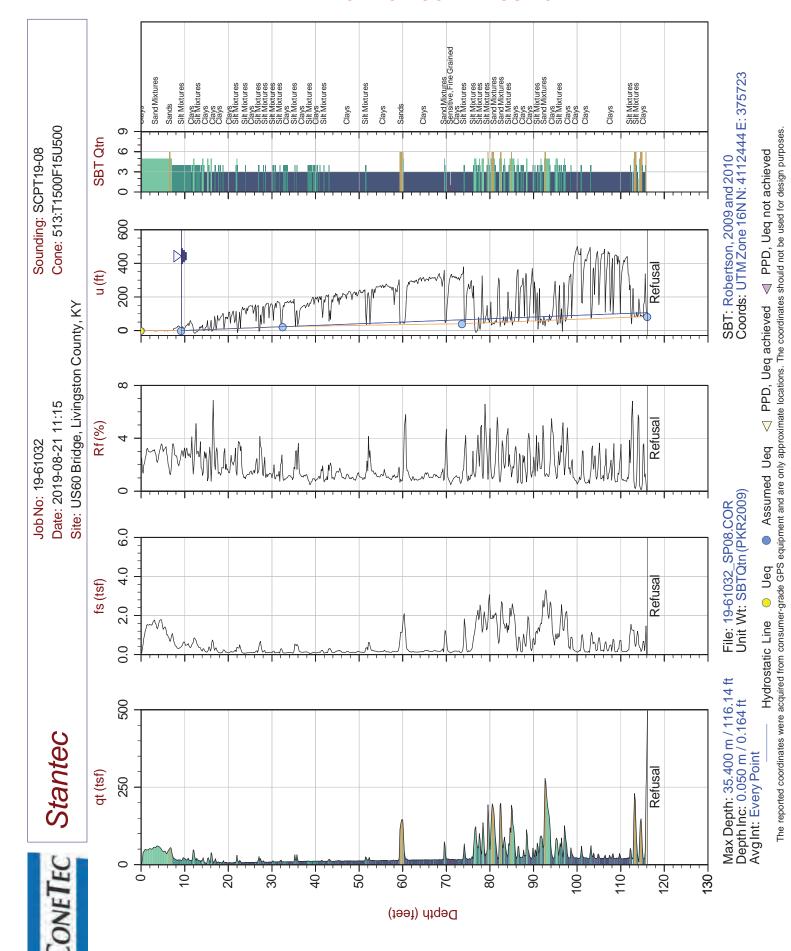
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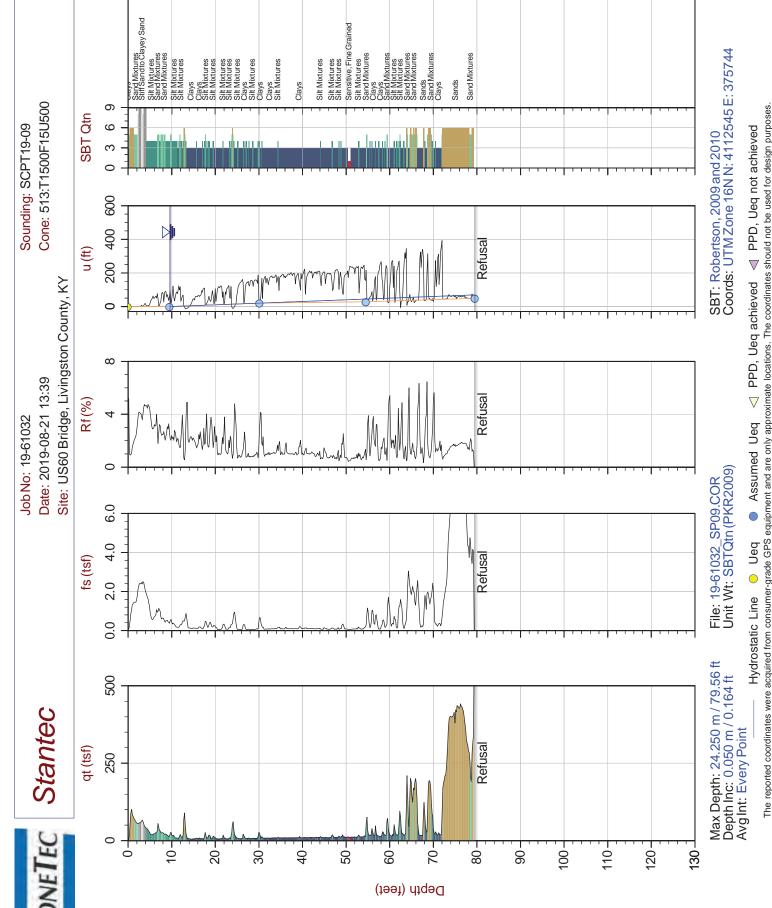


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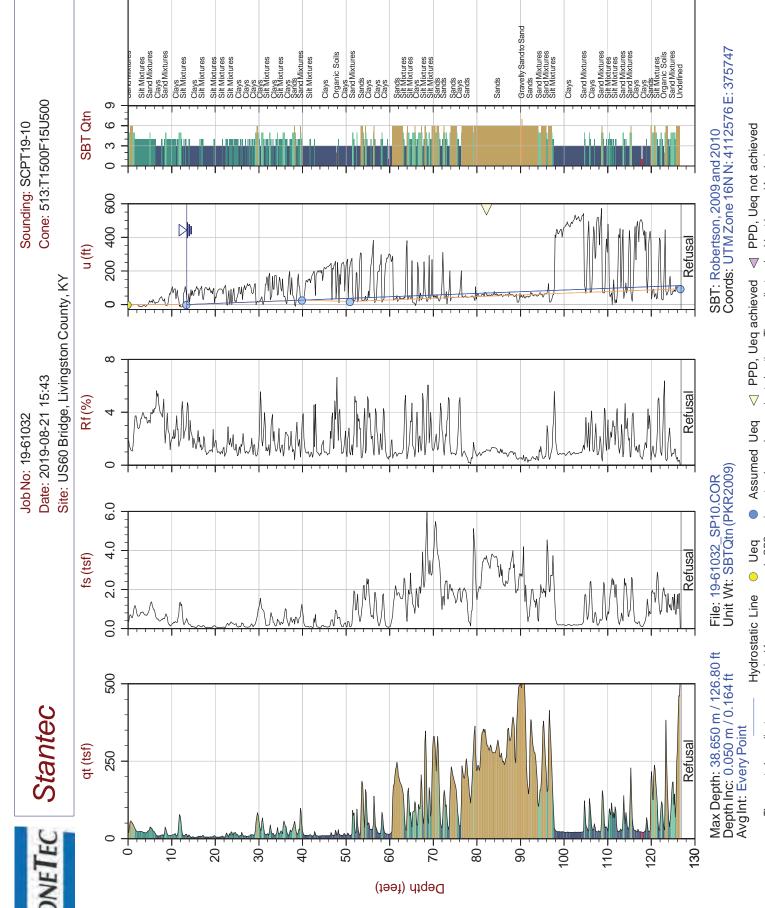
# PRELIMINARY NOT FOR CONSTRCUTION



The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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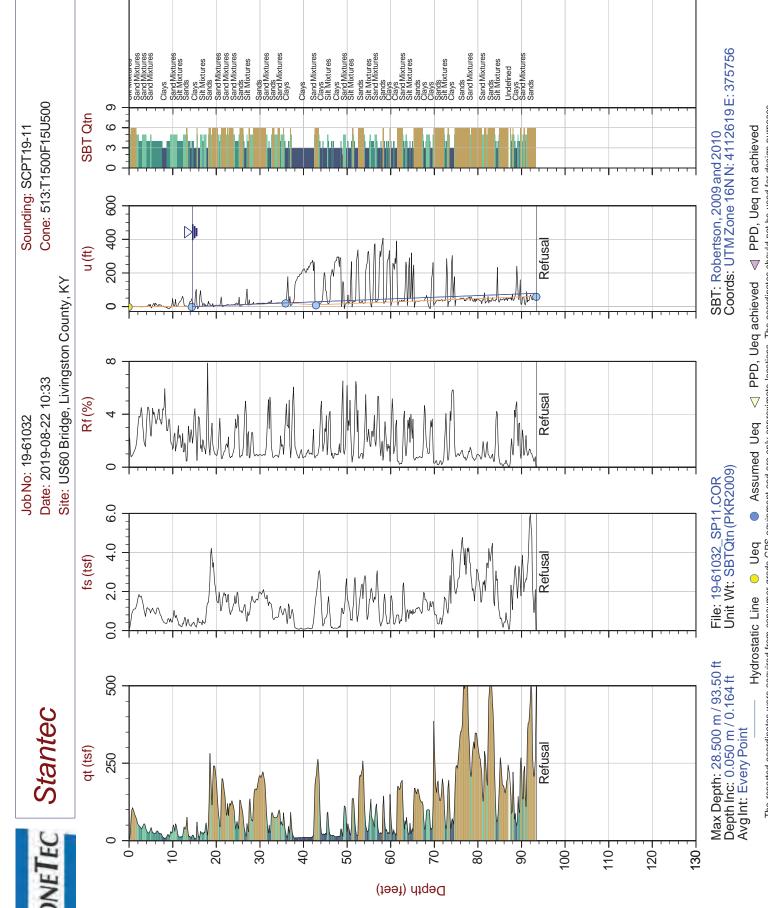
# PRELIMINARY NOT FOR CONSTRCUTION



The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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# PRELIMINARY NOT FOR CONSTRCUTION



The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

# Seismic Cone Penetration Test Plots





Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots





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19-61032 Job No:

US60 Bridge, Livingston County, KY Stantec Project: Client:

CONFTEC

20-Aug-2019 23-Aug-2019

Start Date: End Date:

		CPTu POR	E PRESS	URE DI	RE PRESSURE DISSIPATION SUMMARY	MMARY				
Sounding ID	File Name	Cone Area (cm²)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U <sub>eq</sub> (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t <sub>50</sub> <sup>a</sup> (s)	Assumed Rigidity Index (Ir)	c <sub>h</sub> (cm²/min)
SCPT19-05	19-61032_SP05.PPD	15	160	77.79	83.9	13.8				
SCPT19-07	19-61032_SP07.PPD	15	1515	45.93	42.3		3.6	904	100	0.8
SCPT19-07	19-61032_SP07.PPD	15	180	98.92	75.4	23.5				
SCPT19-10	19-61032_SP10.PPD	15	300	82.18	49.7	32.5				
Total Duration			35.9 min							

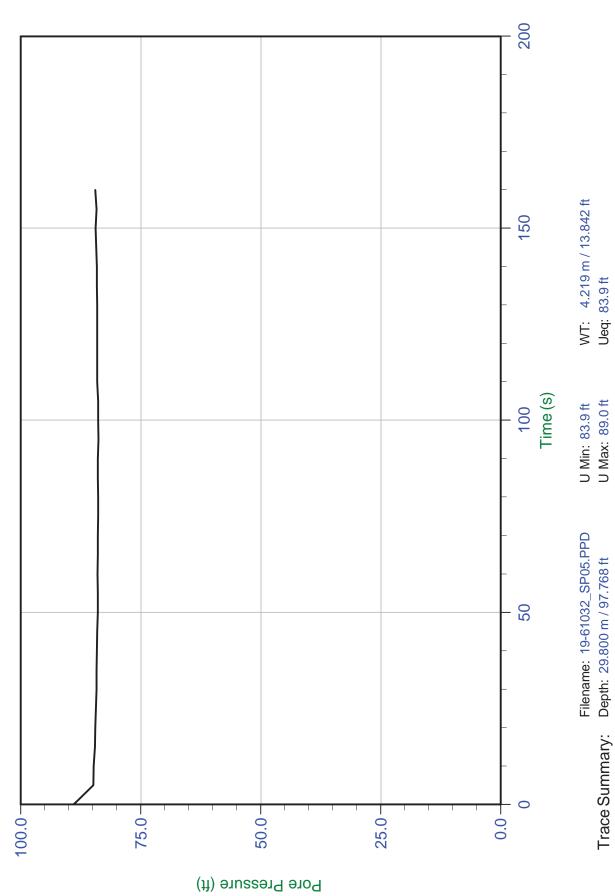
a. Time is relative to where umax occurred.

b. Houlsby and Teh, 1991.

Duration: 160.0 s

# PRELIMINARY NOT FOR CONSTRCUTION





Ch: 0.8 cm²/min

U(50): 144.00 ft

Ueq: 42.3 ft

U Min: 120.4ft U Max: 245.7ft

Filename: 19-61032\_SP07.PPD

Depth: 14.000 m / 45.931 ft

Trace Summary:

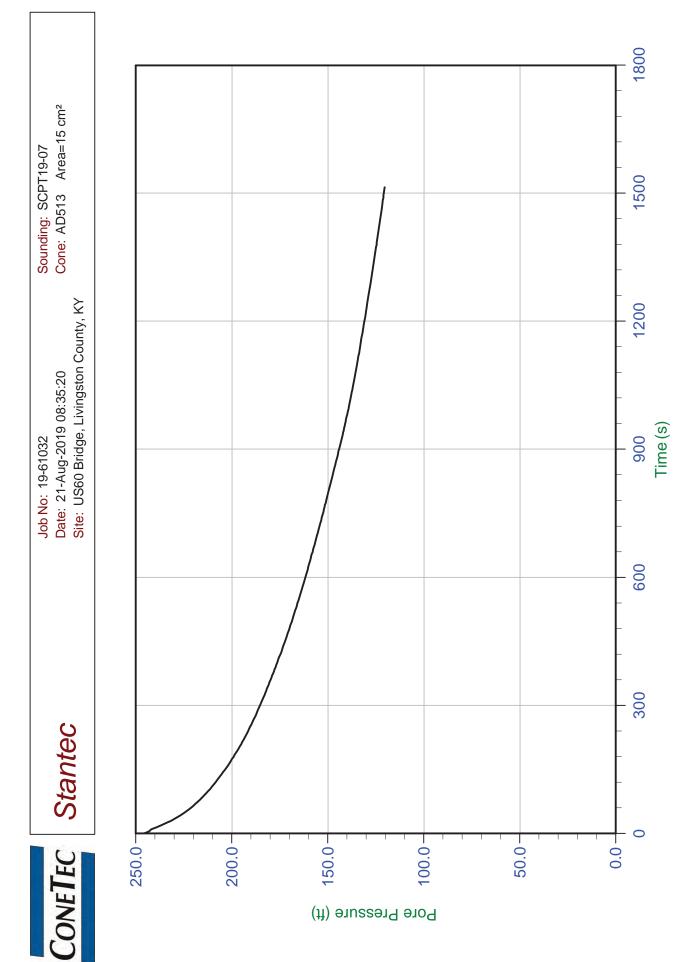
Duration: 1515.0 s

T(50): 903.6 s

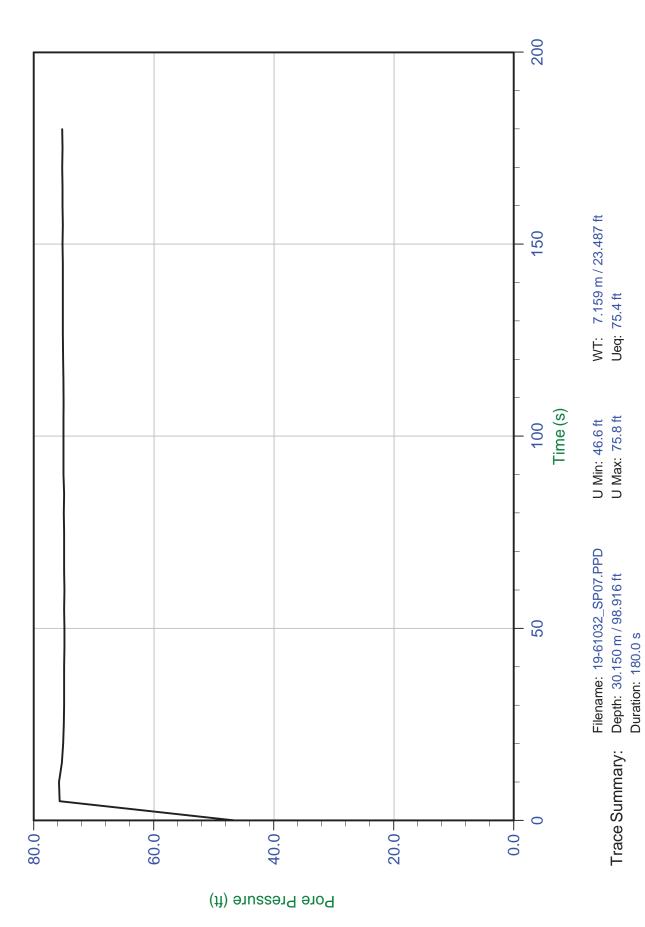
WT: 1.097 m / 3.599 ft

Ir: 100

# PRELIMINARY NOT FOR CONSTRCUTION





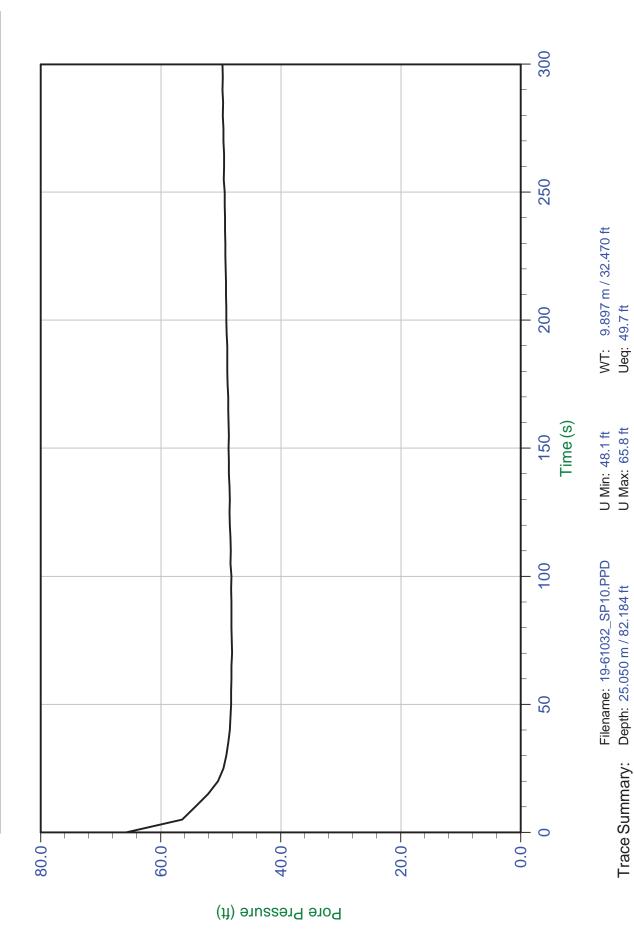


Duration: 300.0 s

# PRELIMINARY NOT FOR CONSTRCUTION



Cone: AD513 Area=15 cm<sup>2</sup> Sounding: SCPT19-10



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# SPECIAL NOTE FOR NON-DESTRUCTIVE TESTING OF DRILLED SHAFTS

# Livingston County – US 60 Bridge over the Cumberland River Item No. 1-1142.0

The following sections provide the requirements for non-destructive testing (Sonar Caliper, Crosshole Sonic Logging and Thermal Integrity Profiling) of the drilled shaft foundations, schedule requirements for submittals, reporting requirements and Contractor/Testing Subcontractor/Department responsibilities. The purpose of the non-destructive testing is to evaluate the integrity of the drilled shafts, to potentially detect voids or sloughed off or highly fractured zones of shale or sandstone or other discontinuities within and along the perimeter of the drilled shafts and to evaluate whether the shafts are within the specified geometrical tolerances.

References to the "Department" refer to the Kentucky Department of Highways and/or consultants acting on behalf of the Department.

In all cases, the Department reserves the right to request raw data, field notes and/or other available information that may be necessary to evaluate the results of testing specified in this Special Note. Upon request, provide any available information at no additional cost to the Department.

In all cases, the Department reserves the right to perform testing to obtain independent results of testing specified in this Special Note. Upon request, provide any assistance required for Department personnel to perform such testing at no additional cost to the Department.

At the request of the Engineer, personnel representing the Contractor (including testing subcontractors) and the Department may be required to attend a pre-test meeting to discuss procedures related to testing, reports, reviews, etc. This meeting will be at no additional cost to the Department.

Unless noted otherwise, the Department will respond to the Contractor regarding acceptability of submittals referenced in this Special Note within ten (10) business days. A "Business Day" is defined as any day except Saturdays, Sundays and Holidays, as defined in Section 101.03 of the Standard Specifications.

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Livingston County Item No. 1-1142.0 US 60 over Cumberland River

# 1.0 Sonar Caliper Testing of Drilled Shafts

# 1.1 Description

Acoustic measuring or Sonar Calipering (SC) devices provide an effective method for evaluating shaft verticality, volume and diameter in-situ by profiling the excavated surfaces of wet drilled shafts prior to reinforcement or concrete placement. The Contractor will be responsible for obtaining the services of an SC firm experienced with SC testing and equipment allowed by the Engineer. The Contractor will be responsible for scheduling and coordinating the testing, and submittal of the data to the Department. Perform SC testing using a device such as a SONICaliper<sup>TM</sup> Testing System (SCTS), Shaft Area Profile Evaluator (SHAPE) or other similar system allowed by the Department.

The calipering system will use one or more radial-spaced ultrasonic transceivers to transmit and receive acoustic signals between the tool and the borehole wall.

As directed by the Engineer, perform SC Testing after rock excavation is completed to the shaft tip elevation. If voids or sloughed off or highly fractured zones of shale or sandstone or other features are detected, additional SC testing may be directed by the Engineer.

Acceptance of a testing firm and/or sonar calipering system to perform and continue to perform SC testing on this project are subject to completing Submittal No. 1 in Table 1 below to the satisfaction of the Department and satisfactory performance.

# 1.2 SC Testing and Evaluation of Test Results

Make submittals in accordance with the Project requirements for submittals. See Table 1 below.

	Table 1 – Schedule of SC Submittals					
Submittal Number	Submittal Item	Deadline	Event			
1	Technical Proposal with SC Testing Firm Qualifications	45 business days before	Start of Drilled Shaft Construction			
2	SC Preliminary Testing Reports	12 HOURS after	Completion of testing on an individual drilled shaft			
3	SC Final Testing Reports	5 business days after	Completion of testing on an individual drilled shaft			
Provide all submittals and reports in .pdf format						

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Livingston County Item No. 1-1142.0 US 60 over Cumberland River

# 1.2.1 Technical Proposal (Including Example Reports)

Submit a technical proposal prepared by the SC Testing Firm that addresses the testing procedures and required qualifications and experience of the testing firm (Submittal No. 1 in Table 1.) Include sufficient documentation to show that the firm and person overseeing the work meet the requirement of having SC testing and data interpretation experience on at least three (3) similar deep foundation projects [or two (2) deep foundation projects supplemented by at least two (2) other projects where similar sonar imaging was performed].

With the technical proposal, include examples of field data report presentation and SC test reports prepared in accordance with the reporting requirements below. Include any costs associated with the examples in the applicable unit bid prices for SC testing. If the initial example submittal does not meet the specified requirements the Department will require additional submittals until the testing firm demonstrates that they can generate a report that meets the specified requirements. The purposes of these reports are for the SC testing firm to demonstrate their understanding of the reporting requirements and capability to meet them and to ensure that Department personnel are familiar with and understand the testing firm's reporting format and style. The ultimate objective of this requirement is to facilitate timely reviews of production test reports and reduce the potential for delays in allowing drilled shaft construction to proceed. Timely evaluation of sonar calipering reports (including field data reports) is critical, so the importance of these example reports cannot be overstated. Failure of a proposed testing firm to take this requirement seriously and/or submit acceptable example reports may result in disqualification of the testing firm.

#### Additionally, include the following

- confirmation that the SC testing firm understands and can meet the specified reporting deadlines in Section 1.2.2 including the requirement to provide a field data report within 60 minutes after completing testing
- confirmation that the SC testing firm understands that the SC test results will be used to evaluate whether the shaft meets the specified as-built shaft tolerances
- plans for set up of the sonar system including drawings, sketches, etc.
- protocol for coordinating with the project surveyor as defined in Section 1.2.3 below, including confirmation that the SC testing firm has discussed and agreed upon the protocol with the Contractor and lead surveyor
- proposal for how and where to perform the dry run test described in Section 1.2.4 below including confirmation that the SC testing firm has discussed and agreed upon the details of the dry run test with the Contractor
- discussion of anticipated effects of drilling slurry on the SC results, if applicable, including the possible need for flocculent to facilitate the testing
- discussion of procedures to ensure and/or verify that the lowering and raising of the sonar device will be vertical and/or how to account for any lateral movement of the sonar device
- discussion of measurement frequency, accuracy, and thus volume reporting

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# 1.2.2 Testing

Perform the SC Testing as described below:

- The Contractor is responsible for providing the testing firm access to the top of the shaft enabling one person to centralize and lower the sonar calipering device into the test shaft or affix it to the shaft drill rig kelly bar as applicable. Provide a surrounding work area clear and free of debris. Provide such assistance, equipment (including a power source if required by the SC testing firm) or necessary materials to the testing firm as required to facilitate the Sonar Calipering process.
- The Contractor is responsible for providing flocculent, if necessary to facilitate performing the SC testing.
- Coordinate with the project surveyor prior to every test as described in Section 1.2.3 below.
- Perform Sonar Calipering testing to evaluate verticality, diameter and volume on all finished excavated shafts (unless directed otherwise by the Engineer) in accordance with generally accepted Sonar Calipering testing methods and transmitting 50 to 400 measurement data points at each elevation. To acquire verticality information, affix the caliper head to a guide cable that is weighted near the bottom of the shaft or on the kelly bar as applicable and position it plumb. If the device is affixed to the kelly bar, use a carpenter's level to assess the verticality of the kelly bar throughout the duration of the test; conform to applicable OSHA and other safety protocol requirements. Refer to the requirement in Section 1.2.1 to include a verticality discussion in the technical proposal.
- At a minimum, take caliper readings using 10 feet increments in the casing, 6-inch increments in rock strata, 12 inch increments within 5 ft. of the transition from casing to rock socket and 12 inch increments within 5 ft. above and below any transitions in casing diameter (due to telescoping casing, etc.). During sonar calipering, measure a 360-degree profile measuring all angles relative to the survey ahead station direction.
- Provide a field data report (either a hard copy or emailed .pdf file) that includes analyses of shaft verticality, diameter or radius, and volume to the Engineer on site within 60 minutes after completion of testing. If it appears that the specified verticality tolerances have not been met, the Engineer may require adjustments to the casing. If a feature, which in the opinion of the Engineer could affect the integrity of the uncased shaft is identified in the field on the visual display, the Engineer may reduce the testing interval as necessary to improve the definition of the feature. Provide these additional readings at no additional cost to the Department. If it appears that the shaft is acceptable based on evaluation of the field data report, the Engineer will allow the Contractor to proceed with reinforcing steel installation and concrete placement.

#### 1.2.3 Surveying Requirements

In order to evaluate shaft tolerances it is necessary to tie the sonar test results to project station, offset and elevation. Therefore, coordination between the sonar caliper test personnel and the Contractor's project surveyor will be required. Ensure that the project surveyor is available to perform the tasks below prior to the beginning of each test:

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- 1. Survey the elevation of the top of permanent casing and the station and offset of a point on the top and interior of the permanent casing at the most ahead station point.
- 2. Survey the location of the sonar calipering device in the hole as necessary to tie the sonar test results to the station and offset.
- 3. Survey the test reference elevation (i.e. zero depth elevation for the test) if the reference elevation is something other than the top of permanent casing.
- 4. Provide a mark on the casing or other fixed object which clearly indicates the ahead station direction so that the SC testing personnel can reference angles relative to the ahead station direction.
- 5. Provide any other information or services needed by the SC testing firm to meet the specified SC test requirements.
- 6. Provide all referenced information to the SC testing firm immediately.

Include any costs associated with providing these surveying services in the applicable unit bid price for Sonar Calipering.

## 1.2.4 Dry Run Test

At least 10 calendar days prior to the anticipated starting date of rock socket excavation at each pier location, perform a "dry run" or practice sonar calipering test at a specific location proposed by the Contractor and accepted by the Engineer. The purpose of this dry run test is for the Contractor and SC Testing Firm to demonstrate their capability to successfully coordinate and perform sonar caliper testing and produce required reports within the specified time frame. Additionally, the purpose is for the Department personnel to observe the testing and ensure that they can interpret the data in the format presented in order to evaluate whether shafts meet the applicable criteria. The intent of requiring the dry run tests is not to delay the project but rather to accelerate the review and acceptance process.

It will be acceptable to perform these tests in either a permanent or temporary casing either at a shaft location or out of position using a minimum 30 ft. test length. Rock socket calipering will not be required for the dry run test. The Department will not make direct payment for any soil excavation required to perform the dry run test. Pending successful performance and considering the similarities of proposed testing procedures and anticipated conditions between the two pier locations, the Department will consider waiving the requirement to perform a dry run test at both pier locations.

Perform the dry run test according the procedures described in Section 1.2.2 above except that readings are required every 12 inches over at least the bottom 10 ft. and every five (5) feet over the remainder of the tested length. Submit preliminary and final reports in accordance with Section 1.2.5 below.

If the specified requirements for a dry run test are not met the Engineer may require additional dry run testing at no cost to the Department. Failure of a proposed SC testing firm to take this

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requirement seriously and/or submit acceptable reports (including providing a field data report) within the specified times may result in disqualification of the testing firm. Begin rock socket excavation in the first production shaft at each pier location only after receiving notification from the Engineer that the presentation of field data report and preliminary SC test report for the dry run test at that pier location is acceptable. As previously stated, the intent of requiring the dry run tests is not to delay the project but rather to accelerate the review and acceptance process.

The Department will pay for each dry run test as a regular production test according to the applicable unit bid price for Sonar Calipering associated with the pier location at which the dry run test is being performed.

## 1.2.5 Test Reports

**Field Data Report** - Within 60 minutes after completion of testing, provide a field data report (either a hard copy or emailed .pdf file) that includes analyses of shaft verticality, diameter or radius, and volume to the Engineer.

**Preliminary Report** - Within 12 hours after completing the SC Testing, perform all required filtering and analyses to submit a preliminary report (Submittal No. 2 in Table 1) in .pdf format. Include the following:

- 1. Test date and times of beginning and end of test
- 2. Shaft No. and reference elevation
- 3. Graphical representation such as wire frame plots of the permanent casing interior and rock socket from multiple viewpoints to facilitate visual evaluation of casing abnormalities, geological features in the rock socket and casing to rock socket transition
- 4. Plot of shaft volume vs. depth
- 5. Brief descriptions of any geologic features that the device is capable of detecting such as cavities, crevices or voids in the rock socket wall, including a general description with approximate depths and elevations
- 6. Verticality analysis including plots as needed to facilitate evaluation of the station and offset of the geometric center (based on coordination with the surveyor as described in Section 1.2.3 above) of shaft along the length of the permanent casing and rock socket from the plan top of shaft to as close to the shaft tip as possible including the items below:
  - Clear indication of the ahead station direction in drawings, sketches, plots, etc.
  - Station and offset of the geometric center of the top of permanent casing and plan top of shaft (if different from top of casing at the time of testing)
  - Sufficient data and/or plots to readily evaluate the change in station and offset of the geometric center of permanent casing from the top to the bottom of casing
  - Sufficient data and/or plots to readily evaluate the change in station and offset of the geometric center of the rock socket from the top to bottom of the rock socket (when the rock socket is profiled)

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- The changes in station and offset of the geometric center of the rock socket relative to the geometric center of the casing at the transition between the casing and the rock socket (when the rock socket is profiled)
- Any other information requested by the Department if necessary to evaluate the shaft tolerances specified in the Special Note for Project Specific Drilled Shaft Requirements.

Ensure that the SC testing firm is prepared to devote sufficient personnel and/or work overnight to meet the submittal time requirement and be available to answer questions via emails and/or phone calls at any time while the Department is reviewing the preliminary report.

**Final Report** - Within five (5) business days after completion of each test, submit a .pdf copy of the final report to the Department (Submittal No. 3 in Table 1), including, as a minimum, the following:

- 1. Contents of the preliminary report with any modifications as required for final report quality presentation
- 2. A narrative which explains all aspects of the test, results and analyses
- 3. Description of any shaft wall encroachment
- 4. One or more photographs of the test setup including orientation sonar device and clear indication of the ahead station direction
- 5. Written documentation of information received from the project surveyor
- 6. Resolution of any outstanding issues based on the preliminary report or any subsequent communication

#### 1.2.6 Evaluation of SC Test Results

Allow direct communication between the SC Testing Firm and the Department. If the SC Testing Firm is different than other testing firms on the project, allow direct contact between the SC and other testing firms.

The Engineer will review the data collected by the SC Testing Firm in the field data report as described in Section 1.2.2 above and will allow the Contractor to proceed if the shaft appears to be acceptable.

The Department will review the submitted preliminary report to perform a more rigorous evaluation of whether the construction tolerances have been met and respond to the Contractor within 48 hours after receiving the preliminary report. If, based on review of a preliminary report, it is found that construction tolerances have not been met then modifications to the footing and/or other shafts may be required at no cost to the Department.

The Department will review the submitted final report to ensure conformance with the final report requirements of Section 1.2.5.

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# 2.0 Crosshole Sonic Logging

# 2.1 Description

Crosshole Sonic Logging (CSL) is a nondestructive method to test the integrity of drilled shafts in accordance with ASTM D6760. It is the responsibility of the Contractor to supply all equipment and materials necessary to perform this testing and for obtaining the services of a CSL Testing Firm, which is experienced with CSL testing in accordance with Section 2.4.1 of this note and approved by the Department, to perform the testing.

The Contractor will be responsible for providing:

- 1. access tubes to be used for CSL testing of the drilled shafts;
- 2. watertight shoes, watertight caps, and non-shrink grout;
- 3. suitable working space and access to every shaft;
- 4. any other equipment, materials, or assistance necessary to accomplish the testing.

#### 2.2 Materials

#### 2.2.1 Access Tubes

- 1. Provide access tubes meeting the requirements below:
  - a. 2 inch ID schedule 40 steel pipe conforming to ASTM A 53, Grade A or B, Type E, F, or S:
  - b. contains round, regular internal diameters free of defects or obstructions, including any at pipe joints;
  - c. capable of permitting the free, unobstructed passage of a 1.5-inch-diameter source and receiver probes; and
  - d. watertight and free from corrosion with clean internal and external faces to ensure passage of the probes and a good bond between the concrete and the tubes.
- 2. Provide watertight shoes on the bottom and removable watertight caps on the top of the tubes.
- 3. The Engineer will accept access tubes based on visual inspection and certification that the steel pipe meets the requirements above.

#### 2.2.2 **Grout**

Provide non-shrink grout to fill the access tubes and any cored holes at the completion of the CSL tests. Use grout conforming to Section 601.03.03 of the Standard Specifications.

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#### 2.3 Execution

#### 2.3.1 Access Tube Installation

- 1. Install access tubes generally evenly-spaced and as shown below:
  - Pier 3 8 tubesPier 4 8 tubes
- 2. Securely attach the CSL tubes that are along the inside periphery to the spiral reinforcement. Wire-tie the tubes a minimum of every 3 ft. so they will stay in position during placement of reinforcement and concrete. Place the tubes so they will be parallel with each other and as near to vertical as possible in the finished shaft. Even moderate bending of the tubes will result in large regional variations in the data.
- 3. Place the tubes approximately 3 to 6 inches above the shaft tip to and at least 3 ft. above the top of rebar cage, at least 3 ft. above the free water level (if above the ground surface), at least 1 ft. above the top of concrete, and at least 3 ft. above the top of casing. Under no circumstances may the tubes be allowed to come to rest on the bottom of the excavation.
- 4. Ensure that any joints in the tubes are watertight and no residual putty is remaining on the outside of the couplers.
- 5. Tubes may be extended with mechanical couplings. Do not use duct tape or other wrapping material to seal the joints. Welding of joints is prohibited.
- 6. During placement of the reinforcement cage, exercise care so that the tubes will not be damaged to the extent that would prevent a 1.5 inch diameter probe from passing through them.
- 7. After placing the reinforcing cage and before beginning concrete placement, **fill the tubes with clean potable water** and cap or seal the tube tops to keep debris out of the tubes. Replace the watertight caps immediately after filling the tubes with water.
- 8. Immediately before placing concrete, use a weighted tape to investigate all tubes to make sure that there are no bends, crimps, obstructions or other impediments to the free passage of the testing probes. Additionally, check to ensure there are no water leaks.
- During removal of the caps from the tubes, exercise care so as not to apply excess torque, hammering, or other stresses which could break the bond between the tubes and concrete.
- 10. Immediately after concrete placement, recheck each access tube to ensure that the water level is at the top of the tube. (This is due to the potential for air bubbles entrapped in the tube to rise during the pour and lower the water level in the tube.)
- 11. After concrete placement and before the beginning of CSL testing, inspect the access tubes and report any access tubes that the 1.5 inch diameter test probe cannot pass through to the Engineer. The Engineer will evaluate whether the CSL testing can be successfully performed without the impacted tube(s); the Engineer may require the Contractor to, at its own expense, replace one or more tubes with 2-inch-diameter holes cored through the concrete for the entire length of the shaft, excluding the bottom 6 inches. Unless directed otherwise by the Engineer, locate core holes approximately 6 inches inside the reinforcement such that it does not damage the reinforcement. For each core hole drilled, record a log with descriptions of inclusions and voids in the cored

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holes and submit a copy of the log and photographs to the Engineer. Preserve the cores, identify as to location and make available for inspection by the Engineer.

# 2.3.2 Grouting

After completion of the CSL and Thermal Integrity Profile (TIP) testing, evaluation of results and upon being directed by the Engineer, remove the water from the access tubes and any cored holes, completely fill the tubes and holes with approved grout using the tremie method. After grouting, cut the tubes flush with the tops of the drilled shafts.

## 2.4 CSL Testing and Evaluation of Test Results

Make submittals in accordance with the Project requirements for submittals. See Table 2 below.

	Table 2 – Schedule of CSL Subr	nittals	
Submittal Number	Submittal Item	Deadline	Event
1	Technical Proposal with CSL Testing Firm qualifications	45 business days before	Start of Drilled Shaft Construction
2	CSL Testing Reports	5 business days after	Completion of testing on an individual drilled shaft

Provide all submittals and reports in .pdf format

#### 2.4.1 Technical Proposal (Including Example Report)

Submit a technical proposal prepared by the CSL Testing Firm that addresses the testing procedures and required qualifications and experience of the testing firm. Include sufficient documentation to show that the firm and the person overseeing the work on this project meet the requirement of having CSL testing, data interpretation and reporting experience on at least three (3) similar deep foundation projects.

With the technical proposal, include an example CSL test report prepared in accordance with the reporting requirements below. Include any costs associated with the example report in the applicable unit bid prices for CSL testing. If deviations from the specified reporting requirements are noted during review, the Department may (depending on the extent of the deviations) elect to require the testing to confirm that they can meet the requirements in production test reports rather than resubmit the example report. The purposes of this report are for the CSL testing firm to demonstrate their understanding of the reporting requirements and capability to meet them and to ensure that Department personnel are familiar with and understand the testing firm's reporting format and style. The ultimate objective of this requirement is to facilitate timely

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Livingston County Item No. 1-1142.0 US 60 over Cumberland River

reviews of production test reports and reduce the potential for delays in shaft acceptance. Failure to submit an acceptable example report may result in disqualification of the testing firm.

# 2.4.2 Testing

- 1. Provide access to the top of the shaft for testing personnel and equipment.
- 2. Perform CSL testing in accordance with ASTM D 6760.
- 3. Perform CSL testing on all completed shafts, including a second test when directed by the Engineer. Perform the first test after the shaft concrete has cured a minimum of 72 hours and no more than 10 days (unless directed otherwise by the Engineer) and has obtained a minimum strength of 3000 psi. Perform the second test after the shaft concrete has cured at least 28 days and obtained a minimum strength of 4000 psi. (Based on prior experience with similar shaft diameters, numerous flaws and defects were encountered on shafts tested at about 14 days and significant improvement was noted upon retesting at about 30 to 40 days.) The Department may waive the 28 day CSL testing on some shafts if acceptance can be granted based on the 72-hour to 10-day test results after evaluating the improvement noted between the 72-hour to 10-day and 28-day tests on previously-tested shafts and considering TIP test results in conjunction with CSL test results. The intent is to perform 28 day testing on the earlier shafts constructed at each pier and eliminate 28 day testing on the later shafts constructed at each pier.
- 4. Obtain logs as shown below unless directed otherwise by the Engineer.

Substructure	Tubes	Perimeter	Major	Minor
Unit		Logs	Diagonal	Diagonal
			Logs	Logs
Pier 3	8	8	4	16
Pier 4	8	8	4	16

- 5. If during testing, it is apparent that tube debonding has occurred, the Contractor may consider flooding the top of the shaft and retesting immediately; it is possible that water may flow into gaps between the tubes and concrete and provide continuity for the sonic waves.
- 6. If the CSL testing firm or Contractor believes that additional testing is required (such as CSL retesting, Angled CSL, Crosshole Tomography Analysis, or Sonic Echo/Impulse Response, etc.), contact the Engineer immediately. The Department will review the test report(s) to evaluate whether additional testing is required. If the additional testing indicates that any drilled shaft on which additional testing was required is acceptable, the Department will pay for the direct cost of additional testing by change order. If the additional testing or evaluation of cores indicates that the concrete for any drilled shaft concrete is unacceptable, the additional testing will be at the expense of the Contractor. The Department will not pay for additional testing performed at the discretion of the Contractor or testing firm that is not directed and/or agreed upon by the Department.

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## 2.4.3 Test Reports

- 1. Submit a test report prepared by the CSL Testing Firm within 5 business days of completion of testing which, as a minimum, contains:
  - a. Date of test;
  - b. Plan Shaft No. and Reference Elevation (i.e. zero depth elevation) and notation of water level in the tubes at the time of testing;
  - c. Schematic showing a plan view of the access tube locations;
  - d. CSL logs with reference elevations;
  - e. CSL logs presented for each tube pair tested with any discontinuity zones indicated on the logs and discussed in the report as appropriate;
  - f. Analyses of <u>both</u> pulse first arrival time (FAT) versus depth <u>and</u> wave speed versus depth;
  - g. Include nested signal peak (i.e. "waterfall") diagrams as a function of time plotted vs. depth. Clearly indicate the FAT picks used to obtain wave speed vs. depth.
  - h. Analyses of pulse energy/amplitude versus depth.
  - i. Tables which indicate tube pairs, vertical extents, and magnitude (FAT % delay and/or energy decrease) of flaw and defect zones, as defined in Section 2.4.5 of this Special Note.
  - j. A narrative portion of the report will be used to present items a thru i.
- 2. Plot data to a scale that will allow adequate evaluation of data variations. The Department reserves the right to request scale adjustments.
- 3. Complete all reports using English units.

#### 2.4.4. Evaluation of CSL Test Results

- 1. Allow direct communication between the CSL Testing Firm and the Department. If the CSL Testing Firm is different than other testing firms on the project, allow direct communication between the CSL and other testing firms.
- 2. The Department will review the CSL test results in the test report to evaluate whether or not the drilled shaft integrity is acceptable. Within 10 business days after receiving a test report, the Engineer will report to the Contractor whether the construction is acceptable or additional analyses are needed. The Department will also use the results of other non-destructive and materials testing, construction records, etc. to evaluate the condition of the shafts.
- Continue with construction of the structure above the drilled shafts only after receiving written approval from the Engineer to do so, based on evaluation of the CSL and TIP test results and other applicable test results, construction records, etc.
- 4. If the CSL and/or TIP records are inconclusive (e.g. records do not clearly indicate discontinuity, good conditions or missing data), the Department may require additional testing, such as CSL retesting, Angled CSL, Crosshole Tomography

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Analysis or concrete cores to sample the concrete in question to verify shaft conditions. After completing report reviews, the Department will discuss options for additional testing with the Contractor and/or testing firm(s) and/or complete evaluation of all test results prior to directing the Contractor to obtain concrete The Department will not pay for additional testing performed at the discretion of the Contractor or testing firm that is not directed and/or agreed upon by the Department. If core samples are needed, obtain cores with a minimum diameter of 2 inches using a double tube core barrel at a minimum of 4 locations selected by the Department, unless directed otherwise by the Engineer. Unless directed otherwise by the Engineer, locate core holes approximately 6 inches inside the reinforcement such that they do not damage the reinforcement. For each core hole drilled, record a log with descriptions of inclusions and voids in the cored holes and submit a copy of the log to the Engineer. Place the cores in core boxes as shown in Exhibit 10 of the KYTC Geotechnical Guidance Manual properly marked showing the shaft depth at each interval of core recovery. Transport the cores and logs to the Geotechnical Branch in Frankfort for inspection and testing unless directed otherwise by the Engineer. Only after being directed by the Engineer grout the core holes in accordance with Section 2.3.2 above.

- 5. If the additional testing or evaluation of cores indicate that concrete for any drilled shaft on which additional testing or coring was required is acceptable, the Department will pay for the direct cost of additional testing and concrete coring and grouting by change order. If the additional testing or evaluation of cores indicates that the concrete for any drilled shaft concrete is unacceptable, the additional testing and concrete coring and grouting will be at the expense of the Contractor.
- 6. If discontinuities are found, an independent structural and/or geotechnical consultant hired by the Contractor will perform structural and/or geotechnical evaluation at the expense of the Contractor. Use consultants who are prequalified by KYTC in applicable areas. Alternatively, the Engineer may require the Department's designer to perform the referenced evaluations and the Department may require the cost of these evaluations to be borne by the Contractor. Based on the design criteria established for the structure and the evaluation, the Engineer will assess the effects of the defects on the structural performance of the drilled shaft. If the results of the analyses indicate that there is conclusive evidence that the discontinuity will result in inadequate or unsafe performance under the design loads, as defined by the design criteria for the structure, the Engineer will reject the shaft.
- 7. If any shaft is rejected, provide a plan for remedial action to the Department for approval. Any modifications to the foundation shafts and/or other substructure elements caused by the remedial action will require calculations and working drawings by consultant(s) hired by the Contractor (or the Department's designer), at the expense of the Contractor, which will be subject to review by the Department. Begin remediation operations only after receiving approval from the Engineer for the proposed remediation. All remedial action will be at no cost to the Department and with no extension of contract time.

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#### 2.4.5. Evaluation Criteria

The Department will generally use the criteria below for evaluation of the shafts but may vary the criteria based on other available information (e.g. TIP results, construction records, etc.)

Satisfactory	Good (G)	FAT increase 0 to 10%
Anomaly	Questionable (Q)	FAT increase 11 to 20%
Flaw	Poor/Flaw (P/F)	FAT increase 21 to 30%
Defect	Poor/Defect (P/D)	FAT increase >31%

The Department will consider energy reductions in conjunction with FAT increases and reserves the right to vary the anomaly, flaw and defect criteria based on energy reductions.

- Flaws must be addressed if they affect more than 50% of the profiles.
- Defects must be addressed if they affect more than one profile (i.e. the result of complete investigation from bottom to top between two tubes) at the same depth.
- "Addressing" a Flaw or Defect may include an evaluation by tomography if the concern is localized (e.g. not across the full section), and/or, depending on the depth to the concern, additional measures like core drilling, repair or replacement, repeat tests after a longer waiting time or testing by other methods (gamma-gamma, low strain, high strain).
- Flaws or Defects covering the entire cross section define a full layer concern requiring repair.
- Anomalies will require evaluation and may need to be addressed based on the results of the evaluation.

Continue with placement of reinforcement and concrete above the top of shaft only after receiving written approval from the Engineer to do so, based on evaluation of the CSL and other applicable test results.

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# 3.0 Thermal Integrity Profiling

## 3.1 Description

Thermal Integrity Profiling (TIP) will be used as part of the program to test the integrity of drilled shafts. The Contractor will be responsible for supplying all equipment and materials necessary to perform this testing, and obtaining the services of a TIP Testing Firm, experienced with TIP testing and approved by the Engineer, to perform the testing using embedded thermal sensors in accordance with ASTM D7949 (Method B).

Installation of sensors/instrumentation to the reinforcing cage is incidental to the applicable contract unit bid price for Drilled Shaft, Common or Drilled Shaft, Solid Rock. Ensuring that the TIP instrumentation is operational and provides the required information is the responsibility of the TIP Testing Firm. Overseeing the installation of the TIP testing instrumentation and properly training the Contractor in the installation of the TIP testing instrumentation is the responsibility of the TIP Testing Firm and is incidental to applicable unit bid price for TIP Testing.

The Contractor will be responsible for providing:

- 1. suitable working space and access to every shaft;
- 2. other equipment, materials, or assistance necessary to accomplish the testing.

#### 3.2 Materials

Provide materials in accordance with ASTM D7949 (Method B).

#### 3.3 Execution

#### 3.3.1 Cloud Enabled Data Collection

The TIP testing firm is encouraged but not required to use a Cloud Enabled Data Collection system to collect and transmit the TIP data. The use of such a system would allow the testing firm to monitor data in real time and notify the Contractor of apparent problems with the data and/or shaft integrity. This would reduce the potential for data being lost in shipment of data boxes. Additionally, it could potentially make the contactor aware of problems in time to make adjustments to construction procedures for subsequent shafts. The use of this technology could also result in faster submittal of TIP test reports and potentially result in shafts being accepted sooner.

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# 3.3.2 Training of Contractor Personnel

A TIP Testing Firm representative meeting the specified experience requirements will be required to be on site during installation of instrumentation, the shaft pour, and at least through the first 24 hours of data collection for the first shaft constructed. (This does not mean that it is necessary for the representative to be on site continuously during the first 24 hours of data collection after completion of concrete placement. However, the representative must visit the site to ensure that the instrumentation is functional and properly acquiring data 24 hours after completion of concrete placement before departing the project vicinity.) If the testing firm uses Cloud Enabled Data Collection the Department will consider waiving the requirement for the representative to remain in the project vicinity during the first 24 hours of data collection. <u>Unsatisfactory performance by Contractor personnel</u> may result in the Engineer requiring the TIP Testing Firm representative to be on site for additional shafts. Additionally, this representative will be required to train applicable Contractor supervisory and/or engineering personnel with regard to instrumentation installation, data collection, and other applicable tasks as deemed necessary by the Tip Testing Firm and/or the Engineer. Department personnel may also participate in this training at the discretion of the Engineer. Submit written documentation prepared by the Tip Testing Firm representative which documents the training and includes the names of all personnel who have been trained. If the Contractor's personnel changes it will be necessary for the representative to train new personnel.

#### 3.3.3 Embedded Thermal Sensor Installation

Install embedded thermal sensor cable in accordance with ASTM D7949 (Method B), the manufacturer's recommendations, and procedures outlined by the TIP Testing Firm representative at plan view access locations which are approximately evenly-spaced and as shown below:

Pier 3 8 embedded thermal sensor access locations per shaft
Pier 4 8 embedded thermal sensor access locations per shaft

Attach the embedded thermal sensor cables to the longitudinal reinforcement of the shaft in accordance with procedures outlined by the TIP Testing Firm representative. Securely attach the cables to the reinforcement at a location on the reinforcement that is 90° to the line connecting the reinforcement to the center of the shaft approximately halfway between nodes, working from the bottom of the cage to the top before tightening cable ties. Attach each cable to a recording apparatus securely suspended (on a protruding rebar, casing, template, etc.) well above the top of the concrete. If the cable is routed with a bend at any location, take extra precautions on securing the cable on either side of each such node. If reinforcement cage splicing is necessary, take extra precautions to ensure that the sensor cables are properly spliced.

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# 3.4 TIP Testing and Evaluation of Test Results

Make submittals in accordance with the Project requirements for submittals. See Table 3 below.

	Table 3 – Schedule of TIP Subn	nittals	
Submittal Number	Submittal Item	Deadline	Event
1	Technical Proposal with TIP Testing Firm qualifications	45 business days before	Start of Drilled Shaft Construction
2	·		Completion of testing on an individual drilled shaft

Provide all submittals and reports in .pdf format

# 3.4.1 Technical Proposal (Including Example Report)

Submit a technical proposal prepared by the TIP Testing Firm that addresses the testing procedures and required qualifications and experience of the testing firm. It is acceptable for the TIP and CSL Testing Firm to be the same firm, provided they meet requirements for both TIP (this Section) and CSL (Section 2.4.1) Testing Firms. Include sufficient documentation to show that the firm and the person overseeing the work on this project meet the requirement of having TIP testing, data interpretation and reporting experience on at least three (3) similar deep foundation projects, including at least one (1) project involving embedded thermal sensors in accordance with ASTM D7949 (Method B).

The Department will allow substitution as defined below for one of the three referenced projects:

- documented participation in the development of ASTM Standard Test Method D7949-14 and/or documented participation in applicable research, OR
- experience on at least two (2) similar projects using other forms of deep foundation integrity testing (e.g. Crosshole Sonic Logging, Sonic Echo, Impulse Response, Gamma-Gamma, etc.). If used, integrity testing experience on other projects must be different projects than used to satisfy the actual TIP Testing project experience.

The Department will not waive the requirement for experience on at least one (1) project involving TIP testing using embedded thermal sensors in accordance with ASTM D7949 (Method B).

With the technical proposal, include an example TIP test report prepared in accordance with the reporting requirements below. Include any costs associated with the example report in the applicable unit bid prices for TIP testing. If deviations from the specified reporting requirements are noted during review, the Department may (depending on the extent of the deviations) elect to require the testing to confirm that they can meet the requirements in production test reports

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rather than resubmit the example report. The purposes of this report are for the TIP testing firm to demonstrate their understanding of the reporting requirements and capability to meet them and to ensure that Department personnel are familiar with and understand the testing firm's reporting format and style. The ultimate objective of this requirement is to facilitate timely reviews of production test reports and reduce the potential for delays in shaft acceptance. Failure to submit an acceptable example report may result in disqualification of the testing firm.

Include a proposed protocol to perform confirmatory TIP testing [such as using a thermal probe in accordance with ASTM D7949 (Method A)] in the event that thermal sensor damage/defects (to the extent that a complete analysis of the shaft cannot be performed using the data from the embedded thermal sensors) are detected after concrete placement has been completed. Such testing would be at no additional cost to the Department.

## 3.4.2 Testing

- 1. Provide access to the top of the shaft for testing personnel and equipment.
- 2. Perform TIP testing in accordance with generally accepted TIP testing methods and in accordance with ASTM D7949.
- 3. Perform TIP testing on all completed shafts, unless directed otherwise by the Engineer. As a minimum, obtain data in 15 minute increments for a duration of 48 hours after completion of concrete placement or three (3) hours after the peak average shaft temperature has been reached, whichever is longer. The Department will consider reducing the 48 hour minimum for subsequent shafts at a given pier location if the Contractor submits a written request prepared by the TIP testing consultant with adequate justification for doing so.
- 4. Perform TIP testing using the embedded thermal sensor array, and in accordance with the ASTM Test Method D7949 (Method B).
- 5. Immediately report potential local discontinuities indicated by locally low temperatures relative to the average temperature at that depth, or average temperatures significantly lower than the average temperatures at other depths to the Department.
- 6. If thermal sensor damage/defects (to the extent that a complete analysis of the shaft cannot be performed using the data from the embedded thermal sensors) are detected after concrete placement has been completed, perform any confirmatory TIP testing as proposed according to Section 3.4.1 of this Special Note and accepted by the Department. Perform this testing at no additional cost to the Department. At the request of the Department, propose corrective methods to prevent repetitive occurrences of such damage/defects.

#### 3.4.3 Test Reports

- 1. Submit a test report prepared by the TIP Testing Firm within five (5) business days of completion of testing which, as a minimum, contains:
  - a. Date of test:
  - b. Plan Shaft No. and Reference Elevation (i.e. zero depth elevation);

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- c. Schematic showing a plan view of the embedded thermal sensor cable locations;
- d. The overall average temperature plotted as a function of time over the entire data collection period, with a clear indication of the selected time of peak temperature. The "overall average temperature" averages all embedded thermal sensor cables and the entire length of the shaft (resulting in only one temperature value plotted at any given time). This temperature is proportional to the average radius computed from the actual total concrete volume installed (assuming a consistent concrete mix throughout). Radius at any point can then be evaluated from the temperature at that point compared to the overall average temperature;
- e. Graphical displays of temperature measurements (including each individual cable and the average of the cables) versus depth at 12, 24, 36, and 48 hours after completion of concrete placement, and at least one plot within the last six (6) hours of the data collection period. Upon request, provide these graphical displays at other times;
- f. At both the time associated with peak temperature and one-half the time to peak temperature, provide graphical displays of temperature (including each individual cable and the average of the cables) vs. depth, radius vs. depth, 3-D interpretations of temperature and radius, and at least one shaft slice at representative depths corresponding to water, overburden and rock socket, as applicable. Upon request, provide any of these graphical figures at other times and/or depths at no additional cost to the Department;
- g. Indication of unusual temperatures, particularly significantly cooler local deviations of the average at any depth from the overall average over the entire length;
- h. Variations in temperature between sensors (at each depth) which may correspond to variations in cage alignment (where concrete volume is known, the cage alignment or offset from center should be noted);
- Where shaft specific construction information is available (e.g. elevations of the top of shaft, bottom of casing, bottom of shaft, etc.), these values should be noted on all pertinent graphical displays;
- j. Drilled shaft radius calculations and the shaft quality, based upon the collected data, as well other available data, such as, as shaft alignment and wall profile from the SC Testing, top/bottom shaft/concrete elevations and concrete volume records collected during construction of the drilled shaft; and
- k. A narrative portion of the report which addresses items a through j above.
- 2. When drastic changes in boundary conditions exist (air to water, water to soil, varying soil strata, varying temperatures in the water column, etc.) a single temperature to radius relationship may not accurately estimate the shaft radius. In such cases, apply algorithms in the software to account for these changes in boundary conditions, normalize temperatures, and remove fluctuations not caused by changes in cross section.
- 3. Plot data to a scale that will allow adequate evaluation of data variations. The Department reserves the right to request scale adjustments.
- 4. Complete all reports using English units.

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#### 3.4.4 Evaluation of TIP Test Results

- 1. Allow direct communication between the TIP Testing Firm and the Department. If the TIP Testing Firm is different than other testing firms on the project, allow direct contact between the TIP and other testing firms
- 2. The Department will review the TIP test results in the test report to evaluate whether or not the drilled shaft integrity is acceptable. Within 10 business days after receiving a test report, the Engineer will report to the Contractor whether the construction is acceptable or additional more detailed analyses are needed. The Department will also use the results of other non-destructive and materials testing, construction records, etc. to evaluate the condition of the shafts.
- Continue with construction of the structure above the drilled shafts only after receiving written approval from the Engineer to do so, based on evaluation of the TIP and CSL test results and other applicable test results, construction records, etc.
- 4. If the TIP and/or CSL records are inconclusive (e.g. records do not clearly indicate discontinuity, good conditions or missing data), the Department may require additional testing, such as CSL retesting, Angled CSL, Crosshole Tomography Analysis or concrete cores to sample the concrete in question to verify shaft conditions. After completing report reviews, the Department will discuss options for additional testing with the Contractor and/or testing firm(s) and/or complete evaluation of all test results prior to directing the Contractor to obtain concrete cores. The Department will not pay for additional testing performed at the discretion of the Contractor or testing firm that is not directed and/or agreed upon by the Department. If core samples are needed, obtain cores with a minimum diameter of 2 inches, double tube core barrel at a minimum of four locations specified by the Department, unless directed otherwise by the Engineer. Unless directed otherwise by the Engineer, locate core holes approximately 6 inches inside the reinforcement such that they do not damage the reinforcement. For each core hole drilled, record a log with descriptions of inclusions and voids in the cored holes and submit a copy of the log to the Engineer. Place the cores in crates properly marked showing the shaft depth at each interval of core recovery. Transport the cores and logs to the Geotechnical Branch in Frankfort for inspection and testing unless directed otherwise by the Engineer. Grout the core holes in accordance with Section 2.3.2 above.
- 5. If the additional testing or evaluation of cores indicate that concrete for any drilled shaft on which additional testing or coring was required is acceptable, the Department will pay for the direct cost of additional testing and concrete coring and grouting by change order. If the additional testing or if evaluation of cores indicate that the concrete for any drilled shaft concrete is unacceptable, the additional testing and concrete coring and grouting will be at the expense of the Contractor.
- 6. If discontinuities are found, an independent structural and/or geotechnical consultant hired by the Contractor may be required to perform structural and/or geotechnical evaluation at the expense of the Contractor. Use consultants who are prequalified by KYTC in applicable areas. Alternatively, the Engineer may require the Department's designer to perform the referenced evaluations and the cost of these evaluations may be borne by the Contractor. Based on the design criteria established for the

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structure and the evaluation, the Department will assess the effects of the defects on the structural performance of the drilled shaft. If the results of the analyses indicate that there is conclusive evidence that the discontinuity will result in inadequate or unsafe performance under the design loads, as defined by the design criteria for the structure, the Engineer will reject the shaft.

7. If any shaft is rejected, provide a plan for remedial action to the Department for approval. Any modifications to the foundation shafts and/or other substructure elements caused by the remedial action will require calculations and working drawings by independent consultant(s) hired by the Contractor, at the expense of the Contractor. The calculations and working drawings will be reviewed by the Engineer and/or the Department's designer. Begin remediation operations only after receiving acceptance from the Engineer for the proposed remediation. All remedial action will be at no cost to the Department and with no extension of contract time.

Continue with placement of reinforcement and concrete above the top of shaft only after receiving written approval from the Engineer to do so, based on evaluation of the TIP and other applicable test results.



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# 4.0 Measurement and Payment

# 4.1 Method of Measurement Sonar Calipering

The Department will pay for the authorized and accepted quantities of "Sonar Calipering" at the contract unit price per test for production shafts and dry run tests. This will constitute full compensation for all costs associated with providing access for testing personnel and equipment, performing the SC Testing, and reporting the results to the Engineer. Payment for the SC Testing will be at the contract unit price per SC Test. Payment for each test required by the Engineer will be the same regardless of whether the testing is performed after casing installation and overburden excavation or after rock excavation. Any additional testing required to verify verticality after casing adjustments (to meet specified verticality tolerances) will be at the expense of the Contractor. The Department will pay 50% of the unit price upon successful completion of the required testing and the remainder upon final acceptance of all required reports.

## 4.2 Method of Measurement CSL Testing

The Department will pay for the authorized and accepted quantities of "CSL Testing" at the contract unit price per each shaft tested. This will constitute full compensation for all costs associated with providing access for testing personnel and equipment, performing the CSL Testing in a single shaft, and reporting the results to the Engineer. The Department will pay 50% of the unit price upon successful completion of the required testing and the remainder upon final acceptance of all required reports.

Installation of CSL Access Tubing is incidental to the applicable contract unit bid price for Drilled Shaft, Common, and Drilled Shaft, Solid Rock. This will constitute all costs and delays associated with installing the CSL Access Tubing in a single shaft, including but not limited to providing and installing access tubing, providing and installing all required bracing for access tubes, providing and placing grout in access tubes.

The Department will pay for the direct cost of additional testing and concrete coring, authorized by the Engineer, required to investigate shafts with inconclusive CSL records if evaluation of the additional testing or cores indicates that concrete for that drilled shaft is acceptable using a change order. This will constitute full compensation for all costs and delays associated with performing additional tests, obtaining and delivering concrete cores to the Geotechnical Branch, and grouting core holes.

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# 4.3 Method of Measurement TIP Testing

The Department will pay for the authorized and accepted quantities of "TIP Testing" at the contract unit price per each shaft tested. This will constitute full compensation for all costs associated with providing access for testing personnel and equipment, performing the TIP Testing in a single shaft, and reporting the results to the Engineer. The Department will pay 50% of the unit price upon successful completion of the required testing and the remainder upon final acceptance of all required reports.

Installation of embedded thermal sensors is incidental to the applicable contract unit bid price for Drilled Shaft, Common, and Drilled Shaft, Solid Rock. This will constitute all costs and delays associated with installing the embedded thermal sensors.

The Department will pay for the cost of additional testing and concrete coring, authorized by the Engineer, required to investigate shafts with complex or inconclusive TIP records if evaluation of the additional testing or cores indicates that concrete for that drilled shaft is acceptable using a change order. This will constitute full compensation for all costs and delays associated with performing additional tests, obtaining and delivering concrete cores to the Geotechnical Branch.

## 4.4 Payment

The Department will pay for the completed and accepted quantities under the following. The Pay Unit of "Each" refers to each individual test.

Code	Pay Item	Pay Unit
24741EC	Sonar Caliper Testing - Pier 3	Each
24741EC	Sonar Caliper Testing - Pier 4	Each
24875EC	CSL Testing (8 tubes) - Pier 3	Each
24875EC	CSL Testing (8 tubes) - Pier 4	Each
24874EC	TIP Testing - Pier 3	Each
24874EC	TIP Testing - Pier 4	Each

The Department will consider payment as full compensation for all work required herein.

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## SPECIAL NOTE FOR PILE DYNAMIC TESTING

# Livingston County – US 60 Bridge over the Cumberland River Item No. 1-1142.0

#### 1.0 GENERAL

1.1 Scope of Work The scope of work includes furnishing all labor, equipment and analyses associated with dynamic testing of driven piles as specified in this Special Note and in general accordance with ASTM D 4945, "High-Strain Dynamic Testing of Piles". Dynamic testing involves attaching at least two strain transducers and two accelerometers to the pile near the pile head during initial driving. A cable or wireless transmission connects the sensors near the pile head with the Pile Driving Monitoring Hardware located a safe distance from the pile, but not more than 330 ft from the pile. The piles that are to be tested must be of sufficient extra length to ensure that sensors are not driven into the ground.

Dynamic pile testing generally applies only to the designated test piles at Piers 5-9 (open-ended pipe piles). However, the Engineer reserves the right to require dynamic pile testing on production piles at Piers 5-9 and any piles at Pier 2 and Abutment 2 (H-piles) if questions arise regarding the resistance or integrity of those piles.

The Department reserves the right to increase or decrease the quantity of dynamic pile tests and/or require dynamic pile testing on production piles if deemed necessary by the Engineer. Restrike testing is not required unless directed otherwise by the Engineer. If requested, the Department will pay for restrike tests at the unit bid price for Dynamic Pile Testing.

At Piers 5 – 9 the Contractor may drive any pile to a tip elevation of 217 ft. at any time prior to hammer acceptance, performance of dynamic testing or acceptance of dynamic pile test reports. If it appears that bedrock has been encountered at a higher elevation stop driving immediately until driving criteria for refusal on bedrock have been provided.

- **1.2 Personnel Qualifications** Perform dynamic pile testing utilizing the services of an independent Dynamic Pile Testing Consultant with qualified personnel as described below.
  - Pile Driving Field Monitoring An engineer with a minimum of 3 years of dynamic pile testing and analysis experience or who has achieved Basic or better certification under the High-Strain Dynamic Pile Testing Examination and Certification process of the Pile Driving Contractors Association or Foundation QA.
  - Wave Equation Analyses, Signal Matching Analyses and Report Responsibility A licensed professional engineer with a minimum of 5 years of dynamic pile testing and analysis experience or who has achieved Advanced or better certification under the High-Strain Dynamic Pile Testing Examination and Certification process of the Pile Driving Contractors Association or Foundation QA.

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**1.3 Equipment** Supply equipment such as sensors, cables or wireless transmitters, etc. conforming to ASTM D 4945, "High-Strain Dynamic Testing of Piles" and furnished by the dynamic testing consultant. Prior to beginning work, submit the product name and manufacturer of the hardware and software components below for acceptance by the Engineer. If requested by the Engineer, submit additional information including technical specifications, etc.

Pile Driving Modeling Pile Driving Monitoring Pile Driving Analysis Wave Equation Software
 Hardware & Software
 Signal Matching Software

To prepare the pile for sensor attachment, provide a drill (and bit) of sufficient power, operated by either a DC battery (preferred) or a generator.

**1.4 Submittals and General Testing & Analysis Requirements** See Tables 1 and 2 herein. The Engineer will respond to the Contractor regarding acceptability of Submittals 1-3 within 10 business days and Submittal 4 reports within three (3) business days. A "Business Day" is defined as any day except Saturdays, Sundays and Holidays, as defined in Section 101.03 of the Standard Specifications.

Submittal	Submittal	Calendar	
Number	Item	Days	Event
1	Proposed independent dynamic pile testing	45 Before	Start of
	consultant, and a listing of assigned		Pile Driving
	personnel and their experience and		Monitoring
	qualifications.		
2	Details of the hardware and software	45 Before	Start of
	components, method of testing, and		Pile Driving
	materials to be used.		Monitoring
3	Completed Pile and Driving Equipment Data	21 Before	Start of
	Form (Figure 1 of this Special Note) and the		Pile Driving
	results of wave equations analyses.		Monitoring
4	Reports as defined in Section 3.0 of this	48 HOURS	Completion of
	Special Note.	After	Each Field Test

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Table 2 - General Testing and Analysis Requirements				
Item Requirement				
Minimum of 1 and sufficient additional analyses as needed to				
define performance for all combinations of piles, driving				
systems and subsurface conditions anticipated.				
Required Nominal Pile Resistance (i.e. Ultimate Pile Capacity)				
as shown in this special note and/or as directed by the				
Engineer.				
For each Test				
Wave Equation Analyses				

Perform testing and analyses in accordance with this table and ASTM D 4945, "High-Strain Dynamic Testing of Piles".



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#### 2.0 TESTING AND ANALYSES

The primary objectives of this testing related to the open-ended piles are to:

- ensure that a properly-sized hammer is used to seat the piles into bedrock and verify the required nominal pile resistances
- · evaluate the potential for excessive driving stresses and/or pile damage

The goal is to evaluate whether the Case I practical refusal criteria in Section 604.03.07 (C) of the 2019 Standard Specifications (Table 3 below) are applicable to the open-ended pipe piles for the required nominal resistances in Table 4 below and if not to develop modified criteria.

Table 3 -						
	Case I Practical Refusal Criteria					
	(from Section 604.03.07 (C) of the 2019 Standard Specifications)					
Case	Case Rock Type Maximum Set					
I	I Hard Bedrock ¼ inch in 5 consecutive blows					
1/4 inch for 5 additional consecutive blows						

Table 4 - Required Nominal Toe Resistance Values						
Pier	Required Nominal Toe Resistance (tons)	Required Nominal Toe Resistance (kips)	Stress at Factored Design Load (ksi)	Percentage of Yield Stress		
5	697	1394	20 ksi	44%		
6	806	1612	23 ksi	51%		
7	883	1766	26 ksi	58%		
8	811.5	1623	24 ksi	53%		
9	771.5	1543	22 ksi	49%		

- The Preconstruction Wave Equation Analyses and initial testing will require the highest nominal resistance (1766 kips). Details are included below.
- The required nominal resistance values are based on factored extreme event earthquake loads with a load factor of 1.0 and include post seismic event down drag. As a result, side resistance must be neglected and only toe resistance may be considered.
- Stress values are based on a cross sectional area of 69 inch<sup>2</sup> and a yield stress of 45 ksi.

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**2.1 Preconstruction Wave Equation Analyses** At least 21 calendar days before beginning pile driving monitoring submit to the Engineer the completed Pile and Driving Equipment Data Form (Figure 1 of this Special Note) and preconstruction wave equation analyses performed by the Dynamic Pile Testing Consultant in accordance with Table 2 herein and a summary report of the results. The required nominal resistance (i.e. ultimate capacity) is provided in the plans and/or elsewhere in the contract documents. Upon request, the Geotechnical Report for the structure can be provided.

Perform Preconstruction Wave Equation Analyses using the highest required nominal resistance (1766 kips) in Table 4 above. First evaluate the Case I practical refusal criteria from Section 604.03.07 (C) of the 2019 Standard Specifications (Table 3 herein). If the analyses show that acceptable results are anticipated, provide the anticipated acceptable range of hammer strokes. If the analyses show that acceptable results are not achieved using the practical refusal criteria, revise the analyses to obtain the driving criteria required to achieve acceptable results for a nominal resistance (i.e. ultimate capacity) of 1766 kips. However, in all cases submit the analyses associated with the Case I practical refusal for the Department's information.

The purpose of the wave equation analyses is to assess the ability of all proposed pile driving systems to install piles to the required nominal resistance (i.e. ultimate capacity) and the desired penetration depth within allowable driving stresses. Acceptability of the wave equation report and the adequacy of analyses will be determined by the Engineer. In the Wave Equation Summary Report, include:

- a. drivability graph relating pile resistance (i.e. capacity), blow count and driving stresses to depth;
- b. bearing graph relating the pile resistance (i.e. capacity) to the pile driving resistance which indicates blow count versus resistance (i.e. capacity) and stroke; and
- c. constant resistance (i.e. capacity) analysis or inspectors chart to assist the Engineer in determining the required driving resistance at other field-observed strokes.
  - **2.1.1** Acceptance by the Engineer of the proposed pile driving system will be based upon the wave equation analyses indicating that the proposed system can develop the specified pile resistance (i.e. capacity) at a pile driving rate of 20 blows per inch (240 blows/ft.) at the end of driving and driving stresses of at least 55% of yield stress but not greater than 90% of yield stress at the end of driving. The contractor may propose to modify the blow count and/or driving stress criteria if it appears that it is impractical to meet them. Provide preliminary pile driving criteria based on wave equation analyses and any anticipated resistance (i.e. capacity) changes after driving, set-up or relaxation, subject to revision based upon dynamic pile testing field measurements.
  - **2.1.2** If any changes or modifications are made to the accepted pile driving system, additional wave equation analyses in accordance with Section 2.1 of this Special Note will be required.

## 2.2 High-Strain Dynamic Pile Testing

Regardless of pier location use a target nominal resistance of 1766 kips during the driving of the first test pile. For subsequent test piles use the required nominal resistance in Table 3 herein unless directed otherwise by the Engineer.

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- **2.2.1** Perform dynamic pile testing at the locations and frequency required in accordance with Table 2 in this Special Note.
- **2.2.2** Dynamic pile testing involves monitoring the response of a pile subjected to heavy impact applied by the pile hammer at the pile head. The testing will provide information on the driving stresses, pile resistance (i.e. capacity), structural integrity, and hammer efficiency.
- **2.2.3** Engage an independent dynamic pile testing consultant and qualified personnel in accordance with Section 1.2 of this Special Note. Prior to testing, the Engineer will review and accept the proposed independent dynamic pile testing consultant, the experience and qualifications of assigned personnel, details of the method of testing, a list of equipment, and the method of analysis of test results.
- **2.2.4** Perform all field testing and measurements in the presence of the Engineer or authorized representative.
- **2.2.5** Remote Dynamic Pile Testing where data is collected in the field and sent to the office of the Dynamic Pile Testing Consultant will not be allowed on this project. The testing consultant is required to have at least one person meeting the requirements for "Pile Driving Monitoring" as defined in Section 1.2 of the Special Note for Dynamic Pile Testing in the field during all dynamic pile testing. However, "wireless" technology that eliminates cables from the test pile to the data acquisition equipment will be allowed.

## 2.3 Field Testing

- **2.3.1 Equipment** Perform dynamic pile testing field measurements using equipment, software and recording equipment accepted in accordance with Section 1.3 of this Special Note. Analyze the data collected at the end of initial driving using accepted signal matching techniques and software.
- **2.3.2 Monitoring During Driving** During pile driving, instrument the piles and monitor them with testing equipment satisfying the requirements of Section 2.0 of this Special Note. Prior to lifting the pile to be dynamically tested, provide a minimum of 3 ft. of clear access to 180 degree opposite faces of the pile for pile preparation then drill and prepare holes for sensor attachment. Sensors are usually attached near the pile top.
  - **2.3.2.1** Install two sets of strain transducers and accelerometers near the top of each pile to be tested, and use a compatible measuring and recording system to record the data during driving.
  - **2.3.2.2** Appropriately position and fix the equipment required to be attached to the pile to the satisfaction of the Engineer.
  - **2.3.2.3** Use a pile driving hammer and other equipment capable of delivering an impact force sufficient to mobilize the specified pile resistance (i.e. capacity) indicated in the structure plans without damaging the pile.

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- **2.3.2.4** Use the testing equipment to monitor pile stresses during driving to prevent pile damage and ensure pile integrity and resistance (i.e. capacity). If the testing equipment indicates overstressing or damage to the pile, immediately discontinue driving and notify the Engineer and propose a new pile driving system, modifications to existing system, or new pile installation procedures. Acceptance by the Engineer of any proposed changes to the pile driving system or pile installation procedures will be based upon the results of additional wave equation analyses in accordance with Section 2.1 of this Special Note.
- **2.3.3 Preparation of the Pile Head** The preparation of the pile head for the application of dynamic test load may involve, where appropriate, trimming the head, cleaning, and building up the pile using materials that, at the time of testing, safely withstand the impact stresses. Provide an impact surface that is flat and at right angles to the pile axis.
- **2.3.4 Dynamic Measurement and Analysis**Begin monitoring of pile driving when the pile tip is approximately 5 feet above the anticipated bedrock elevation. Record and process the data immediately in the field by the pile driving monitoring equipment and software. Unless monitoring indicates that additional driving will damage the pile, continue pile driving and monitoring until both the specified pile tip elevation and the specified pile resistance (i.e. capacity) are reached. When the level of the sensors is within 1 foot of any obstruction endangering the survival of sensors or cables, halt driving to remove the sensors from the pile. If additional driving is required, remove the obstruction or splice the pile and reattach the sensors to the head of the next pile segment prior to resuming driving. For each pile tested, perform pile driving analysis using signal matching techniques for a selected blow at the end of driving (EOD) to determine the relative capacities from end bearing and skin friction along the pile.

Make any required adjustments to the fuel and/or power setting of the hammer if necessary to verify the resistance at a pile driving rate of 20 blows per inch (240 blows/ft.) at the end of driving and driving stresses of at least 55% of the yield stress but not greater than 90% of yield stress at the end of driving or to meet other applicable testing objectives. The contractor may propose to modify the blow count and/or driving stress criteria if it appears that it is impractical to meet them and/or if pile damage is occuring or it appears that there is the potential for pile damage to occur.

- **2.3.4.1** The Engineer may request use of pile driving monitoring equipment and software on additional piles if inconclusive results are obtained or unusual driving conditions are encountered.
- **2.3.4.2** Evaluate pile resistance and integrity based on industry standards.

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#### 3.0 DYNAMIC PILE TEST REPORTS

Within 24 hours after the completion of testing, submit test report for each pile tested for review by the Engineer. In the reports, include tabular as well as graphical presentation of the dynamic test results versus depth and proposed pile driving criteria for the additional piles to be installed at the substructure unit of the pile tested. Also include the following:

- a. Identification of the structure, including: County, Route, Crossing, and Drawing Number.
- b. Date of testing and date of pile installation.
- c. Pile identification number and location.
- d. All information given in preliminary reports as follows:
  - 1. Length of pile below the surface.
  - 2. Total length of pile, including projection above the surface at time of test.
  - 3. Length of pile from instrumentation position to tip.
- e. The maximum force applied to the pile head.
- f. The maximum energy imparted to the pile.
- g. The assumed soil damping factor and wave speed.
- h. Static resistance (i.e. capacity) estimate.
- i. The maximum compressive and tensile forces in the pile.
- j. Pile integrity.
- k. Blows per inch.
- I. Stroke
- m. Hammer type, drop, and other relevant details.
- n. Blow(s) selected for signal matching analysis.
- o. Maximum compressive and tensile stresses, stroke, and resistance (i.e. capacity) versus penetration depth.
- p. Pile integrity and location of damage, if any.
- q. Force/velocity versus time trace.
- r. Force/velocity match curve.
- s. Resistance distribution along the pile.
- t. Detailed graphical and tabular results from <u>up to three selected blows</u> analyzed using signal matching techniques and software.
- u. Results of <u>refined wave equation analyses</u> based upon dynamic testing signal matching analysis. Include tabular and graphical inspector's charts at EOD for the required pile resistance values for each specific substructure and any additional information that may be needed by field inspectors.

If possible, use the above-referenced practical refusal criteria and provide the required range of hammer strokes. If changes to the practical refusal criteria are required use the same driving criteria for all piers if possible.

The Engineer will use the results of the preliminary reports to provide pile driving criteria for production piles to the Contractor.

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## 4.0 INCIDENTAL EQUIPMENT

Prior to the beginning of dynamic testing, provide one electronic device to aid in recording pile hammer blows, stroke, and energy such as an "E-Saximeter" or accepted equivalent meeting the specifications in the Appendix to this Special Note. This device will immediately become property of the Department for use by project inspectors. The Contractor and Dynamic Pile Testing Consultant are advised to agree upon who will purchase the device.

Provide field training by someone proficient in the use of the device to ensure that approximately 3 to 5 employees of the Department are competent in the use of the device. This training may be performed by a representative of the independent Dynamic Pile Testing Consultant who is proficient in the use of the device or a manufacturer's representative. The required training time is anticipated to be no more than one day.

The cost of furnishing this device and providing the training is incidental to the contract price for "Dynamic Pile Testing" and no separate payment will be made.

#### 5.0 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Dynamic pile testing will be measured per each. Payment for each test will include pile driving monitoring and pile driving analysis performed. Payment for the above described work, including all material, equipment, tools, labor and any other incidental work necessary to complete this item.

The Department will make payment under:

Code Pay Item Pay Unit

23233EC Dynamic Pile Testing Each

The Department will consider payment as full compensation for all work required herein.

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Contract No.: Project:			) NO.: _		
		Pile Driving Contracto	r or Sub	ocontractor:	
County:			(Piles	driven by)	
nemts		Manufacturer: Hammer Type: Manufacturers Maximum Rate		Serial No.:	
Ram	Hammer	Stroke at Maximum Rated En Range in Operating Energy:	ergy:	to	(ft.) (ft lb.)
Ram Components Ram Air Components		Range in Operating Stroke: _ Ram Weight: Modifications:	(l)	b.)	
	Striker Plate	Weight:		Diameter:	(in.)
	i iate	Thickness:		Material #2 (for Composite Cushion)	
	Hammer	Name: Area:	(in. <sup>2</sup> )	Name: Area:	
	Cushion	Thickness/Plate: No. of Plates:	_ (in.)	Thickness/Plate:	(in.)
	Helmet	Total Thickness of Hammer C	ushion:		
		Weight:	- <sup>(lb.)</sup>		
	Pile	Material:			
<u> </u>	Cushion	Area: ( No. of Sheets: Total Thickness of Pile Cushic	_	\	(in.)
	Dile	Pile Type:	(in.	Taper:	
	Pile	Ordered Length: Design Load: Ultimate Pile Capacity:	(ki	ps)	
		Description of Splice:			
		Driving Shoe/Closure Plate De	scription	n:	
		Submitted By:		Date:	
		Telephone No.:		Fax No.:	

Figure 1
Pile and Driving Equipment Data Form (From FHWA-HI-097-014)

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# **Appendix**

# Physical:

Size: 100mm X 190mm X 50mm (4 inches X 7.5 inches X 2 inches)

Weight: 0.7 kg (1.5 lb.)

Temperature range: -10 to 50°C (14 to 104°F) operating

Power: built-in rechargeable battery w/ 8 hour min duration

Display: LCD, 4 Lines x 16 characters, viewing area 62 mm by 26 mm (2.5 inches

by 1 inch)

Keypad: Large key (1.27 mm²), non tactile

#### **Electronic:**

32 bit microcontroller up to 20.97 MHz
12 bit digital to analog converter 8 bit 4 channel analog to digital converter
Internal microphone 70 to 115 dB
RS232 connector for data transfer
4 MB internal memory

#### **Functional and Other:**

Maximum blow detection rate: 68 bpm for open end diesel hammers; 300 bpm for all others Furnished with SAXLINK program for data transfer in text format Operates in English or SI units Full one year warranty Technical manual included

# SPECIAL NOTE FOR INSTRUMENTATION ON EXISTING BRIDGE

# Livingston County – US 60 Bridge over the Cumberland River Item No. 1-1142.0

Construction activities (including but not limited to pile driving, drilled shaft construction, blasting, excavation, or operation of other heavy construction equipment) which could potentially damage the existing bridge will be required during bridge construction activities. The Contractor is advised that the existing bridge structure is located close to the proposed work and that construction activities are to be conducted so as to preclude damage to the existing bridge. Any damage caused by construction activities on this contract is the responsibility of the Contractor. The instrumentation program will begin when foundation construction activities at proposed Piers 2 - 9 are started and conclude when traffic is moved to the new bridge.

#### 1.0 DESCRIPTION

This work consists of furnishing all instrumentation, tools, materials, and labor necessary to install and monitor bridge instrumentation and perform surveys of the pre-foundation construction and post-foundation construction (proposed Piers 2 – 9) condition of the existing Cumberland River Bridge located adjacent to the new bridge, and performing tiltmeter and crackmeter monitoring during the construction activities as specified in this Special Note to evaluate whether construction activities are impacting the existing bridge piers. Provide access and traffic control as required for personnel to conduct the condition surveys and instrumentation work. Schedule and coordinate activities that will impact traffic with the Engineer in accordance with project protocols including required advance notifications to the traveling public. Instrument and monitor the piers on the existing Cumberland River Bridge identified in Table 1 below.

Table 1 – Schedule of Piers on Existing Bridge to be Instrumented			
Pier	Primary Reason(s) for Instrumenting		
SP3	Location of an emergency bearing retrofit performed in 2019		
SP1	Location of bearing retrofit to be performed as part of this project		
	Location of scour repair project performed in 2013		
Α	Main truss pier founded on spread footings		
В	Main truss pier founded on spread footings		
	Issues with rotation soon after construction forcing a retrofit		
NP1	Location of bearing retrofit to be performed		
	Issues with rotation soon after construction forcing a retrofit		
NP2	Founded on soil bearing footing		
NP5	Location of bearing retrofit to be performed as part of this project		
NP7	Location with a noted rocking of the bearings		

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Establish specific recommended monitoring locations in the Pre-Construction Condition Survey and Instrumentation Plan. During the course of construction, the Contractor and/or its consultant(s) will be responsible for taking tiltmeter and crackmeter readings and providing website access of data to Department personnel. Any monitoring data that indicates excessive structure deflections, the potential for unstable conditions, or damage to adjacent facilities, as determined by the Engineer, is cause for preventative measures to be taken in the affected area until the causes are identified and resolved to the satisfaction of the Engineer. Provide equipment for tiltmeter and crackmeter monitoring as outlined in Section 6 below.

Carry out the monitoring program in two phases as indicated below:

- Phase 1 foundation construction activities at Piers 2 9. Depending on the project schedule, the Contractor may propose to break Phase 1 into Phases 1a and 1b to separate foundation construction on each side of the river.
- Phase 2 remainder of construction until traffic is moved to the new bridge

#### 2.0 PERSONNEL QUALIFICATIONS

Perform the services described below using the services of qualified personnel assigned to this project as described below. Personnel who meet the requirements for both descriptions below may perform the duties of both positions. Note that at least two people are required for both positions described below.

## 2.1 Pre-Construction and Post-Foundation Construction Surveys

Use licensed Professional Engineers to conduct pre-construction and post-foundation construction condition surveys who meet the requirements below.

- Documented completion of at least one of the instructor-led National Highway Institute (NHI) courses below within the last five (5) years:
  - FHWA-NHI-130053 "Bridge Inspection Refresher Training"
  - o FHWA-NHI-130053A "Bridge Inspection Refresher Training"
  - FHWA-NHI-130055 "Safety Inspection of In-Service Bridges"
  - FHWA-NHI-130056 "Safety Inspection of In-Service Bridges for Professional Engineers"
- At least three (3) years of experience conducting pre- and/or post-construction condition surveys on structures and/or conventional bridge maintenance inspections
- Experience on a minimum of three (3) projects which include structural pre- and/or post-construction condition surveys and/or conventional bridge maintenance inspections

Include one primary person and at least one backup who meets the same requirements.

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# 2.2 Tiltmeter Instrumentation Installation and Monitoring

Use qualified Instrumentation Engineer or Specialists who are licensed Professional Engineers and meet the requirements below to supervise the Contractor's tiltmeter monitoring program.

- At least three (3) years of experience in the installation and use of instrumentation to monitor deformations of structures and/or slopes
- Experience on a minimum of three (3) projects using tiltmeters to monitor deformations of structures

Include one primary person and at least one backup who meets the same requirements.

#### 3.0 SUBMITTALS AND REPORTS

Make submittals in accordance with applicable Project requirements for submittals. See Table 2 for a list and schedule of required Submittals and Reports. The Department will respond to the Contractor regarding acceptability of Submittals and Reports within 10 business days. A "Business Day" is defined as any day except Saturdays, Sundays and Holidays, as defined in Section 101.03 of the Standard Specifications.



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Table 2 – Schedule of Submittals and Reports				
Submittal Number	Submittal Item	Deadline (Calendar Days)	Event	
1	Proposed personnel as defined in Section 2.0. Also include a listing of other assigned personnel and their experience and qualifications.	30 After	Notice to Begin Work	
2	Pre-Construction Condition Survey Report as defined in Section 4.0 of this Special Note	60 Before	Anticipated Start of Foundation Construction (Prop. Piers 2 - 9)	
3	Instrumentation Monitoring Plan	7 After	Submittal of Pre- Construction Condition Survey Report	
4	Tiltmeter and Crackmeter Monitoring Monthly* Reports as defined in Section 7.  * The frequency may be reduced to bi-monthly during Phase 2.	30 After	Start of Foundation Construction (Prop. Piers 2 - 9)	
5	Post-Foundation Construction Condition Survey Report as defined in Section 4.0 of this Special Note	30 After	Completion of Foundation Construction (Prop. Piers 2 - 9)	
6	Phase 1 Instrumentation Monitoring Summary Report	15 After	Completion of Foundation Construction (Prop. Piers 2 - 9)	
7	Phase 2 Instrumentation Monitoring Summary Report	15 After	Traffic is Moved to New Bridge	
Provide all submittals and reports in .pdf format				

## 4.0 CONDITION SURVEYS

Conduct Pre-Construction and Post-Foundation Installation (proposed Piers 2 - 9) Condition Surveys on the piers identified in Table 1 prior to the commencement and after the completion of foundation construction activities at the referenced piers. Include documentation of the substructure and bearings. Detail (by engineering sketches, video, photographs, and/or notes) any existing structural or cosmetic damage.

Submit Pre-Construction and Post-Foundation (proposed Piers 2 - 9) Condition Survey reports for the piers identified in Table 1 that summarizes the pre- and post-construction conditions of the referenced pier substructures and identifies areas of concern, including potential personnel hazards (falling debris) and structural elements that may require support or repair such as, but not limited to, existing visible cracks. Submit full reports in digital form condensed to a .pdf file. If higher resolution photographs or other records resulting in larger file sizes are required for detail, submit higher resolution versions CD, USB-drive media or internet uploads.

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#### 5.0 INSTRUMENTATION MONITORING PLAN

Based on observations from the Pre-Construction Condition Survey, submit a written Instrumentation Monitoring Plan to the Engineer, which includes, but is not necessarily limited to the following:

- planned monitoring activities
- proposed monitoring equipment with supporting documentation that it meets the requirements specified in Section 6 below
- proposed specific locations of tiltmeters and crackmeters including drawings, sketches, photographs, etc.
- discussion of anticipated effects of temperature on monitoring data including possible methods to reduce notifications that may occur as the result of thermal expansion and contraction.
- examples of format for reporting the data via electronically-submitted written reports and a website accessible to Department and Contractor personnel
- proposed communications protocols with Contractor and Department personnel for the levels defined below
- tilt values (degrees) associated with deformations at the top of the piers identified in Table 1 as defined below

Level	Deformation at Top of Pier (Longitudinal and Transverse)	
Alert	0.125 inch (1/8")	
Threshold	0.188 inch (3/16")	
Limiting	0.250 inch (1/4")	

 proposed crack gage criteria for alert, threshold and limiting criteria based on the preconstruction condition survey

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#### 6.0 EQUIPMENT AND INSTALLATION

All instrumentation equipment including associated ancillaries referenced in Sections 6.1 and 6.2 below will immediately become property of the Department after use on this project.

#### 6.1 Tiltmeters

Provide and install new instrumentation designed, fabricated, and assembled in proper operating condition and in full conformity with the manufacturer's requirements and this Special Note. Furnish items complete with all components specified herein, all accessories required for proper operation, and all additional materials required by the design of the system.

Provide new tiltmeter monitoring equipment with an instrumentation system expressly designed for the purpose of measuring tilt on structural elements that meets the following requirements:

- tiltmeters capable of measuring both longitudinal and transverse tilt as well as temperature
- tiltmeters with a range of up to +/-10 degrees from the vertical, with a minimum resolution of approximately 0.001 degrees in a temperature range of 0 to 175 degrees Fahrenheit
- includes data loggers, cabling, solar panels to recharge the data logger batteries, a cellular modem and is capable of:
  - capturing, storing and downloading time-stamped tiltmeter readings in retrievable memory
  - > collecting, storing and transmitting data via cellular modem
  - uploading data in real time to a website accessible by Department and Contractor personnel and available for "near real time" review at any time

Install tiltmeters with data loggers and solar panels in accordance with the manufacturer's specifications, one set each on the west side of the piers identified in Table 1 of the existing bridge on or near the pier caps. In all cases, provide equipment conforming to the requirements herein.

Position the transverse axis of each tiltmeter so that a tilt to the west (toward the new bridge alignment) is in the "positive" direction. Similarly, position the longitudinal axis of each tiltmeter so that tilt to the north (toward End Bent 2) is in the "positive" direction. Set the tiltmeter data loggers to send alerts when the change in tilt exceeds the value associated with the levels defined in Section 5.0 above. Send alerts to applicable personnel according to agreed-upon protocols.

Install the tiltmeters on Piers SP3, SP1 and A of the existing bridge a minimum of 30 calendar days prior to beginning foundation construction activities at proposed Piers 2 & 3. Install the tiltmeters on Piers B, NP1, NP2, NP5 and NP7 of the existing bridge a minimum of 30 calendar days prior to beginning foundation construction activities at proposed Piers 4 - 9. On each side of the river, perform any trouble shooting so that a minimum of 21 days of baseline data is obtained prior to the beginning of foundation construction.

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## 6.2 Crackmeters

Provide and install remote sensing crack displacement monitoring gages on the piers identified in Table 1 of the existing bridge across any significant existing cracks as defined by the Pre-Construction Condition Survey Engineer to help verify any additional structure distress if it should develop. The location, number, and type of gages will be established by the Contractor and the Department based on the pre-construction condition survey. Provide a minimum of five (5) crackmeters per pier monitored (average). If more than an average of five (5) crackmeters per pier monitored are deemed necessary, proposed and agreed upon by the Engineer, the Department will compensate the Contractor for the additional crackmeters via change order. An average of less than five (5) crackmeters per pier monitored may result in a deduction.

Provide new crackmeter instrumentation such as Durham Geo Slope Indicator (DGSI) VW, GEOKON VW Model 4420 or approved comparable devices that are designed, fabricated, and assembled in proper operating condition and in full conformity with the manufacturer's requirements and this Special Note. Furnish items complete with all components specified herein, all accessories required for proper operation, and all additional materials required by the design of the system.

Install the crackmeters a minimum of 30 calendar days prior to beginning proposed Piers 2 - 9 foundation construction activities and perform any trouble shooting so that a minimum of 21 days of baseline data is obtained prior to the beginning of foundation construction at proposed Piers 2-9.

## 7.0 MONTORING AND REPORTING

If requested by the Engineer, provide a minimum of one day of in-person on-site training (by the Instrumentation Specialist) to the Department's and Contractor's personnel in the use of the instrumentation system including all ancillary equipment and accessing data from the website. Coordinate the scheduling of this training with the Engineer.

Protect all instrumentation until it is removed and ensure that the system is functioning at all times. If the system is found not to be functioning take applicable action to ensure the capability to obtain data is restored as soon as possible. Replace or restore any defective or damaged instrumentation at no expense to the Department. Coordinate and cooperate as necessary with the Engineer.

### 7.1 Tiltmeters

Set each data logger to record tiltmeter readings on nominal 15-minute intervals. At night and/or when cloudy weather prevents solar recharging, the units may be switched to low power mode to collect data on nominal one-hour intervals. Provide an information guide relative to accessing the website to review the tiltmeter data.

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Submit monthly reports including plots of tilt (in degrees) and corresponding deformations (inches) at the top of the pier in both the longitudinal, transverse directions and temperature vs. time and a log of construction activities prepared by the Contractor for the monthly period. Additionally, include separate plots of the same parameters for the cumulative time since installation. Include a brief summary with explanations of data anomalies, significant construction activities or other events and any other observations. In the first monthly report include photographs of the installed tiltmeters and verification that the tiltmeters were installed according to the accepted Instrumentation Monitoring Plan or explanations for any deviations.

As provided in Section 5.0 above, the Department has established the criteria below. The Department reserves the right to modify the deformation values based on baseline readings and/or field observations, bridge inspections, etc. If the criteria are modified provide tilt values (degrees) associated with the modified deformations.

Level	Deformation at Top of Pier (Either Longitudinal or Transverse)	
Alert	0.125 inch (1/8")	
Threshold	0.188 inch (3/16")	
Limiting	0.250 inch (1/4")	

If the Alert level is reached perform the actions below unless modifications are agreed upon by the Department.

- 1. Review the data to see if the value seems reasonable or if there may be an explanation for the observed tilt.
- 2. Notify the Engineer and other applicable Department personnel.

If a Threshold Value is reached, perform the actions below unless modifications are agreed upon by the Department.

- 1. Review the data to see if the value seems reasonable or if there may be an explanation for the observed tilt.
- 2. Notify the Engineer and other applicable Department personnel (The Section Engineer will notify the District Bridge Maintenance Engineer to request an inspection.)
- 3. Meet with the Section Engineer and District Bridge Maintenance Engineer to discuss the need for response action(s).
- 4. If directed by the Engineer, implement response action(s) within 24 hours of submitting a detailed specific plan of action to reduce the potential for exceeding the Limiting Value.

If a Limiting Value is reached, perform the actions below unless modifications are agreed upon by the Department.

- 1. Suspend construction activities in the affected area.
- Immediately notify the Engineer and other applicable Department personnel and close the bridge to traffic, unless directed otherwise by the Engineer. (The Section Engineer will notify the District Bridge Maintenance Engineer to request an immediate inspection.)

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- 3. Review the data to see if the value seems reasonable or if there may be an explanation for the observed tilt.
- Meet with the Section Engineer and District Bridge Maintenance Engineer to discuss the need for response action(s).
- 5. If directed by the Engineer, implement response action(s) within 24 hours of submitting a detailed specific plan of action as required to re-open the bridge.

Notifications are not required prior to the commencement of foundation construction activities when baseline readings are being obtained.

#### 7.2 Crackmeters

Remotely monitor the crackmeters and provide an information guide relative to accessing the website to review the tiltmeter data. Notify the Department of any significant movement detected by the crackmeters according to the criteria in the accepted instrumentation monitoring plan. Based on the proposed and accepted criteria for alert, threshold and limiting values, perform the actions described for tiltmeters in Section 7.1 unless modifications are agreed upon by the Department.

Submit monthly reports which include plots of remote crackmeter data and documentation of the crack widths. Include these reports with the monthly tiltmeter report submittals. Additionally, include separate plots of the same parameters for the cumulative time since installation. Include a brief summary with explanations of data anomalies, significant construction activities or other events and any other observations. In the first monthly report include photographs of the installed crackmeters and verification that the crackmeters were installed according to the accepted Instrumentation Monitoring Plan or explanations for any deviations.

## 7.3 Summary Reports

Submit Phase 1 and Phase 2 Monitoring Summary Reports which summarizes the data collected in each phase. As a minimum include the following sections: Introduction, Tiltmeter and Crackmeter Monitoring Description, Findings, General Comments and Appendix that includes installation records including drawings/sketches, photographs, plots, equipment manufacturer's specifications.

Interpret the data collected, including making correlations between tiltmeter data and specific construction activities. Evaluate the data to determine whether the measured deformations can be reasonably attributed to construction activities. Include these evaluations in the final report.

Include all tiltmeter and crack gage records such as daily event logs and associated construction activity data in the final report, submitted to the Engineer, in a format allowed by the Engineer. Submit a full report in digital form condensed to a .pdf file. If higher resolution photographs or other records resulting in larger file sizes are required for detail, submit higher

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resolution versions using a CD, USB-drive media, or uploaded to an online site accessible by applicable Department personnel.

## 8.0 INSTRUMENTATION REMOVAL

Upon completion of tiltmeter monitoring and prior to demolition remove the instrumentation systems and all ancillary equipment under the direction of the Instrumentation Specialist. Exercise caution so that all equipment remains in working order for the Department's use on subsequent projects. The Department will immediately take custody of these items.

#### 9.0 METHOD OF MEASUREMENT

Payment for instrumenting the existing bridge is for all work and equipment described in this special note including but not necessarily limited to furnishing and installing instrumentation, condition surveys, monitoring, and providing access and traffic control as required to install, monitor and remove the instrumentation. The Department will make partial payments according to the schedule below.

SCHEDULE OF LUMP SUM PARTIAL PAYMENTS			
Milestone	Cumulative %		
Acceptance of Pre-Foundation Construction (proposed Piers 2 – 9) Condition Survey Report & Instrumentation Monitoring Plan	15		
Installation of Tiltmeters & Crackmeters with Confirmation that all Instrumentation is Functional	30		
Completion of Phase 1 Monitoring & Acceptance of all Monthly Reports	50		
Acceptance of Post-Foundation Construction (proposed Piers 2 – 9) Condition Survey Report	60		
Acceptance of Phase 1 Instrumentation Monitoring Summary Report	70		
Completion of Phase 2 Monitoring Program and Acceptance of all Bi-Monthly Reports	90		
Acceptance of Phase 2 Instrumentation Monitoring Summary Report & Transfer of Entire Instrumentation System to the Department	100		

#### 10.0 PAYMENT

The Department will pay for the completed and accepted work under the following:

Code	Pay Item	Pay Unit
20610NC	Instrumentation	Lump Sum

The Department will consider payment as full compensation for all work required herein.

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## SECTION 312000 - EARTH MOVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

#### A. Section Includes:

1. Excavating and backfilling for utility trenches.

#### 1.2 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- C. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

#### 1.3 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site.

#### 1.4 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

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#### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GC, SC, CL, ML, GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
  - 1. Plasticity Index: 30 (beneath Structures and Pavements.
  - 2. Minimum Unit Weight: 100 lbs/cubic foot
- C. Unsatisfactory Soils: Soil Classification Groups OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.
- D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

#### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

#### 3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

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#### 3.3 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: 8 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
  - Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
  - 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

## 3.4 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

## 3.5 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

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#### 3.6 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course.
- E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

# 3.7 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use satisfactory soil material or engineered fill.
  - 4. Under building slabs, use satisfactory soil material or engineered fill.
  - 5. Under footings and foundations, use engineered fill.

## 3.8 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

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2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

#### 3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil 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.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 5 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 92 percent.

## 3.10 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1 inch.
  - 3. Pavements: Plus or minus 1/2 inch.

## 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

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- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.
- E. Density testing shall be performed at a rate of at least one test per 10,000 square feet per lift and with a minimum of 3 tests per lift.

## 3.12 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

## 3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

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#### SECTION 331113- MUNICIPAL WATER DISTRIBUTION

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes water-distribution piping and related components for water distribution piping to be turned over to municipal water district or company for public water supply.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

## 1.3 QUALITY ASSURANCE

## A. Regulatory Requirements:

- 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
- 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
- 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

#### D. NSF Compliance:

1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

#### 1.4 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then

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only after arranging to provide temporary water-distribution service according to requirements indicated:

- 1. Notify Engineer and Distribution Owner no fewer than two days in advance of proposed interruption of service.
- 2. Do not proceed with interruption of water-distribution service without Engineer and Distribution Owner written permission.

## 1.5 COORDINATION

Coordinate connection to water main with utility company Provide fees for main line taps, distribution system owner shall make all taps to existing mains.

PART 2 - PRODUCTS

#### 2.1 PIPE AND FITTINGS

A. Ductile Iron Pipe Class 51 and Pressure Class 350

All ductile iron pipe shall be designed in accordance with AWWA/ANSI C151/A21.51. Ductile iron pipe class 51 shall be manufactured with thickness, diameter, and weight in accordance with AWWA C151, Table 3 and Table 4. All ductile iron pipe shall have a rating of not less than 300 psi. Ductile iron pipe exterior surface shall have an asphaltic coating, minimum thickness of 1 mil., in accordance with AWWA C151. Ductile iron pipe shall be cement lined in accordance with AWWA/ANSI C104/A21.4. Cement lining shall be standard thickness with a thickness tolerance of plus 1.8 inch. The pressure rating, metal thickness class, net weight of pipe without lining of pipe, and name of manufacturer shall be clearly marked on each length of pipe. Joints shall be Fastite, Bell-Tite, or Tyton as specified. Where restrained joint is specified, it shall be Tyton joint pipe with Tyton-Loc gasket by U.S. Pipe & Foundry Company, Inc., or approved equal. All joints, 4 inch through 12 inch, shall be adaptable for locking gaskets. All ductile iron pipe shall be manufactured in the United States unless otherwise approved by PW.

B. Plastic Pipe and Fittings: Plastic pipe shall be rigid unplasticized polyvinyl chloride (PVC) conforming to the requirements of ASTM D 1784 and ASTM D 2241. Pipe shall have a minimum standard dimension ratio (SDR) of 21 and a pressure rating of 200 complying with ASTM D2241. The PVC compound used in the manufacture of this pipe shall meet or exceed the requirements for class 12454-A or 12454-B as defined by ASTM D1784. Plastic pipe joint shall be of the push-on type with a continuous elastomeric ring gasket compressed into the annular space between bell and spigot end of pipe complying with ASTM D 3139. All piping shall be SDR 21 PVC 200 psl rating.

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## D. Fittings

- Fittings for PVC and ductile iron water mains shall be ductile iron fittings in accordance with AWWA C110-77 (ANSI A21.10) and shall conform to the details and dimensions shown therein. Fittings shall have mechanical joints meeting the requirements of AWWA CIII-80 (ANSI A21.11). Fittings shall have interior cement-mortar lining as specified for the pipe.
- 2. Plugs, where required, shall be ductile iron mechanical joint dished or flat plugs in accordance with AWWA C110-77. Joints for plugs shall be restrained with the use of ductile iron mechanical joint retainer glands.

#### 2.2 VALVES

#### A. Gate Valves

- All gate valves shall be of the resilient seat type, iron body, non-rising stem, fully bronze mounted and suitable for water working pressures of 200 psi. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.
- 2. All gate valves shall be furnished with mechanical joint and connections, unless otherwise shown on the Drawings or specified hereinafter.
- 3. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.
- 4. Each gate valve shall be installed in a vertical position with a valve box. Gate valves set with valve boxes shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counter-clockwise).
- 5. All valves shall conform with the latest revision of "AWWA Standard for Gate Valves 3 inch through 48 inch For Water and Other Liquids", AWWA C509. Valves shall be as manufactured by Mueller, M & H, American Valve and Hydrant, U.S. Pipe, Kennedy or equal.

#### B. Tapping Valves

Tapping valves shall be iron body and iron rubber encapsulated, with an iron gate. They shall be AWWA resilient seated gate valves, conforming to AWWA Standard C509 and be UL listed - FM approved. They shall have a non-rising bronze stem with two (2) inch square wrench nut and "O" ring packing. The inside and outside of the body and bonnet shall be coated with an epoxy coating to meet the AWWA C550 Standard. The internal design shall provide for the passing of full size cutters and tapping machine bits. The valve connection shall be Class 125, flanged for tapping sleeve, opening left. They shall have a mechanical joint for branch pipe connection,

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complete with bolts, nuts, and gaskets. Tapping valves shall be Mueller valve, or approved equal.

## C. Stainless Steel Tapping Sleeves

This specification covers tapping sleeves of all stainless steel construction. All metal parts of the tapping sleeve shall be of 304 stainless steel, and the gaskets shall be of virgin SBR rubber compound for water service. The gasket shall have a full circumferential seal. The shell and neck of the sleeve shall be of 304 stainless steel. The neck shall be mig welded to the shell to form a strong permanent fusion with the shell. The welded areas then shall be fully passivated. Passification shall mean the weld areas of the sleeve shall be chemically treated and the residue removed so as to return the welded stainless steel to its original state and produce a highly corrosion resistant coating. The sleeve shall have heavy hex nuts, and the bolts shall be rolled national course thread of 304 stainless steel and shall be Teflon coated. It shall have a plastic lubricating washer. The armors shall be heavy gauge 304 stainless steel with a lip curve to hold position while tightening. The flange shall be 304 stainless steel with standard square head for pressure testing before tapping pipe. The tapping sleeve shall be of the SST style as manufactured by Romac Industries, Inc., or approved equal.

#### D. Valve Boxes

Valve boxes shall be constructed of cast iron in two-piece sections with heavy duty lids. Valve boxes shall be of the screw type, adjustable, and with a five and one-quarter (5 ¼) inch shaft. The lengths of the boxes shall be specified in the Bidder's Proposal. Valve boxes shall be as manufactured by the Tyler/Union Corporation or approved equal.

# 2.3 HYDRANTS

### A. Fire Hydrants

- 1. The Contractor shall furnish and install fire hydrants where shown on the Drawings. Hydrants shall conform in all respects to the requirements of AWWA C502-80. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2-inch discharge nozzles and one (1) 5-1/4 inch pumper nozzle with caps fitted with cap chains. Connection threads shall conform to local standards. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains should barrel be broken off.
- 2. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

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- 3. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.
- 4. Hydrants shall be designed for 250 psi working pressure and shop tested to 300 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.
- 5. Hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and backed with at least one (1) cubic foot of Class "C" concrete or equivalent. Set hydrants so that centerline of pumper nozzle is minimum 18 inches above finished grade. An operating wrench and traffic damage repair kit shall be provided with every 15 hydrants. Provide one (1) set where quantity of hydrants is less than 15.
- 6. Hydrants shall be M&H model 129 Fire Hydrant 3 way, 5-1/4" AWWA with National Hydrant threads, 3.5' minimum bury length, open left or approved equal.

#### 2.4 Service Meter Sets

#### A. Meter Sets

- 1. Service meter sets shall include main line service tap, saddle and corporation stop, meter setter with dual check valve backflow preventer, meter, meter pit, frame and cover and reconnection to the service line to the structure.
  - a. Corporation Stops:
    - 1) Comply with ASTM B62.
    - 2) Body: Brass or red brass alloy.
    - 3) Inlet End: Threaded for tapping according to AWWA C800.
    - 4) Outlet End: Suitable for service pipe specified.
  - b. Service Saddles:
    - 1) Type: Double strap.
    - 2) Designed to hold pressures in excess of pipe working pressure.
  - c. Polyethylene Pipe:
    - 1) 1" nominal diameter. Comply with ASTM D3035, 200 psig pressure rating.
    - 2) Fittings: Comply with AWWA C901, molded or fabricated. Joints: Compression or Butt fusion.
  - d. Meter Yokes:
    - 1) Material: Copper.
    - 2) Inlets and Outlets: Horizontal setting, with matching couplings, fittings, and stops.
  - e. Double Check Valve Assemblies:
    - 1) Comply with ASSE 1012.
    - 2) Materials:
      - a) Body: Bronze.
      - b) Internal Parts: Corrosion resistant.
      - c) Springs: Stainless steel.
    - 3) Check Valves:

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- a) Quantity: Two, operating independently.
- b) Intermediate atmospheric vent
- f. Water Meters
  - 1) Master Meter or approved equal. Size 5/8".
- g. Water Meter Boxes
  - Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.
    - a) Option: Base section may be cast-iron, PVC, or other pipe.
  - 2) Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
- h. Reconnect new meter to existing service line to structure.
  - 1) Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.
    - a) Option: Base section may be cast-iron, PVC, or other pipe.
  - 2) Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
- i. Reconnect new meter to existing service line to structure.

### E. EXECUTION

#### A. EARTHWORK

1. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

### B. PIPING APPLICATIONS

- 1. Piping is arbitrarily limited to NPS 6 (DN 150) for water service, NPS 8 (DN 200) for fire-service mains, and NPS 10 (DN 250) for combined water service and fire-service mains.
- 2. Select piping applications from this Article. Coordinate with materials specified in Part 2.
- 3. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- 4. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- 5. Do not use flanges or unions for underground piping.
- 6. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- 7. Retain "any of" option in first paragraph below to allow Contractor to select piping materials from those retained.
- 8. Retain one or more of three subparagraphs below.
- 9. Retain "any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

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# C. VALVE APPLICATIONS

- General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts.
- 2. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - a. underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
  - b. Use the following for valves in vaults and aboveground:
  - c. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.

### D. PIPING INSTALLATION

- 1. Water-Main Connection: Contractor verify for tap of size and in location indicated in water main.
- 2. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- 3. Make connections larger than NPS 2 with tapping machine according to the following:
- 4. Install tapping sleeve and tapping valve according to MSS SP-60.
- 5. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
- 6. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
- 7. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- 8. Install ductile-iron, water-service piping according to AWWA C600, AWWA M41 and Paducah Water Works Standards.
- 9. Bury piping with depth of cover over top at least 42 inches, with top at least 12 inches below level of maximum frost penetration.
- 10. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

# E. JOINT CONSTRUCTION

- 1. Make pipe joints according to the following:
- 2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
- 3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
- 4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
- 5. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Paducah Water Works "Standard Specifications and Procedures" for joining piping of dissimilar metals.

#### F. ANCHORAGE INSTALLATION

- 1. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
  - Concrete thrust blocks.

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- b. Locking mechanical joints.
- c. Set-screw mechanical retainer glands.
- d. Bolted flanged joints.
- e. Pipe clamps and tie rods.
- 2. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
  - Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
  - b. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

#### G. VALVE INSTALLATION

1. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

#### H. FIRE HYDRANT INSTALLATION

- 1. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- 2. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- 3. AWWA Fire Hydrants: Comply with AWWA M17.

#### I. CONNECTIONS

1. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

### J. FIELD QUALITY CONTROL

- 1. No pressure testing shall begin after 1:30 p.m. or on Friday.
- 2. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- 3. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
  - a. Increase pressure in 50-psig increments to a minimum of 150 psig Hold at test pressure for not less than 2 hours.
  - b. Contractors shall pressure test all new mains prior to chlorination sampling.
  - c. Prepare reports of testing activities.

### K. IDENTIFICATION

 Install continuous underground Tracer Wire during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.

#### L. CLEANING

- Clean and disinfect water-distribution piping as follows:
  - a. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - b. Retain subparagraph below for fire-protection-water piping not connected to potable-water supply.
  - c. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction,

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use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

- d. Use purging and disinfecting procedure prescribed by Union County Water District or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
  - 1) Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
  - 2) Retain last subparagraph above or first subparagraph below.
  - 3) Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
  - 4) After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
  - 5) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- e. Prepare reports of purging and disinfecting activities.

**END OF SECTION 221113** 

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#### SECTION 331313 - MUNICIPAL SANITARY SEWERS

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes gravity-flow, nonpressure sanitary sewerage outside the building, with the following components:
  - 1. Cleanouts.
  - 2. Precast concrete manholes.
  - 3. PVC sewer pipe

### 1.2 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: Minimum of SDR 35

#### 1.3 SUBMITTALS

- A. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.
- B. Coordination Drawings: Show pipe sizes, locations, and elevations.
- C. Field quality-control test reports.

# PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

# 2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

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# 2.3 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Gaskets: AWWA C111, rubber.

# 2.4 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

#### 2.5 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
  - 1. Available Manufacturers:
    - a. Josam Company.
    - b. MIFAB Manufacturing Inc.
    - c. Smith, Jay R. Mfg. Co.
    - d. Wade Div.; Tyler Pipe.
    - e. Watts Industries, Inc.
    - f. Watts Industries, Inc.; Enpoco, Inc. Div.
    - g. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
  - 2. Top-Loading Classification: Medium and Heavy duty.
  - 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

### 2.6 MANHOLES

- A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  - 1. Diameter: 48 inches minimum, unless otherwise indicated.
  - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
  - 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  - 4. Riser Sections: 4-inch minimum thickness, and of length to provide depth indicated.
  - 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  - 6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

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- 7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
- 8. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
- 9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
- 10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
- 11. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
  - a. Material: ASTM A 536, Grade 60-40-18 ductile iron, unless otherwise indicated.

### 2.7 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  - 1. Cement: ASTM C 150, Type II.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
  - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
  - 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    - a. Invert Slope: 2 percent through manhole.
  - 2. Benches: Concrete, sloped to drain into channel.
    - a. Slope: 8 percent.

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- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
  - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

### PART 3 - EXECUTION

# 3.1 PIPING APPLICATIONS

- A. Pipe couplings and fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  - 1. Use pressure-type Ductile Iron mechanical joint solid sleeve type joints where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
- B. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials for each size range:
  - 1. NPS 3 and NPS 4: NPS 6 ductile-iron, gravity sewer pipe; ductile-iron standard fittings; gaskets; and gasketed joints.
  - 2. NPS 3 and NPS 4: NPS 4 PVC sewer pipe and fittings, gaskets, and gasketed joints.
  - 3. NPS 5 and NPS 6: NPS 6 ductile-iron, gravity sewer pipe; ductile-iron standard fittings; gaskets; and gasketed joints.
  - 4. NPS 5 and NPS 6: NPS 6 PVC sewer pipe and fittings, gaskets, and gasketed joints.
  - 5. NPS 8 and NPS 10: Ductile-iron, gravity sewer pipe; ductile-iron standard fittings; gaskets; and gasketed joints.
  - 6. NPS 8 and NPS 10: PVC sewer pipe and fittings, gaskets, and gasketed joints.
  - 7. NPS 12 to NPS 16: Ductile-iron, gravity sewer pipe; ductile-iron standard fittings; gaskets; and gasketed joints.
  - 8. NPS 12 and NPS 15: PVC sewer pipe and fittings, gaskets, and gasketed joints.

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

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- C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, nonpressure, drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at minimum slope of 1% for pipe under 8" in diameter 0.4% for 8 in pipe, 0.28% for 10 inch pipe and 0.22% for 12" pipe, unless otherwise indicated.
  - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
  - 3. Install piping with 36-inch minimum cover.
  - 4. Install piping below frost line.
  - 5. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 6. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
- F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

# 3.3 PIPE JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 22 Section "Common Work Results for Plumbing." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure, drainage piping according to the following:
  - 1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
  - 2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.
  - 3. Join dissimilar pipe materials with pressure-type mechanical joint solid sleeve type couplings.

# 3.4 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.

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D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

#### 3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use medium-duty, top-loading classification cleanouts in unpaved areas.
  - 2. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

### 3.6 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section "Sanitary Waste and Vent Piping."
- B. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

## 3.7 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate report for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.

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- 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
- 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
    - a. Allowable leakage is maximum of 30 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
    - b. Close openings in system and fill with water.
    - c. Purge air and refill with water.
    - d. Disconnect water supply.
    - e. Test and inspect joints for leaks.
    - f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
  - 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
    - b. Option: Test concrete gravity sewer piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

**END OF SECTION 221313** 

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#### SPECIAL NOTE FOR AN AUTOMATED GATE

#### 1. **DESCRIPTION:**

Furnish and erect an automated gate of the height and type to go with the Chain Link Fence specified in the Plans. Furnish and install Automated Gate.

#### 2. MATERIALS:

30' Slide Gate For 8-Foot-High Gate With 3 Strands Barbed Wire. Conform to Section 817. "V" Barbed wire Arms W/Three Additional Strands. Conform to Section 816.04. Automated Sliding Gate Operator

#### 3. CONSTRUCTION

### 30' Slide Gate For 8-Foot-High Gate With 3 Strands Barbed Wire.

Gate frame shall be hot dipped galvanized steel. Top member shall be steel structural channel/tube extrusion weight not less than 3.0. Frame shall be keyed to interlock with the keyed track member. Vertical members at the ends of the opening portion of the frame shall be "P" shaped in cross section with a nominal base dimension of no less than 2"x2" and weight not less than 1.6 LB. The spacing for the vertical intermediates shall be less than 50% of the gate frame height. The track member to be located on each side of the top primary. When interlocked with and welded to the "Keyed" top member, it forms a composite structure with the top of the gate framed. Welds placed alternately along the top and side of the track at 9" centers with welds being a minimum of 2". All welds on the gate frame shall conform to welding procedures. Gate frame is to be supported from the track by two (2) or four (4) swivel type, self-aligning, sealed lubricant, ball bearing truck assemblies with stainless steel races according to size of gate. Each track is to be attached to a hot dipped, galvanized steel hanger bracket which in turn is to be attached to a 4" O.D. support post. Bottom of each support post is to be equipped with a pair of 3" guide wheel. Diagonal "x" bracing of 3/16" minimum diameter stainless steel cable shall be installed to brace the gate panels. The gate shall be completed by installation of approved filler. The gate filler will be chain link and the gate filler shall extend the entire length of the gate and shall be secured at each end of the gate frame by standard fence industry tension bars and ties. Price should include installation if double support posts is needed, shall be minimum 4" O.D. round or square galvanized steel if ground work and concrete is needed, it should be included with Bid.

# "V" Barbed wire Arms W/Three Additional Strands.

Barbed Wire: Three (3) Strand of Barbed Wired of the same description used for fencing, shall be placed above top frame. Barbed wire shall extend to one foot (1"-0") above the gate frame and shall be tack weld secured.

#### **AUTOMATIC SLIDING GATE OPERATOR.**

Materials for automatic sliding gate operator. One Hy-Security Model DC15 slide smart gate operator with battery backup. One 6' x 16' reversing detector loop. One 6' x 16' free egress/reversing detector loop. Two Reno B-4 loop detectors with wiring harnesses. One door king stainless, lighted standalone key pad. One black steel 42" flanged gooseneck pedestal. One edco surge suppressor for power. Two concrete pads, 1' square(pedestal) 2' square(gate

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operator). All cables, conduit & connectors needed. Power to the unit is to be provided by others(110v - 20amp circuit) Line CL Description Delivery Days Quantity Unit Issue Unit Price

### **4.0 MEASUREMENT**

30' Slide Gate: The Department will measure the quantity by each individual unit.
"V" Barbed Wire Arms: The Department will measure the quantity by linear feet.
Automated Sliding Gate Operator: The Department will measure the quantity by each individual unit.

**5.0 PAYMENT.** The Department will make payment for the completed and accepted quantities under the following:

Code	Pay Item Pay	Unit
<mark>xxxxx</mark>	30' Slide Gate For 8-Foot-High Gate With 3 Strands Barbed Wire	(EA)
<mark>xxxxx</mark>	"V" Barbed Wire Arms W/Three Additional Strands	(FT)
xxxx	Automated Sliding Gate Operator	(EA)



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# SPECIAL NOTE FOR CLASS 1A GEOTEXTILE FABRICS USED IN STRUCTURAL PAVEMENT DESIGNS

- 1. **DESCRIPTION.** This special note covers requirements for Class 1A geotextile fabrics to be used for subgrade stabilization that is a part of a structural pavement design. Section references herein are to the current edition of the Department's Standard Specifications for Road and Bridge Construction, including Supplemental Specifications, unless otherwise noted.
- **2. GEOTEXTILE FABRIC.** Use a woven or non-woven fabric meeting the requirements of AASHTO M 288 for Class 1A fabric and Section 3 of this special note.

Conform to the general requirements for GEOTEXTILE FABRIC in Section 843. This includes participation in the National Transportation Product Evaluation Program (NTPEP) for Geotextiles and Geosynthetics and the product data must be posted in NTPEP DataMine

- **2.1 PACKING, SHIPMENT AND STORAGE.** Conform to Section 7 of AASHTO M 288, current edition for Identification, Shipment, and Storage. Conform to the requirements for PACKAGING in Section 843.
- **2.2 ACCEPTANCE.** Obtain the Department's approval for all material before incorporating it into the project, as required by Section 843.

# 3. CONSTRUCTION.

Prepare the surface according to Sections 207 or 302.

Place Fabric-Geotextile Class 1A at the proper elevation and locations in continuous strips to minimize the amount of joints and wrinkles during placement. Place fabric according to requirements for CONSTRUCTION in Section 214, **expect that the high-strength fabric shall be temporarily secured in place to maintain tension during aggregate placement**. This may be done with staples, pins, sand bags or backfill as required by fill properties, fill placement procedures, or weather conditions as the Engineer directs.

Fabric overlaps shall be 2 feet, contrary to Section 214, unless a larger overlap or seaming is required by the project plan notes. Longitudinal overlaps (parallel to roadway) should not be placed within traffic wheel paths, but should be placed approximately at the centerline or the shoulder. Overlaps for the ends of fabric rolls should be shingled in the

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direction of aggregate/fabric construction (i.e. place the start of the new roll beneath the end of the previous roll).

Any ruts that form during aggregate placement or compaction shall be filled with aggregate to maintain adequate cover over the fabric. Ruts should never be bladed down, as this would decrease aggregate cover over the fabric.

- **4. FASTENER PINS.** Comply with the requirements of Section 843 for fastener pins used for Subgrade and Embankment Stabilization, and the fabric Manufacturer's recommendations.
- **5. MEASUREMENT.** The Department will measure the Class 1A Fabric in accordance with Section 214
- **6. PAYMENT.** The Department will make payment for the completed and accepted quantities under the following:

CodePay ItemPay Unit02604FABRIC-GEOTEXTILE CLASS 1ASquare Yard



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### SPECIAL NOTE FOR COMPLETION DATE

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River

I. COMPLETION DATE. All work required as part of the Contract shall be completed by December 1, 2023. The contract completion date includes 244 calendar days of lost time due to High Water Impact. The elevation of High-Water Impact has been selected as a water surface elevation of EL. 320.0 (NAVD88). Figure 1 illustrates a water surface elevation of EL. 320.0 (NAVD88) relative to the profile of the bridge. The estimated number of high-water days is derived from extrapolating water surface elevation data at the Gage site noted below between the years 2008-2019.

An adjustment of contract completion date may be considered if the number of days, in the period from Contract execution to December 1, 2023, that the water surface elevation exceeds EL. 320.0 (NAVD88), as recorded at the tailwater of the Smithland Lock and Dam (USGS Site 03399800), is greater than 244. The Contractor shall provide, in any request for time extension, an analysis detailing the number and timing of high-water days and material impacts to the critical path schedule. Any adjustment of the contract completion date will be at the discretion of the Engineer.

The gauge data for USGS Site 03399800 at the tailwater of the Smithland Lock and Dam can be accessed at the following URL: <a href="https://waterdata.usgs.gov/nwis/uv/?site\_no=03399800&agency\_cd=USGS">https://waterdata.usgs.gov/nwis/uv/?site\_no=03399800&agency\_cd=USGS</a>. Note that water surface data is presented as gauge height with a tailwater gauge datum of EL. 289.08 (NAVD88); therefore, EL. 320.0 (NAVD88) corresponds to a gauge height of 30.9 ft.

Costs associated with reasonably anticipated high-water days should be included in the Contractor's bid price to complete the work. Additional costs due to excessive high-water days beyond those anticipated herein may be considered for reimbursement at the discretion of the Engineer. The Contractor shall provide detailed justification and proof of cost to be considered for any such compensation.

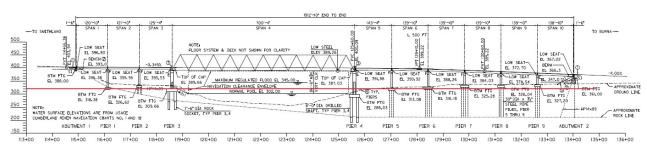


Figure 1 – Bridge Profile Showing Water Surface Elevation EL. 320.0

II. LIQUIDATED DAMAGES. Liquidated damages will be assessed on the Contractor in accordance with the Transportation Cabinet, Department of Highway's 2019 Standard Specifications for Road and Bridge Construction, Section 108.09, at a rate of \$4,750 per calendar day, when the Contract completion date is exceeded.

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# SPECIAL NOTE FOR CPM SCHEDULING

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River

### 1.0 GENERAL

Standard Specifications Section 108.07.04 notwithstanding, contract time extensions will not be given unless the Engineer deems the critical path of the project has been adversely affected. Any contract time extensions will be solely at the discretion of the Engineer. Create the progress schedule required for this project using the critical path method (CPM.) The Contractor shall designate a Schedule Representative who will be responsible for coordinating with the Engineer during the preparation and maintenance of the schedule. The contractor shall submit an interim schedule followed by a baseline schedule, or only a baseline schedule, depending on when the contractor starts work as described below. All references to "days" within this special note are to be construed as calendar days. The Contractor shall hold Monthly progress meetings to discuss status of the project and updates to the schedule.

## 2.0 INTERIM SCHEDULE

Prior to beginning critical activities, material procurement or site work within the first 28 days after the Start Project Milestone, the Contractor shall submit an interim schedule. The interim schedule must be in CPM schedule format. The interim schedule shall include detailed activities for the work to be accomplished during the first 30 days of the Contract and summary activities for the balance of the work. No work shall begin without the submission of an interim schedule.

# 3.0 BASELINE SCHEDULE

The Contractor shall submit a baseline schedule as outlined in the submission requirements section (3.2) within 28 days after the Start Project Milestone, which corresponds to the date that the contract is executed and signed by the Department. The baseline schedule is to represent the project as envisioned at the time of bid. No pay estimates will be processed after 28 days without the submission of the baseline schedule. The baseline schedule must be in CPM schedule format and as described below. The Engineer will review the baseline schedule and will indicate the review disposition as "accepted", "accepted as noted" or "rejected" within 14 days of receipt.

For baseline schedules that are "accepted as noted", the Contractor shall make the necessary revisions and resubmit the revised schedule within 14 days. The Engineer will "reject" baseline schedules that are not in compliance with contract requirements. For baseline schedules that are "rejected", the Engineer will indicate in writing portions of the schedule that are not in compliance with the contract requirements. The Project Engineer will conduct a mandatory meeting with the Contractor and the Contractor's Schedule Representative within 7 days of the Engineer's written notice. The purpose of this meeting is to resolve disputes with the baseline schedule so that it may be resubmitted.

The Contractor shall submit the revised Baseline Schedule to the Engineer within 14 days of this meeting for review and acceptance.

No pay estimates will be generated until the baseline schedule is "accepted" or "accepted as noted." In the event the baseline schedule is not "accepted" within 90 days of the Start Project Milestone, all work shall cease on the project until the baseline schedule is "accepted." The incurred delays from the "cease work order" will be the Contractor's responsibility and will not be considered for time extension. Any claims associated with time impacts from work performed or due to delay experienced prior to the baseline schedule being "accepted" or "accepted as noted" will be evaluated at the sole discretion of the Engineer. Acceptance by the Engineer will not relieve the Contractor of responsibility for compliance with specifications and contract requirements or for the accuracy or feasibility of the schedule.

Acceptance of the baseline schedule does not revise the Contract Documents. The baseline schedule must be "accepted" or "accepted as noted" by the Engineer prior to the Engineer evaluating any Contractor claims associated with time impacts.

The Engineer's review of the baseline schedule will be for compliance with the specifications and contract requirements. Acceptance by the Engineer will not relieve the Contractor of responsibility for the accuracy or feasibility of the schedule.

# 3.1 SCHEDULE REQUIREMENTS

Generate and submit an electronic copy of the baseline schedule using latest version of Primavera P6 by Primavera Systems Inc., or equivalent electronically transferable software. The Contractor's costs associated with these provisions should be incorporated into the bid item for the progress schedule. Provide and maintain current, two licenses of the software for the Engineer's use for the duration of the contract.

Provide a calendar day schedule that shows the various activities of work in sufficient detail to demonstrate a reasonable and workable plan to complete the Project by the Original Contract Completion Date. Include calendar days, not activities, to represent non-work periods due to adverse temperatures or calendar date restrictions. Show the order and interdependence of activities and the sequence for accomplishing the work. Describe all activities in sufficient detail so that the Engineer can readily identify the scope of work and measure the progress of each activity. The baseline schedule must reflect the scope of work, required phasing, maintenance of traffic requirements, interim completion dates, the Original Contract Completion Date, and other project milestones established in the Contract Documents. Only contractually specified constraints (i.e., milestones) are allowed in the schedule. Include all specified project milestones. Use only project calendars as opposed to global calendars. Do not include commas in activity descriptions because Primavera P6 exports data as comma-separated values. Include activities for submittals, working drawings, shop drawing preparation, submittal review time by the Department for shop drawings, material procurement and fabrication, delivery of materials, plans, and equipment, and other similar activities.

The Contractor shall ensure all work, including that by subcontractors, is included in the

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schedule. The Contractor shall ensure that all work sequences are logical and that the schedule indicates a coordinated plan.

Failure by the Contractor to include any element of work required for performance of the Contract will not excuse the Contractor from completing all work within the required time. Omissions and errors will be corrected as described in Sections 6.0 or 8.0 of this note and will not affect contract time.

The Baseline Schedule shall include, as a minimum, the following:

- a) Administrative Identifier Information
  - 1. Project Number
  - 2. County
  - 3. Route Number
  - 4. Item Number
  - 5. CID Number
  - 6. Award Date

- 7. Date of Notice to Begin Work
- 8. Completion Date
- 9. Contractor's Name
- 10. Contractor's Dated Signature
- 11. KYTC's Dated Accepted Signature

- b) Project Activities
  - i. Activity Identification (ID): Assign each activity a unique identification number. Activity ID length shall not exceed 10 characters. Assign baseline Activity IDs in sequences of 10 (e.g. A1000, A1010, A1020). This will allow modifications and additional items to be placed into the Identification scheme easily. Once accepted, the Activity ID shall be used for the duration of the project.
  - ii. Activity Description: Each activity shall have a narrative description consisting of a verb or work function (e.g. form, pour, excavate, pier #2) and an object (e.g. slab, footing, underdrain).
  - iii. Activity Original Duration: Assign planned duration in calendar days for each activity. Do not exceed a duration of 20 calendar days for any construction activity unless approved by the Engineer. Do not represent the maintenance of traffic, erosion control, and other similar items as single activities extending to the Completion Date. Break these Contract Items into component activities in order to meet the duration requirements of this paragraph.
  - iv. Activity Relationships:
    - All activities, except the first activity, shall have a predecessor(s). All activities, except the final activity, shall have a successor(s).
    - Use finish-to-start relationships with no leads or lags to link activities or use start-to-start relationships with lags no greater than the predecessor duration to link activities.
    - Use of finish-to-finish relationship is permitted when both activities are already linked with a start-to-start relationship.
    - At least 90% of the relationships must be finish-to-start with no

leads or lags.

# c) Project Milestones

- i. Start Project: The Contractor shall include "Start Project" as the first milestone in the schedule. The date used for this milestone is the date the contract is executed and signed by the Department.
- ii. End Project Milestone: The Contractor shall include "End Project" as the last activity in the project schedule. The date used for this milestone is considered the project completion date.
- iii. Start Phase Milestone: The Contractor shall include "Start Phase X" as the first activity for a project phase, where "X" identifies the phase of work.
- iv. End Phase Milestone: The Contractor shall include "End Phase X" as the last activity in a project phase, where "X" identifies the phase of work.

The Contractor may include additional milestones but, at a minimum, must include all contractual milestones.

# d) Schedule Options

The schedule may only be calculated using retained logic. Show open ends as non-critical. Schedule durations are to be contiguous. The project calendar will be based on the Contractor's plan for completing the project. However, the scheduling increment (hours or days) will be stipulated during the Preconstruction Conference. All days must remain active unless the Contractor is instructed not to work by contract documents. Total float shall be calculated as finish float.

# 3.2 SUBMISSION REQUIREMENTS

Submit all schedules within the timeframes specified. Submit the schedule and information in electronic file format via email, and compact disc (CD) compatible with the Engineer's computer. Submit the following information along with the electronic baseline schedule:

- a) A baseline schedule in bar chart format including the Administrative Identifier Information discussed in Section 3.1.a on the first page of the schedule. For each activity on the chart, indicate the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start Date, Early Finish Date, and Percent Complete. Use arrows to show the relationships among activities.
- b) A baseline schedule in bar chart format, on paper. Identify the critical path of the project on the bar chart in red. The critical path is defined as the longest path of activities in the project that determines the project completion date. The activities that make-up the critical path are the "Critical Activities."

#### 3.3 SUBMITTAL COVER MEMO

All submittals shall be accompanied with a brief cover memo containing:

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- Identification of the submission as the Baseline Schedule
- Administrative Identifier Information (see section 3.1.a)
- Any critical notes as determined by the Contractor

### 4.0 FLOAT

Use of float suppression techniques, such as preferential sequencing (arranging critical path through activities more susceptible to Department caused delay), lag logic restraints, unrealistic activity durations, zero total or free float constraints, extending activity times, or imposing constraint dates other than as required by the contract, shall be cause for rejection of the project schedule or its updates. Schedules with negative float will also not be accepted.

### 4.1 DEFINITION OF FLOAT

Total Float is the length of time along a given network path that the actual start and finish of activity(s) can be delayed without delaying the project completion date. Project Float is the length of time between the End Project Milestone and the Contract Completion Date.

### 4.2 OWNERSHIP OF FLOAT

Float available in the schedule at any time shall not be considered for the exclusive use of either the Department or the Contractor. During the course of contract execution, any float generated due to the efficiencies of either party is not for the sole use of the party generating the float; rather, it is a shared commodity to be reasonably used by either party. Efficiencies gained as a result of favorable weather within a Monthly period, where the number of days of normally anticipated weather is less than expected, will also contribute to the Project Float. A schedule showing work completing in less time than the contract time, and accepted by the Department, will be considered to have Project Float. Project Float will be a resource available to both the Department and the Contractor. No time extensions will be considered or granted nor delay damages paid unless a delay occurs which impacts the project's critical path, consumes all available float and extends the work beyond the Contract Completion Date.

# 4.3 NEGATIVE FLOAT

Negative float is not allowed. Schedules with negative float will not be accepted. Negative float will not be a basis for requesting time extensions. Any extension of time will be addressed in accordance with the Section 6.0. Scheduled completion date(s) that extend beyond the contract (or phase) completion date(s) may be used in computations for assessment of liquidated damages. The use of this computation is not to be construed as an order by the Department to accelerate the project.

### 5.0 MONTHLY UPDATE SCHEDULE

A Monthly update schedule is a schedule in which only progress is updated from the prior data date to the current data date. Work added and/or excusable delays encountered since the prior data date must be represented as a schedule revision as described in Section 5.0.

# 5.1 Update Requirements

Monthly on a date set at the Preconstruction Conference and until Formal Acceptance, submit an updated schedule and all required information with a data date of the last day of

the preceding Monthly submittal. The date for submission and data date may be adjusted to accommodate regularly scheduled progress meetings. Submit the Monthly updated bar chart on paper and a copy of the updated schedule in electronic format in Section 3.2. The Engineer shall "accept" or "reject" the schedule update within 14 days of receipt of the updated CPM schedule. The Engineer may withhold estimates if the updated schedule is not submitted as required by this section. For each updated schedule, identify the actual start and finish dates for all completed activities and the actual start date and remaining duration for all activities in progress. Provide a written narrative that identifies any changes or shifts in the critical path and submit reasons for the changes or shifts in the critical path.

Submit the following with each updated schedule:

- a) CPM Schedule in Bar Chart Format
- b) Electronic files (formatted as described above)

# 5.2 SUBMITTAL COVER MEMO

All update submittals shall be accompanied with a brief cover memo containing all the information require in the Baseline Submittal Cover Memo per section 3.3 with the addition of:

- Baseline Report
  - o Narrative of baseline expectations
  - o Project completion status per baseline expectations of Logic Report
  - o Logic Modification Report per Section 6.0
  - o Narrative of all logic changes and reasoning
  - o Two separate CPM submissions; one reflecting the schedule without changes in logic, the other reflecting the proposed logic and the effects.
  - o Description of fragnet required per section 6.0
- Progress Report
  - o Narrative of all schedule changes since last update
  - Details of each change including impact of change on the schedule, float consumption or addition, and reason causing change when float is consumed

# 6.0 REVISIONS

The Work may require and/or the Contractor may revise the CPM schedule. Addition of new activities (fragnets required) or new calendars or changes to existing activities, calendars, original durations or logic constitute a revision. All revisions must be reported in a Logic Modification Report. The Logic Modification Report is a separate CPM update which includes all the changes recommended by the Contractor within the current Monthly update schedule. It shall include a Narrative explanation of the necessary changes accompanying the Monthly update schedule. Any revision which modifies the critical path or impacts an interim date or project completion date is considered a Logic Modification. A fragnet is defined as the sequence of new activities that are proposed to be added to the existing schedule. The fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities. If submitted as a fragnet, the Contractor shall compute two Finish Dates. The first Finish Date shall be computed without consideration of any impact by the fragnet. The Second Finish Date shall also submit a written

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narrative stating the reason for the proposed revisions. The Engineer shall "accept" or "reject" proposed revisions within 14 days of receipt of appropriate schedules and narrative. All approved revisions will be incorporated into the Monthly Update Schedule which will become the Revised Monthly Update Schedule.

#### 7.0 TIME EXTENSIONS

The Work may require and/or the Contractor may request an extension of the Completion Date. Perform the following analysis to compute the duration of the time extension. Submit two paper copies and two electronic copies of each analysis performed.

- a) Determine project progress prior to circumstance(s) necessitating the time extension. Unless the Engineer requests an interim schedule updated to the date of the circumstance alleging to have caused delay, the previous accepted Monthly update shall be used to display the prior progress of the project. This schedule is referred to as the Un-impacted Schedule. Unless otherwise agreed in advance by the Department and the Contractor, the impact will be based upon when the work is to be performed as opposed to authorized. Time extensions based on estimated impacts will be the Contractor's risk.
- b) Prepare a fragmentary network (fragnet) depicting the circumstance that is believed to have delayed the project. Estimate duration of impact as accurately as possible. The time extension will be based upon actual durations as described below.
- c) Insert the fragnet into the Un-impacted Schedule, run the schedule calculations and determine the finish date. This schedule is referred to as the Impacted Schedule.
- d) Compare the Impacted Schedule finish date with the Un-impacted Schedule finish date in order to determine the estimated duration of any warranted time extension.
- e) Within 14 days of the termination of the impact, submit a schedule update which includes the actual dates of the impact, and the resulting impact to the project milestones.

Submit the impacted schedule with the request for time extension. Include a narrative report describing the effects of new activities and relationships to interim and contract completion dates. All time extensions approved by the Engineer will be incorporated into the Monthly update with the fragnet used to determine impacts incorporated into the schedule.

### 8.0 RECOVERY SCHEDULE

If the Monthly Update Schedule or Revised Monthly Update Schedule projects a finish date for the Project more than 14 calendar days later than the Contract Completion Date, submit a recovery schedule showing a plan to finish by the current Completion Date. The acceptance of any schedule projecting a completion date for the Project beyond the Current Contract Completion Date does not constitute approval of a time extension or an order to accelerate. All changes to completion dates and orders to accelerate must be made via Change Order. The Department will withhold Estimates until the Engineer "accepts" the recovery schedule. The Engineer will use the schedule to evaluate time extensions and associated costs requested by the Contractor. In the event the current Completion Date is in dispute, the recovery schedule will need to be submitted once the dispute has been resolved.

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# 9.0 PAYMENT

The Department will make partial payments according to Section 109.05 of the standard specifications and as modified by the following schedule:

- a) The Department will release 50 percent of the lump sum amount bid for Project CPM Schedule to the Contractor with the first regular payable after the Engineer has accepted" the CPM Baseline schedule submission and the Department has received the scheduling software.
- b) The Department will release an additional 25 percent of the lump sum amount bid for Project CPM Schedule to the Contractor with the first regular estimate payable after 50 percent of the original contract amount is complete.
- c) The Department will release the remaining 25 percent of the lump sum amount bid for Project CPM Schedule to the Contractor with the first regular estimate payable after project completion.

The Department will pay for the accepted quantities at the contract price as follows:

Bid Item Code	Pay Item	<u>Pay Unit</u>
02570	Project CPM Schedule	Lump Sum

The Department will consider payment as full compensation for all work required in this provision.

# SPECIAL NOTE FOR DISC BEARINGS

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River – Drawing No. 27458

## 1.0 DESCRIPTION AND SCOPE OF WORK

- 1.1 This work shall consist of designing, furnishing, testing, and installing Multi-Rotational, High Load Disc Bearings and Assemblies at the locations shown on the plans in accordance with this special note and the following specifications:
  - KYTC Standard Specification for Road and Bridge Construction
  - AASHTO LRFD Bridge Design Specifications
  - AASHTO LRFD Bridge Construction Specifications
  - AASHTO/AWS D1.5 Bridge Welding Code
- 1.2 Disc bearings shall consist of a polyether urethane structural element (disc) confined by upper and lower steel bearing plates. The bearing shall be equipped with a shear resisting mechanism, and/or positive location device to prevent lateral movement of the disc. Bearings shall adequately provide for the thermal expansion and contraction, rotation, camber changes, and creep and shrinkage of structural members, where applicable. Assemblies shall also include all other plates and fasteners designated in the plans as part of the "Bearing Assembly".
- 1.3 Disc bearing supplier shall demonstrate a minimum of five (5) years' experience in the design and fabrication of disc bearings and a minimum of ten (10) bridge installations. Documentation of the supplier's experience and installations shall be provided to the engineer for approval.
- 1.4 Shop Drawings The contractor shall submit drawings and calculations to the engineer for approval, and shall have received said approval, prior to the fabrication of the disc bearing assemblies. The shop drawings and design calculations shall be sealed by a Professional Engineer with at least five (5) years of documented history of disc bearing design experience. These drawings shall include, but not be limited to, the following information:
  - Plan and elevation of each disc bearing
  - Complete details and sections showing all materials (with ASTM or other designations) incorporated in the disc bearings.
  - Vertical and horizontal load capacities.
  - All bearing connection details and weld procedures.
  - Temporary support details for handling, transporting, storing, field adjustment, and installation.
  - Design calculations verifying compliance with AASHTO LRFD standards and with the design loadings, movements, and other specified requirements.

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# 2.0 MATERIALS

- **2.1** Materials shall conform to the following standards:
  - Steel Plate: AASHTO M270 (ASTM A709) Grade 50W. All steel surfaces in contact with PTFE, or other steel surfaces, shall be finished to a smoothness of 125 micro- inches (rms) or better.
  - Stainless Steel: ASTM A240, Type 304, with a minimum No. 8 mirror finish. The minimum thickness of stainless steel sheet shall be 12 gage.
  - Polytetrafluoroethylene (PTFE): PTFE sheet shall be manufactured from pure virgin unfilled PTFE resin conforming to the requirements of AASHTO LRFD Bridge Construction Specification, Section 18.8.
- 2.2 All materials shall be new and unused, with no reclaimed material incorporated in the finished bearing.
- 2.3 Unless otherwise noted herein, all materials for the disc bearing assemblies shall be as specified in the plans and in accordance with Section 18 of the AASHTO LRFD Bridge Construction Specifications.
- **2.4** Material test certificates shall be provided for all materials used in the bearing assemblies.

# 3.0 DESIGN REQUIREMENTS

- 3.1 Bearings shall be designed based on the current AASHTO LRFD Bridge Design Specification using the loads, rotations and movements given on the project plans. Designs shall assume that vertical and horizontal loads occur simultaneously. The design of the bearings shall meet the additional requirements listed herein.
- 3.2 The bearing assembly shall be removable and replaceable by raising the bridge superstructure 3/8 inch maximum. This requires the fabrication of a minimum of a four plate system including a masonry plate, lower load plate, upper load plate and sole plate. The design plans show a feasible bearing replacement connection detail. Approval of alternative connection details proposed by the Contractor shall be at the sole discretion of the Engineer.
- 3.3 The sole and masonry plates shall be designed to distribute the bearing loads into the surrounding substructure and/or superstructure. Service or installation considerations specified by the design engineer, such as weldability and bearing height, may require thicker masonry and sole plates than are required due to strength considerations alone.
- 3.4 When necessary, guide bars shall be welded to the slide plates or integrally machined into a larger plate. Guide bars shall be designed for the specified horizontal loads, but not less than 10% of the vertical capacity of the bearing. Guided members must have their contact area within the guide bars in all operating positions. The total clearance between guide bars and the guided member shall be 1/16 inch,  $\pm 1/32$  inch.
- 3.5 The shear restriction mechanism shall be designed to allow free rotation and withstand the specified horizontal forces. The mechanism shall be designed to withstand the design forces on the bearing without exceeding the allowable shear, bending and bearing capacities. Shear resistance of the urethane disc shall not be included.

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#### 4.0 FABRICATION

- **4.1** The contractor shall provide the engineer with written notification prior to the start of bearing fabrication.
- 4.2 Unless otherwise noted herein, fabrication of the disc bearing, including tolerances, shall be in accordance with Section 18 of the AASHTO LRFD Bridge Construction Specifications.
- 4.4 All welding shall conform to, and all welders shall be qualified in accordance with, the requirements of the American Welding Society (AWS).
- 4.5 After assembly, including sole plates and masonry plates as applicable, bearing components shall be held together with steel strapping or other means to prevent disassembly until the time of installation.
- Each bearing shall be stamped with the manufacturer's name, bearing type or model number, bearing number and the installed location. The stamp shall be on a surface visible after installation.
- 4.7 All steel surfaces exposed to the atmosphere, except stainless steel surfaces and metal surfaces to be welded, shall be shop painted. Prior to painting, the exposed steel surfaces shall be cleaned in accordance with the recommendations of the paint manufacturer. All surfaces covered by stainless steel or PTFE sheet are not painted. Painting shall be completed in accordance with the paint manufacturer's recommendations and the KYTC Construction Specifications.

#### 5.0 TESTING

- 5.1 Production bearing sampling and testing shall be performed in accordance with AASHTO LRFD Bridge Construction Specifications, Section 18.3.4. For sampling, the two guided bearings at Pier 4 shall be considered one lot, and the two fixed bearings at Pier 3 shall be considered another lot.
- 5.2 All testing shall be performed in the presence of a representative from KYTC or its designated inspection agency in accordance with Section 18.1.5 of the AASHTO LRFD Bridge Construction Specification.
- 5.3 The following test shall be performed on all disc bearing types (fixed and guided):
  - Material certification testing Refer to AASHTO Section 18.3.4.4.1
  - Dimensional check Refer to AASHTO Section 18.1.5.2.4.
  - Clearance test Refer to AASHTO Section 18.1.5.2.5.
  - Proof load test Load the bearing to 150 percent of the design service compressive load at a rotation of 0.02 rad for a duration of one hour. Refer to AASHTO Section 18.3.4.4.4.
  - The horizontal load carrying capacity shall be tested per AASHTO 18.1.5.2.8.
- **5.4** The sliding coefficient of friction shall be measured for guided bearings per AASHTO 18.3.4.4.5.
- 5.5 Each bearing shall be visually examined both during and after testing. Any resultant defects, such as bond failure, physical destruction or cold flow of PTFE to the point of debonding, shall be cause for rejection. Defects such as permanently extruded or severely deformed elastomer or cracked steel shall also be cause for rejection.

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#### 6.0 INSTALLATION

- Bearings shall be installed in strict accordance with the manufacturer's instructions. The Contractor shall submit an installation procedure to the Engineer for review and acceptance prior to bearing installation, containing at a minimum:
  - Installation sequence of the bearings in accordance with the accepted bridge superstructure erection sequence.
  - Measures to prevent disturbances to the grout during its initial setting and early strength gain.
  - Methods to support and shim the bearing assemblies.
  - Methods for field setting and adjustments as required to compensate for installation temperatures and erection conditions in order to achieve the installation tolerances specified in Section 18 of the AASHTO LRDF Bridge Construction Specifications.
  - Procedure for grouting operations including measures to ensure no voids in the grouted area.
- A technical representative from the bearing manufacturer shall be present on-site to supervise the installation of the bearing assemblies.
- 6.3 Bearings delivered to the bridge site shall be stored under cover on a platform above the ground surface. Bearings shall be protected at all times from damage. When placed, bearings shall be dry, clean, and free from dirt, oil, grease, or other foreign substances.
- **6.4** Bearing devices shall not be disassembled unless otherwise permitted by the engineer or manufacturer.
- Bearings assemblies shall be handled by their bottom surfaces only, unless specially designed lifting brackets are used. Do not lift bearings by their tops, sides and/or shipping bands. Lifting brackets shall be approved by the bearing supplier prior to use.
- 6.6 Upon final installation of the bearings, the Engineer shall inspect the bearing components to assure that they are level and parallel to within  $\pm 0.005$  radians. Any deviations in excess of the allowed tolerances shall be corrected.
- 6.7 Caution shall be taken to ensure that the steel temperature directly adjacent to the polyether urethane rotational element does not exceed 225°F. The polyether urethane disc must not be exposed to direct flame or sparks. In addition, no weld current shall pass between bearing plates on either side of the urethane disc.

#### 7.0 GROUT AND GROUTING OPERATION

- 7.1 Grout for bearing assemblies shall be a non-shrink, non-metallic and cementitious grout containing no chloride conforming to Section 601 of the KYTC Standard Specifications. The grout shall have a minimum compressive strength of 7,000 psi at 28 days as tested in accordance with ASTM C109. The grout shall have appropriate early setting and strength gain properties as required to minimize the duration during which the grout is susceptible to disturbances from superstructure movement or other causes.
- **7.2** Surface preparations, installation temperatures ranges, mixing methods, equipment, application methods, and curing conditions and times shall be in strict accordance with the grout manufacturer's written specifications.
- 7.3 The Contractor shall submit the manufacturer's product data sheets for review and

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- acceptance prior to ordering the grout material.
- **7.4** Grouting operations shall not commence until the grouting procedure has been reviewed and accepted by the Engineer.
- 7.5 Load transfer to the grouted bearing assemblies will be permitted only after the grout has reached the minimum strength specified.

### 8.0 CERTIFICATION

**8.1** After installation of all bearing assemblies and prior to acceptance by KYTC, the bearing manufacturer shall provide a written certification that the bearing assemblies have been fabricated, tested, and installed in accordance with the project requirements and manufacturer's requirements.

#### 9.0 MEASUREMENT AND PAYMENT

9.1 The Department will pay for the "Disc Expansion Bearing" and "Disc Fixed Bearing" at the contract unit price per each bearing assembly. This will constitute full compensation for all costs associated with preparing concrete surfaces; installation of anchor bolts; grouting; design, fabrication, testing, and installation of the bearing assemblies (including all steel plates and fasteners below the sole plate).

The Department will pay for the completed and accepted quantities under the following:

Pay Item	Pay Uni
Disc Expansion Bearing	Each
Disc Fixed Bearing	Each

# SPECIAL NOTE FOR MAINTAINING EXISTING BRIDGE

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River

### 1.0 SCOPE OF WORK

In addition to the Contractor's responsibility described in specification 105.11, the Contractor shall be responsible for the maintenance of the existing Lucy Jefferson Lewis Memorial bridge deck, curb, railing, joints, and any other component item on the structure that is identified by the Engineer for maintenance. The period of responsibility for maintenance will start when the contractor begins mobilization to the site, continues throughout construction and until public traffic has been shifted onto the new bridge and is no longer required on the existing bridge. No extension of time will be granted for maintaining the existing Lucy Jefferson Lewis Memorial Bridge.

# 2.0 PAYMENT

The Department has established an allowance within the project budget to perform anticipated bridge maintenance activities as directed by the Engineer. The maintenance performed will be paid as Force Account Work in accordance with specification 109.04.02. Provide justification and documentation to support payment for all work performed. Maintain cost records reconciled daily conforming to specification 109.04.02.E. This item does not include repairs to be performed on the bearings at piers SP1, NP1, and NP5 or the repairs to the cap and column of Pier A. The Department will make payment for authorized work to maintain the existing bridge per the following:

<b>Bid Item Code</b>	Pay Item	Pay Unit
24755EC	Maintain Existing Bridge	DOLL

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# SPECIAL NOTE FOR MITIGATION OF IMPACTS TO OSPREY

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River

Osprey nests on the existing US 60 bridge shall not be removed or disturbed. Construction activities shall not be permitted within a 150-foot buffer of any Osprey nest during the nesting season from March 1 to August 31, the work buffer is not required outside of these dates. During this period, construction equipment shall not be placed between the existing and new bridge and equipment, including concrete trucks, shall not be allowed to work from the existing bridge. The buffer zone may be reduced to a minimum of 75-ft pending tests to evaluate the Ospreys' tolerance to certain construction activities. Tests shall be conducted on warm, dry days in the presence of a trained biologist designated by the KYTC. The Biologist shall have authority to specify a new buffer distance as well as shut down construction activities. The Biologist shall record all observations and report them to the KYTC as well as the KDFWR. The buffer requirement may be ended before August 31, if the biologist observes that young ospreys have fledged from a nest and left the area. The Contractor should note that the most crucial time for the nesting Osprey occurs between April and July, during this time there is an increased likelihood that nesting Osprey will be present and greater potential for the birds to be disturbed by construction activities. Consequently, demolition of the existing bridge shall not occur between the months of April and July.



# SPECIAL NOTE FOR PROVISION OF COMPRESSION TESTING MACHINE

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River

### 1.0 SCOPE OF WORK

The Contractor shall supply, delivered and installed, to the Kentucky Transportation Cabinet (KYTC) Smithland Section Office a new and unused compression testing machine capable of testing concrete cylinders, beams, cubes, masonry, brick, rock samples and a variety of other samples. The machine must be installed and operational prior to the commencement of any construction activities on the new bridge or roadway approaches; upon installation, the machine will become property of the KYTC. The machine shall meet the minimum specification detailed in this Special Note.

### 2.0 PRODUCT SPECIFICATIONS

The compressive testing machine shall be a Forney F-325EX equipped with automatic control systems or an approved equivalent. The minimum specifications are as follows:

DESCRIPTION: Compression testing machine capable of testing concrete cylinders, beams, cubes, masonry, brick, and rock samples.

CAPACITY: 325,000 lbf compression

RANGE: 3,250 to 325,000 lbf

SYSTEM DESIGN: Single-unit, self-contained design. The load readout, hydraulic pump and control valve directly connected to the compression unit.

COMPRESSION UNIT CONSTRUCTION: Load frame manufactured from structural steel with top and bottom crossheads of 3.5" thick solid steel plate. Hydraulic cylinder assembly mounted to the bottom crosshead, with force being applied in upward direction and debris protection by metal shroud.

INSIDE DIMENSIONS: Vertical daylight opening of 19.25" for the compression area of the load frame, and a 9.5" horizontal dimension for the horizontal opening. Dimensions are without upper platen installed.

OUTSIDE DIMENSIONS: Outside dimensions are 57" vertical x 35" wide x 17" deep, including electrically operated hydraulic pump.

COMPRESSION PLATEN: Lower platen of 1" thick by 6.5" in diameter and chrome plated for wear and rust resistance. Concentric circles shall be inscribed into the platen for centering of test specimens.

HYDRAULIC RAM ASSEMBLY: Testing pressure applied by a 6.75" diameter power piston. Stability length of 6" for the piston and a working stroke of 2.5". The piston shall

be precision ground and polished to an 8 RMS finish, piston to be mounted in a polished solid steel cylinder with a non-frictional "0" ring and Teflon back-up ring for sealing.

HYDRAULIC PUMPING SYSTEM: Hydraulic pressure is to be supplied to the power piston assembly by a special two-stage pump. Power pump shall feature a first stage which provides low-pressure, high-volume deliver for rapid advance of the ram to the specimen. Once system pressure exceeds 100 psi, a second stage pump shall take over to deliver high-pressure, low-volume flow to machine capacity. Pump shall be directly connected to the electric motor shaft and be immersed in oil for maintenance free service.

HYDRAULIC CONTROL SYSTEM: Shall feature a single automatic control valve with multiple loading and unloading functions as outlined below:

METERED ADVANCE: Maintains stress loading adjustable from 2,000 pounds to 200,000 pounds per minute. Rate of loading automatically maintained by the pressure compensating valve until it is either readjusted, or the test specimen reaches its yield point.

FULL ADVANCE: Rapid traverse lever used to position the platen at the rate of 2.5" travel per minute.

HOLD: Pressure advance stopped and held to inspect the alignment of the test sample or interrupt the test cycle.

RETRACT: Release of pressure and return of the compression platen to the start position or total retract.

STAND: Shall position the machine to a convenient working height.

ELECTRICAL SPECIFICATIONS: hydraulic pump motor rated at -110/220 volts, 12.0/6.0 full load amps, single phase, 50/60 Hz current,  $\frac{3}{4}$  horsepower.

SAFETY: Protective mechanical limit switch installed to protect the machine against piston over extension.

ACCESSORY SYSTEM: Accessories held in the compression unit by means of a holding stem system. Holding stem to be inserted into the hydraulic piston and held by a locking setscrew.

SHIPPING: Machine shall be shipped in an upright position, bolted to a wooden skid and crated.

AUTOMATIC CONTROL SYSTEM: Shall provide fully automatic "one touch" testing and be configurable for 2x4 cylinders, 4x8 cylinders, 6x12 cylinders, beams, cubes, and proppant cylinder fixtures. The system shall automatically gather all test parameters and test data and compile the results into a database format along with printed results including load vs time graph. The detailed individual test data shall be stored on the machine via encrypted CSV files with the capability to unencrypt and move to a user-defined location using the machine software.

### OPERATOR INTERFACE: Shall include the following:

• Human machine interface incorporating "touchscreen" technology facilitating all setup, data logging, calibration, and password protection. Manual pushbuttons limited to those necessary for safety precautions (emergency stop).

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- Equipped with
  - o Intel E3845, 1.91 GHz Quad Core CPU
  - o 10" Wide Super Video Graphic Array, 1024x600 px
  - o 8GB Ram, 64GB Hard Drive
  - o 802.11 WIFI
  - o RS-232, (2) Dual Intel 82574L Gigabit Ethernet ports, (4) USB ports
  - o Fanless, VESA Compliance
  - o Windows 10 LoT Enterprise 64-bit
- Ability, at the operator's discretion, to print hard copy printout of individual test data including the following:
  - Machine make, model, and capacity
  - Machine serial number
  - Calibration date
  - o Manufacturer name, address and contact information
  - Test Operator's name, business address and contact information
  - Test ID
  - o Date
  - Time
  - Test type
  - Specimen dimensions
  - Correction factor
  - Ramp rate
  - Load at break
  - Stress at break
  - Break type
  - o Graph of load versus time, or stress versus strain
- Option of printing test data from a previous test with the information listed above.
- System prints to a manufacturer-specified printer via USB or Wi-Fi.
- Ability to transfer summary or test data to a portable "flash" drive storage device, or a shared network file.
- Capability for remote troubleshooting and the addition of factory supported system updates.

ELECTRICAL REQUIREMENT: 110VAC, 60Hz, 5Amps at full load

ACCURACY: 1.0% over calibrated range (from 1% of full scale to full scale)

COMPLIANCE: The system shall be in compliance with ASTM C39, C78, C109, C293, C469, A370, and E-4 ASTM specifications.

# 3.0 PAYMENT

All cost, including material and labor, associated with the provision of the compressive testing machine shall be considered incidental to the unit bid price for Class 'A' Concrete.



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# SPECIAL NOTE FOR STEEL ERECTION

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River – Drawing No. 27458

### 1.0 DESCRIPTION

This work shall consist of fabricating, furnishing and installing the truss span superstructure, including truss main members, connections, floor beams, stringers and bracing.

Materials and workmanship shall be in accordance with the KYTC Standard Specifications for Road and Bridge Construction, 2019 Edition (KYTC); AASHTO/AWS D1.5M/D1.5 "Bridge Welding Code"; AWS D1.1/D1.1M "Structural Welding Code - Steel"; the Contract Drawings; and this Special Note.

Where a conflict exists between this Special Note and KYTC Section 607, the provisions herein shall govern.

#### 2.0 MATERIALS

Materials shall conform to the Contract Drawings and KYTC Section 607.

### 3.0 ERECTION ANALYSIS AND STABILITY

3.1 Steel Erection Responsibility. The stability of the structure during erection, and the final geometry of the structure, is the responsibility of the Contractor. The Contractor shall retain an erection engineer for the purpose of evaluating the stability, state of stress and geometry of the structure during and after erection. The erection engineer shall evaluate and propose wind loads during construction which are appropriate for the proposed erection scheme chosen. The Contractor shall erect the bridge in a safe manner without overstressing the structural components during erection and shall leave the structure in a state of stress compatible with the design.

Structural steel shall be in conformance with KYTC Section 607. Steel erection shall be in conformance with the AASHTO/NSBA "Steel Bridge Erection Guide Specification," S10.1-2014.

3.2 Conceptual Erection Sequence. The assumed erection sequence, as described in the Contract Drawings, is that a portion of the truss and floor system is constructed on blocking in the "no-load condition." This would require floating in of the fully completed steel superstructure for placement on top of the constructed piers. The Contractor may choose and develop any sequence that can safely erect the bridge without overstress or damage to

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the structural steel subject to approval by the Engineer and United States Coast Guard. The design of any necessary shoring / falsework and its foundations is the responsibility of the contractor.

3.3 Truss Erection and Camber. In addition to full analysis of the completed structure, load capacity and stability of the truss structure has been verified by the Engineer of Record for the completely erected steel superstructure, prior to deck placement. The Contract Drawings details the assumed erection and deck pour sequence that is consistent with the camber shown on the Contract Drawings and the load capacity of the fully-erected structure. No provision in either the camber or structural capacity of the members has been included for erection stresses.

The load capacity and stability verification of a partially completed truss span in the various stages of erection prior to installation of all steel members is the responsibility of the Contractor. The Contractor shall evaluate the partially completed structure in accordance with the same design provisions used for the permanent structure except as indicated herein. Wind loads for the final structure are given on the Contract Drawings. The erection engineer shall evaluate wind loads during construction which are appropriate for the proposed erection scheme chosen.

No uplift at bearings shall be allowed in any construction phase.

3.4 Changes to the Structure. Any changes to the structural steel system shown in the Contract Plans require reanalysis for load capacity and stability for both construction and permanent load conditions, including seismic. Diaphragm action of the stay-in-place forms shall be neglected in all analyses.

Dead load deflection, camber and stringer haunch thickness are based on the erection and slab pouring sequences as shown in the plans. Any deviation from this sequence will need to be evaluated by the Contractor's engineer to determine the effect on camber, dead load deflection and structural member stresses. This evaluation must be submitted to the Engineer for review and approval by the Engineer of Record.

#### 4.0 QUALIFICATIONS AND SUBMITTALS

- **4.1 Erector Qualifications.** Structural steel shall be erected by a qualified, competent erection contractor. To establish qualification the erection contractor shall submit to the Department proof of their experience on previous projects of equivalent complexity which, at a minimum, include the following:
  - A. Any one lift using two or more cranes/derricks/poles,
  - B. Steel truss spans over water,
  - C. Erection with floating equipment,
  - D. Field splicing primary members while held in place by erection equipment.

The Department shall determine whether the submitted evidence is satisfactory to establish qualification and competency.

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4.2 Erection Procedure. The Contractor shall submit a detailed erection procedure to the Engineer, prepared and sealed by a professional engineer licensed in Kentucky. The professional engineer who prepares the erection procedure and calculations shall have experience in steel erection of similar size, complexity, and scope. The procedure shall address all requirements for erection of the structural steel into the final designed configuration and satisfy all written comments from the Engineer of Record and the Department or its agents prior to the start of erection. The procedure, as a minimum, shall include the following information:

#### Drawings.

- A. Plan of the work area showing permanent support structures (piers and abutments), roads, waterways (including navigational channel), overhead and underground utilities, and other information pertinent to erection.
- B. Erection sequence for all members noting any temporary support conditions, such as holding crane positions, temporary supports, falsework, etc. Member reference marks, when reflected on the erection plans, should be the same as used on shop detail drawings.
- C. Primary member delivery location and orientation.
- D. Location of each crane for each primary member pick, showing radius and crane support (barges, mats, etc.).
- E. Capacity chart for each crane configuration and boom length used in the work.
- F. Center of gravity locations for primary members.
- G. Detail, weight, capacity, and arrangement of all rigging for primary member picks.
- H. Lifting weight of primary member picks, including all rigging and pre-attached elements.
- I. Details of any temporary lifting devices to be bolted or welded to permanent members, including: method and place (shop or field) of attachment; capacity; and method, time and crew responsible for removal.
- J. Bolted splice assembly requirements.
- K. Lifting/handling procedure for any primary member that has a lifted length-to-width ratio (1/b) greater than 85.
- L. Blocking details for bridge bearings.

#### Calculations.

A. Design calculations indicating the load capacity and verifying the stability of temporary supports for structure and crane(s) for each pick and release.

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- B. Calculations to substantiate structural adequacy and stability of all steel members for each step of bridge assembly, including documentation of the wind loads and other construction loads assumed to be applied.
- C. Calculations to verify adequate capacity of contractor-fabricated rigging such as lift beams, welded lugs, spreader beams, beam clamps, etc. Submit manufacturers' certification or catalog cuts for pre-engineered devices.
- D. Geometrical information that will be used to monitor the structure during erection to ensure that the final geometry of the structure is as indicated on the plans.

#### **Coordination Items.**

- A. Review / approval by other agencies as required (e.g., US Coast Guard, US Army Corp of Engineers, etc.).
- B. Construction activities that occur concurrently with steel erection, such as setting forms or concrete deck pours.
- **4.3 Shop Drawings.** Shop drawings for truss and components shall conform to KYTC Section 607. The following replaces Subsection 607.03.01 of the Department's 2012 Standard Specifications for Road and Bridge Construction in its entirety.

**607.03.01 Shop Drawings and Welding Procedures.** Submit detailed shop drawings and welding procedures to the Division of Structural Design or their designated representative ("Reviewer"). The Department will furnish plans showing sufficient details for the Contractor to prepare detailed shop drawings. Include welding procedures and details, when required, as part of the shop drawings. The Department will not consider the shop drawing submittal process to be complete without the submittal of welding procedures.

Submit a shop drawing submittal schedule (Schedule) for review and approval no later than thirty calendar days prior to the first submittal. List all anticipated shop drawing packages for the project by component and superstructure unit, span or pier, and show the estimated submittal dates for each package. Update the Schedule and resubmit to the Engineer, for review but not approval, on the first day of each calendar month until all required shop drawing submittals have been approved.

Submit shop drawings in substantial conformance with the latest Schedule submitted to the Engineer and include all relevant drawings and construction procedures necessary for a thorough review. Allow sufficient lead time to permit a complete review.

Submit shop drawings in electronic format. Make all drawing submittals in a 22 inch by 36 inch Portable Document Format (PDF) that will produce clear prints and sharp lines on both 11 inch by 17 inch prints and 22 inch by 36 inch prints ("PDF Prints"). The Department reserves the right to require hard copy prints on a case-by-case basis.

Submission of two or three-dimensional computer modeling data will not by itself constitute a complete shop drawing submittal. The use of two- or three-dimensional computer modeling techniques to facilitate fabrication will not relieve the fabricator from providing detailed shop drawings of all bridge members and components for the Department's records.

Submit to the Reviewer PDF Print Files of the detailed shop drawings and welding

procedures. Electronically stamp all shop drawings and procedures with the Contractor's stamp as an acknowledgment that the Contractor has reviewed the submittal for completeness and appropriateness. Each sheet will be electronically stamped by the Reviewer. The Reviewer will return one PDF file of reviewed shop drawings with all required corrections noted. When corrections and resubmittal are required, submit PDF Print Files of the corrected drawings. After the final review, when additional resubmittal is unnecessary, the Reviewer will forward the reviewed shop drawing PDF Print files with the Reviewer's Stamp indicating approval (or conditional approval) and any final comments to the DOSD Shop Plan Coordinator for distribution. Only plans submitted directly to the Shop Plan Coordinator by the Reviewer will be distributed, and only plans electronically stamped "distributed by the Division of Structural Design" are to be used for fabrication.

After fabrication is complete and the Engineer has approved the structural steel for shipment, furnish to the Engineer one electronic set of the as-built shop drawings, including the welding procedures, as PDF Prints.

Review cycles will begin the first Business Day after a submittal is received ("logged"), or the next Business Day after the submittal date indicated on the most recently submitted Schedule, whichever occurs later. Submittals received after 2:00 PM Eastern Time will be logged as the next Business Day following receipt of the submission. 'Business Days' are weekdays, Monday through Friday except official Department holidays.

The Reviewer will determine if all relevant drawings and construction procedures have been submitted. If a submission is incomplete or otherwise requires additional information or data to properly complete the review, the review cycle for the submission will be reset and the cycle will begin as specified in the previous paragraph once all required information is received (logged.)

Review cycle durations for shop drawing submittal packages deemed complete by the Reviewer are as follows:

- Allow at minimum 30 Business Days for review of shop drawing submissions of welded plate girders or rolled steel sections.
- Allow at minimum 30 Business Days for review of shop drawing submissions for disc bearings, truss members, lateral bracing, floor beams, and their respective connections.
- Allow at minimum 15 Business Days for review of other shop drawing packages.
  No claims for delay will be considered for shop drawing reviews when the Engineer
  has indicated that relevant drawings or construction procedures are insufficient for a
  thorough review. No claims for delay will be considered for shop drawing reviews when
  information relevant to the submittal review is still in the process of being developed.
  Additional time to review requested changes to any relevant drawings and construction

Do not make changes to any drawing after the Engineer has reviewed it without the Engineer's written approval or written direction.

Only make substitutions of sections different from those shown on the drawings when the Engineer approves in writing.

Although the drawings may have been reviewed, take responsibility for the correctness of the drawings and for shop fits and field connections.

procedures will not be considered cause for delay claims.

Take responsibility for any material ordered or work done before the Engineer reviews the drawings and welding procedures.

When design drawings differ from the shop drawings, the design drawings govern. When the requirements of this section differ from the shop drawings, the requirements of this section govern.

When the design drawings differ from the requirements of this section, the design drawings govern.

#### 5.0 TRANSPORTATION, HANDLING AND SUPPORT

## 5.1 Transportation.

**Responsibility.** The Contractor is responsible for coordinating delivery from the fabricator to the jobsite and for providing adequate site access.

**Shipping plan.** The Contractor is responsible for preparing a shipping plan indicating support, lateral bracing, and tie-down points for primary members during transportation to the jobsite.

**Handling.** Ship primary members upright, unless otherwise approved by the Department. Load, support, and unload primary members in a manner that will not damage, excessively stress or permanently deform the steel or cause repeated stress reversals in the members.

# 5.2 Lifting and Assembly.

**General.** Lift, position and assemble all members in accordance with the approved erection procedures. The proposed crane location(s) and member delivery location(s) may require modification in the field to suit changing jobsite conditions. However, cranes and material must be located such that the lift is safe and within the crane manufacturer's rated capacity for all required positions.

**Lifting device.** Install lifting devices, including bolted assemblies using existing bolt holes (splices, cross frame connection plates, etc.), using Department-approved details. Welded lugs are not permitted without approval of the Engineer.

**Erection stability.** All structural members shall be stabilized with falsework, temporary bracing and/or holding cranes until the structure is complete and has the necessary lateral stability to make the structure self-supporting.

**Falsework and temporary supports.** Falsework and temporary supports shall be detailed to ensure that the temporary elevation of supported steel accommodates the deflections expected to occur as the structure is completed.

**Pins.** Pins are normally used to align holes for bolted field connections. Field reaming to facilitate fit-up will only be allowed with the Department's prior approval. Any abnormal distortion of the member or of the holes during the alignment process shall be immediately reported to the Engineer.

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**Connections.** For splice connections of primary members, fill at least 50 percent of the holes prior to crane release. The 50 percent may be either erection bolts in a snug tight condition or full-size erection pins. At least half (25 percent of all holes) shall be filled with bolts, and sufficient pins shall be used near outside corners of splice plates and at member ends near splice plate edges to ensure alignment. Uniformly distribute the filled holes.

The 50 percent requirement may be waived if a reduced percentage is calculated as sufficient and shown on the approved erection procedure. Permanent bolts may be used as erection bolts, provided they are installed in accordance with the specifications.

Primary member splice connections that are assembled on the ground (prior to erection) shall be 100 percent complete, in the no-load condition, prior to any lifting operation.

**Abnormalities.** Any abnormal member deformation or brace deflection after crane release or temporary support removal shall be immediately reported to the Engineer for swift resolution. Further work affecting the area, except for restoring support or adding bracing, shall be stopped until the deformation/deflection is resolved.

#### 6.0 REPAIR

- **6.1 Documentation.** The Contractor is responsible for documenting damage due to handling, removal of erection aids, aligning members and other actions, uncorrected misfits at connections, and misalignments exceeding tolerances in erected members. As-received damage attributable to transport or fabrication shall also be documented.
- **6.2 Implementation.** The Contractor shall propose a method of repair and basis for acceptance for the Department's review.
- **Repair Procedures.** Submit repair procedures for damaged or misaligned steel in the form of sketches and/or written procedures as applicable and as requested by the Department. Information must provide sufficient detail for the Department to adequately review the repair application. After repairs are complete, the Contractor shall provide as-built detailed drawings, NDT results, and procedures/materials used to the Engineer for inclusion in the project file.
- **6.4 Welds.** Field or shop welds that are unacceptable must be repaired in accordance with AWS D1.5. Responsibility for the cost of the repair and subsequent inspection shall be at the Contractor's expense.

#### 7.0 Construction Staging Area

Beyond the limits of acquired Right-of-Way, the Cabinet has completed environmental clearance activities on a construction staging/erection area. This area, defined as *Potential Staging Area* in the Construction Plans (Sheet S87) along the southern bank of the Cumberland River immediately west of the bridge, is available for the Contractor's use without additional environmental clearance activities required. The Contractor should note that the Cabinet has not acquired an easement for

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this area. Use of the *Potential Staging Area* will require a Right-of-Entry or Construction Easement agreement between the Contractor and Landowner, and any such agreements shall be provided to the Cabinet prior to any activity or disturbance.

The Potential Staging Area has received all necessary environmental clearances. If the Contractor elects to utilize or disturb any areas outside of the Right-of-Way or *Potential Staging Area* limits, the Contractor shall submit the proposed activity and limits to the Cabinet for review. The Contractor will be responsible for performing all field investigations for archaeological, historical, ecological, and other environmental clearances for the proposed area. The results of these investigations shall be provided to the Cabinet for coordination with the appropriate Agencies to evaluate and provide environmental clearance for the proposed area. Outside of the *Potential Staging Area*, it is the Contractor's responsibility to provide a staging/erection area that meets all environmental requirements and/or any commitments that result from clearance activities at no additional cost to the Cabinet.

#### 8.0 MEASUREMENT

The cost of fabricating, furnishing and installing the truss span superstructure, including truss main members, connections, floor beams, stringers, bracing, and truss disc bearing masonry plates and masonry plate studs; and all material, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents; shall be included in the lump sum unit price for Structural Steel. The cost of performing environmental clearance activities required for a staging/erection area outside of that previously cleared for the project shall be included in the lump sum unit price for Structural Steel. Impacts to the project schedule related to any additional environmental clearance coordination shall be the responsibility of the Contractor.

#### 9.0 PAYMENT

CodePay ItemPay Unit08160STRUCTURAL STEELLS

# SPECIAL NOTE FOR STEEL PAINT COLOR

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River – Drawing No. 27458

Clean and paint the steel truss in accordance with the plans and specifications. The final color shall be "Kentucky Blue" (Federal Standard 595B Color X5095) and meet the requirements of Section 821 of the Standard Specification. The cost of painting the truss shall be included in the lump sum bid price for Structural Steel.



# SPECIAL NOTE FOR STRUCTURE LIGHTNING PROTECTION

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River – Drawing No. 27458

#### 1.0 DESCRIPTION AND SCOPE OF WORK

- 1.1 Perform all work in accordance with the Kentucky Transportation Cabinet, Department of Highway's 2019 Standard Specifications for Road and Bridge Construction and applicable Supplemental Specifications, the Standard Drawings, this Note, and the attached detail drawings. Section references are to the Standard Specifications.
- 1.2 This work shall include the design, furnishing and installation of a complete structure lightning protection system on the truss. At a minimum the following work is included:
  - Design of a Lightning Protection System meeting the requirements of the Specifications, Plans and this Special Note.
  - Preparation and submittal for approval of shop drawings for Structure Lightning Protection System.
  - Furnishing all labor, materials, tools, and equipment necessary for installation of Structure Lightning Protection System.
  - 124 Any other work specified as part of this contract.

#### 2.0 GENERAL

The Structure Lightning Protection for the truss bridge superstructure shall be in accordance with the latest edition of ANSI/NFPA 780 lightning protection installation standards, ANSI/UL 96 lightning protection components and UL96A installation requirements for lightning protections systems. Protection shall include, but not be limited to air terminals, bonding, interconnecting conductors, and grounding as required under the provisions of UL 96A, NFPA 780, and as specified in excess of the referenced standards herein.

#### 3.0 DESIGN

3.1 The contractor shall design and prepare calculations and shop drawings for the Structure Lightning Protection System. All design documents shall be stamped by a Professional Engineer registered in the State of Kentucky. Design calculations and shop drawings shall be submitted to the engineer for review and approval. The contractor shall receive engineer's approval prior to purchasing any materials or equipment for the Structure Lightning Protection System.

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- 3.2 The Lightning Protection System shall be designed to continue to function after the design seismic event. During this event the truss at Pier 4 can be anticipated to move 8.0 inches longitudinally relative to the Pier.
- 3.3 At a minimum, the structure shall be grounded at each of the main bearings at Pier3 and Pier 4. A grounding conductor shall run down through the pier columns and footing encased in the concrete. Separate ground connections shall be made at the base of the piers for each grounding conductor.
- 3.4 No welding will be allowed on any truss members or plates designated as fracture critical. All other welding must be approved by the engineer. Only welding as shown on the approved shop drawings will be allowed.

#### 4.0 MATERIALS

- 4.1 All materials shall comply in weight, size and composition with the requirements of the Underwriters' Laboratories, Inc., the National Fire Protection Association Code and OSHA relating to the height of the structure.
- 4.2 All rods, cables, ground rods, and connectors used in the system shall carry an UL Label "A" & "B" and all lightning air terminals shall carry the Manufacturer's name.
  - **4.2.1** Conductors: Conductors shall consist of commercially pure copper cable, sized in accordance with NFPA Code.
  - **4.2.2** Conductor Fasteners: Conductor fasteners shall be an approved type of noncorrosive metal having ample strength to support conductor.

#### 5.0 INSTALLATION

#### **5.1** General

- **5.1.1** All ungrounded sizable metallic objects within 6' of the truss or metal connected to the trusses shall be bonded to the system with approved fittings and conductors.
- **5.1.2** Copper materials connecting to steel shall be lead-coated.
- **5.1.3** Connection between metals shall be made with approved exothermic welds.
- **5.1.4** All materials shall be fastened to eliminate any possibility of displacement and subsequent maintenance.

#### **5.2** Air Terminals

- **5.2.1** Air terminals shall be approved type extending not less than 10 inches above the top chord of the truss and shall be securely anchored.
- **5.2.2** Air terminals shall not extend higher than 24 inches except with individual approval or as required by OSHA. Terminals 23 inches and less shall be spaced 20 feet apart.

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- **5.2.3** Terminals 24 inches and higher shall be spaced 25 feet apart or as required by codes.
- **5.3** Conductors: Conductors shall be run concealed.
- **5.4** Conductor Fasteners: Space 3'-0" O.C. max.
- **5.5** Ground Connection
  - **5.5.1** Lay out an extensive wire network on the surface of the rock surrounding the abutment and pier footings, consisting of ring, radial, and/or plate electrodes. Other grounding will be permitted, providing it will pass UL requirements.

#### 6.0 MEASUREMENT

Structure Lightning Protection. Measurement will be lump sum and include the design, shop drawing preparation, and installation of the Structure Lightning Protection.

#### 7.0 PAYMENT

Structure Lightning Protection. Payment at the contract unit price is full compensation for contractor to design, prepare shop drawings, and to provide all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified by this note.

The Department will consider payment as full compensation for all work required by this note.

# SPECIAL NOTE FOR WEB CAMERA CONST MONITORING SYSTEM

# Livingston County Item No. 1-1142 US 60 Bridge over Cumberland River

#### 1.0 GENERAL

#### 1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

Section includes an integrated, professional-grade, high resolution digital webcam system designed specifically for the construction industry as a turnkey package including camera(s) and related hardware, mounting equipment, software, wireless cellular data transmission service, website hosting, image hosting and storage, online interface for the system and technical support.

#### Related Sections:

- 1. Division 1 Section "Photographic Documentation" for periodic construction photographs.
- 2. Division 1 Section "Closeout Procedures" for submitting digital photographs as Project Record Documents at Project closeout.

#### 1.3 **DEFINITIONS**

CCD: Charge-coupled device.

System Vendor: Provider of camera system hardware and software and host maintaining off-site server, data storage devices, and troubleshooting software and equipment. Contractor shall maintain an active contract for System Service for duration of Contract Time unless other term is agreed upon in writing by the Owner. Cost for System Service shall be included in the Contract Sum.

System Service: Host services provided by System Vendor including image acquisition, transfer, backup, periodic upgrades to the system, viewing access via a maintained interface on the Internet and on-line storage of images for duration of the Service Contract.

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#### 1.4 SUBMITTALS

#### 1.4.1 SHOP DRAWINGS

Submit key plan of Project site with notation of vantage points marked for location and direction of each camera. Indicate camera mounting heights relative to ground or bridge deck elevation.

# 1.4.2 QUALITY ASSURANCE SUBMITTALS

Follow manufacturer's installation and testing instructions.

# 1.4.3 CLOSEOUT SUBMITTALS

Digital Images: Submit digital still images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software. Include date and time in filename for each image. Submit a sortable/identifiable archive of all digital still images on an external hard drive or DVD format.

Time-Lapse "Movie": Compile select digital still images into a time- lapse movie of the construction period. Optimize images included and run- time length of movie to suit Owner's requirements.

# 1.5 QUALITY ASSURANCE

Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Factory assemble camera system from components bearing UL Classification Marking indicating that materials have been produced under UL's Classification and Follow-Up Service.

Comply with NECA 1, "Standard Practices for Good Workmanship in Electrical Construction."

Comply with NFPA 70, "National Electrical Code."

Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

#### 1.6 DELIVERY, STORAGE, AN D HANDLING

Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels.

Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other causes.

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# 1.7 PROJECT CONDITIONS

Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

 System components installed in location exposed to weather shall be rated for continuous operation in ambient temperatures of minus 10 to plus 120 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. NEMA 250, Type 3R enclosures.

#### 1.8 COORDINATION

Coordinate installation of cameras so that system is fully operational prior to commencement of construction operations.

Coordinate layout and installation of cameras to avoid interference from trees or other obstructions and to prevent sunlight and light from fixtures entering directly into the camera lens.

Coordinate layout and installation of cameras to avoid interference with construction operations.

#### 1.9 WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras and equipment related to camera operation that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

- Failure of system to meet performance requirements.
- Faulty operation of hardware and software.
- Defects in other components of the work.

Warranty Period: Lifetime product warranty required

#### 1.10 USAGE RIGHTS

Obtain and transfer copyright usage rights to Owner for unlimited reproduction of photographs and archives generated by the system.

Contractor shall understand that photographs and archives generated by the camera system become the mutual property of the Owner and System Vendor and cannot be used for advertisement or publicity reasons without the expressed written consent of the Owner and System Vendor.

#### 1.11 MAINTENANCE

Maintenance Service: Provide service and maintenance of camera system for entire Construction period.

- Examine monthly; clean and adjust equipment.
- Provide remote emergency repair services by System Vendor 24 hours a day, seven days a week to ensure uninterrupted camera service. Provide personnel on-site to assist System Vendor as needed during working hours. Provide replacement parts and components due to system failure, damage, or theft within two business days.
- Maintenance service shall not be assigned or transferred to another agent or subcontractor without prior written consent of Owner.
- Require System Vendor to proactively monitor the system by means of service and maintenance contract. If no connection is made within a span of time not to exceed 24 hours during regular business days, require System Vendor to notify Contractor and commence troubleshooting. Provide necessary staff during troubleshooting to verify power availability, to remove and replace system, and to verify functioning phone lines or internet access for dialup and Ethernet based systems.

#### 2.0 PRODUCTS

#### 2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by the following:

- OxBlue, Inc., 888-849-2583, http://www.OxBlue.com/.
- EarthCam, Inc., 800-327-8422, http://www.EarthCam.net

Substitutions: As approved by the Owner

#### 2.2 SYSTEM REQUIREMENTS

The indoor/outdoor camera system shall consist of a tamper and impact resistant, discreet, fixed pole or wall-mount enclosure with integrated fixed camera, lens and controller.

The cameras shall have the ability to take a high-resolution **8.0 Megapixel** digital still images of the construction site at a set time interval, every 15 minutes, and upload the still images over a wireless cellular modem to a secure, password-protected website.

#### 2.3 EQUIPMENT

Camera: Integrated high definition camera and lens assembly consisting of a charge coupled device (CCD) camera with a remotely controlled focal length lens mounted

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as a permanent module with the following features:

- Digital Still Image Resolution: Minimum sensor size of **8.0 megapixels**, and at an image resolution of not less than 3264 x 2448 pixels.
- Memory: Unlimited remote storage provided by the system vendor.
- Lens: System capable of optical zoom and production of wide angle images to provide sufficient coverage and detail of the construction site as required by the Owner.
- Focus Mode: iESP auto, Spot AF, Selective AF target, Manual.
- Metering Mode: Digital iESP multi-pattern auto TTL, Spot metering, Center Weighted metering.
- Data Connection: Provide one of the following:
  - o In areas with cellular coverage, operate cameras via built-in cellular data connection provided and maintained by the system vendor.
  - In areas without cellular coverage, operate cameras via and RJ-45
     Ethernet data connection over broadband or satellite internet access provided and maintained by the Contractor.
- Electrical Operation: 120 VAC at maximum 83 Watts.

Quantity of Cameras: Four (4)

Camera Enclosure: Construct tamper and impact resistant housing of extruded aluminum, die cast aluminum, and sheet aluminum body with factory-applied powder coated finish. Construct with forward opening, front hinged lid, allowing easy access to camera mounting sled. Provide rear link-lock latch, manufactured from stainless steel, suitable for use with pad lock. Equip with heater, blower and thermostat.

#### 2.4 INTERFACE AND ONLINE ACCESS

Remote Access: Contractor's System Vendor shall provide an online interface system to allow viewing of all high-definition digital still images captured and stored during construction, from any location with internet access and with password protection. Maintain images on the System Vendor's website for reference available at all times during construction and for not less than 90 days after Final Completion.

#### Online Interface:

- The online interface system shall be accessible by an unlimited number of human users.
- System shall display Project name and Owner Logo.
- The system shall display online time-lapse videos and allow for videos to be downloaded by users.
- Navigation: Provide calendar based navigation system for selecting specific images.
- Zoom: Provide pan and zoom capability for zooming into high definition

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images.

- User Screen Viewing Options:
  - Dynamic Calendar: Provide screen showing calendar in which each day displays an image for that day.
  - o Project Dashboard: Provide screen allowing user to view multiple sites at one time.
  - O Quad View: Provide screen showing four windows, allowing user to view last four days, weeks, or months on one screen.
  - o Split Screen: Provide screen showing two discrete images side by side, from same camera or from two different cameras.
  - o Overlay Mode: Provide screen showing two discrete images overlaid, allowing user to determine differences between the two.
  - o Full-Screen: Provide screen maximizing view of images on users monitor.
- Email: Provide capability to email photos with comments from within the system.
- Slideshow: Provide capability to browse through images, moving forward and backward in time by individual image and by day.

#### 3.0 EXECUTION

#### 3.1 PREPARATION

Unpack camera system components and save packing materials (box and foam) for future shipment of camera system including associated appurtenances and mounting equipment to Owner or Manufacturer as required.

#### 3.2 INSTALLATION

General:

- Install camera system in accordance with manufacturer's printed instructions, State and Municipality codes and requirements and approved submittals. The Owner shall have final approval of all camera locations.
- Install units plumb and at proper angle to provide maximum field of view of on-site operations.
- Securely and rigidly anchor products in place.
- Connect cameras to power.

Location: Cameras shall be located to provide coverage of full bridge site including staging areas without any "blind spots".

- One (1) camera shall be located at the south end of the new bridge to capture construction of the south approach spans.
- One (1) camera shall be located on the south end of the new truss to capture construction of the south approach spans, main span, and potential staging area.

- One (1) camera shall be located on the north end of the new truss to capture construction of the north approach spans and main span.
- One (1) camera shall be located at the north end of the new bridge to capture construction of the north approach spans.
- The Owner shall have final approval of all camera locations.

Relocate camera as directed by Owner during construction progress. Each camera may be relocated up to two (2) times prior to Final Completion. Camera positions may include attachment to existing construction, new construction and temporary facilities.

Position camera so that the field of view of each camera covers the intended area of the project site. Install camera at elevation that will provide uncompromised visual coverage. Install camera so that position of sun or man made light sources will not come into direct contact with field of view of camera at any time.

# 3.3 FIELD QUALITY CONTROL

Preinstallation Testing: Test camera on site at ground level prior to mounting unit in its intended elevated position. Test shall follow the following sequence:

- Contact System Vendor not less than 24 hours in advance of installation for testing.
- Connect unit.
- After 30 minutes contact System Vendor and require System Vendor to remotely confirm camera is operating properly.
- Install cameras in approved locations.

# 3.4 CLEANING

Clean installed items using methods and materials recommended in writing by manufacturer.

Clean camera system components, including camera-housing windows, lenses, and monitor screens.

#### 3.5 INSTRUCTION

Engage a factory-authorized service representative by phone to instruct Contractors personnel in procedures to adjust and maintain camera equipment. Instruct personnel on procedures and schedules for troubleshooting and maintaining equipment. Explain methods of determining optimum alignment and adjustment of components.

#### 3.6 OPERATION, TERMINATION, AND REMOVAL

Maintenance: Maintain camera equipment in good operating condition on a 24-hour basis until removal.

Termination and Removal: Remove camera system after Final Completion of the project and with approval from Owner. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with camera system. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired. Camera system including associated appurtenances and mounting equipment are property of the Owner.

#### 3.7 METHOD OF MEASUREMENT

When WEB CAMERA CONST MONITORING SYSTEM is included in the Bid Proposal as a separate bid item, the Department will measure the work performed as part of providing WEB CAMERA CONST MONITORING SYSTEM as a lump sum.

### 3.8 PAYMENT

The Department will pay for the quantities at the contract unit price. When WEB CAMERA CONST MONITORING SYSTEM is included in the Bid Proposal as a separate bid item the Department will make partial payments for WEB CAMERA CONST MONITORING SYSTEM in two (2) equal or approximately equal payments.

- 50 percent after the system is installed and fully operational.
- 50 percent after all Closeout Submittals have been submitted and accepted by the Department.

The Department will consider payment as full compensation for all work required under this section. Payment will be made under the following:

Bid Item Code	Pay Item	<u>Pay Unit</u>
23912EC	WEB CAMERA CONST MONITORING SYSTEM	LS



# BRIDGE PERMIT

WHEREAS by Title V of an act of Congress approved August 2, 1946, entitled "General Bridge Act of 1946," as amended (33 U.S.C. 525-533), the consent of Congress was granted for the construction, maintenance and operation of bridges and approaches thereto over the navigable waters of the United States;

AND WHEREAS the Secretary of Homeland Security has delegated the authority of Section 502(b) of that act to the Commandant, U.S. Coast Guard by Department of Homeland Security Delegation Number: 0170.1;

AND WHEREAS before construction is commenced, the Commandant must approve the location and plans of any such bridge and may impose any specific conditions relating to the construction, maintenance and operation of the structure deemed necessary in the interest of public navigation, such conditions to have the force of law;

AND WHEREAS the Commandant of the Coast Guard has further delegated to the District Commanders, by Section 1.01-60(b) of Title 33, Code of Federal Regulations, authority to issue permits of the construction, reconstruction, or alteration of bridges across navigable waters of the United States.

AND WHEREAS the - STATE OF KENTUCKY - has submitted for approval the location and plans of a bridge to be constructed across the Cumberland River at Smithland, Livingston County, Kentucky;

NOW THEREFORE, This is to certify that the location and plan sheets 1, 2, 3 and 4 (of 4) dated October 25, 2019 are hereby approved by the Commander, Eighth Coast Guard District, subject to the following conditions:

1. No deviation from the approved plans may be made either before or after completion of the atructure unless the modification of said plans has previously been submitted to and received the approval of the District Commander.

2. The construction of falsework, pilings, cofferdams or other obstructions, if required, shall be in accordance with plans submitted to and approved by the District Commander, prior to construction of the bridge. All work shall be so conducted that the free navigation of the waterway is not unreasonably interfered with and the present navigable depths are not impaired. Timely notice of any and all events that may affect navigation shall be given to the District Commander during construction of the bridge. The channel or channels through the structure shall be promptly cleared of all obstructions placed therein or caused by the construction of the bridge to the satisfaction of the District Commander, when in the judgment of the District Commander the of the District Commander, when in the judgment of the District Commander the of the District Commander, when in the judgment of the District Commander the construction work has reached a point where such action should be taken, but in no case

PRELIMINARY NOT FOR CONSTRCUTION

LIVINGSTON COUNTY STP BRO 0601 (196)

TIMA39 320178 (8-91-4)9

Bridge across the Cumberland River at Smithland, Kentucky

Continuation Sheet

later than 90 days after the bridge has been opened to traffic.

3. Issuance of this permit does not relieve the permittee of the obligation or responsibility for compliance with the provisions of any other law or regulation as may be under the jurisdiction of any federal, state or local authority having cognizance of any aspect of the location, construction or maintenance of said bridge.

A. A bridge fendering system shall be installed and maintained in good condition by and at the expense of the owner of the bridge when so required by the District Commander. Said installation and maintenance shall be for the safety of navigation and be in accordance with plans submitted to and approved by the District Commander prior to its construction.

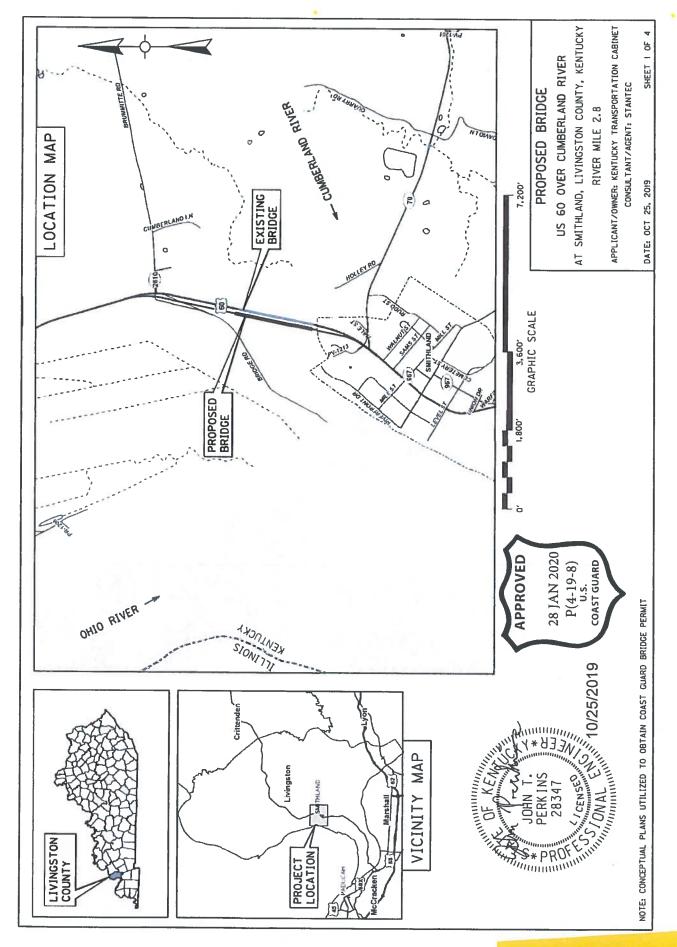
5. Clearance gauges shall be installed and maintained in a good and legible condition by and at the expense of the owner of the bridge when so required by the District Commander. The type of gauges and the location in which they are to be installed will be submitted to the District Commander for approval.

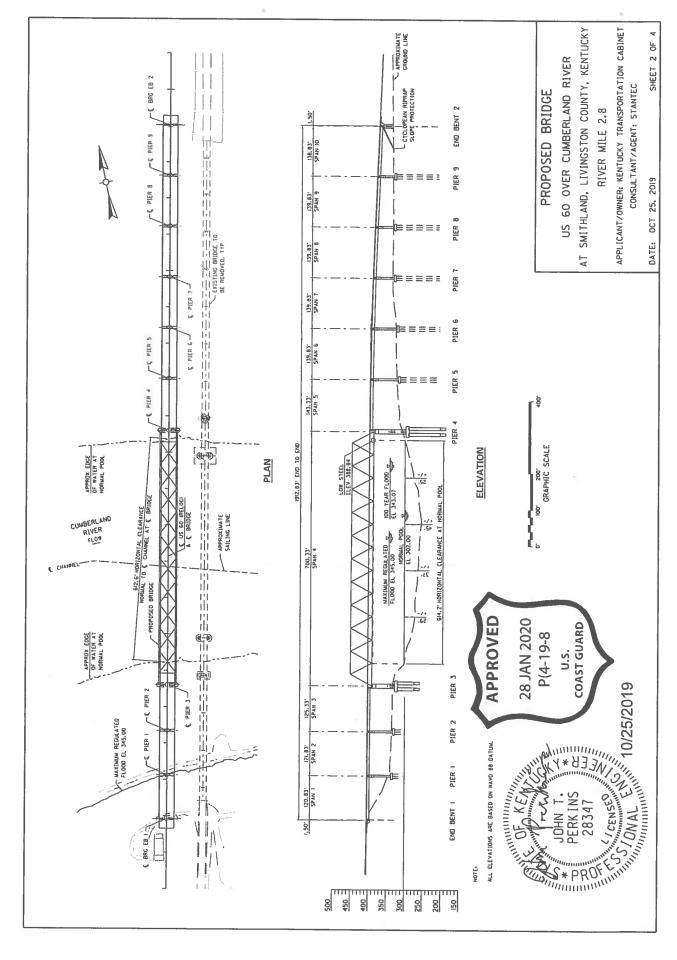
6. All parts of the existing to-be-replaced US 60 Highway Bridge across the Cumberland River, mile 2.8, not utilized in the new bridge, which are located within the waterway shall be removed down to five feet below grade or elevation 284.0 feet MAVD 88, whichever is lower. All other parts shall be removed down to two feet below the mudiine or below the natural ground line. The waterway shall be cleared to the satisfaction of the District Commander. A period of 90 days subsequent to the opening to traffic of the new US 6- Highway Bridge, mile 2.8, will be allowed for such removal and clearance. The proposed method and schedule for removal of the existing bridge shall be submitted to the District Commander for approval prior to commencing such removal.

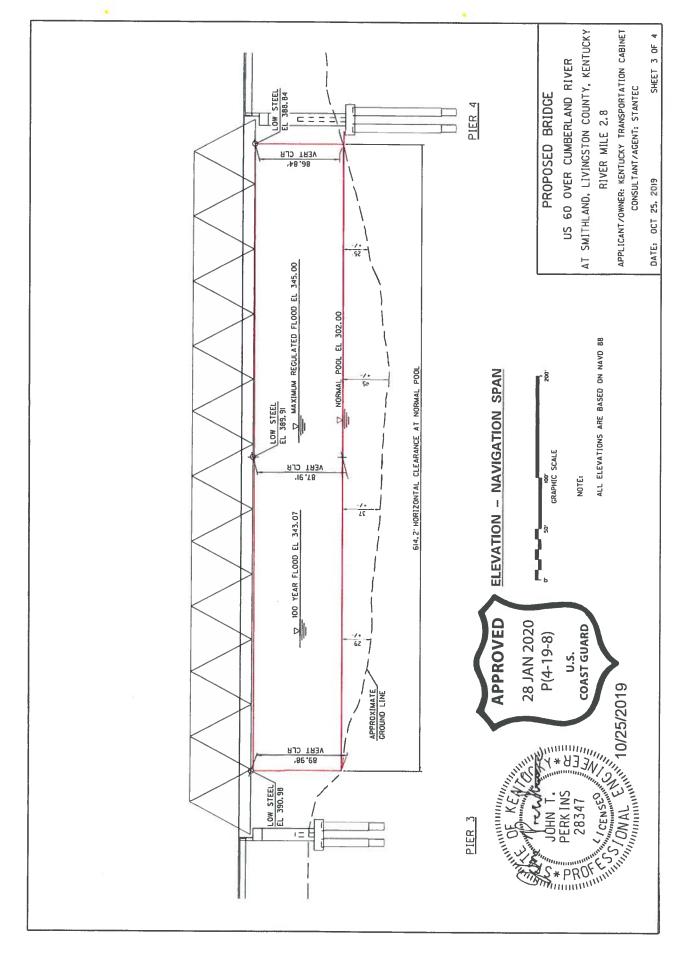
7. When the proposed bridge is no longer used for transportation purposes, it shall be removed to an elevation deemed appropriate by the District Commander. Commander and the waterway cleared to the satisfaction of the District Commander. Such removal and clearance shall be completed by and at the expense of the owner of the bridge upon due notice from the District Commander.

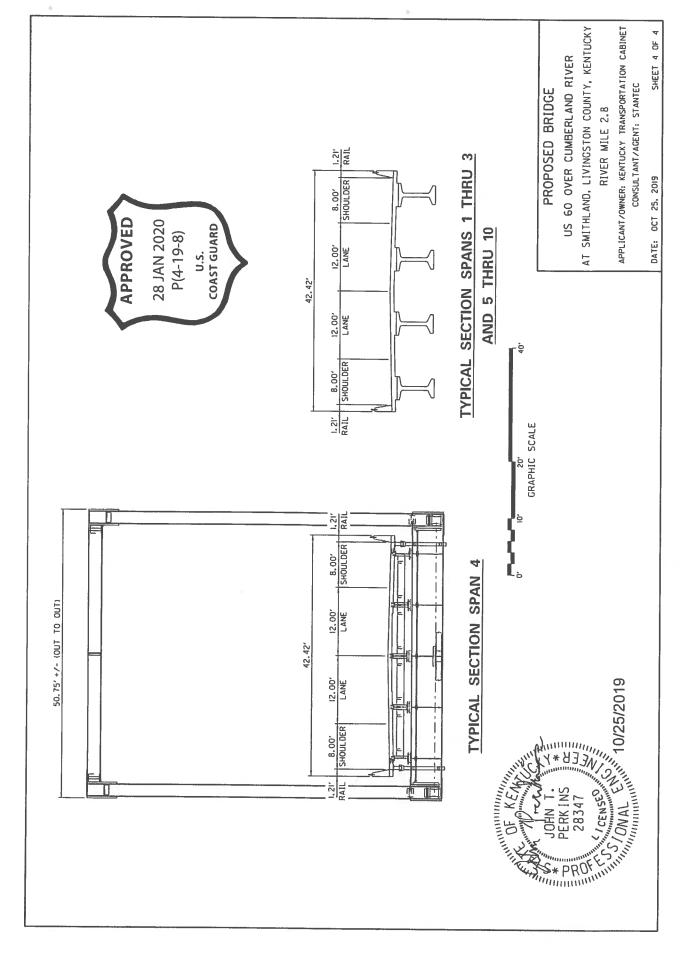
8. The approval hereby granted shall cease and be null and void unless construction of the bridge is commenced within three years and completed within five years after the date of this permit.

John P. Nadeau Rear Admiral U.S. Coast Guard Commander, Eighth Coast Guard District









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#### SPECIAL NOTE FOR PROJECT SPECIFIC DRILLED SHAFT REQUIREMENTS

# Livingston County – US 60 Bridge over the Cumberland River Item No. 1-1142.0

#### 1.0 DESCRIPTION

This special note is a supplement to the Standard Special Note for Drilled Shafts (11C), and includes drilled shaft requirements specific to Piers 3 & 4 on this project. In the case of conflicts with the standard Special Note for Drilled Shafts (11C), this Special Note for Project Specific Drilled Shaft Requirements will control.

#### 2.0 DRILLED SHAFT CONSTRUCTION SEQUENCE

At Pier 3, begin rock construction (i.e. rock drilling through concrete placement) at one of the interior shafts (i.e. 3C, 3D, 3E or 3F). Likewise, at Pier 4 begin rock construction at one of the interior shafts (4C, 4D, 4E or 4F). The specified construction sequence does not apply to activities prior to rock drilling (e.g. casing installation and overburden excavation).

Construction of the first drilled shaft at each pier will be used to evaluate whether the methods and equipment used by the Contractor are sufficient to produce a completed drilled shaft meeting the requirements of the plans and specifications. The Department will evaluate the Contractor's ability to satisfactorily execute any necessary construction operations and meet required tolerances during construction of the first shaft at each pier. Revise the methods and equipment as necessary to satisfactorily construct the drilled shafts within tolerances.

Non-destructive testing reports, including Sonar Calipering (SC) Field Reports and SC Preliminary Reports (but not the SC Final Reports), Thermal Integrity Profiling (TIP) Test Reports and initial Crosshole Sonic Logging (CSL) Test Reports (but not 28-day CSL reports) for the first drilled shaft completed at each pier must be submitted and accepted before beginning rock drilling activities on any exterior drilled shafts at that pier (i.e. 3A, 3B, 3G & 3H or 4A, 4B, 4G & 4H as applicable). This includes completion and acceptance of any corrective items that are a result of failed materials tests, non-destructive testing results, or out-of-tolerance measurements. Account for delays to complete non-destructive testing, corrective work, and review time for acceptance in the schedule and bid prices. Proceed with rock construction on other interior shafts during evaluation of the first shaft at the same pier unless directed otherwise by the Engineer due to significant problems encountered during construction of the first shaft.

A post-construction meeting may be required after the successful completion of the first shaft at each pier and prior to the beginning of rock excavation of the second shaft. Once acceptance has been given to construct subsequent shafts in a pier (after complete evaluation of the first shaft at the same pier) no changes will be permitted in the methods or equipment used to construct the satisfactory shaft without written approval of the Engineer. Proceed with rock construction at exterior shafts only with written notification by the Engineer.

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## 3.0 SUPERVISOR'S DRILLED SHAFT CONSTRUCTION EXPERIENCE

Provide a drilled shaft superintendent or foreman in responsible charge of all drilled shaft operations with a minimum of 5 years' experience constructing drilled shaft foundations and experience with similar shaft lengths, shaft diameters, subsurface conditions, and construction techniques to be used on this project.

As part of the Drilled Shaft Installation Plan, submit documentation containing names and current phone numbers of owners' representatives who can verify the supervisor's successful participation in at least three (3) total drilled shaft projects, including two (2) projects in each of the categories below. Some or all of the experience may be with a previous employer. If necessary, more than one drilled shaft superintendent or foreman may be used to meet the requirements if all are actively involved in the project. However, one person must be designated as the contact for drilled shaft operations between the Contractor and the Department. It is not necessary that any one project satisfy both criteria below, but at least two (2) projects from each category are required.

- 1. Constructing rock socket drilled shafts with total depths of 40 feet or deeper, with rock socket diameters 5.0 feet or larger
- 2. Using polymer slurry in drilled shafts (required for supervisor of Pier 3 shafts, but not for Pier 4 shafts)

The Engineer may suspend drilled shaft construction if supervisory personnel meeting the requirements above are not present or performance is unsatisfactory. Any cost associated with the suspension of work will be at no expense to the Department and with no extension of contract time.

#### 4.0 PRE-CONSTRUCTION SUBMITTALS

No later than 45 calendar days prior to beginning drilled shaft construction, submit a Drilled Shaft Installation Plan for review by the Department. Final acceptance will be subject to satisfactory performance in the field. Include detailed information such as the following:

- a) List and size of proposed equipment including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casings, etc.
- (b) Details of overall construction operation sequence and the sequence of shaft construction.
- (c) Details of shaft excavation methods and method that will be used to ensure that the rock socket is centered.
- (d) Details of casing to be used including calculations showing ability of casing to withstand anticipated hydraulic and earth pressures and to withstand stresses due to installation without undue deformation. These details shall include methods for casing handling, splicing, straightening, and out-of-round correction with any associated timetables.

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- (e) Details of slurry. See requirements for Slurry Submittals in Section 9.
- (f) Details of proposed methods to clean shaft and inside of casing after initial excavation.
- (g) Details of reinforcement handling, lifting, and placement including support and method to center in shaft, must include rebar cage support during concrete placement.
- (h) Details of concrete placement including proposed operational procedures for concrete tremie or pump including initial placement, raising during placement, and overfilling of the shaft to expel contaminated concrete.
- (i) Details of casing removal if contractor chooses to remove casing.
- (j) Required submittals including shop drawings and concrete design mixes.
- (k) Other information shown in the plans or requested by the Engineer.
- (n) Special considerations for wet construction.
- (o) Details of environmental control procedures to protect the environment from discharge of excavation spoil, dry polymer slurry and concrete overpour.
- (p) Method for measuring and determining vertical and horizontal alignment during construction.
- (q) How Disposal of excavated material.
- (r) Proposed method to provide inspectors access to the top of casing to inspect shafts.

Within 15 business days after receipt of the plan, the Department will notify the contractor of any additional information required and/or changes necessary to meet the contract requirements. A "Business Day" is defined as any day except Saturdays, Sundays and Holidays, as defined in Section 101.03 of the Standard Specifications. Any part of the plan that is unacceptable will be rejected and the Contractor will be required to submit changes agreed upon for reevaluation. The Department will notify the Contractor within five (5) business days after receipt of proposed changes of their acceptance or rejection. All procedural acceptance by the Department is subject to trial and satisfactory performance in the field and does not relieve the contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. Begin construction on any items affected by the Drilled Shaft Installation Plan only after the plan has been accepted by the Department. Delays due to resubmission of the Drilled Shaft Installation Plan will be at no additional cost to the Department and with no extension of contract time.

#### 5.0 DRILLED SHAFT PRE-CONSTRUCTION MEETING

A pre-construction meeting to discuss drilled shaft construction will be required no later than 30 calendar days prior to the beginning of drilled shaft construction. The purpose of the meeting is to discuss construction procedures, personnel, and equipment to be used. The following are required to attend:

1. Representing the Contractor – Project Superintendent, Drilled Shaft Superintendent or Foreman, and Foreman in charge of the following operations (if different than the Drilled Shaft Superintendent or Foreman): placing casing, excavating shafts, mixing slurry, tying and setting steel reinforcement, and pumping and placing concrete.

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2. Representing the Department – Drilled Shaft Inspector(s), Section Engineer, Central Office Construction Engineer, Geotechnical Branch representative(s) and others as deemed appropriate by the Section Engineer.

If the Contractor's key personnel change or if the Contractor proposes a significant revision to drilled shaft construction procedures, an additional drilled shaft pre-construction meeting may be required at the discretion of the Engineer.

#### 6.0 EQUIPMENT

Perform the excavations required for the shafts through materials encountered to the dimensions and elevations shown in the plans. Use methods and equipment suitable for the intended purpose and the materials encountered. Due to the potential for the need to lower shaft tip elevations, provide equipment capable of constructing shafts to a tip elevation of 220 ft. (approximately 20 ft. below plan tip elevation) at Pier 3 and tip elevation 182 ft. (approximately 10 ft. below plan tip elevation) at Pier 4.

#### 7.0 CONSTRUCTION METHOD

Construct drilled shafts as indicated in the plans or described in this Special Note. Propose a construction method on the basis of its suitability to the site conditions and submit it in the Drilled Shaft Installation Plan for review and acceptance by the Engineer. Provide for casing from the top of the rock socket to at least 5 feet above the water level when the shaft is poured. Remove any temporary casing only after the concrete has achieved a minimum strength of 3000 psi.

#### 8.0 TOP OF ROCK ELEVATIONS

The Department averaged the top of rock elevations encountered in the design-phase geotechnical investigation borings at each pier to estimate drilled shaft plan quantities. The Department will use the actual top of rock elevations encountered at each shaft location of the borings included in the construction contract for actual pay quantities.

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## 9.0 POLYMER SLURRY AT PIER 3

Shales at Pier 3 are subject to rapid degradation when exposed to water. Based on previous experience, the Department has found that using polymer slurry during rock drilling reduces the degradation of such shales.

Provide PHPA Dry Polymer Slurry to reduce degradation of shales. Provide a sufficient quantity of slurry mix meeting the material requirements, test the slurry in the tanks and in the shafts. Include all costs associated with polymer slurry in the unit bid price for "Pier 3 – Drilled Shaft – 96 inch (Common)" or "Pier 3 – Drilled Shaft – 90 inch (Solid Rock)", as applicable. Recycling of polymer slurry used during rock drilling is not permitted and the Contractor will be responsible for disposing of the slurry after use.

# 9.1 Slurry Submittals

As part of the Drilled Shaft Installation Plan, submit a Proposed Method of Slurry Use, including the following prepared by the Slurry Supplier:

- 1. a detailed slurry mix design, specific slurry properties, adequate time for hydration, and a discussion of suitability for the anticipated subsurface conditions
- 2. methods to mix, circulate, and desand the slurry
- 3. details of the proposed testing, test methods, sampling methods, and test equipment;
- 4. the name and current phone number of the supplier's representative for the project
- 5. any other information the slurry supplier deems necessary
- 6. a sample of the dry slurry (may be submitted separate from the Drilled Shaft Installation Plan)
- 7. proposed method and location to dispose of slurry

#### 9.2 Slurry Supplier Technical Representative

Provide the services of a technical representative of the slurry supplier to be responsible for:

- 1. training project inspectors and contractor personnel regarding the slurry properties and proper testing procedures
- being at the site during premixing prior to introduction of slurry into the first shaft and during the first 4 hours of rock socket drilling on the first shaft or until the mix shows consistent behavior, as determined by the Engineer
- 3. being available to provide technical assistance and consultation to the Contractor and/or the Department during construction of all Pier 3 shafts

Allow direct communication between the technical representative and the Department at all times.

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# 9.3 Slurry Materials and Testing

Provide PHPA Dry Polymer and mix with water to form a slurry mix meeting the requirements in Table 1 below.

Table 1 – Polymer Slurry Material Requirements					
Property	Allowable Range	Units	Test Apparatus		
Marsh Funnel Viscosity	> 65	sec/qt	Marsh Funnel		
рН	7-10		pH paper or pH meter		
Density	< 64	pcf	Density Balance		
Sand Content	< 1	% by volume	API Sand Content Kit		

The Contractor is responsible for providing quality control testing of the slurry to ensure conformance with the requirements specified above. Designate one person on each shift to be responsible for mixing and testing slurry. The Department's inspection personnel may perform independent comparison testing at any time. Provide slurry testing equipment for the exclusive use project inspectors; include a carrying case which contains all equipment necessary to test the slurry properties in the table above. This testing equipment will immediately become property of the Department. Provide this testing equipment at no additional cost the Department.

A set of tests is defined as the tests included in Table 1 and performed on samples extracted from:

- one sample within 3 ft. of the shaft tip at the time of sampling
- one sample approximately midway between the bottom of casing and shaft tip at the time of sampling (unless this distance is less than 10 ft.) and
- two samples at approximate third points in the casing

At the discretion of the Engineer, sand content tests may be omitted on selected samples. Take samples using a sampling tool marked so the depth of the slurry sample can be evaluated.

Perform tests to establish a consistent working pattern taking into account the mixing process and blending of freshly mixed slurry with previously used slurry. Perform a set of tests every 2 hours during the first 8 hours of slurry use on the project. If the results show consistent behavior, as evaluated by the Engineer, after the first 8 hours, decrease the testing frequency to 1 set every 4 hours of slurry use, during drilling. Perform a set of tests immediately prior to and immediately after every drilling shift. Perform at least 2 test sets per day after drilling is complete and prior to concreting. Representatives of the Department may perform comparison tests as necessary.

Report all test results to the Engineer immediately and add additional slurry, meeting the material requirements, and/or remove slurry to adjust the mix in the shaft as needed to meet the specified requirements in Table 1. Furnish written reports of all tests required above, signed by

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an authorized representative of the Contractor, to the Engineer on completion of each drilled shaft. Include shaft number, sampling and test times and dates, sample depths and elevations, and all test results.

Sample the slurry in the tanks at a rate of at least 1 sample per 10,000 gallons (+/-10%) and perform control tests to evaluate the properties of the freshly mixed slurry as defined in Table 1. At the discretion of the Engineer, sand content tests may be omitted on selected samples. If any portion of slurry is not within the specified ranges, adjust the mix and retest at no additional cost to the Department.

# 9.4 Slurry Use

Prior to beginning rock excavation in any shaft, premix slurry in tanks using an approved water supply. Use water that does not have characteristics detrimental to the slurry, drilled shaft excavation, or concrete. Additives are not allowed unless approved in writing by the Engineer. Use air diaphragm pumps or other similar non-shearing mixing devices to mix the slurry and pump it into the shaft. Allow adequate time (as prescribed by the slurry supplier) for hydration prior to introduction into the shaft. Provide slurry tanks with adequate capacity for slurry mixing, circulation, storage, and treatment.

Perform a set of tests (as defined in the Slurry Materials and Testing Subsection) to determine the properties of the slurry mix in the shaft and report the values to the Engineer immediately. Add additional slurry to the shaft to adjust the mix if necessary to meet the specified requirements in Table 1.

Prior to beginning rock drilling, pump slurry meeting the material requirements into the shaft, as directed by the Engineer. Pump slurry to the bottom of the shaft through a hose or tremie pipe. Pump until the slurry is at least 4 ft. above the water surface level and maintain a minimum 4 ft. head of slurry above the water surface level at all times until concrete placement has been completed.

Begin rock drilling only if a minimum of 34,000 gallons of slurry meeting the specified material requirements is stored in the mixing tanks (i.e. in addition to the slurry in the casing). This is approximately 4600 cubic feet or about 130% of the theoretical volume of one shaft from the plan top of shaft to shaft tip elevation. The reason for this requirement is to ensure that sufficient a sufficient volume of slurry is available in case the slurry in the excavation falls out of the specified requirements.

After adding slurry, continuously premix additional slurry any time the supply of slurry mix meeting the material requirements in the tanks is less than 34,000 gallons. Ensure that a minimum of 34,000 gallons of slurry mix meeting the material requirements is available at the beginning of every drilling shift. Take all steps necessary to prevent the slurry from "setting up" in the shaft at no additional cost to the Department; such methods may include but are not limited to agitation and circulation.

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Prior to placing concrete in any shaft excavation, ensure that heavily contaminated slurry suspensions which could impair the free flow of concrete have not accumulated in the bottom of the shaft excavation. Settling time after the completion of drilling may be necessary to accomplish this. Perform a set of tests after completing shaft excavation and initial cleanout. At no additional cost to the Department, remove suspended solids until all values of density and sand content in a test set are less than 64 pcf and 1%, respectively. Perform final shaft bottom cleaning after suspended solids have settled from the slurry mix.

Take precautions to ensure that contaminated (i.e. used) slurry, especially within 15 to 20 ft. of the rising concrete head, does not mix with slurry to be used for subsequent shaft excavation. If the contaminated slurry is pumped into a mixing tank, use a separate tank. If this tank is to be for used for subsequent slurry mixing, clean the tank thoroughly after slurry disposal to ensure that concrete contamination has been removed. Verify that the tank has been sufficiently cleaned by filling it with water and performing a minimum of 3 pH tests. Continue cleaning the tank until the pH is below 9.

#### 9.5 Slurry Disposal

Dispose of all slurry after use (including any slurry used at the Contractor's option). Dispose of slurry off site in areas approved by the Engineer at no additional cost to the Department and with no extension of contract time. Exercise care to ensure that slurry does not spill into the river.

#### 10.0 EXCAVATIONS

The plans indicate the expected bottom of rock socket, top of rock socket, and top of shaft/bottom of footing elevations. Drilled shafts may be extended deeper when the Engineer determines that the material encountered while drilling the shaft excavation is unsuitable and/or is not the same as anticipated in the design of the drilled shaft. No two rock sockets at the same pier may be open at the same time. Do not excavate shafts that are in the same pier within 48 hours of the completion of another shaft at the same pier.

Maintain a construction method log during shaft excavation which includes but is not limited to the description and approximate top and bottom elevation of each soil or rock material, and remarks.

Provide the Department with the following records:

- Drilled Shaft Excavation Log
- (2) Drilled Shaft Concrete Placement Log
- (3) Field and Theoretical Concreting Curves
- (4) Drilling Slurry

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Livingston County Item No. 1-1142.0 US 60 over Cumberland River

Submit other records as required by the Engineer.

Dispose of excavated materials which are removed from the shaft in accordance with the Standard Specifications and requirements of other regulatory agencies.

Do not permit workmen to enter the shaft excavation for any reason unless both a suitable casing has been installed and adequate safety equipment and procedures have been provided to workmen entering the excavation. Recommended Procedures for the Entry of Drilled Shaft Foundation Excavations, prepared by ADSC: The International Association of Foundation Drilling, provides guideline recommendations for down-hole entry of drilled excavations.

At Pier 3, due to the susceptibility of the shale to rapid degradation, perform drilled shaft construction beginning with rock drilling using a "continuous operation" which, for this project, is defined according to the following criteria:

- 1. Perform drilled shaft solid rock excavation on consecutive full workdays, working on drilling operations in shifts of no less than 10 hours actual drilling time per day, with no breaks for weekends, holidays, etc. Time required to sample slurry and adjust the slurry mix in the shaft during a drilling shift will count toward the 10 hours of drilling time. Time required to sample slurry and adjust the slurry mix immediately prior to and immediately after every drilling shift will not count toward the 10 hours of drilling time. Time required for equipment maintenance will not count toward the required 10 hours of drilling time.
- 2. Ensure that a sufficient supply of slurry mix meeting the material requirements in Table 1 is available.
- 3. Begin concrete placement as soon as possible and no later than 12 hours after completing excavation to the shaft tip elevation. Perform shaft cleanout, sonar calipering, placing reinforcing steel, and all operations necessary to begin concrete placement within this 12 hour period.
- 4. Complete concrete placement in a nonstop operation.
- 5. If the above criteria are not met on a shaft, submit, in writing, a remedial plan to the Engineer. Until the plan is accepted by the Engineer, no additional drilled shaft rock excavations can be started on subsequent Pier 3 shafts. No additional compensation or contract extension will be allowed for any delays for work stoppage associated with non-compliance of the above criteria.

#### 11.0 INSPECTION OF EXCAVATIONS

Provide safe access and equipment for checking the dimensions and alignment of each shaft and for conducting any required inspections. Use a safe device with handrails meeting all applicable OSHA requirements and allowed by the Engineer to provide access for project inspectors at the top of casing at the center and any plan location in the shaft. Evaluate the dimensions and alignment of the shaft under the observation and direction of the Engineer. Cooperate with the Department in the use of any inspection device.

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# PRELIMINARY NOT FOR CONSTRCUTION

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Using a Shaft Inspection Device (SID) or Mini-SID, verify that the shaft bottom has been adequately cleaned. Perform SID inspection once the accepted bottom of drilled shaft excavation has been achieved and the bottom cleaning of the shaft has been performed. Use SID's with a high-resolution camera mounted in a watertight chamber and fitted with a depth gauge(s) to indicate the thickness of the debris on the shaft bottom. Mini-SID devices meeting the specified requirements of this section will be considered for acceptance by the Department. Have a horizontal gage(s) fitted to the SID in the event any fractures or crevices are observed at the base of the shaft excavation. Furnish all equipment necessary to conduct the SID inspection. Provide nitrogen gas or other means to pump the water out of the interior of the chamber such that the bottom of the shaft is visible. Do a minimum of nine (9) drops as follows: north, northwest, northeast, south, southwest, southeast, east, west, and center to measure sediment at the bottom of the shaft. Operate the SID camera and supporting equipment in such a manner as to obtain optimum clarity from the equipment acceptable to the Engineer. Use television cameras and lighting equipment capable of operating in submerged conditions encountered during the inspection. Record the observations for the shaft bottom on a DVD or flash drive in .mov, .avi or other acceptable electronic format allowed by the Engineer to become the property of the Department upon completion of the project. Store DVD's or flash drives in proper containers with dust tight closures. Label DVD's or flash drives as to shaft number, project number, contract number, and contractor name. Furnish DVD's or flash drives to the Engineer or upload the files to a site accessible by applicable Department personnel upon completion of the SID inspection.

Estimate sediment thickness at the bottom of the shaft in terms of percent of view with sediment thicknesses greater than ½ inch and percent of view with sediment thickness greater than 1½ inch at each location. If the average percent of view of sediment thickness greater than ½ inch between all nine locations is greater than 50%, or if the sediment thickness at any point is greater than 1½ inch, the SID test will be considered failed. Perform additional bottom cleaning of the failed shaft using air lift methods. After the Contractor has completed final cleaning, repeat the SID test. Use of weighted tapes to measure sediment at the bottom of the shafts will not be accepted by the Department. Report results of bottom inspection to the Engineer. Continue cleaning until the Engineer is satisfied that the shaft bottom is adequately cleaned and the excavation is accepted.

During the SID inspection, report any fractures or crevices observed at the bottom of the shaft. Report any fractures or crevices to the Department. The Department will evaluate if any vertical crevice stabilization will be required.

Upon evaluation of the test data, the KYTC Geotechnical Branch may inspect the drilled shaft rock socket with a downhole camera; provide assistance as required for personnel and equipment.

The cost of inspection equipment and time, including SID inspection and any downhole camera inspections of the sidewalls of the rock sockets conducted by the Department, is incidental to the price per foot of shaft. Sonar Calipering (SC), Crosshole Sonic Logging (CSL) and Thermal

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Livingston County Item No. 1-1142.0 US 60 over Cumberland River

Integrity Profiling (TIP), are separate pay items for production shafts as defined in the Special Note for Non-Destructive Testing of Drilled Shafts.

The Department will consider allowing the use of a Shaft Quantitative Inspection Device (SQUID) in lieu of a SID or Mini-SID. Include proposed acceptance criteria for bottom cleanliness comparable to those for the SID or Mini-SID with any proposal to use a SQUID. The referencing of this device in this special note does not constitute an endorsement and/or guarantee that the device will be permitted.

#### 12.0 CONSTRUCTION TOLERANCES

The following construction tolerances apply to drilled shafts:

- a) Provide drilled shafts within 6 inches of plan position in the horizontal plane at the top of the shaft in both the longitudinal and transverse directions.
- b) Provide a vertical alignment, over the <u>entire shaft length</u> (plan top of shaft elevation to tip elevation), within 2% (2H:100V) of true vertical in both the longitudinal and transverse directions.
- c) Provide a vertical alignment, as measured from the <u>plan top of shaft elevation to the top of rock socket</u>, within 2% (2H:100V) of true vertical in the both the longitudinal and transverse directions.
- d) Provide a vertical alignment, as measured from the top of rock socket to the shaft tip, within 2% (2H:100V) of true vertical in the both the longitudinal and transverse directions.
- e) The Department will evaluate each of the criteria above when reviewing the Preliminary SC Test Reports.
- d) Place any additional steel reinforcement or concrete needed in the footings or caps due to the misalignment of the shafts at no additional cost to the Department.
- e) Extend the vertical reinforcement a minimum value into the footing, as shown on the plans. Extend the horizontal or spiral reinforcement above the top of permanent casing into the footing as shown in the plans.
- f) Drilled shaft diameters are shown on the plans. The contractor may provide a thicker-walled casing than shown in the plans at no additional cost to the Department, but do not increase the inside diameter of the casing shown on the plans unless approved by the Engineer. For out-of-round tolerance of steel casings before and after installation, the departure of any point on the periphery of the casing from the true circle, the maximum tolerable departure of any point is 1 inch measured radially.
- g) Design excavation equipment and methods so that the completed shaft excavation will have a planar bottom. Maintain the cutting edges of excavation equipment normal to the vertical axis of the equipment within a tolerance of +/- 3/8 inch per foot of diameter.
- h) Maintain the tip elevation of the shaft within +/- 6 inches from final shaft tip elevation unless otherwise specified in the plans.

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The Engineer will use the results of surveying and Sonar Calipering to evaluate the construction tolerances; refer to the Special Note for Non-Destructive Testing of Drilled Shafts. The Engineer will allow the contractor to proceed based on the Sonar Calipering Field Report if it appears that the tolerances have been met. However, since there may not sufficient information and/or time to rigorously evaluate all of the criteria, the Department will also review the Preliminary Sonar Calipering Reports and for any deficiencies and discuss options such as modifying other shafts, modifying the footing, etc. with the Contractor.

Correct all unacceptable shaft excavations and complete shafts to the satisfaction of the Engineer. Furnish materials and work necessary to complete corrections for out of tolerance drilled shaft excavations without either additional cost to the Department or an extension of the contract time. Engineering analysis and redesign for out of tolerance drilled shaft excavations shall be conducted by an independent structural and/or geotechnical consultant hired by and at the expense of the Contractor. Use consultants who are prequalified by KYTC in applicable areas. Alternatively, the Engineer may require the Department's designer to perform the referenced evaluations and the Department may require the cost of these evaluations to be borne by the Contractor. Based on the design criteria established for the structure and the evaluation, the Engineer will assess the effects of the defects on the structural performance of the drilled shaft. If the results of the analyses indicate that there is conclusive evidence that the discontinuity will result in inadequate or unsafe performance under the design loads, as defined by the design criteria for the structure, the Engineer will reject the shaft.

The contractor is responsible for proposing, developing, and after acceptance by the Engineer, implementing corrective work when a shaft excavation is completed with unacceptable tolerances. Typical corrective work includes:

- a) Over-drilling the shaft excavation to a larger diameter and/or depth to permit accurate placement of the reinforcing steel cage with the required minimum concrete cover.
- b) Increasing the number and/or size of the steel reinforcement bars.
- c) Removing the cage and drilling out the green concrete and reforming the hole.

The acceptance of correction procedures is dependent on analysis of the effect of misalignment and improper positioning. Submit redesigned drawings and computations that are signed by a Professional Engineer licensed in Kentucky.

#### SPECIAL NOTE

#### Pending U.S. Army Corps of Engineers 404 Permit

The contractor should be aware that for this project a Clean Water Act 404 permit has been submitted to the U.S. Army Corps of Engineers (USACE) and approval is currently pending. No work shall occur in a Water of the United States (stream or wetland) until the USACE 404 permit has been approved and secured. It is anticipated the permit will be secured by the time of award.



#### SPECIAL NOTE

#### For Tree Removal

#### Livingston County US 60 Smithland Bridge Replacement Item No. 01-1142

NO CLEARING OF TREES 5 INCHES OR GREATER (DIAMETER BREAST HEIGHT) FROM JUNE 1 THROUGH JULY 31.

If there are any questions regarding this note, please contact Danny Peake, Director, Division of Environmental Analysis, 200 Mero Street, Frankfort, KY 40601, Phone: (502) 564-7250.



#### SPECIAL NOTE FOR CONCRETE SLURRY

If diamond grinding, grooving or any other process which produces slurry is required on roadways or bridges, the contractor shall ensure that all concrete slurry associated with these processes is collected, managed, and disposed of appropriately. The waste material shall be disposed of at a permitted disposal facility, in accordance with the Kentucky Standard Specifications for Road and Bridge Construction and the Environmental Performance Standards outlined in 401 KAR 47:030, or managed as a material for beneficial reuse. Any fines or remediation related to improper disposal shall be the sole responsibility of the contractor.

Disposal of concrete slurry will not be paid separately and shall be considered incidental to other bid items.



8/20/2019

#### SPECIAL NOTE FOR PIPELINE INSPECTION

- 1.0 DESCRIPTION. The Department will perform visual inspections on all pipe on the project. A video inspection will be required on projects having more than 250 linear feet of storm sewer and/or culvert pipe and on routes with an ADT of greater than 1,000 vehicles. Conduct video inspections on all pipe located under the roadway and 50 percent of the remaining pipe not under the roadway. Storm sewer runs and outfall pipes not under the roadway take precedence over rural entrance pipes. Contractors performing this item of work must be prequalified with the Department in the work type J51 (Video Pipe Inspection and Cleaning). Deflection testing shall be completed using a mandrel in accordance with the procedure outlined below or by physical measurement for pipes greater than 36inches in diameter. Mandrel testing for deflection must be completed prior to the video inspection testing. Unless otherwise noted, Section references herein are to the Department's Standard Specifications for Road and Bridge Construction, current edition.
- **2.0 VIDEO INSPECTION.** Ensure pipe is clear of water, debris or obstructions. Complete the video inspection and any necessary measurement prior to placing the final surface over any pipe. When paving will not be delayed, take measurements 30 days or more after the completion of earthwork to within 1 foot of the finished subgrade. Notify the Engineer a minimum of 24 hours in advance of inspection and notify the Engineer immediately if distresses or locations of improper installation are logged.

#### 2.1 INSPECTION FOR DEFECTS AND DISTRESSES

- **A)** Begin at the outlet end and proceed through to the inlet at a speed less than or equal to 30 ft/minute. Remove blockages that will prohibit a continuous operation.
- **B)** Document locations of all observed defects and distresses including but not limited to: cracking, spalling, slabbing, exposed reinforcing steel, sags, joint offsets, joint separations, deflections, improper joints/connections, blockages, leaks, rips, tears, buckling, deviation from line and grade, damaged coatings/paved inverts, and other anomalies not consistent with a properly installed pipe.
- C) During the video inspection provide a continuous 360 degree pan of every pipe joint.
- **D)** Identify and measure all cracks greater than 0.1" and joint separations greater than 0.5".
- **E)** Video Inspections are conducted from junction to junction which defines a pipe run. A junction is defined as a headwall, drop box inlet, curb box inlet, manhole, buried junction, or other structure that disturbs the continuity of the pipe. Multiple pipe inspections may be conducted from a single set up location, but each pipe run must be on a separate video file and all locations are to be referenced from nearest junction relative to that pipe run.
- F) Record and submit all data on the TC 64-765 and TC 64-766 forms.

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#### PRELIMINARY NOT FOR CONSTRCUTION

- **3.0 MANDREL TESTING.** Mandrel testing will be used for deflection testing. For use on Corrugated Metal Pipe, High Density Polyethylene Pipe, and Polyvinyl Chloride Pipe, use a mandrel device with an odd number of legs (9 minimum) having a length not less than the outside diameter of the mandrel. The diameter of the mandrel at any point shall not be less than the diameter specified in Section 3.6. Mandrels can be a fixed size or a variable size.
  - **3.1** Use a proving ring or other method recommended by the mandrel manufacturer to verify mandrel diameter prior to inspection. Provide verification documentation for each size mandrel to the Engineer.
  - **3.2** All deflection measurements are to be based off of the AASHTO Nominal Diameters. Refer to the chart in section 3.6.
  - 3.3 Begin by using a mandrel set to the 5.0% deflection limit. Place the mandrel in the inlet end of the pipe and pull through to the outlet end. If resistance is met prior to completing the entire run, record the maximum distance achieved from the inlet side, then remove the mandrel and continue the inspection from the outlet end of the pipe toward the inlet end. Record the maximum distance achieved from the outlet side.
  - 3.4 If no resistance is met at 5.0% then the inspection is complete. If resistance occurred at 5.0% then repeat 3.1 and 3.2 with the mandrel set to the 10.0% deflection limit. If the deflection of entire pipe run cannot be verified with the mandrel then immediately notify the Engineer.
  - 3.5 Care must be taken when using a mandrel in all pipe material types and lining/coating scenarios. Pipe damaged during the mandrel inspection will be video inspected to determine the extent of the damage. If the damaged pipe was video inspected prior to mandrel inspection then a new video inspection is warranted and supersedes the first video inspection. Immediately notify the Engineer of any damages incurred during the mandrel inspection and submit a revised video inspection report.
  - 3.6 AASHTO Nominal Diameters and Maximum Deflection Limits.

Base Pipe Diameter	AASHTO Nominal	Max. Deflection Limit				
1	Diameter	5.0%	10.0%			
(inches)	(inches)	(iı	nches)			
15	14.76	14.02	13.28			
18	17.72	16.83	15.95			
24	23.62	22.44	21.26			
30	29.53	28.05	26.58			
36	35.43	33.66	31.89			
42	41.34	39.27	37.21			
48	47.24	44.88	42.52			
54	53.15	50.49	47.84			
60	59.06	56.11	53.15			

- **4.0 PHYSICAL MEASUREMENT OF PIPE DEFLECTION.** Alternate method for deflection testing when there is available access or the pipe is greater than 36 inches in diameter, as per 4.1. Use a contact or non-contact distance instrument. A leveling device is recommended for establishing or verifying vertical and horizontal control.
  - **4.1** Physical measurements may be taken after installation and compared to the AASHTO Nominal Diameter of the pipe as per Section 3.6. When this method is used, determine the smallest interior diameter of the pipe as measured through the center point of the pipe (D2). All measurements are to be taken from the inside crest of the corrugation. Take the D2 measurements at the most deflected portion of the pipe run in question and at intervals no greater than ten (10) feet through the run. Calculate the deflection as follows:

% Deflection = [(AASHTO Nominal Diameter - D2) / AASHTO Nominal Diameter] x 100%

Note: The Engineer may require that preset monitoring points be established in the culvert prior to backfilling. For these points the pre-installation measured diameter (D1) is measured and recorded. Deflection may then be calculated from the following formula:

% Deflection = 
$$[(D1 - D2)/D1](100\%)$$

- **4.2** Record and submit all data.
- **5.0 DEDUCTION SCHEDULE.** All pipe deductions shall be handled in accordance with the tables shown below.

FLEXIBLE PIPE	DEFLECTION
Amount of Deflection (%)	Payment
0.0 to 5.0	100% of the Unit Bid Price
5.1 to 9.9	50% of the Unit Bid Price (1)
10 or greater	Remove and Replace (2)

(1) Provide Structural Analysis for HDPE and metal pipe. Based on the structural analysis, pipe may be allowed to remain in place at the reduced unit price. (2) The Department may allow the pipe to remain in place with no pay to the Contractor in instances where it is in the best interest to the public and where the structural analysis demonstrates that the pipe should function adequately.

RIGID PIPE REMEDIATION TABLE PIPE					
Crack Width (inches)	Payment				
≤ 0.1	100% of the Unit Bid Price				
Greater than 0.1	Remediate or Replace (1)				

(1) Provide the Department in writing a method for repairing the observed cracking. Do not begin work until the method has been approved.

**6.0 PAYMENT.** The Department will measure the quantity in linear feet of pipe to inspect. The Department will make payment for the completed and accepted quantities under the following:

<u>Code</u>	Pay Item	<u>Pay Unit</u>
24814EC	Pipeline Inspection	Linear Foot
10065NS	Pipe Deflection Deduction	Dollars



#### **Special Note for Bridge Demolition, Renovation and Asbestos Abatement**

If the project includes any bridge demolition or renovation, the successful bidder is required to notify Kentucky Division for Air Quality (KDAQ) via filing of form (DEP 7036) a minimum of 10 days prior to commencement of any bridge demolition or renovation work.

Any available information regarding possible asbestos containing materials (ACM) on or within bridges to be affected by the project has been included in the bid documents. These are to be included with the Contractor's notification filed with the KDAQ. If not included in the bid documents, the Department will provide that information to the successful bidder for inclusion in the KDAQ notice as soon as possible. If there are no documents stating otherwise, the bidders should assume there are no asbestos containing materials that will in any way affect the work.





Secretary Greg Thomas

#### Frankfort, Kentucky 40622 TRANSPORTATION CABINET COMMONWEALTH OF KENTUCKY

www.transportation.ky.gov/

Governor Matthew G. Bevin

#### Asbestos Inspection Report

To: Brad Whybark

District: 1

Date: December 5, 2019

Conducted By: O'Dail Lawson

Report Prepared By: O'Dail Lawson

#### Project and Structure Identification

Project Number: Livingston 01-1142

Structure ID: 070B00017N

Structure Location: US 60 over the Cumberland Rviver

Sample Description: Any suspect materials collected were negative for asbestos.

Inspection Date: November 20th, 2019

#### Results and Recommendations

No abatement is required at this time. The results of the samples collected were negative for the presence of asbestos above 1%.

abatement, demolition, or renovation of any building or structure in the Commonwealth. (DEP7036 Form) which is to be submitted to the Kentucky Division of Air Quality prior to It is recommended that this report accompany the 10-Day Notice of Intent for Demolition



Contract ID: 201015 Page 190 of 243

MRS, Inc. Analytical Laboratory Division

MRS, INC.

9950-566 (205) 395-5515

332 West Broadway / Suite # 902 Louisville, Kentucky - 40202 - 2133

#### BULK SAMPLE ASBESTOS ANALYSIS

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U.S Government. Partial Reproduction of any part of this report is strictly prohibited. Samples shall be retained for (30) days.

# Chain of Custody Record Kentucky Transportation Cabinet

200 Mero Street, 5th Floor West Frankfort, Kentucky 40622 (502) 564-7250 fax (502) 564-5655

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P.O Box 99603 Louisville, KY 40269 (502)640-2951

Certification Number: ETC-AIR-041619-00415

## O'Dail Lawson

has on 04-16-2019, attended and successfully completed the requirements and passed the examination with a score of 70% of better on the entitled course.

## **ASBESTOS INSPECTOR REFRESHER**

502

Training was in accordance with 40 CFR Part 763 (AHERA) approved by the Commonwealth of Kentucky, the Indiana Department of Environmental Management and Tennessee Department of Environment & Conservation The above student received requisite training for Asbestos Accreditation under Title II of the Toxic Substance Act (TSCA).

Conducted at: 1520 Alliant Ave., Louisville, KY

Expiration Date: 04-16-2020

Name - Instructor



TC 62-226 8ev. 01/2016 Page 1 of 1

### DIVISION OF RIGHT OF WAY & UTILITIES RENTUCKY TRANSPORTATION CABINET



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Contract ID: 201015 Page 195 of 243

#### UTILITIES AND RAIL CERTIFICATION NOTE

Livingston County STPBRO0601196 FD52 070 8684701U

Mile point: 12.524 TO 12.868

ADDRESS DEFICIENCIES OF BRIDGE ON US 60 OVER THE CUMBERLAND RIVER 0.27 MILE N OF KY 70 070B00017N.

ITEM NUMBER: 01-1142.00

#### **PROJECT NOTES ON UTILITIES**

Please call KY 811 before any underground activity takes place, and contact utilities that do not participate in KY 811. KYTC expects the contractor to make every effort to protect all utilities from damage.

#### NOTE: DO NOT DISTURB THE FOLLOWING FACILITIES LOCATED WITHIN THE PROJECT DISTURB LIMITS

Crittenden-Livingston Water District - Water

Windstream dba Kentucky Data Link (KDL) - Communication

City of Smithland - Sewer

City of Smithland - Water

\*The Contractor is fully responsible for protection of all utilities listed above\*

#### THE FOLLOWING FACILITY OWNERS ARE RELOCATING/ADJUSTING THEIR FACILITIES WITHIN THE PROJECT LIMITS AND WILL BE COMPLETE PRIOR TO CONSTRUCTION

Jackson Purchase Energy Corp - Electric, Completion date: 04/30/2020. Will all be on the north side of the bridge, and will be relocating their lines to the east side of existing US 60

LIVINGSTON COUNTY STP BRO 0601 (196)

#### PRELIMINARY NOT FOR CONSTRCUTION

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#### UTILITIES AND RAIL CERTIFICATION NOTE

Livingston County STPBRO0601196 FD52 070 8684701U

Mile point: 12.524 TO 12.868

ADDRESS DEFICIENCIES OF BRIDGE ON US 60 OVER THE CUMBERLAND RIVER 0.27 MILE N OF KY 70 070B00017N.

ITEM NUMBER: 01-1142.00

#### THE FOLLOWING FACILITY OWNERS HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE OWNER OR THEIR SUBCONTRACTOR AND IS TO BE COORDINATED WITH THE ROAD CONTRACT

Windstream dba Kentucky Data Link (KDL) – Communication, will have relocations that cannot begin until the new conduit under the new bridge is in place. Please coordinate phasing with their relocation.

#### THE FOLLOWING FACILITY OWNERS HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE ROAD CONTRACTOR AS INCLUDED IN THIS CONTRACT

Jackson Purchase Energy Corp – Electric, will have a 3" conduit installed in the barrier wall of the new bridge.

Windstream dba Kentucky Data Link (KDL) – Communication, Will have two (2) 4" conduits installed under the new bridge.

The City of Smithland will have Water and Sewer relocations included in the plans. (see plans)

Crittenden-Livingston Water District – Water will have a a 6" water line relocated under KY 2610 (see plans)

#### RAIL COMPANIES HAVE FACILITIES IN CONJUNCTION WITH THIS PROJECT AS NOTED

☑ No Rail Involvement ☐ Rail Involved ☐ Rail Adjacent

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#### **UTILITIES AND RAIL CERTIFICATION NOTE**

Livingston County STPBRO0601196 FD52 070 8684701U

Mile point: 12.524 TO 12.868

ADDRESS DEFICIENCIES OF BRIDGE ON US 60 OVER THE CUMBERLAND RIVER 0.27 MILE N OF KY 70

070B00017N.

ITEM NUMBER: 01-1142.00

#### **AREA FACILITY OWNER CONTACT LIST**

Facility Owner	Address	Contact Name	Phone Email
City of Smithland - Sewer	310 Wilson Avenue Smithland KY 42081	Chuck Black	2709284890 scww1@windstream.net
City of Smithland - Water	310 Wilson Avenue Smithland KY 42081	Chuck Black	2709284890 scww1@windstream.net
Crittenden- Livingston Water District - Water	620 East Main Street Salem KY 42078	Ronny Sladen	2709882680 ajdossett@tds.net
Jackson Purchase Energy Corp - Electric		Scott Ribble	2704427321 scott.ribble@JPEnergy.com
Windstream dba Kentucky Data Link (KDL) - Communication	3701 Communications Way Evansville IN 47715	Rick Cunico	8127606602 wci.maintenance.south@windstream.com

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#### PRELIMINARY NOT FOR CONSTRCUTION KyTC BMB Plan for Project CID 01 801

KyTC BMP Plan for Project CID 01 - 801



## Kentucky Transportation Cabinet Highway District 1

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1	<b>(2</b> )	), (	Cons	truction	
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## Kentucky Pollutant Discharge Elimination System Permit KYR10 Best Management Practices (BMP) plan

**Groundwater protection plan** 

**For Highway Construction Activities** 

For

Replace Bridge and Approaches on US 60 Over Cumberland River Livingston County, KY

**Project: PCN ##-###** 

KPDES BMP Plan Page 1 of 14

Contract ID: 201015

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KyTC BMP Plan for Project CID 01 - 801

#### **Project information**

Note -(1) = Design (2) = Construction (3) = Contractor

- 1. Owner Kentucky Transportation Cabinet, District 1
- 2. Resident Engineer: (2)
- 3. Contractor name: (2)

Address: (2)

Phone number: (2)

Contact: (2)

Contractors agent responsible for compliance with the KPDES permit requirements (3):

- 4. Project Control Number (2)
- 5. Route (Address) US 60, Smithland KY 42081
- 6. Latitude/Longitude (project mid-point) 37^08'55"N, 88^23'58"W
- 7. County (project mid-point) Livingston
- 8. Project start date (date work will begin): (2)
- 9. Projected completion date: (2)

#### Contract ID: 201015 Page 200 of 243

#### PRELIMINARY NOT FOR CONSTRCUTION

KyTC BMP Plan for Project CID 01 - 801

#### A. Site description:

- Nature of Construction Activity (from letting project description) Replace bridge and approaches on US 60 over the Cumberland River, including demolition of existing bridge
- 2. Order of major soil disturbing activities (2) and (3)
- 3. Projected volume of material to be moved 67,588 CY
- 4. Estimate of total project area (acres) 24.65 acres
- 5. Estimate of area to be disturbed (acres) 24.65 acres
- 6. Post construction runoff coefficient will be included in the project drainage folder. Persons needing information pertaining to the runoff coefficient will contact the resident engineer to request this information.
- 7. Data describing existing soil condition The geologic mapping indicates that alluvial soils consisting of sand, silt, sandy gravel, and cherty rubble are present at the site.
- 8. Data describing existing discharge water quality (if any) (1) & (2)
- 9. Receiving water name Cumberland River
- 10. TMDLs and Pollutants of Concern in Receiving Waters: (1 DEA)
- 11. Site map Project layout sheet plus the erosion control sheets in the project plans that depict Disturbed Drainage Areas (DDAs) and related information. These sheets depict the existing project conditions with areas delineated by DDA (drainage area bounded by watershed breaks and right of way limits), the storm water discharge locations (either as a point discharge or as overland flow) and the areas that drain to each discharge point. These plans define the limits of areas to be disturbed and the location of control measures. Controls will be either site specific as designated by the designer or will be annotated by the contractor and resident engineer before disturbance commences. The project layout sheet shows the surface waters and wetlands.
- 12. Potential sources of pollutants:

KyTC BMP Plan for Project CID 01 - 801

The primary source of pollutants is solids that are mobilized during storm events. Other sources of pollutants include oil/fuel/grease from servicing and operating construction equipment, concrete washout water, sanitary wastes and trash/debris. (3)

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#### **B. Sediment and Erosion Control Measures:**

1. Plans for highway construction projects will include erosion control sheets that depict Disturbed Drainage Areas (DDAs) and related information. These plan sheets will show the existing project conditions with areas delineated by DDA within the right of way limits, the discharge points and the areas that drain to each discharge point. Project managers and designers will analyze the DDAs and identify Best Management Practices (BMPs) that are site specific. The balance of the BMPs for the project will be listed in the bid documents for selection and use by the contractor on the project with approval by the resident engineer.

Projects that do not have DDAs annotated on the erosion control sheets will employ the same concepts for development and managing BMP plans.

- 2. Following award of the contract, the contractor and resident engineer will annotate the erosion control sheets showing location and type of BMPs for each of the DDAs that will be disturbed at the outset of the project. This annotation will be accompanied by an order of work that reflects the order or sequence of major soil moving activities. The remaining DDAs are to be designated as "Do Not Disturb" until the contractor and resident engineer prepare the plan for BMPs to be employed. The initial BMP's shall be for the first phase (generally Clearing and Grubbing) and shall be modified as needed as the project changes phases. The BMP Plan will be modified to reflect disturbance in additional DDA's as the work progresses. All DDA's will have adequate BMP's in place before being disturbed.
- 3. As DDAs are prepared for construction, the following will be addressed for the project as a whole or for each DDA as appropriate:
  - ➤ Construction Access This is the first land-disturbing activity. As soon as construction begins, bare areas will be stabilized with gravel and temporary mulch and/or vegetation.
  - > At the beginning of the project, all DDAs for the project will be inspected for areas that are a source of storm water pollutants.

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KyTC BMP Plan for Project CID 01 - 801

Areas that are a source of pollutants will receive appropriate cover or BMPs to arrest the introduction of pollutants into storm water. Areas that have not been opened by the contractor will be inspected periodically (once per month) to determine if there is a need to employ BMPs to keep pollutants from entering storm water.

- Clearing and Grubbing The following BMP's will be considered and used where appropriate.
  - Leaving areas undisturbed when possible.
  - Silt basins to provide silt volume for large areas.
  - Silt Traps Type A for small areas.
  - Silt Traps Type C in front of existing and drop inlets which are to be saved
  - Diversion ditches to catch sheet runoff and carry it to basins or traps or to divert it around areas to be disturbed.
  - Brush and/or other barriers to slow and/or divert runoff.
  - Silt fences to catch sheet runoff on short slopes. For longer slopes, multiple rows of silt fence may be considered.
  - Temporary Mulch for areas which are not feasible for the fore mentioned types of protections.
  - Non-standard or innovative methods.
- Cut & Fill and placement of drainage structures The BMP Plan will be modified to show additional BMP's such as:
  - Silt Traps Type B in ditches and/or drainways as they are completed
  - Silt Traps Type C in front of pipes after they are placed
  - Channel Lining
  - Erosion Control Blanket
  - Temporary mulch and/or seeding for areas where construction activities will be ceased for 21 days or more.
  - Non-standard or innovative methods
- Profile and X-Section in place The BMP Plan will be modified to show elimination of BMP's which had to be removed and the addition of new BMP's as the roadway was shaped. Probably changes include:
  - Silt Trap Type A, Brush and/or other barriers, Temporary Mulch, and any other BMP which had to be removed for final grading to take place.
  - Additional Silt Traps Type B and Type C to be placed as final drainage patterns are put in place.
  - Additional Channel Lining and/or Erosion Control Blanket.
  - Temporary Mulch for areas where Permanent Seeding and Protection cannot be done within 21 days.
  - Special BMP's such as Karst Policy

KPDES BMP Plan Page 5 of 14

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#### PRELIMINARY NOT FOR CONSTRCUTION

KyTC BMP Plan for Project CID 01 - 801

- Finish Work (Paving, Seeding, Protect, etc.) A final BMP Plan will result from modifications during this phase of construction. Probably changes include:
  - Removal of Silt Traps Type B from ditches and drainways if they are protected with other BMP's which are sufficient to control erosion, i.e. Erosion Control Blanket or Permanent Seeding and Protection on moderate grades.
  - Permanent Seeding and Protection
  - Placing Sod
  - Planting trees and/or shrubs where they are included in the project
- BMP's including Storm Water Management Devices such as velocity dissipation devices and Karst policy BMP's to be installed during construction to control the pollutants in storm water discharges that will occur after construction has been completed are: Channel Lining

#### **C. Other Control Measures**

- No solid materials, including building materials, shall be discharged to waters of the commonwealth, except as authorized by a Section 404 permit.
- 2. Waste Materials

All waste materials that may leach pollutants (paint and paint containers, caulk tubes, oil/grease containers, liquids of any kind, soluble materials, etc.) will be collected and stored in appropriate covered waste containers. Waste containers shall be removed from the project site on a sufficiently frequent basis as to not allow wastes to become a source of pollution. All personnel will be instructed regarding the correct procedure for waste disposal. Wastes will be disposed in accordance with appropriate regulations. Notices stating these practices will be posted in the office.

#### 3. Hazardous Waste

All hazardous waste materials will be managed and disposed of in the manner specified by local or state regulation. The contractor shall notify the Section Engineer if there any hazardous wastes being generated at the project site and how these wastes are being managed. Site personnel will be instructed with regard to proper storage and handling of hazardous wastes when required. The Transportation Cabinet will file for generator, registration when appropriate, with the Division of Waste Management and advise the contractor regarding waste management requirements.

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KyTC BMP Plan for Project CID 01 - 801

#### 4. Spill Prevention

The following material management practices will be used to reduce the risk of spills or other exposure of materials and substances to the weather and/or runoff.

#### Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project.

- An effort will be made to store only enough product required to do the iob
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure
- Products will be kept in their original containers with the original manufacturer's label
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of the product will be used up before disposing of the container
- Manufacturers' recommendations for proper use and disposal will be followed
- The site contractor will inspect daily to ensure proper use and disposal of materials onsite

#### > Hazardous Products:

These practices will be used to reduce the risks associated with any and all hazardous materials.

- Products will be kept in original containers unless they are not resealable
- Original labels and material safety data sheets (MSDS) will be reviewed and retained
- Contractor will follow procedures recommended by the manufacturer when handling hazardous materials
- If surplus product must be disposed of, manufacturers' or state/local recommended methods for proper disposal will be followed

The following product-specific practices will be followed onsite:

#### Petroleum Products:

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#### PRELIMINARY NOT FOR CONSTRCUTION

KyTC BMP Plan for Project CID 01 - 801

Vehicles and equipment that are fueled and maintained on site will be monitored for leaks, and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products onsite will be stored in tightly sealed containers, which are clearly labeled and will be protected from exposure to weather.

The contractor shall prepare an Oil Pollution Spill Prevention Control and Countermeasure plan when the project that involves the storage of petroleum products in 55 gallon or larger containers with a total combined storage capacity of 1,320 gallons. This is a requirement of 40 CFR 112.

This project (will / will not) (3) have over 1,320 gallons of petroleum products with a total capacity, sum of all containers 55 gallon capacity and larger.

#### > Fertilizers:

Fertilizers will be applied at rates prescribed by the contract, standard specifications or as directed by the resident engineer. Once applied, fertilizer will be covered with mulch or blankets or worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

#### > Paints:

All containers will be tightly sealed and stored indoors or under roof when not being used. Excess paint or paint wash water will not be discharged to the drainage or storm sewer system but will be properly disposed of according to manufacturers' instructions or state and local regulations.

#### Concrete Truck Washout:

Concrete truck mixers and chutes will not be washed on pavement, near storm drain inlets, or within 75 feet of any ditch, stream, wetland, lake, or sinkhole. Where possible, excess concrete and wash water will be discharged to areas prepared for pouring new concrete, flat areas to be paved that are away from ditches or drainage system features, or other locations that will not drain off site. Where this approach is not possible, a shallow earthen wash basin will be excavated away from ditches to receive the wash water

#### > Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

KyTC BMP Plan for Project CID 01 - 801

- Manufacturers' recommended methods for spill cleanup will be clearly posted. All personnel will be made aware of procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area. Equipment and materials will include as appropriate, brooms, dust pans, mops, rags, gloves, oil absorbents, sand, sawdust, and plastic and metal trash containers.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contract with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate state/local agency as required by KRS 224 and applicable federal law.
- The spill prevention plan will be adjusted as needed to prevent spills from reoccurring and improve spill response and cleanup.
- Spills of products will be cleaned up promptly. Wastes from spill clean up will be disposed in accordance with appropriate regulations.

#### D. Other State and Local Plans

This BMP plan shall include any requirements specified in sediment and erosion control plans, storm water management plans or permits that have been approved by other state or local officials. Upon submittal of the NOI, other requirements for surface water protection are incorporated by reference into and are enforceable under this permit (even if they are not specifically included in this BMP plan). This provision does not apply to master or comprehensive plans, non-enforceable guidelines or technical guidance documents that are not identified in a specific plan or permit issued for the construction site by state or local officials. (1)

#### E. Maintenance

- 1. The BMP plan shall include a clear description of the maintenance procedures necessary to keep the control measures in good and effective operating condition.
- Maintenance of BMPs during construction shall be a result of weekly and post rain event inspections with action being taken by the contractor to correct deficiencies.
- Post Construction maintenance will be a function of normal highway maintenance operations. Following final project acceptance by the cabinet, district highway crews will be responsible for identification and correction of deficiencies regarding ground cover and cleaning of storm water BMPs. The project manager shall identify any BMPs that will be for KPDES BMP Plan Page 9 of 14

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#### PRELIMINARY NOT FOR CONSTRCUTION

KyTC BMP Plan for Project CID 01 - 801

the purpose of post construction storm water management with specific guidance for any non-routine maintenance. (1)

#### F. Inspections

Inspection and maintenance practices that will be used to maintain erosion and sediment controls:

- All erosion prevention and sediment control measures will be inspected at least once each week and following any rain of one-half inch or more.
- ➤ Inspections will be conducted by individuals that have successfully completed the KEPSC-RI course as required by Section 213.02.02 of the Standard Specifications for Road and Bridge Construction, current edition.
- Inspection reports will be written, signed, dated, and kept on file.
- > Areas at final grade will be seeded and mulched within 14 days.
- Areas that are not at final grade where construction has ceased for a period of 21 days or longer and soil stock piles shall receive temporary mulch no later than 14 days from the last construction activity in that area.
- ➤ All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of being reported.
- ➤ Built-up sediment will be removed from behind the silt fence before it has reached halfway up the height of the fence.
- > Silt fences will be inspected for bypassing, overtopping, undercutting, depth of sediment, tears, and to ensure attachment to secure posts.
- > Sediment basins will be inspected for depth of sediment, and built-up sediment will be removed when it reaches 50 percent of the design capacity and at the end of the job.
- ➤ Diversion dikes and berms will be inspected and any breaches promptly repaired. Areas that are eroding or scouring will be repaired and re-seeded / mulched as needed.
- Temporary and permanent seeding and mulching will be inspected for bare spots, washouts, and healthy growth. Bare or eroded areas will be repaired as needed.
- All material storage and equipment servicing areas that involve the management of bulk liquids, fuels, and bulk solids will be inspected weekly for conditions that represent a release or possible release of pollutants to the environment.

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#### G. Non – Storm Water discharges

It is expected that non-storm water discharges may occur from the site during the construction period. Examples of non-storm water discharges include:

- Water from water line flushings.
- Water form cleaning concrete trucks and equipment.
- Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
- > Uncontaminated groundwater and rain water (from dewatering during excavation).

All non-storm water discharges will be directed to the sediment basin or to a filter fence enclosure in a flat vegetated infiltration area or be filtered via another approved commercial product.

#### H. Groundwater Protection Plan (3)

This plan serves as the groundwater protection plan as required by 401 KAR 5:037.

Contractors statement: (3)

The following activities, as enumerated by 401 KAR 5:037 Section 2 that require the preparation and implementation of a groundwater protection plan, will or may be may be conducted as part of this construction project:

2. (e) land treatment or land disposal of a pollutant;
2. (f) Storing,, or related handling of hazardous waste, solid waste of pecial waste,, in tanks, drums, or other containers, or in piles, (This does not not contained wastes managed in a container placed for collection and removal contained solid waste for disposal off site);
2. (g) Handling of materials in bulk quantities (equal or greater than 5s allons or 100 pounds net dry weight transported held in an individual container nat, if released to the environment, would be a pollutant;
2. (j) Storing or related handling of road oils, dust suppressants,, at a entral location;

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#### Contract ID: 201015 Page 209 of 243

#### PRELIMINARY NOT FOR CONSTRCUTION

KyTC BMP Plan for Project CID 01 - 801

2. (k) Application or related handling of road oils, dust suppressants of delicing materials, (does not include use of chloride-based delicing materials applied to roads or parking lots);
2. (m) Installation, construction, operation, or abandonment of wells, bore holes, or core holes, (this does not include bore holes for the purpose o explosive demolition);
Or, check the following only if there are no qualifying activities
There are no activities for this project as listed in 401 KAR 5:037 Section 2 that require the preparation and implementation of a groundwater protection plan
The contractor is responsible for the preparation of a plan that addresses the

- 401 KAR 5:037 Section 3. (3) Elements of site specific groundwater protection plan:
  - (a) General information about this project is covered in the Project information;
  - (b) Activities that require a groundwater protection plan have been identified above:
  - (c) Practices that will protect groundwater from pollution are addressed in section C. Other control measures.
  - (d) Implementation schedule all practices required to prevent pollution of groundwater are to be in place prior to conducting the activity;
  - (e) Training is required as a part of the ground water protection All employees of the contractor, sub-contractor and resident engineer personnel will be trained to understand the nature and requirements of this plan as they pertain to their job function(s). Training will be accomplished within one week of employment and annually thereafter. A record of training will be maintained by the contractor with a copy provide to the resident engineer.
  - (f) Areas of the project and groundwater plan activities will be inspected as part of the weekly sediment and erosion control inspections
  - (q) Certification (see signature page.)

LIVINGSTON COUNTY STP BRO 0601 (196)

#### PRELIMINARY NOT FOR CONSTRCUTION KyTC BMP Plan for Project CID 01 - 801

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Contractor and Resident Engineer Plan certification

The contractor that is responsible for implementing this BMP plan is identified in the Project Information section of this plan.

The following certification applies to all parties that are signatory to this BMP plan:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. Further, this plan complies with the requirements of 401 KAR 5:037. By this certification, the undersigned state that the individuals signing the plan have reviewed the terms of the plan and will implement its provisions as they pertain to ground water protection.

Resident Engineer and Contractor Certification:

(2) Resident Engineer signa	ture	
Signed Typed or printed n	titleame²	signature
(3) Signed	title	,
Typed or printed na	me <sup>1</sup>	signature

- 1. Contractors Note: to be signed by a person who is the owner, a responsible corporate officer, a general partner or the proprietor or a person designated to have the authority to sign reports by such a person in accordance with 401 KAR 5:060 Section 9. This delegation shall be in writing to: Manager, KPDES Branch, Division of Water, 14 Reilly Road, Frankfort Kentucky 40601. Reference the Project Control Number (PCN) and KPDES number when one has been issued.
- 2. KyTC note: to be signed by the Chief District Engineer or a person designated to have the authority to sign reports by such a person (usually the resident engineer) in accordance with 401 KAR 5:060 Section 9. This delegation shall be in writing to: Manager, KPDES Branch, Division of Water, 14 Reilly Road, Frankfort Kentucky 40601 Reference the Project Control Number (PCN) and KPDES number when one has been issued.

KPDES BMP Plan Page 13 of 14

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KyTC BMP Plan for Project CID 01 - 801

#### **Sub-Contractor Certification**

The following sub-contractor shall be made aware of the BMP plan and responsible for implementation of BMPs identified in this plan as follows:

Subconf	tractor
A	Name: Address: Address:
F	Phone:
The par	t of BMP plan this subcontractor is responsible to implement is:
Kentuck discharg discharg	under penalty of law that I understand the terms and conditions of the general ky Pollutant Discharge Elimination System permit that authorizes the storm water ges, the BMP plan that has been developed to manage the quality of water to be ged as a result of storm events associated with the construction site activity and ement of non-storm water pollutant sources identified as part of this certification.
Signed	
	Typed or printed name <sup>1</sup> signature
resp desi	Sub Contractor Note: to be signed by a person who is the owner, a ponsible corporate officer, a general partner or the proprietor or a person ignated to have the authority to sign reports by such a person in ordance with 401 KAR 5:060 Section 9. This delegation shall be in writing

KPDES BMP Plan Page 14 of 14

to: Manager, KPDES Branch, Division of Water, 14 Reilly Road, Frankfort Kentucky 40601. Reference the Project Control Number (PCN) and KPDES

number when one has been issued.

#### Contract ID: 201015 Page 212 of 243

#### SPECIAL NOTE

#### Filing of eNOI for KPDES Construction Stormwater Permit

County: Livingston Route: US 60

Item No.: 1-1142.00 KDOW Submittal ID:

Project Description: Construct new bridge on US 60 over Cumberland River

A Notice of Intent for obtaining coverage under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Stormwater Discharges Associated with Construction Activities (KYR10) has been drafted, copy of which is attached. Upon award, the Contractor will be identified in Section III of the form as the "Building Contractor" and it will be submitted for approval to the Kentucky Division of Water. The Contractor shall be responsible for advancing the work in a manner that is compliant with all applicable and appropriate KYTC specifications for sediment and erosion control as well as meeting the requirements of the KYR10 permit and the KDOW.

If there are any questions regarding this note, please contact Danny Peake, Director, Division of Environmental Analysis, TCOB, 200 Mero Street, Frankfort, KY 40622, Phone: (502) 564-7250.

1/27/2020

#### KENTUCKY POLLUTION DISCHARGE

#### **ELIMINATION SYSTEM (KPDES)**

Notice of Intent (NOI) for coverage of Storm Water Discharge Associated with Construction Activities Under the KPDES Storm Water General Permit KYR100000



eMaih Address.(*) kyle.post@ky.gov			Business Phone (*) 2708982431		orly etemetily ecsorsors	-		
Mailing Address:(*) US 60 - Livingston County	City (*) Smithland		700		State:(*)		<b>A</b>	(*) 170S4
Company Name:(V)		First Name (V) Kyle		ELM M	Last Name:(- Post	(,		
SECTION 1 - FACILITY OPERATOR INFORMATION	(BBTTTIME							
Stormwater discharges associated with construction activities that cumulatively equal one (1)  EXCLUSIONS:  1) Are conducted at or on properties that have obtains of a Best Management Practices (BMP) plan;  2) Any operation that the DOW determines an individed and a second second the conducted at or on properties that have obtains of a Best Management Practices (BMP) plan;  2) Any project that discharges to an impaired Water this construction at the conducted a	or more of distured lesses the permit: provided KPDI	rbance. ES permit for the dis	of other wastewai	ecz which requ	qoleveb edi zet	nolisinamaiqmi bna inam		
If change to existing permit coverage is requested, de	e sue cysudes po	Todincation Todincation	nos Guieo si aggie	- (A)pu6i				
Reason for Submittal:(°) Application for New Permit Coverage	Agency Interest ID: Agency Interest ID			·	er:(V) mil Number			
		)	Controls/KP[ Click here to obtain in Click here to obtain in	ick here for JES_Formk Mometon and a Mometon and a	copy of the KPDE uments/KYR10Pe may be required	ctions.htm)		

PRELIMINARY NOT FOR CONSTRCUTION Total Number of Acres in Project:(V) Total Number of Acres Disturbed:(V) a. For single projects provide the following information Replacement and Road Approach for Lucy Jefferson Lewis Memorial Bridge over Cumberland River on US 60 Project Description (\*) SECTION III -- SPECIFIC SITE ACTIVITY INFORMATION (?) 119841,76 PPP66E.88 (https://www.fcc.gov/media/radio/dms-decimal) Latitude(decimal degrees)(\*)DMS to DD Converter (\*)(seergeb lambeb)ebutignoJ Kentucky diz State (\*) (\*) qiZ Site Physical Address (\*) Кув Poat Company Name: (V) First Name:(V) (V):emsN izaJ :TM Smithland Bridge Replacement - SYP item#01-1142 State Government 1622 Bridge, Tunnel, and Elevate Project Name: (\*) SIC Code(\*) Status of OwnerlOperator(\*) SECTION II - GENERAL SITE LOCATION INFORMATION

Livingston

**Smithland** 

County:(\*)

CIP:(,)

09 SN

KALC

PRELIMINARY NOTE	A SA SA CON BOLL MONTH AND MAN STATE OF A SAME
Δ	ls a Clean Water Act 401 Water Quality Certification required?:(*)
<u> </u>	Is a Clean Water Act 40¢ permit required?:(*)
Constructing of Piers and abutments to Cross Cumberland River	If Yes, describe scope of activity: (V)
səд	Will the project require construction activities in a water body or the riparian zone?:(")
FENDS VAINARIN SONE?	SECTION VI - WILL THE PROJECT REQUIRE CONSTRUCTION ACTIVITIES IN A WAY
Discharge Point(s):{*}    Latitude   Longitude   +	Sate of application/notification to the MS4 for construction site permit coverage.  Date
Δ	
	:42M to embN
(a) REQUIRED (b)	SECTION V - IF THE PERMITTED SITE DISCHARGES TO A MS4 THE FOLLOWING II
LOWING INFORMATION IS REQUIRED (2)	Consider the permitted site discharges to A WATER BODY THE FOLLows IV IF THE PERMITTED SITE DISCHARGES TO A WATER BODY THE FOLLows IV IF THE PERMITTED SITE DISCHARGES TO A WATER BODY THE FOLLows IV.
	List Building Contractor(s) at the time of Application.(*)   Company Name   +
Anticipated Completion Date (V)	(A) pine vizio poinderiin
Disturbed Acres	Project Acres  Anticipated Start Date (V)
Number of acres intended to be disturbed at any one time (V)	(V) begoleveb ed of bebneini afol to egses as listo
Number of lots in development:(√) # lot(s)	fumber of individual lots in development, if applicable:(V) # lot(s)
Total Number of Acres Disturbed.(V) # Acre(s)	otal Number of Acres in Project.(V) # Acre(s)
	not common plans of development provide the following information
(V):alse Conpletion Date: (V) 9/1/2023	(V):əlaCl hakS bəlaqlolin/ 0202/t/3
S9*tZ	24.65

### Contract ID: 201015 61821.16627199-3196-9966-9966-9999-119978781=G1 S887=G1 word-leading states the second contract ID: 201015 PRELIMINARY NOT FOR CONSTRCUTION

				-{	OBB of fimdui	Click to S	Click to Save Values for Future Retrieval
Signature Date:(*) Oste		Alfemate Phone:	·		Business Phone (*)		eMeil Address (*) kyle post@ky gov
(*).emeV lzeJ			W			First Name.(*) Ayle	
					(°) Jeo9 elyk		
I certify under pensity of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting take information, including the possibility of tine and impresonment for knowing violations.							
SECTION IX – CERTIFICATION							
	eiñ bsolqU inolismoînt Istnemelqqui						:noi/smmo/n/ Is/neme/qqu2
aiñ bsolqU					Facility Location Map.(*)		
SECTION VIII – ATTACHMENTS							
	dq ətsmətlA ESOrSOTS	8usiness Phone (*) 2708982431			Mali Address.(*) voopsr@ky.gov		
42003	A	State:(*)			City:(*)		(*) seesbAgnilieM SeOA msb YX F022
KALC Combany Name:(*)				1000		(*):emaN Jariq noset	
SECTION VII – NOI PREPARER INFORMATION						LION	SECTION VII - NO! PREPARER INFORMAL

LIVINGSTON COUNTY STP BRO 0601 (196)

#### GUARDRAM DELIVERY VERHIGATION SHEET

Contract ID: 201015 Page 216 of 243

Contract Id:		Contractor:				
Section Engineer:		_ District & County:				
<u>DESCRIPTION</u>	<u>UNIT</u>	QTY LEAVING PROJECT	QTY RECEIVED@BB YARD			
GUARDRAIL (Includes End treatments & crash cushions)	LF					
STEEL POSTS	EACH	<del></del>				
STEEL BLOCKS	EACH		<del></del>			
WOOD OFFSET BLOCKS	EACH					
BACK UP PLATES	EACH					
CRASH CUSHION	EACH					
NUTS, BOLTS, WASHERS	BAG/BCKT					
DAMAGED RAIL TO MAINT. FACILI	TY LF					
DAMAGED POSTS TO MAINT. FACI	LITY EACH					
* <b>Required Signatures before</b> Printed Section Engineer's Ro		ect Site	& Date			
Signature Section Engineer's	Representativ	e	_& Date			
Printed Contractor's Represe	entative		& Date			
Signature Contractor's Repre	esentative	/	_& Date			
*Required Signatures after A	<u>Arrival at Baile</u>	y Bridge Yard (All material (	on truck must be counted & the			
quantity received column co	mpleted befor	<u>re signatures)</u>				
Printed Bailey Bridge Yard Re	epresentative_		& Date			
Signature Bailey Bridge Yard	Representativ	e	_& Date			
Printed Contractor's Represe	entative		& Date			
Signature Contractor's Repre	esentative		_& Date			
	ent will not be	made for guardrail removal	uantities shown in the Bailey Bridge until the guardrail verification sheets e Yard Representative.			

Completed Form Submitted to Section Engineer

Date: \_\_\_\_\_\_ By: \_\_\_\_\_

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# PART II SPECIFICATIONS AND STANDARD DRAWINGS



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## SPECIAL NOTE FOR PORTABLE CHANGEABLE MESSAGE SIGNS

This Special Note will apply when indicated on the plans or in the proposal.

**1.0 DESCRIPTION.** Furnish, install, operate, and maintain variable message signs at the locations shown on the plans or designated by the Engineer. Remove and retain possession of variable message signs when they are no longer needed on the project.

### 2.0 MATERIALS.

**2.1 General.** Use LED Variable Message Signs Class I, II, or III, as appropriate, from the Department's List of Approved Materials.

Unclassified signs may be submitted for approval by the Engineer. The Engineer may require a daytime and nighttime demonstration. The Engineer will make a final decision within 30 days after all required information is received.

### 2.2 Sign and Controls. All signs must:

- 1) Provide 3-line messages with each line being 8 characters long and at least 18 inches tall. Each character comprises 35 pixels.
- Provide at least 40 preprogrammed messages available for use at any time.
   Provide for quick and easy change of the displayed message; editing of the message; and additions of new messages.
- 3) Provide a controller consisting of:
  - a) Keyboard or keypad.
  - b) Readout that mimics the actual sign display. (When LCD or LCD type readout is used, include backlighting and heating or otherwise arrange for viewing in cold temperatures.)
  - Non-volatile memory or suitable memory with battery backup for storing pre-programmed messages.
  - d) Logic circuitry to control the sequence of messages and flash rate.
- 4) Provide a serial interface that is capable of supporting complete remote control ability through land line and cellular telephone operation. Include communication software capable of immediately updating the message, providing complete sign status, and allowing message library queries and updates.
- 5) Allow a single person easily to raise the sign to a satisfactory height above the pavement during use, and lower the sign during travel.
- Be Highway Orange on all exterior surfaces of the trailer, supports, and controller cabinet.
- 7) Provide operation in ambient temperatures from -30 to + 120 degrees Fahrenheit during snow, rain and other inclement weather.
- Provide the driver board as part of a module. All modules are interchangeable, and have plug and socket arrangements for disconnection and reconnection. Printed circuit boards associated with driver boards have a conformable coating to protect against moisture.
- 9) Provide a sign case sealed against rain, snow, dust, insects, etc. The lens is UV stabilized clear plastic (polycarbonate, acrylic, or other approved material) angled to prevent glare.
- 10) Provide a flat black UV protected coating on the sign hardware, character PCB, and appropriate lens areas.
- 11) Provide a photocell control to provide automatic dimming.

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- 12) Allow an on-off flashing sequence at an adjustable rate.
- 13) Provide a sight to aim the message.
- 14) Provide a LED display color of approximately 590 nm amber.
- 15) Provide a controller that is password protected.
- 16) Provide a security device that prevents unauthorized individuals from accessing the controller.
- 17) Provide the following 3-line messages preprogrammed and available for use when the sign unit begins operation:

 $/KEEP/RIGHT/\Rightarrow\Rightarrow\Rightarrow/$ /MIN/SPEED/\*\*MPH/ /ICY/BRIDGE/AHEAD/ /ONE /KEEP/LEFT/< LANE/BRIDGE/AHEAD/ /LOOSE/GRAVEL/AHEAD/ /ROUGH/ROAD/AHEAD/ /RD WORK/NEXT/\*\*MILES/ /TWO WAY/TRAFFIC/AHEAD/ /MERGING/TRAFFIC/AHEAD/ /NEXT/\*\*\*/MILES/ /PAINT/CREW/AHEAD/ /HEAVY/TRAFFIC/AHEAD/ /REDUCE/SPEED/\*\*MPH/ /SPEED/LIMIT/\*\*MPH/ /BRIDGE/WORK/\*\*\*0 FT/ /BUMP/AHEAD/ /MAX/SPEED/\*\*MPH/ /TWO/WAY/TRAFFIC/ /SURVEY/PARTY/AHEAD/

\*Insert numerals as directed by the Engineer.

Add other messages during the project when required by the Engineer.

### 2.3 Power.

- Design solar panels to yield 10 percent or greater additional charge than sign consumption. Provide direct wiring for operation of the sign or arrow board from an external power source to provide energy backup for 21 days without sunlight and an on-board system charger with the ability to recharge completely discharged batteries in 24 hours.
- **3.0 CONSTRUCTION.** Furnish and operate the variable message signs as designated on the plans or by the Engineer. Ensure the bottom of the message panel is a minimum of 7 feet above the roadway in urban areas and 5 feet above in rural areas when operating. Use Class I, II, or III signs on roads with a speed limit less than 55 mph. Use Class I or II signs on roads with speed limits 55 mph or greater.

Maintain the sign in proper working order, including repair of any damage done by others, until completion of the project. When the sign becomes inoperative, immediately repair or replace the sign. Repetitive problems with the same unit will be cause for rejection and replacement.

Use only project related messages and messages directed by the Engineer, unnecessary messages lessen the impact of the sign. Ensure the message is displayed in either one or 2 phases with each phase having no more than 3 lines of text. When no message is needed, but it is necessary to know if the sign is operable, flash only a pixel.

When the sign is not needed, move it outside the clear zone or where the Engineer directs. Variable Message Signs are the property of the Contractor and shall be removed from the project when no longer needed. The Department will not assume ownership of these signs.

**4.0 MEASUREMENT.** The final quantity of Variable Message Sign will be

the actual number of individual signs acceptably furnished and operated during the project. The Department will not measure signs replaced due to damage or rejection.

**5.0 PAYMENT.** The Department will pay for the Variable Message Signs at the unit price each. The Department will not pay for signs replaced due to damage or rejection. Payment is full compensation for furnishing all materials, labor, equipment, and service necessary to, operate, move, repair, and maintain or replace the variable message signs. The Department will make payment for the completed and accepted quantities under the following:

Code 02671 Portable Changeable Message Sign Each

Effective June 15, 2012

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### SPECIAL NOTE FOR BARCODE LABEL ON PERMANENT SIGNS

- **1.0 DESCRIPTION.** Install barcode label on sheeting signs. Section references herein are to the Department's Standard Specifications for Road and Bridge Construction, current edition.
- **2.0 MATERIALS.** The Department will provide the Contractor with a 2 inch x 1 inch foil barcode label for each permanent sheeting sign. A unique number will be assigned to each barcode label.

The Contractor shall contact the Operations and Pavement Management Branch in the Division of Maintenance at (502) 564-4556 to obtain the barcode labels.

**3.0 CONSTRUCTION.** Apply foil barcode label in the lower right quadrant of the sign back. Signs where the bottom edge is not parallel to the ground, the lowest corner of the sign shall serve as the location to place the barcode label. The barcode label shall be placed no less than one-inch and no more than three inches from any edge of the sign. The barcode must be placed so that the sign post does not cover the barcode label.

Barcodes shall be applied in an indoor setting with a minimum air temperature of 50°F or higher. Prior to application of the barcode label, the back of the sign must be clean and free of dust, oil, etc. If the sign is not clean, an alcohol swab shall be used to clean the area. The area must be allowed to dry prior to placement of the barcode label.

Data for each sign shall include the barcode number, MUTCD reference number, sheeting manufacturer, sheeting type, manufacture date, color of primary reflective surface, installation date, latitude and longitude using the North American Datum of 1983 (NAD83) or the State Plane Coordinates using an x and y ordinate of the installed location.

Data should be provided electronically on the TC 71-229 Sign Details Information and TC 71-230 Sign Assembly Information forms. The Contractor may choose to present the data in a different format provided that the information submitted to the Department is equivalent to the information required on the Department TC forms. The forms must be submitted in electronic format regardless of which type of form is used. The Department will not accept PDF or handwritten forms. These completed forms must be submitted to the Department prior to final inspection of the signs. The Department will not issue formal acceptance for the project until the TC 71-229 and TC-230 electronic forms are completed for all signs and sign assemblies on the project.

**4.0 MEASUREMENT.** The Department will measure all work required for the installation of the barcode label and all work associated with completion and submission of the sign inventory data (TC 71-229 and TC 71-230).

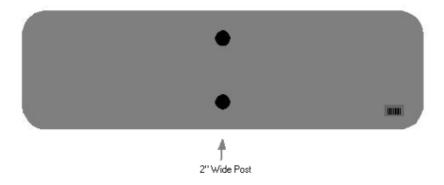
The installation of the permanent sign will be measured in accordance to Section 715.

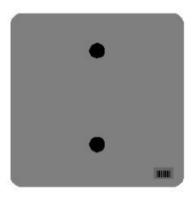
**5.0 PAYMENT.** The Department will make payment for the completed and accepted quantities under the following:

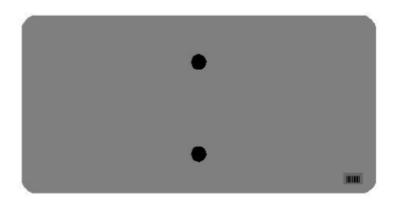
CodePay ItemPay Unit24631ECBarcode Sign InventoryEach

The Department will not make payment for this item until all barcodes are installed and sign inventory is complete on every permanent sign installed on the project. The Department will make payment for installation of the permanent sign in accordance to Section 715. The Department will consider payment as full compensation for all work required under this special note.

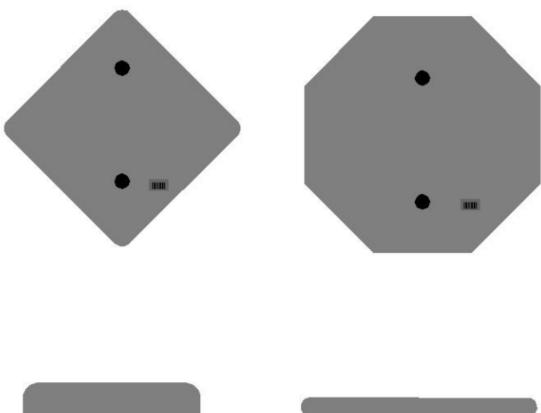
One Sign Post

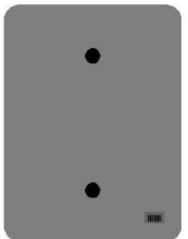


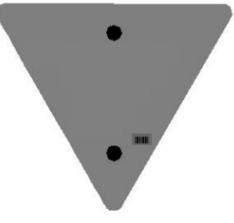




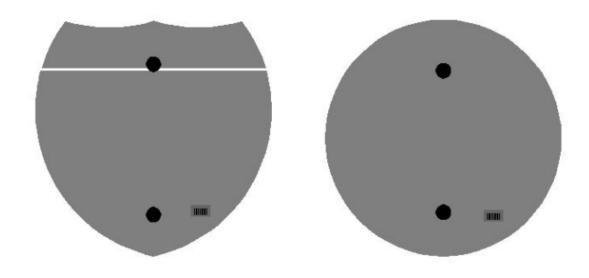
One Sign Post

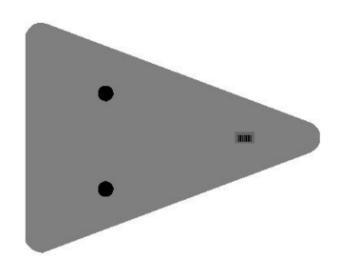




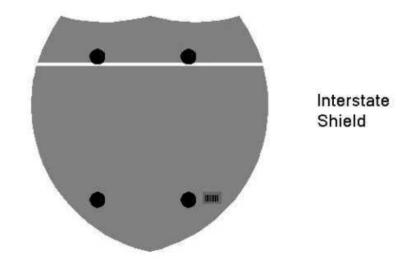


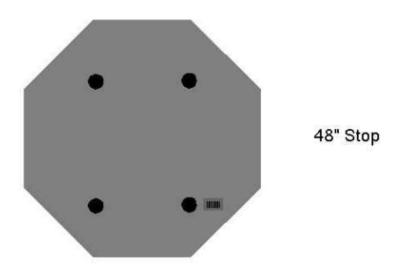
One Sign Post





# Double Sign Post

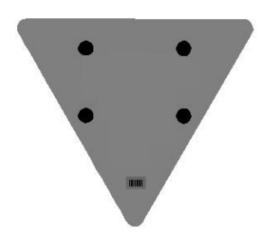




# 2 Post Signs







11N

### SPECIAL NOTE FOR LONGITUDINAL PAVEMENT JOINT ADHESIVE

- 1. DESCRIPTION. This specification covers the requirements and practices for applying an asphalt adhesive material to the longitudinal joint of the surface course of an asphalt pavement. Apply the adhesive to the face of longitudinal joint between driving lanes for the first lane paved. Then, place and compact the adjacent lane against the treated face to produce a strong, durable, waterproof longitudinal joint.
- 2. MATERIALS, EQUIPMENT, AND PERSONNEL.
  - 2.1 Joint Adhesive. Provide material conforming to Subsection 2.1.1.
  - 2.1.1 Provide an adhesive conforming to the following requirements:

Property	Specification	Test Procedure
Viscosity, 400 ° F (Pa·s)	4.0 – 10.0	ASTM D 4402
Cone Penetration, 77 ° F	60 – 100	ASTM D 5329
Flow, 140 ° F (mm)	5.0 max.	ASTM D 5329
Resilience, 77 ° F (%)	30 min.	ASTM D 5329
Ductility, 77 ° F (cm)	30.0 min.	ASTM D 113
Ductility, 39 ° F (cm)	30.0 min.	ASTM D 113
Tensile Adhesion, 77 ° F (%)	500 min.	ASTM D 5329, Type II
Softening Point, ° F	171 min.	AASHTO T 53
Asphalt Compatibility	Pass	ASTM D 5329

Ensure the temperature of the pavement joint adhesive is between 380 and 410 °F when the material is extruded in a 0.125-inch-thick band over the entire face of the longitudinal joint.

- 2.2. Equipment.
- 2.2.1 Melter Kettle. Provide an oil-jacketed, double-boiler, melter kettle equipped with any needed agitation and recirculating systems.
- 2.2.2 Applicator System. Provide a pressure-feed-wand applicator system with an applicator shoe attached.
- 2.3 Personnel. Ensure a technical representative from the manufacturer of the pavement joint adhesive is present during the initial construction activities and available upon the request of the Engineer.

### 3. CONSTRUCTION.

3.1 Surface Preparation. Prior to the application of the pavement joint adhesive, ensure the face of the longitudinal joint is thoroughly dry and free from dust or any other debris that would inhibit adhesion. Clean the joint face by the use of compressed air.

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Ensure this preparation process occurs shortly before application to prevent the return of debris on the joint face.

- 3.2 Pavement Joint Adhesive Application. Ensure the ambient temperature is a minimum of 40 °F during the application of the pavement joint adhesive. Prior to applying the adhesive, demonstrate competence in applying the adhesive according to this note to the satisfaction of the Engineer. Heat the adhesive in the melter kettle to the specified temperature range. Pump the adhesive from the melter kettle through the wand onto the vertical face of the cold joint. Apply the adhesive in a continuous band over the entire face of the longitudinal joint. Do not use excessive material in either thickness or location. Ensure the edge of the extruded adhesive material is flush with the surface of the pavement. Then, place and compact the adjacent lane against the joint face. Remove any excessive material extruded from the joint after compaction (a small line of material may remain).
- 3.3 Pavement Joint Adhesive Certification. Furnish the joint adhesive's certification to the Engineer stating the material conforms to all requirements herein prior to use.
- 3.4 Sampling and Testing. The Department will require a random sample of pavement joint adhesive from each manufacturer's lot of material. Extrude two 5 lb. samples of the heated material and forward the sample to the Division of Materials for testing. Reynolds oven bags, turkey size, placed inside small cardboard boxes or cement cylinder molds have been found suitable. Ensure the product temperature is 400°F or below at the time of sampling.
- 4. MEASUREMENT. The Department will measure the quantity of Pavement Joint Adhesive in linear feet. The Department will not measure for payment any extra materials, labor, methods, equipment, or construction techniques used to satisfy the requirements of this note. The Department will not measure for payment any trial applications of Pavement Joint Adhesive, the cleaning of the joint face, or furnishing and placing the adhesive. The Department will consider all such items incidental to the Pavement Joint Adhesive.
- 5. PAYMENT. The Department will pay for the Pavement Joint Adhesive at the Contract unit bid price and apply an adjustment for each manufacturer's lot of material based on the degree of compliance as defined in the following schedule. When a sample fails on two or more tests, the Department may add the deductions, but the total deduction will not exceed 100 percent.

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Pavement Joint	Adhesive l	Price Ad	justment	Schedul	e							
Test	Specification	100% Pay	90% Pay	80% Pay	50% Pay	0% Pay						
Joint Adhesive Referenced in Subsection 2.1.1												
Viscosity, 400 ° F (Pa•s)			3.0-3.4	2.5-2.9	2.0-2.4	≤1.9						
ASTM D 3236	4.0-10.0	3.5-10.5	10.6-11.0	11.1-11.5	11.6-12.0	≥ 12.1						
Cone Penetration, 77 ° F			54-56	51-53	48-50	≤ 47						
ASTM D 5329	60-100	57-103	104-106	107-109	110-112	≥ 113						
Flow, 140 ° F (mm) ASTM D 5329	≤ 5.0	≤ 5.5	5.6-6.0	6.1-6.5	6.6-7.0	≥ 7.1						
Resilience, 77 ° F (%) ASTM D 5329	≥ 30	≥ 28	26-27	24-25	22-23	≤ 21						
Tensile Adhesion, 77 ° F (%) ASTM D 5329	≥ 500	≥ 490	480-489	470-479	460-469	≤ 459						
Softening Point, ° F AASHTO T 53	≥ 171	≥ 169	166-168	163-165	160-162	≤ 159						
Ductility, 77 ° F (cm) ASTM D 113	≥ 30.0	≥ 29.0	28.0-28.9	27.0-27.9	26.0-26.9	≤ 25.9						
Ductility, 39 ° F (cm) ASTM D 113	≥ 30.0	≥ 29.0	28.0-28.9	27.0-27.9	26.0-26.9	≤ 25.9						

<u>Code</u> 20071EC

Pay Item Joint Adhesive Pay Unit Linear Foot

May 7, 2014

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### SPECIAL PROVISION FOR EMBANKMENT AT BRIDGE END BENT STRUCTURES

This Special Provision will apply when indicated on the plans or in the proposal. Section references herein are to the Department's Standard Specifications for Road and Bridge Construction, Current Edition.

**1.0 DESCRIPTION.** Construct a soil, granular, or rock embankment with soil, granular or cohesive pile core and place structure granular backfill, as the Plans require. Construct the embankment according to the requirements of this Special Provision, the Plans, Standard Drawing RGX 100 and 105, and the Standard Specifications, Current Edition.

### 2.0 MATERIALS.

- **2.1 Granular Embankment.** Conform to Subsection 805.10. When Granular Embankment materials are erodible or unstable according to Subsection 805.03.04, use the Special Construction Methods found in 3.2 of the Special Provision.
- **2.2 Rock Embankment.** Provide durable rock from roadway excavation that consists principally of Unweathered Limestone, Durable Shale (SDI equal to or greater than 95 according to KM 64-513), or Durable Sandstone.
- **2.3 Pile Core.** Provide a pile core in the area of the embankments where deep foundations are to be installed unless otherwise specified. The Pile Core is the zone indicated on Standard Drawings RGX 100 and 105 designated as Pile Core. Material control of the pile core area during embankment construction is always required. Proper Pile Core construction is required for installation of foundation elements such as drilled or driven piles or drilled shafts. The type of material used to construct the pile core is as directed in the plans or below. Typically, the pile core area will be constructed from the same material used to construct the surrounding embankment. Pile Core can be classified as one of three types:
- A) Pile Core Conform to Section 206 of the Standard Specifications. Provide pile core material consisting of the same material as the adjacent embankment except the material in the pile core area shall be free of boulders or particle sizes larger than 4 inches in any dimension or any other obstructions that may hinder pile driving operations. If the pile core material hinders pile driving operations, take the appropriate means necessary to reach the required pile tip elevation, at no expense to the Department.
- **B) Granular Pile Core.** Granular pile core is required only when specified in the plans. Select a gradation of durable rock to facilitate pile driving that conforms to Subsection 805.11. If granular pile core material hinders pile driving operations, take appropriate means necessary to reach the required pile tip elevation, at no expense to the Department.
- C) Cohesive Pile Core. Cohesive Pile Core is required only when specified in the plans. Conform to Section 206 of the Standard Specifications and use soil with at least 50 percent passing a No. 4 sieve having a minimum Plasticity Index (PI) of 10. In addition, keep the cohesive pile core free of boulders, larger than 4 inches in any dimension, or any other obstructions, which would interfere with drilling operations. If cohesive pile core material interferes with drilling operations, take appropriate means necessary to maintain

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excavation stability, at no expense to the Department.

- 2.4 Structure Granular Backfill. Conform to Subsection 805.11
- **2.5 Geotextile Fabric.** Conform to Type I or Type IV in Section 214 and 843.

### 3.0 CONSTRUCTION.

**3.1 General.** Construct roadway embankments at end bents according to Section 206 and in accordance with the Special Provision, the Plans, and Standard Drawings for the full embankment section. In some instances, granular or rock embankment will be required for embankment construction for stability purposes, but this special provision does not prevent the use of soil when appropriate. Refer to the plans for specific details regarding material requirements for embankment construction.

Place and compact the pile core and structure granular backfill according to the applicable density requirements for the project. If the embankment and pile core are dissimilar materials (i.e., a granular pile core is used with a soil embankment or a cohesive pile core is used with a granular embankment), a Geotextile Fabric, Type IV, will be required between the pile core and embankment in accordance with Sections 214 and 843 of the Standard Specifications.

When granular or rock embankment is required for embankment construction, conform to the general requirements of Subsection 206.03.02 B. In addition, place the material in no greater than 2-foot loose lifts and compact with a vibrating smooth wheel roller capable of producing a minimum centrifugal force of 15 tons. Apply these requirements to the full width of the embankment for a distance of half the embankment height or 50 feet, whichever is greater, as shown on Standard Drawing RGX-105.

When using granular pile core, install 8-inch perforated underdrain pipe at or near the elevation of the original ground in the approximate locations depicted on the standard drawing, and as the Engineer directs, to ensure positive drainage of the embankment. Wrap the perforated pipe with a fabric of a type recommended by the pipe manufacturer.

After constructing the embankment, excavate for the end bent cap, drive piling, install shafts or other foundation elements, place the mortar bed, construct the end bent, and complete the embankment to finish grade according to the construction sequence shown on the Plans or Standard Drawings and as specified hereinafter.

Certain projects may require widening of existing embankments and the removal of substructures. Construct embankment according to the plans. Substructure removal shall be completed according to the plans and Section 203. Excavation may be required at the existing embankment in order to place the structure granular backfill as shown in the Standard Drawings.

After piles are driven or shafts installed (see design drawings), slope the bottom of the excavation towards the ends of the trench as noted on the plans for drainage. Using a separate pour, place concrete mortar, or any class concrete, to provide a base for forming and placing the cap. Place side forms for the end bent after the mortar has set sufficiently to support workmen and forms without being disturbed.

Install 4-inch perforated pipe in accordance with the plans and Standard Drawings. In the event slope protection extends above the elevation of the perforated pipe, extend the pipe through the slope protection.

After placing the end bent cap and achieving required concrete cylinder strengths, remove adjacent forms and fill the excavation with compacted structure granular backfill material (maximum 1' loose lifts) to the level of the berm prior to placing beams for the bridge. Place Type IV geotextile fabric between embankment material and structure granular backfill. After completing the end bent backwall, or after completing the span end

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wall, place the compacted structure granular backfill (maximum 1' loose lifts) to subgrade elevation. If the original excavation is enlarged, fill the entire volume with compacted structure granular backfill (maximum 1' loose lifts) at no expense to the Department. Do not place backfill before removing adjacent form work. Place structure granular backfill material in trench ditches at the ends of the excavation. Place Geotextile Fabric, Type IV over the surface of the compacted structure granular backfill prior to placing aggregate base course.

Tamp the backfill with hand tampers, pneumatic tampers, or other means approved by the Engineer. Thoroughly compact the backfill under the overhanging portions of the structure to ensure that the backfill is in intimate contact with the sides of the structure.

Do not apply seeding, sodding, or other vegetation to the exposed granular embankment.

**3.2** Special Construction Methods. Erodible or unstable materials may erode even when protected by riprap or channel lining; use the special construction method described below when using these materials.

Use fine aggregates or friable sandstone granular embankment at "dry land" structures only. Do not use them at stream crossings or locations subject to flood waters.

For erodible or unstable materials having 50 percent or more passing the No. 4 sieve, protect with geotextile fabric. Extend the fabric from the original ground to the top of slope over the entire area of the embankment slopes on each side of, and in front of, the end bent. Cover the fabric with at least 12 inches of non-erodible material.

For erodible or unstable materials having less than 50 percent passing a No. 4 sieve, cover with at least 12 inches of non-erodible material.

Where erodible or unstable granular embankment will be protected by riprap or channel lining, place Type IV geotextile fabric between the embankment and the specified slope protection.

### 4.0 MEASUREMENT.

**4.1 Granular Embankment**. The Department will measure the quantity in cubic yards using the plan quantity, increased or decreased by authorized adjustments as specified in Section 204. The Department will not measure for payment any Granular Embankment that is not called for in the plans.

The Department will not measure for payment any special construction caused by using erodible or unstable materials and will consider it incidental to the Granular Embankment regardless of whether the erodible or unstable material was specified or permitted.

- **4.2 Rock Embankment.** The Department will not measure for payment any rock embankment and will consider it incidental to roadway excavation or embankment in place, as applicable. Rock embankments will be constructed using granular embankment on projects where there is no available rock present within the excavation limits of the project.
- **4.3 Pile Core.** Pile core will be measured and paid under roadway excavation or embankment in place, as applicable. The Department will not measure the pile core for separate payment. The Department will not measure for payment the 8-inch perforated underdrain pipe and will consider it incidental to the Pile Core.
- **4.4 Structure Granular Backfill.** The Department will measure the quantity in cubic yards using the plan quantity, increased or decreased by authorized adjustments as specified in Section 204. The Department will not measure any additional material required for backfill outside the limits shown on the Plans and Standard Drawings for payment and will

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consider it incidental to the work.

The Department will not measure for payment the 4-inch perforated underdrain pipe and will consider it incidental to the Structure Granular Backfill.

**4.5 Geotextile Fabric.** The Department will not measure the quantity of fabric used for separating dissimilar materials when constructing the embankment and pile core and will consider it incidental to embankment construction.

The Department will not measure for payment the Geotextile Fabric used to separate the Structure Granular Backfill from the embankment and aggregate base course and will consider it incidental to Structure Granular Backfill.

The Department will not measure for payment the Geotextile Fabric required for construction with erodible or unstable materials and will consider it incidental to embankment construction.

- **4.6 End Bent.** The Department will measure the quantities according to the Contract. The Department will not measure furnishing and placing the 2-inch mortar or concrete bed for payment and will consider it incidental to the end bent construction.
- **4.7 Structure Excavation.** The Department will not measure structure excavation on new embankments for payment and will consider it incidental to the Structure Granular Backfill or Concrete as applicable.
- **5.0 PAYMENT.** The Department will make payment for the completed and accepted quantities under the following:

<u>Code</u>	Pay Item	Pay Unit
02223	Granular Embankment	Cubic Yards
02231	Structure Granular Backfill	Cubic Yards

The Department will consider payment as full compensation for all work required in this provision.

September 16, 2016

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# PART III EMPLOYMENT, WAGE AND RECORD REQUIREMENTS



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### PRELIMINARY NOT FOR CONSTRCUTION

KENTUCKY TRANSPORTATION CABINET DEPARTMENT OF HIGHWAYS

### TRAINING SPECIAL PROVISIONS

This Training Special Provision supersedes subparagraph 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities," (Attachment 1), and is in implementation of 23 U.S.C. 140(a).

As part of the contractor's equal employment opportunity affirmative action program training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

The number of trainees to be trained under these special provisions and in this contract is shown in "Special Notes Applicable to Project" in the bid proposal.

In the event that a contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction the contractor shall submit to the Kentucky Transportation Cabinet, Department of Highways for its approval, an acceptable training program on forms provided by the Cabinet indicating the number of trainees to be trained in each selected classification. Failure to provide the Cabinet with the proper documentation evidencing an acceptable training program prior to commencing construction shall cause the Cabinet to suspend the operations of the contractor with (if applicable) working days being charged as usual against the contract time or (if applicable), no additional contract time being granted for the suspension period. The Cabinet will not be liable for the payment of any work performed during the suspension period due to the failure of the contractor to provide an acceptable training program. Said suspension period shall be terminated when an acceptable training program is received by the Cabinet. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeymen status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the findings in each case. The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Kentucky Transportation Cabinet, Department of Highways and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs

registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed for each hour of training given an employee on this contract in accordance with an approved training program. As approved by the engineer, reimbursement will be made for training persons in excess of the number specified herein. This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees be on board for the entire length of the contract. A contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The contractor shall furnish the trainee a copy of the program he will follow in providing the training. The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

## **PART IV**

## **INSURANCE**



Kentucky Standard Specifications for Road and Bridge Construction, current edition

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# PART V

# **BID ITEMS**



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## PRELIMINARY NOT FOR CONSTRUCTION

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### Report Date 2/14/20

Section: 0001 - PAVING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	AMOUNT
0010	00003		CRUSHED STONE BASE	12,047.00	TON		\$	
0020	80000		CEMENT STABILIZED ROADBED	11,123.00	SQYD		\$	
0030	00078		CRUSHED AGGREGATE SIZE NO 2	4,626.00	TON		\$	
0040	00100		ASPHALT SEAL AGGREGATE	84.00	TON		\$	
0050	00103		ASPHALT SEAL COAT	10.10	TON		\$	
0060	00190		LEVELING & WEDGING PG64-22	1,030.00	TON		\$	
0070	00214		CL3 ASPH BASE 1.00D PG64-22	5,339.00	TON		\$	
0800	00324		CL3 ASPH SURF 0.50B PG64-22	2,084.00	TON		\$	
0090	00356		ASPHALT MATERIAL FOR TACK	14.30	TON		\$	
0100	00358		ASPHALT CURING SEAL	11.00	TON		\$	
0110	02223		GRANULAR EMBANKMENT	1,481.00	CUYD		\$	
0120	02542		CEMENT	223.00	TON		\$	
0130	02602		FABRIC-GEOTEXTILE CLASS 1	10,407.00	SQYD		\$	
0140	02604		FABRIC-GEOTEXTILE CLASS 1A	8,157.00	SQYD		\$	
0150	02677		ASPHALT PAVE MILLING & TEXTURING	100.00	TON		\$	
0160	02702		SAND FOR BLOTTER	28.00	TON		\$	
0170	20071EC		JOINT ADHESIVE	15,913.00	LF		\$	

Section: 0002 - ROADWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	<b>AMOUNT</b>
0180	01000		PERFORATED PIPE-4 IN	267.00	LF		\$	
0190	01010		NON-PERFORATED PIPE-4 IN	64.00	LF		\$	
0200	01020		PERF PIPE HEADWALL TY 1-4 IN	1.00	EACH		\$	
0210	01024		PERF PIPE HEADWALL TY 2-4 IN	2.00	EACH		\$	
0220	01028		PERF PIPE HEADWALL TY 3-4 IN	1.00	EACH		\$	
0230	01310		REMOVE PIPE	368.00	LF		\$	
0240	01740		CORED HOLE DRAINAGE BOX CON-4 IN	2.00	EACH		\$	
0250	01987		DELINEATOR FOR GUARDRAIL BI DIRECTIONAL WHITE	22.00	EACH		\$	
0260	02014		BARRICADE-TYPE III	4.00	EACH		\$	
0270	02091		REMOVE PAVEMENT	2,347.00	SQYD		\$	
0280	02159		TEMP DITCH	3,774.00	LF		\$	
0290	02160		CLEAN TEMP DITCH	1,887.00	LF		\$	
0300	02200		ROADWAY EXCAVATION	11,352.00	CUYD		\$	
0310	02230		EMBANKMENT IN PLACE	57,270.00	CUYD		\$	
0320	02242		WATER	250.00	MGAL		\$	
0330	02275		FENCE-8 FT CHAIN LINK	30.00	LF		\$	
0340	02287		DOUBLE VEHICULAR CHAIN LINK GATE	1.00	EACH		\$	
0350	02351		GUARDRAIL-STEEL W BEAM-S FACE	2,187.50	LF		\$	
0360	02360		<b>GUARDRAIL TERMINAL SECTION NO 1</b>	2.00	EACH		\$	
0370	02371		<b>GUARDRAIL END TREATMENT TYPE 7</b>	2.00	EACH		\$	
0380	02391		<b>GUARDRAIL END TREATMENT TYPE 4A</b>	2.00	EACH		\$	
0390	02429		RIGHT-OF-WAY MONUMENT TYPE 1	29.00	EACH		\$	
0400	02432		WITNESS POST	3.00	EACH		\$	
0410	02483		CHANNEL LINING CLASS II	81.00	TON		\$	

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## Report Date 2/14/20

0760       10030NS       ASPHALT ADJUSTMENT       27,786.00       DOLL \$1.00       \$ \$27,786.00         0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       LS       \$         0820       24605ED       RELOCATE       1.00       EACH       \$         0830       25078ED       TL-3       4.00       EACH       \$         AUTOMATED SLIDE GATE       30' SLIDE GATE FOR 8-FOOT-HIGH GATE       4.00       EACH       \$	LINE	BID CODE	ALT DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0.430   0.2545   APPROX_25 ACRES	0420	02484	CHANNEL LINING CLASS III	9.00	TON		\$	
0.440   0.2555   CONCRETE-CLASS B   1.00   CUYD   \$								
0.450         0.2562         TEMPORARY SIGNS         362.00         SQFT         \$           0.460         0.2570         PROJECT CPM SCHEDULE         1.00         LS         \$           0.470         0.2585         EDGE KEY         241.00         LF         \$           0.400         0.2561         MAINTAIN & CONTROL TRAFFIC         1.00         LS         \$           0.500         0.2676         MOBILIZATION FOR MILL & TEXT         1.00         LS         \$           0.501         0.2690         SAFELOADING         17.00         CUYD         \$           0.510         0.2690         SAFELOADING         17.00         CUYD         \$           0.520         2.2896         SHOULDER RUMBLE STRIPS         5.434.00         LF         \$           0.540         0.2701         TEMP SILT FRAP TYPE B         2.500         EACH         \$           0.550         0.2704         SILT TRAP TYPE B         2.500         EACH         \$           0.550         0.2705         SILT TRAP TYPE B         2.500         EACH         \$           0.570         0.2706         CLEAN SILT TRAP TYPE C         2.500         EACH         \$           0.580         0.2707					_			
0460   02570   PROJECT CPM SCHEDULE   1.00		1 1 1 1	CONCRETE-CLASS B		_			
0470   02585   EDGE KEY	0450	02562	TEMPORARY SIGNS	362.00	SQFT		\$	
0480         02850         MAINTAIN & CONTROL TRAFFIC         1.00         LS         \$           0490         02871         PORTABLE CHANGEABLE MESSAGE SIGN         2.00         EACH         \$           0500         02876         MOBILIZATION FOR MILL & TEXT         1.00         LS         \$           0510         02890         SAFELOADING         17.00         CUYD         \$           0520         02696         SHOULDER RUMBLE STRIPS         5,434.00         LF         \$           0530         02701         TEMP SILT FENCE         3,774.00         LF         \$           0540         02703         SILT TRAP TYPE A         25.00         EACH         \$           0550         02704         SILT TRAP TYPE C         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0570         02707         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0580         02707         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0590         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0590		1 1 1			_			
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0500   02676   MOBILIZATION FOR MILL & TEXT   1.00   LS   \$	0480	02650		1.00	LS			
0510   02690   SAFELOADING	0490	02671	PORTABLE CHANGEABLE MESSAGE SIGN	2.00	EACH		\$	
0520         02696         SHOULDER RUMBLE STRIPS         5,434.00         LF         \$           0530         02701         TEMP SILT FENCE         3,774.00         LF         \$           0550         02703         SILT TRAP TYPE A         25.00         EACH         \$           0550         02704         SILT TRAP TYPE B         25.00         EACH         \$           0570         02705         SILT TRAP TYPE A         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0580         02707         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0600         02726         STAKING         1.00         LS         \$           0600         02726         STAKING         1.00         LS         \$           0610         02731         CUMBERLANDRYER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTION	0500	02676	MOBILIZATION FOR MILL & TEXT	1.00	LS		\$	
0530         02701         TEMP SILT FENCE         3,774.00         LF         \$           0540         02703         SILT TRAP TYPE A         25.00         EACH         \$           0550         02704         SILT TRAP TYPE B         25.00         EACH         \$           0560         02705         SILT TRAP TYPE C         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0590         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0590         02726         STAKING         1.00         LS         \$           REMOVE STRUCTURE REMOVE EXISTING US60 BRIDGE OVER CUMBERLAND RIVER         1.00         LS         \$           0610         02731         CUMBERLAND RIVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MUCH         79,404.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTIO	0510	02690	SAFELOADING	17.00	CUYD		\$	
0540         02703         SILT TRAP TYPE A         25.00         EACH         \$           0550         02704         SILT TRAP TYPE B         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE A         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0590         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0590         02726         STAKING         1.00         LS         \$           0610         02721         REMOVE STRUCTURE REMOVE STRUCTURE REMOVE STRUSTING US60 BRIDGE OVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0620         02755         ARROW PANEL         2.00         EACH         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTION         \$9,553.00         SQYD         \$           0660         05964 <td>0520</td> <td>02696</td> <td>SHOULDER RUMBLE STRIPS</td> <td>5,434.00</td> <td>LF</td> <td></td> <td>\$</td> <td></td>	0520	02696	SHOULDER RUMBLE STRIPS	5,434.00	LF		\$	
0550         02704         SILT TRAP TYPE B         25.00         EACH         \$           0560         02705         SILT TRAP TYPE C         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE A         25.00         EACH         \$           0590         02707         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0590         02726         STAKING         1.00         LS         \$           0600         02726         STAKING         1.00         LS         \$           0610         02731         CUMBERLAND RIVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0660         05953         TEMP SEEDING AND PROTECTION         \$9,553.00         SQYD         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0670         05982         AGRICULTURAL LIMESTONE	0530	02701	TEMP SILT FENCE	3,774.00	LF		\$	
0560         02705         SILT TRAP TYPE C         25.00         EACH         \$           0570         02706         CLEAN SILT TRAP TYPE A         25.00         EACH         \$           0580         02707         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0580         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0600         02726         STAKING         1.00         LS         \$           0610         02731         CUMBERLAND RIVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0660         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0660         05965         SEEDING A	0540	02703	SILT TRAP TYPE A	25.00	EACH		\$	
0570         02706         CLEAN SILT TRAP TYPE A         25.00         EACH         \$           0580         02707         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0590         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0600         02726         STAKING         1.00         LS         \$           0610         02731         REMOVE EXISTING US60 BRIDGE OVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0650         05953         TEMP SEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992 </td <td>0550</td> <td>02704</td> <td>SILT TRAP TYPE B</td> <td>25.00</td> <td>EACH</td> <td></td> <td>\$</td> <td></td>	0550	02704	SILT TRAP TYPE B	25.00	EACH		\$	
0580         02707         CLEAN SILT TRAP TYPE B         25.00         EACH         \$           0590         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0600         02726         STAKING         1.00         LS         \$           REMOVE STRUCTURE REMOVE EXISTING US60 BRIDGE OVER         1.00         LS         \$           0610         02731         CUMBERLAND RIVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0660         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0660         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTO	0560	02705	SILT TRAP TYPE C	25.00	EACH		\$	
0590         02708         CLEAN SILT TRAP TYPE C         25.00         EACH         \$           0600         02726         STAKING         1.00         LS         \$           0610         02731         REMOVE STRUCTURE REMOVE EXISTING US60 BRIDGE OVER         1.00         LS         \$           0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0660         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0660         05963         INITIAL FERTILIZER         9.00         TON         \$           0660         05984         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700	0570	02706	CLEAN SILT TRAP TYPE A	25.00	EACH		\$	
0600   02726   STAKING	0580	02707	CLEAN SILT TRAP TYPE B	25.00	EACH		\$	
REMOVE STRUCTURE REMOVE CURSTING US60 BRIDGE OVER CUMBERLAND RIVER 1.00 LS \$ 0620 02775 ARROW PANEL 2.00 EACH \$ 0630 05950 EROSION CONTROL BLANKET 6,811.00 SQYD \$ 0640 05952 TEMP MULCH 79,404.00 SQYD \$ 0660 05953 TEMP SEEDING AND PROTECTION 59,553.00 SQYD \$ 0660 05963 INITIAL FERTILIZER 17.00 TON \$ 0660 05964 MAINTENANCE FERTILIZER 9.00 TON \$ 0660 05994 MAINTENANCE FERTILIZER 9.00 TON \$ 0680 05992 AGRICULTURAL LIMESTONE 74.00 TON \$ 0700 06510 PAVE STRIPING-TEMP PAINT-4 IN 5,000.00 LF \$ 0710 06542 PAVE STRIPING-THERMO-6 IN W 13,459.00 LF \$ 0720 06543 PAVE STRIPING-THERMO-6 IN W 13,459.00 LF \$ 0730 06568 PAVE MARKING-THERMO STOP BAR-24IN 52.00 LF \$ 0740 06574 PAVE MARKING-THERMO CURV ARROW 4.00 EACH \$ 0750 10020NS FUEL ADJUSTMENT 51,125.00 DOLL \$1.00 \$ \$51,125.00 DOLL \$1.00 \$ \$51,125.00 DOLL \$1.00 \$ \$27,786.00 DO	0590	02708	CLEAN SILT TRAP TYPE C	25.00	EACH		\$	
REMOVE EXISTING US60 BRIDGE OVER	0600	02726	STAKING	1.00	LS		\$	
0620         02775         ARROW PANEL         2.00         EACH         \$           0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0730         06568         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$			REMOVE EXISTING US60 BRIDGE OVER					
0630         05950         EROSION CONTROL BLANKET         6,811.00         SQYD         \$           0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0660         05953         TEMP SEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-TEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$		02731	CUMBERLAND RIVER		_			
0640         05952         TEMP MULCH         79,404.00         SQYD         \$           0650         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-TEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$ <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		-						
0650         05953         TEMP SEEDING AND PROTECTION         59,553.00         SQYD         \$           0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-TEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$ \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL \$	0630	05950	EROSION CONTROL BLANKET	-			\$	
0660         05963         INITIAL FERTILIZER         17.00         TON         \$           0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-THEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL \$1.00         \$27,786.00           0770         20166ES810         TEMPORARY PIPE         129.00         LF<	0640	05952	TEMP MULCH	79,404.00	SQYD		\$	
0670         05964         MAINTENANCE FERTILIZER         9.00         TON         \$           0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-TEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO STOP BAR-24IN         52.00         LF         \$           0730         06568         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$ \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL \$1.00         \$ \$27,786.00           0770         20166ES810         TEMPORARY PIPE         129.00         LF         \$           0780         20191ED         OBJECT MARKER TY 3         2.00 <td< td=""><td>0650</td><td>05953</td><td>TEMP SEEDING AND PROTECTION</td><td>59,553.00</td><td>SQYD</td><td></td><td>\$</td><td></td></td<>	0650	05953	TEMP SEEDING AND PROTECTION	59,553.00	SQYD		\$	
0680         05985         SEEDING AND PROTECTION         83,727.00         SQYD         \$           0690         05992         AGRICULTURAL LIMESTONE         74.00         TON         \$           0700         06510         PAVE STRIPING-TEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL         \$1.00         \$ \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL         \$1.00         \$ \$27,786.00           0770         20166ES810         TEMPORARY PIPE         129.00         LF         \$           0780         20191ED         OBJECT MARKER TY 3         2.00         EACH         \$           0800         23189EC         REMOVE GATE	0660	05963	INITIAL FERTILIZER	17.00	TON		\$	
0690       05992       AGRICULTURAL LIMESTONE       74.00       TON       \$         0700       06510       PAVE STRIPING-TEMP PAINT-4 IN       5,000.00       LF       \$         0710       06542       PAVE STRIPING-THERMO-6 IN W       13,459.00       LF       \$         0720       06543       PAVE STRIPING-THERMO-6 IN Y       15,344.00       LF       \$         0730       06568       PAVE MARKING-THERMO STOP BAR-24IN       52.00       LF       \$         0740       06574       PAVE MARKING-THERMO CURV ARROW       4.00       EACH       \$         0750       10020NS       FUEL ADJUSTMENT       51,125.00       DOLL \$1.00       \$ \$51,125.00         0760       10030NS       ASPHALT ADJUSTMENT       27,786.00       DOLL \$1.00       \$ \$27,786.00         0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       E	0670	05964	MAINTENANCE FERTILIZER	9.00	TON		\$	
0700         06510         PAVE STRIPING-TEMP PAINT-4 IN         5,000.00         LF         \$           0710         06542         PAVE STRIPING-THERMO-6 IN W         13,459.00         LF         \$           0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$         \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL \$1.00         \$         \$27,786.00           0770         20166ES810         TEMPORARY PIPE         129.00         LF         \$           0780         20191ED         OBJECT MARKER TY 3         2.00         EACH         \$           0790         21289ED         LONGITUDINAL EDGE KEY         2,870.00         LF         \$           0810         23912EC         REMOVE GATE         1.00         LS         \$           0820         24605ED         RELOCATE         RELOCATE <td>0680</td> <td>05985</td> <td>SEEDING AND PROTECTION</td> <td>83,727.00</td> <td>SQYD</td> <td></td> <td>\$</td> <td></td>	0680	05985	SEEDING AND PROTECTION	83,727.00	SQYD		\$	
0710       06542       PAVE STRIPING-THERMO-6 IN W       13,459.00       LF       \$         0720       06543       PAVE STRIPING-THERMO-6 IN Y       15,344.00       LF       \$         0730       06568       PAVE MARKING-THERMO STOP BAR-24IN       52.00       LF       \$         0740       06574       PAVE MARKING-THERMO CURV ARROW       4.00       EACH       \$         0750       10020NS       FUEL ADJUSTMENT       51,125.00       DOLL \$1.00       \$ \$51,125.00         0760       10030NS       ASPHALT ADJUSTMENT       27,786.00       DOLL \$1.00       \$ \$27,786.00         0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       REMOVE GATE       1.00       LS       \$         0820       24605ED       RELOCATE       1.00       EACH       \$         0830       25078ED       TL-3       4.00       EACH       \$         0830       25078ED       TL-3       4.00       EACH       \$ <td>0690</td> <td>05992</td> <td>AGRICULTURAL LIMESTONE</td> <td>74.00</td> <td>TON</td> <td></td> <td>\$</td> <td></td>	0690	05992	AGRICULTURAL LIMESTONE	74.00	TON		\$	
0720         06543         PAVE STRIPING-THERMO-6 IN Y         15,344.00         LF         \$           0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$ \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL \$1.00         \$ \$27,786.00           0770         20166ES810         TEMPORARY PIPE         129.00         LF         \$           0780         20191ED         OBJECT MARKER TY 3         2.00         EACH         \$           0790         21289ED         LONGITUDINAL EDGE KEY         2,870.00         LF         \$           0800         23189EC         REMOVE GATE         1.00         EACH         \$           0810         23912EC         SYSTEM         1.00         LS         \$           0820         24605ED         RELOCATE EXISTING FLAGPOLE         1.00         EACH         \$           0830         25078ED         TL-3         4.00         EACH         \$	0700	06510	PAVE STRIPING-TEMP PAINT-4 IN	5,000.00	LF		\$	
0730         06568         PAVE MARKING-THERMO STOP BAR-24IN         52.00         LF         \$           0740         06574         PAVE MARKING-THERMO CURV ARROW         4.00         EACH         \$           0750         10020NS         FUEL ADJUSTMENT         51,125.00         DOLL \$1.00         \$ \$51,125.00           0760         10030NS         ASPHALT ADJUSTMENT         27,786.00         DOLL \$1.00         \$ \$27,786.00           0770         20166ES810         TEMPORARY PIPE         129.00         LF         \$           0780         20191ED         OBJECT MARKER TY 3         2.00         EACH         \$           0790         21289ED         LONGITUDINAL EDGE KEY         2,870.00         LF         \$           0800         23189EC         REMOVE GATE         1.00         EACH         \$           0810         23912EC         SYSTEM         1.00         LS         \$           0820         24605ED         RELOCATE         1.00         EACH         \$           0830         25078ED         TL-3         4.00         EACH         \$           AUTOMATED SLIDE GATE         30' SLIDE GATE FOR 8-FOOT-HIGH GATE         4.00         EACH         \$	0710	06542	PAVE STRIPING-THERMO-6 IN W	13,459.00	LF		\$	
0740       06574       PAVE MARKING-THERMO CURV ARROW       4.00       EACH       \$         0750       10020NS       FUEL ADJUSTMENT       51,125.00       DOLL \$1.00       \$ \$51,125.00         0760       10030NS       ASPHALT ADJUSTMENT       27,786.00       DOLL \$1.00       \$ \$27,786.00         0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       LS       \$         0820       24605ED       RELOCATE EXISTING FLAGPOLE       1.00       EACH       \$         TH-3       4.00       EACH       \$         AUTOMATED SLIDE GATE         30' SLIDE GATE FOR 8-FOOT-HIGH GATE       4.00       EACH       \$	0720	06543	PAVE STRIPING-THERMO-6 IN Y	15,344.00	LF		\$	
0750       10020NS       FUEL ADJUSTMENT       51,125.00       DOLL \$1.00       \$ \$51,125.00         0760       10030NS       ASPHALT ADJUSTMENT       27,786.00       DOLL \$1.00       \$ \$27,786.00         0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       LS       \$         0820       24605ED       RELOCATE EXISTING FLAGPOLE       1.00       EACH       \$         TH-3       4.00       EACH       \$         AUTOMATED SLIDE GATE         30' SLIDE GATE FOR 8-FOOT-HIGH GATE       4.00       EACH       \$	0730	06568	PAVE MARKING-THERMO STOP BAR-24IN	52.00	LF		\$	
0760       10030NS       ASPHALT ADJUSTMENT       27,786.00       DOLL \$1.00       \$ 227,786.00         0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       LS       \$         0820       24605ED       RELOCATE       1.00       EACH       \$         0830       25078ED       TL-3       4.00       EACH       \$         AUTOMATED SLIDE GATE       30' SLIDE GATE FOR 8-FOOT-HIGH GATE       4.00       EACH       \$	0740	06574	PAVE MARKING-THERMO CURV ARROW	4.00	EACH		\$	
0770       20166ES810       TEMPORARY PIPE       129.00       LF       \$         0780       20191ED       OBJECT MARKER TY 3       2.00       EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       LS       \$         0820       24605ED       RELOCATE       1.00       EACH       \$         0830       25078ED       TL-3       4.00       EACH       \$         AUTOMATED SLIDE GATE 30' SLIDE GATE FOR 8-FOOT-HIGH GATE       4.00       EACH       \$	0750	10020NS	FUEL ADJUSTMENT	51,125.00	DOLL	\$1.00	\$	\$51,125.00
0780       20191ED       OBJECT MARKER TY 3       2.00 EACH       \$         0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00 LF       \$         0800       23189EC       REMOVE GATE       1.00 EACH       \$         0810       23912EC       SYSTEM       1.00 LS       \$         0820       24605ED       RELOCATE EXISTING FLAGPOLE       1.00 EACH       \$         0830       25078ED       TL-3       4.00 EACH       \$         AUTOMATED SLIDE GATE 30' SLIDE GATE 50' SLIDE GATE FOR 8-FOOT-HIGH GATE       \$       *	0760	10030NS	ASPHALT ADJUSTMENT	27,786.00	DOLL	\$1.00	\$	\$27,786.00
0790       21289ED       LONGITUDINAL EDGE KEY       2,870.00       LF       \$         0800       23189EC       REMOVE GATE       1.00       EACH       \$         0810       23912EC       SYSTEM       1.00       LS       \$         0820       24605ED       RELOCATE EXISTING FLAGPOLE       1.00       EACH       \$         0830       25078ED       TL-3       4.00       EACH       \$         AUTOMATED SLIDE GATE 30' SLIDE GATE 50' SLIDE 50' SL	0770	20166ES810	TEMPORARY PIPE	129.00	LF		\$	
0800 23189EC REMOVE GATE 1.00 EACH \$  WEB CAMERA CONST MONITORING 1.00 LS \$  RELOCATE RELOCATE EXISTING FLAGPOLE 1.00 EACH \$  THRIE BEAM GUARDRAIL TRANSITION TL-3 1.00 EACH \$  AUTOMATED SLIDE GATE 30' SLIDE GATE 30' SLIDE GATE FOR 8-FOOT-HIGH GATE	0780	20191ED	OBJECT MARKER TY 3	2.00	EACH		\$	
WEB CAMERA CONST MONITORING  SYSTEM  RELOCATE RELOCATE EXISTING FLAGPOLE  THRIE BEAM GUARDRAIL TRANSITION TL-3  TL-3  AUTOMATED SLIDE GATE 30' SLIDE GATE FOR 8-FOOT-HIGH GATE	0790	21289ED	LONGITUDINAL EDGE KEY	2,870.00	LF		\$	
0810 23912EC SYSTEM 1.00 LS \$  RELOCATE RELOCATE EXISTING FLAGPOLE 1.00 EACH \$  THRIE BEAM GUARDRAIL TRANSITION TL-3 4.00 EACH \$  AUTOMATED SLIDE GATE 30' SLIDE GATE FOR 8-FOOT-HIGH GATE	0800	23189EC	REMOVE GATE	1.00	EACH		\$	
0820 24605ED RELOCATE EXISTING FLAGPOLE 1.00 EACH \$ THRIE BEAM GUARDRAIL TRANSITION TL-3 TL-3 4.00 EACH \$ AUTOMATED SLIDE GATE 30' SLIDE GATE FOR 8-FOOT-HIGH GATE	0810	23912EC		1.00	LS		\$	
0830 25078ED TL-3 4.00 EACH \$ AUTOMATED SLIDE GATE 30' SLIDE GATE FOR 8-FOOT-HIGH GATE	0820	24605ED		1.00	EACH		\$	
30' SLIDE GATE FOR 8-FOOT-HIGH GATE	0830	25078ED		4.00	EACH		\$	
VOTO ESCOCEO WITH CONTAINED DAILDED WILL 1.00 EACH	0840	25086EC		1.00	EACH		\$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	AMOUNT
0850	25087EC		V BARBED WIRE ARMS WITH THREE ADDITIONAL STRANDS	30.00	LF		\$	
0860	25088EC		AUTOMATED SLIDING GATE OPERATOR	1.00	EACH		\$	

### Section: 0003 - DRAINAGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	<b>AMOUNT</b>
0870	00440		ENTRANCE PIPE-15 IN	199.00	LF		\$	
0880	00462		CULVERT PIPE-18 IN	340.00	LF		\$	
0890	00521		STORM SEWER PIPE-15 IN	335.00	LF		\$	
0900	00522		STORM SEWER PIPE-18 IN	58.00	LF		\$	
0910	00524		STORM SEWER PIPE-24 IN	588.00	LF		\$	
0920	01450		S & F BOX INLET-OUTLET-18 IN	10.00	EACH		\$	
0930	01451		S & F BOX INLET-OUTLET-24 IN	1.00	EACH		\$	
0940	01496		DROP BOX INLET TYPE 3	8.00	EACH		\$	
0950	01691		FLUME INLET TYPE 2	2.00	EACH		\$	
0960	01761		MANHOLE TYPE B	2.00	EACH		\$	
0970	02600		FABRIC GEOTEXTILE TY IV FOR PIPE	2,368.00	SQYD	\$2.00	\$	\$4,736.00
0980	23952EC		DRAINAGE JUNCTION BOX TY B 18 IN	1.00	EACH		\$	
0990	24575ES610		HEADWALL 15 IN MITERED	8.00	EACH		\$	
1000	24575ES610		HEADWALL 18 IN MITERED	1.00	EACH		\$	
1010	24814EC		PIPELINE INSPECTION	1,027.00	LF		\$	

## Section: 0004 - BRIDGE-EXISTING STRUCTURE REPAIR

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	AMOUNT
1020	02650		MAINTAIN & CONTROL TRAFFIC	1.00	LS		\$	
1030	02671		PORTABLE CHANGEABLE MESSAGE SIGN	2.00	EACH		\$	
1040	22146EN		CONCRETE PATCHING REPAIR	400.00	SQFT		\$	
1050	23853EC		BEARING REPAIR	6.00	EACH		\$	
1060	25015EC		FRP WRAP	2,234.00	SQFT		\$	

## Section: 0005 - BRIDGE-MAINTAIN EXISTING BRIDGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC F	AMOUNT
1070	24755EC		MAINTAIN EXISTING BRIDGE	500,000.00	DOLL	\$	

## Section: 0006 - BRIDGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1080	02231		STRUCTURE GRANULAR BACKFILL	500.00	CUYD		\$	
1090	02555		CONCRETE-CLASS B	75.00	CUYD		\$	
1100	02998		MASONRY COATING	11,557.00	SQYD		\$	

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LINE	BID CODE	ALT DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1110	03299	ARMORED EDGE FOR CONCRETE	80.00	LF		\$	
1120	04775	NAVIGATION LIGHT 360 DEG GREEN		EACH		\$	
1130	04776	NAVIGATION LIGHT 180 DEG RED		EACH		\$	
1140	04793	CONDUIT-1 1/4 IN	180.00	LF		\$	
1150	04797	CONDUIT-3 IN	4,022.00			\$	
1160	04799	CONDUIT-4 IN	4,028.00	LF		\$	
1170	06406	SBM ALUM SHEET SIGNS .080 IN		SQFT		\$	
1180	08001	STRUCTURE EXCAVATION-COMMON	3,350.00	CUYD		\$	
1190	08002	STRUCTURE EXCAV-SOLID ROCK		CUYD		\$	
1200	08003	FOUNDATION PREPARATION	1.00	_		\$	
1210	08019	CYCLOPEAN STONE RIP RAP	3,780.00	TON		\$	
1220	08020	CRUSHED AGGREGATE SLOPE PROT	220.00	TON		\$	
1230	08033	TEST PILES	809.00	LF		\$	
1240	08037	COFFERDAM	1.00	LS		\$	
1250	08051	PILES-STEEL HP14X89	3,826.00	LF		\$	
1260	08095	PILE POINTS-14 IN	42.00	EACH		\$	
1270	08100	CONCRETE-CLASS A	8,751.20	CUYD		\$	
1280	08104	CONCRETE-CLASS AA	2,540.00	CUYD		\$	
1290	08137	<b>MECHANICAL REINF COUPLER #14</b>	1,080.00	EACH		\$	
1300	08150	STEEL REINFORCEMENT	1,229,769.00	LB		\$	
1310	08151	STEEL REINFORCEMENT-EPOXY COATED	995,365.00	LB		\$	
1320	08160	STRUCTURAL STEEL 5,198,270 LBS	1.00	LS		\$	
1330	08170	SHEAR CONNECTORS 13,760 EACH	1.00	LS		\$	
1340	08470	EXPANSION DAM-2 IN NEOPRENE	40.00	LF		\$	
1350	08471	EXPANSION DAM-2.5 IN NEOPRENE	40.00			\$	
1360	08500	APPROACH SLAB		SQYD		\$	
1370	08752	PAINT CLEARANCE GAUGES	1.00	LS		\$	
1380	20410ED	MAINTAIN LIGHTING	1.00	LS		\$	
1390	20610NC	INSTRUMENTATION	1.00	LS		\$	
1400		ROCK SOUNDINGS	1,243.00			\$	
1410	20746ED	ROCK CORINGS	810.00			\$	
1420	23233EC	DYNAMIC PILE TESTING		EACH		\$	
1430	23365EC	LIGHTING-NAV MONITORING SYSTEM	1.00			\$	
1440	23859EC	FINGER EXPANSION JOINT	40.00	_		\$	
1450		STRUCTURE LIGHTNING PROTECTION	1.00			\$	
1460	24098EC	PPC I-BEAM TYPE HN 66-49	1,452.00			\$	
1470	24534ED	PIPE PILE-30"	6,634.00			\$	
1480	24534ED 24537ED	OPEN END INSIDE FIT CUTTING SHOE-30"	•	EACH		\$	
1490	24614EC	DISC EXPANSION BEARING		EACH		\$	
1500	24741EC	SONAR CALIPER TESTING		EACH		\$	
1510	24741EC 24804EC	PPC I-BEAM 4N 78 49	3,336.00			\$	
1520	24804EC 24838EC	SOLAR POWERED NAV LIGHTING SYSTEM		EACH		\$	
1530	24874EC	TIP TESTING PIER 3		EACH		\$	
1540	24874EC	TIP TESTING PIER 4		EACH		\$	
	24875EC	CSL TESTING (8 TUBES) PIER 3		EACH		\$	

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LINE	BID CODE	ALT DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	<b>AMOUNT</b>
1560	24875EC	CSL TESTING (8 TUBES) PIER 4	16.00	EACH		\$	
1570	25003EC	DRILLED SHAFT - 96 IN (COMMON) PIER 3	267.00	LF		\$	
1580	25003EC	DRILLED SHAFT - 96 IN (COMMON) PIER 4	603.00	LF		\$	
1590	25004EC	DRILLED SHAFT - 90 IN (SOLID ROCK) PIER 3	285.00	LF		\$	
1600	25004EC	DRILLED SHAFT - 90 IN (SOLID ROCK) PIER 4	165.00	LF		\$	
1610	25027ED	RAIL SYSTEM SINGLE SLOPE - 36 IN	3,826.00	LF		\$	
1620	25029ED	STEEL HANDRAIL	3,826.00	LF		\$	
1630	25046EC	DISC FIXED BEARING	2.00	EACH		\$	
1640	25085EC	STRIP SEAL EXPANSION JOINT - 5 INCH	40.00	LF		\$	

## Section: 0007 - UTILITIES- WATER AND SEWER

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	AMOUNT
1650	01314		PLUG PIPE	4.00	EACH		\$	
1660	02690		SAFELOADING	16.00	CUYD		\$	
1670	05985		SEEDING AND PROTECTION	1,374.00	SQYD		\$	
1680	14000		W AIR RELEASE VALVE 1 INCH	2.00	EACH		\$	
1690	14008		W ENCASEMENT STEEL BORED RANGE 3	255.00	LF		\$	
1700	14019		W FIRE HYDRANT ASSEMBLY	4.00	EACH		\$	
1710	14021		W FIRE HYDRANT REMOVE	3.00	EACH		\$	
1720	14025		W METER 1 INCH	10.00	EACH		\$	
1730	14058		W PIPE PVC 04 INCH	652.00	LF		\$	
1740	14059		W PIPE PVC 06 INCH	778.00	LF		\$	
1750	14074		W PLUG EXISTING MAIN	4.00	EACH		\$	
1760	14077		W SERV PE/PLST LONG SIDE 1 IN	2.00	EACH		\$	
1770	14082		W SERV PE/PLST SHORT SIDE 1 IN	8.00	EACH		\$	
1780	14089		W TAPPING SLEEVE AND VALVE SIZE 1	2.00	EACH		\$	
1790	14094		W TIE-IN 06 INCH	3.00	EACH		\$	
1800	14105		W VALVE 06 INCH	6.00	EACH		\$	
1810	14156		W METER REMOVE	7.00	EACH		\$	
1820	15000		S BYPASS PUMPING	1.00	EACH		\$	
1830	15017		S ENCASEMENT STEEL BORED RANGE 4	86.00	LF		\$	
1840	15023		S ENCASEMENT STEEL OPEN CUT RANGE 4	130.00	LF		\$	
1850	15090		S LATERAL SHORT SIDE 06 INCH	8.00	EACH		\$	
1860	15092		S MANHOLE	7.00	EACH		\$	
1870	15093		S MANHOLE ABANDON/REMOVE	4.00	EACH		\$	
1880	15094		S MANHOLE ADJUST TO GRADE	1.00	EACH		\$	
1890	15096		S MANHOLE CASTING WATERTIGHT	10.00	EACH		\$	
1900	15097		S MANHOLE RECONSTRUCT INVERT	1.00	EACH		\$	
1910	15099		S MANHOLE TAP EXISTING	2.00	EACH		\$	
1920	15101		S MANHOLE WITH DROP	1.00	EACH		\$	
1930	15112		S PIPE PVC 08 INCH	1,169.00	LF		\$	
1940	15136		S LATERAL LOCATE	8.00	EACH		\$	

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Section: 0008 - TRAINEE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	AMOUNT
1950	02742		TRAINEE PAYMENT REIMBURSEMENT 1 - IRONWORKER	1,400.00	HOUR		\$	

## Section: 0009 - DEMOBILIZATION &/OR MOBILIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	<b>UNIT PRIC</b>	FP	AMOUNT
1960	02568		MOBILIZATION	1.00	LS		\$	
1970	02569		DEMOBILIZATION	1.00	LS		\$	