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 D4945, High-Strain Dynamic Testing of Piles. Dynamic testing involves attaching strain transducers and accelerometers, as defined in Section 2.3.2 of this Special Note, to the pile near the pile head during initial driving or at an appropriate location during restrike testing. A cable or wireless transmission connects the gages near the pile head with the Pile Driving Monitoring Hardware located a safe distance from the pile. The piles that are to be tested must be of sufficient extra length to ensure that gages are not driven into the ground or water, unless the gages are specifically designed for underwater use. The purpose of the dynamic pile testing is to ensure that applicable design criteria and design codes are met.

For the purposes of this Special Note, “Department” refers to the Kentucky Department of Highways and/or consultants acting on behalf of the Department of Highways. “Engineer” is defined in Section 101.03 of the Standard Specifications.

1.2 Test Locations

Perform testing on piles designated in the plans or as directed by the Engineer. The Department reserves the right to require the contractor to perform initial drive and/or restrike dynamic testing on additional piles or previously tested piles or additional restrikes without dynamic testing, if deemed necessary to ensure that applicable bridge design criteria and design codes are met. Contingency testing quantities are included in the contract drawings.

1.3 Personnel Qualifications

Perform dynamic pile testing using the services of an independent Dynamic Pile Testing Consultant with qualified personnel assigned to this project as described below.
Personnel should demonstrate experience similar to the type and magnitude of the project.

- **Pile Driving Monitoring** – A licensed professional engineer with a minimum of 5 years dynamic pile testing and analysis experience or who has achieved Advanced or better certification under the High-Strain Dynamic Pile Testing Examination or Certification process of the Pile Driving Contractors Association or Foundation QA.
- **Wave Equation and Pile Driving Analyses** – A licensed professional engineer with a minimum of ten (10) years dynamic pile testing and analysis experience or who has achieved Master or better certification under the High-Strain Dynamic Pile Testing Examination or Certification process of the Pile Driving Contractors Association or Foundation QA.

1.4 **Equipment**

Supply equipment such as gages, cables or wireless transmitters, etc. conforming to ASTM D4945, High-Strain Dynamic Testing of Piles and furnished by the dynamic testing consultant. Submit the product name and manufacturer of the hardware and software components below for acceptance by the Department in Submittal Number 2. If requested by the Department, submit additional information including technical specifications, etc.

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

1.5 **Submittals and General Testing & Analysis Requirements**

Make submittals via SharePoint software in accordance with the Project requirements for submittals. See Tables 1 and 2 below. The Department will respond to the Contractor regarding acceptability of submittals 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.
Table 1 – Schedule of Dynamic Pile Testing Submittals

<table>
<thead>
<tr>
<th>Submittal Number</th>
<th>Submittal Item</th>
<th>Calendar Days</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Proposed independent dynamic pile testing consultant, and a listing of assigned personnel and their experience and qualifications.</td>
<td>30 After</td>
<td>Notice to Begin Work</td>
</tr>
<tr>
<td>2</td>
<td>Details of the hardware and software components, method of testing, and materials to be used. Include gage calibration documentation. Include pile hammer warm-up procedure for restrike tests. Include anticipated delivery and training dates for E-Saximeters.</td>
<td>45 Before</td>
<td>Start of Pile Driving/Monitoring</td>
</tr>
<tr>
<td>3</td>
<td>Complete Pile and Driving Equipment Data Form (Figure 1 of the Special Note) and the results of wave equation analyses.</td>
<td>30 Before</td>
<td>Start of Pile Driving/Monitoring</td>
</tr>
<tr>
<td>4</td>
<td>Preliminary report(s) as defined in Section 3.1 of this Special Note.</td>
<td>2 After (48 hrs.)</td>
<td>Completion of Each Field Test</td>
</tr>
<tr>
<td>5</td>
<td>Summary Report(s) as defined in Section 3.2 of this Special Note.</td>
<td>10 After</td>
<td>Completion of All Field Tests</td>
</tr>
</tbody>
</table>

Provide all submittals and reports in .pdf format

Table 2 – General Testing and Analysis Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave Equation Analysis</td>
<td>Perform analyses in Table 3 and sufficient additional analyses as needed to define performance for all combinations of piles, driving systems, and subsurface conditions anticipated.</td>
</tr>
<tr>
<td>End of Initial Driving Test Frequency (EOD)</td>
<td>Minimum of two piles for each substructure or as directed by the Engineer. At piers containing only three piles, test all three piles.</td>
</tr>
<tr>
<td>Beginning of Restrike Test Frequency (BOR)</td>
<td>Minimum of two piles for each substructure or as directed by the Engineer.</td>
</tr>
<tr>
<td>Time Interval between End of Initial Driving and Restrike Tests</td>
<td>Perform restrike tests on dynamically tested piles at 72 hours (68 to 108 hours after end of drive) and 168 hours (164 to 240 hours after end of drive) after driving unless directed otherwise by the Engineer. At piers containing only three piles, test all three piles at 72 hours and only the center pile at 168 hours.</td>
</tr>
<tr>
<td>Pile Driving Analyses using Signal Matching Techniques</td>
<td>For each End of Initial Driving Test and each Restrike Test</td>
</tr>
</tbody>
</table>

Perform testing, analyses and reporting in accordance with this table and ASTM D4945, *High-Strain Dynamic Testing of Piles*.

Perform and submit wave equation analyses for one pipe pile at each end bent location and one pipe pile of each diameter within the station ranges indicated below using the representative pier for each driving hammer and system proposed for use. Perform analyses to demonstrate that the pile hammer has sufficient energy to install the piles to the design tip elevation and 75 and 100 percent of the required nominal axial resistances (RNAR) without overstressing or damaging the piles. Dynamic testing results will determine the driving criteria and control the final pile tip elevation.
2.0 TESTING AND ANALYSES

2.1 Preconstruction Wave Equation Analyses

At least 30 calendar days before beginning pile driving, submit to the Department the completed Pile and Driving Equipment Data Form (Figure 1 of this Special Note) and preconstruction wave equation analyses performed by the Independent Dynamic Pile Testing Consultant in accordance with Table 1 in this Special Note and a summary report of the results. The required driving criteria are outlined in Sections 2.3.1 and 2.3.2 of the Special Note for Steel Pipe Piles - Install. Perform wave equation analyses based upon the production pile lengths (i.e. cutoff elevation minus lowest anticipated pile tip elevation) but with the piles driven to the production pile Estimated Pile Tip Elevations provided in the Contract Drawings.

Prior to bidding, additional wave equation analyses may be performed by the bidders to select the appropriate driving system. Bidders are advised to retain an engineering consultant to perform independent wave equation analyses in order to select hammer(s) that meets the specified requirements for this project. This engineering consultant should meet the criteria for “Wave Equation and Pile Driving Analyses” in Section 1.3 of this Special Note and have extensive experience performing wave equation analyses, dynamic pile testing and signal matching analyses on projects with pile and hammer sizes similar to those to be used on this project.

The purpose of the wave equation analyses is to assess the ability of all proposed pile driving systems to install piles per the outlined driving criteria. Model the 72-inch-diameter pipe piles with the constrictor plates with a single toe using radiation damping, limiting the Smith damping factor in the radiation damping model to a maximum value of
0.4 feet/sec. Select the pile hammers for the 72-inch-diameter pipe piles at the pier locations and 30-inch-diameter pipe piles at the end bents based upon the criteria described below.

Select hammer(s) and driving system components with the following characteristics:

- Capable of producing 0.33 to 0.1 inches of set (3 to 10 blows per inch) when verifying 75% and 100% of the Required Nominal Axial Resistance (RNAR) as shown in the contract drawings;
- Produce driving stresses not exceeding 90% of the yield stress of the steel based on wave equation analysis;
- Capable of varying the stroke or energy to control driving stresses and blow counts. The results of wave equation analyses may be used to assess the need for varying the stroke or energy; and
- Refer to the Special Note for Steel Pipe Piles - Install for additional driving system criteria, including minimum hammer energies based upon pipe pile diameters and type of substructure.

Do not mobilize hammer(s) to site until the wave equation analysis and hammer selection have been reviewed and accepted by the Department.

In the Wave Equation Summary Report, include:

- Explanation of how the piles were modeled;
- Brief discussion of how the soil parameters were selected;
- Brief discussion of the hammer, helmet and cushion properties selected for the model;
- Drivability graph relating pile resistance (i.e. capacity), blow count and driving stresses with depth;
- 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 or energy;
- Constant resistance (i.e. capacity) analysis or inspectors chart to assist the Department in determining the required driving resistance at other field-observed strokes or energy; and
- Discussion and interpretation of the results.

2.1.1 The Department will base acceptance of the proposed pile driving system upon the wave equation analyses indicating that the proposed system can meet the driving criteria outlined in Section 2.3.1 of the Special Note for Steel Pipe Piles - Install.
2.1.2 If any changes or modifications are made to the approved pile driving system, submit additional wave equation analyses in accordance with Section 2.1 of this Special Note.

2.2 High-Strain Dynamic Pile Testing

2.2.1 Perform dynamic pile testing at the locations and frequency required in accordance with Table 4 and Section 1.2 in this Special Note and at the locations indicated on the project plans.

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 1.3 of this Special Note. Prior to testing, the Department will review 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 for acceptance.

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 1.3 of the Special Note for Dynamic Pile Testing in the field during all dynamic pile testing. “Wireless” technology that eliminates cables from the test pile to the data acquisition equipment will be allowed.
Table 4 - Dynamic Load Testing Summary

<table>
<thead>
<tr>
<th>Substructure / Pile</th>
<th>Dynamic Pile Load Testing (Number of Tests)</th>
<th>End of Drive and During Drive</th>
<th>72-Hour Restrike</th>
<th>168-Hour Restrike</th>
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</thead>
<tbody>
<tr>
<td>End Bent 1 / Test Piles</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pier 1 / Test Piles</td>
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<td>1</td>
</tr>
<tr>
<td>Pier 1 / Production Piles</td>
<td></td>
<td>2</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Pier 2 / Test Piles</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pier 2 / Production Piles</td>
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<td>--</td>
</tr>
<tr>
<td>End Bent 2 / Test Piles</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: The Department reserves the right to require additional dynamic load tests.

2.3 Field Testing

2.3.1 Equipment

Perform dynamic pile testing field measurements using equipment, software and recording equipment approved in accordance with Section 1.4 of this Special Note. Consultant will analyze the data collected at the end of initial driving and the beginning of restrike using accepted signal matching techniques and software.

Provide safe access to the piles allowing the independent testing consultant to attach the gages, including man lifts, shelters, etc.

2.3.2 Monitoring During Driving

During pile driving, instrument the piles and monitor them with testing equipment satisfying the requirements of Section 1.4 of this Special Note. Prior to lifting the pile to be dynamically tested in to place, provide a minimum of 3 feet of clearance to the gage locations on the pile for pile preparation, and prepare holes.
for gage attachment. Attach gages a minimum of two diameters below the pile head.

- Install strain transducers and accelerometers near the head of each pile to be tested, and use a compatible measuring and recording system to record the data during driving. If desired, install fully waterproof underwater wires, transducers, accelerometers and all other applicable devices that have been waterproofed by their manufacturer. Provide training by the manufacturer of the underwater devices for the Pile Driving Monitoring Engineer(s) to ensure that they understand how to properly use the underwater devices. Submit a letter of certification from the manufacturer stating that the underwater devices have been properly waterproofed and that includes the name(s) of the engineer(s) who will be using them stating that they have been trained to be proficient in the use of the underwater devices. Consider the anticipated variations in lake level and the selected pile length above the design cut-off elevation when planning the dynamic pile load testing;

- Install a minimum of two and four sets of transducers/accelerometers (equally spaced around the pile), for the 30- and 72-inch-diameter piles, respectively;

- Appropriately position and fix the equipment required to be attached to the pile to the satisfaction of the Engineer and the testing consultant. Monitor, and re-tighten gages as needed during testing. Replace defective gages as needed during testing;

- Use the testing equipment to monitor pile stresses during driving to prevent pile damage and ensure pile integrity and resistance (i.e. capacity); and

- Do not exceed driving stresses of 45 ksi (90% of specified 50 ksi yield stress steel) or 40.5 ksi (90% of specified 45 ksi yield stress steel).

- Refer to the driving criteria in Sections 2.3.1 and 2.3.2 of the Special Notes for Steel Pipe Piles-Install.

2.3.3 Preparation of the Pile Head

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

Monitor pile driving when pile driving begins unless otherwise allowed by the Engineer. 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 the driving criteria outlined in Sections 2.3.1 and 2.3.2 of Special Note for Steel Pipe Piles-Install is satisfied. Make any required adjustments to the fuel and/or power setting of the hammer if necessary to verify the resistance within the specified range of blow counts or to meet other applicable testing objectives. When the level of the gages is within 1 foot of any obstruction endangering the survival of gages or cables, halt driving and remove gages from the pile. If additional driving is required, remove the obstruction or splice the pile and reattach the gages near the head of the next pile segment prior to resuming driving. For each initial drive and restrike dynamic pile test, as defined in Section 5.0 of this Special Note, perform pile driving analysis using signal matching techniques for up to three (3) selected hammer blows per each test (as defined in Section 5.0 of this Special Note) to determine the relative resistance (capacity) from end bearing and skin friction along the length of the pile.

- Perform beginning of restrike (BOR) tests at the frequency indicated in Table 2 and Table 4 of this Special Note with the time interval between end of initial driving and beginning of restrike in accordance with Table 2 and Table 4 of this Special Note. During restrike, instrument and monitor the pile in a manner similar to that used during initial driving. For each restrike test, perform pile driving analysis using signal matching techniques for selected blows from the beginning of restrike to determine the relative resistance from end bearing and skin friction along the length of the pile.

- Record set per each hammer blow or for a known number of hammer blows during BOR tests. If underwater gages are used, weld a bracket on the side of the pile beneath the hammer bonnet, with a visually observable extension above the waterline for the purpose of set measurements. Use surveying equipment and the bracket to measure the set per hammer blow. The Department will consider alternate methods if proposed by the Contractor.

- Perform restrike tests with a warmed-up hammer (if applicable) by striking the pile a maximum of 5 blows unless testing equipment indicates overstressing or damage to the pile. Include the hammer warm-up procedure in Submittal No. 2 per Table 1 of this Special Note.
If hammer warm-up is not required, the hammer operation should at least be checked and confirmed by a qualified operator prior to each restrike.

- If directed by the Engineer, advance the pile and perform re-drive dynamic testing immediately after performing a restrike test. Perform signal matching on one or more selected hammer blows (up to two) at the end of the re-drive.
- If overstressing or damage to the pile is indicated, immediately discontinue driving and notify the Engineer. If the contractor overdrives the pile during restrike testing, and disturbs the set up of the skin resistance, additional wait/setup time may be required by the Engineer. In the event initial restrike testing indicates a pile resistance below the specified resistance, additional driving may be required as directed by the Engineer.
- The Engineer may require dynamic pile testing on additional piles beyond those listed in Table 4 if inconclusive results are obtained or unusual driving conditions are encountered. These restrikes will be paid using the established unit bid prices.
- Evaluate pile resistance and integrity based on the standard procedure used in practice.
- Provide the Department within 48 hours with tabular records of the dynamic pile testing field measurements obtained at the end of initial driving and at the beginning of restrike, which includes the signal matching results.

2.4 Dynamic Testing Overruns

If the Engineer directs the contractor to perform dynamic testing which results in dynamic testing overruns or performed tests which exceed the total contract plan quantities (including contingency quantities) for one (1) or more of the four (4) dynamic testing bid items, the Department will consider requests by the contractor to grant time extension(s) for one or more of the specified milestone dates. Submit any requests for time extension(s) of the specified milestone(s) in writing to the Engineer as soon as possible and no later than 10 calendar days after being directed to perform the additional dynamic test(s). Include justification to show how performing the additional dynamic test(s) will directly impact the contractor’s schedule and adversely affect the ability of the contractor to meet one or more of the milestone dates. The Department will not consider any requests for time extensions which are not submitted within 10 calendar days and/or do not meet the above requirements. The Department will pay for any dynamic tests which result in dynamic testing overruns at the contract unit bid price.
3.0 DYNAMIC PILE TEST REPORTS

3.1 Preliminary Dynamic Pile Test Reports

Submit a preliminary test report for each pile tested (for both End of Drive (EOD) and Beginning of Restrike (BOR) tests) for review by the Department. In the reports, include narrative, tabular as well as graphical presentation of the dynamic test results versus depth of the pile tested. Also include the following:

- Maximum force applied to the pile head.
- Maximum pile head velocity.
- Maximum energy imparted to the pile.
- Assumed soil damping factor and wave speed.
- Static resistance (i.e. capacity) estimate.
- Maximum compressive and tensile forces in the pile.
- Pile integrity.
- Blows per inch.
- Stroke length.
- Datum elevation and description of datum (i.e. template, water surface, mudline, etc.).
- Mudline elevation.
- Indication of drive time and any delays experienced during driving.
- Elevation of soil inside the pipe pile above the constrictor plate at end of drive and beginning of restrike.
- Elevation of soil inside the pipe piles at the end bents at end of drive and indicate whether plugging has occurred in the pipe pile.
- Pile tip elevation at beginning and end of test.
- Signal matching analysis for EOD and/or BOR. Both BOR and EOD if a re-drive is required. Use a single-toe model with radiation damping, limiting the radiation damping Smith damping factor to 0.4 feet/sec for the 72-inch-diameter pipe piles.
- Impact of driving shoe on the signal matching model.
- Number of usable (in-calibration and operational) accelerometers and strain gages.
- Actual elapsed hours since end of drive, for restrikes only.
- Refined wave equation based upon dynamic testing analysis, including inspector’s chart for the pile resistance values specified by the Engineer for each specific substructure.
Provide data files of the results for independent analyses by the Department.

3.2 Dynamic Pile Test Summary Report

Submit a summary report, including signal matching, for each pile tested for review by the Department. Include the results of hammer performance, pile driving stresses, and pile resistance during initial driving and restrike for all piles tested. Resolve any issues between the saximeter, inspector’s records and the blow counts recorded on the dynamic testing equipment in the summary report. Also include the following for both EOD and BOR tests:

- Pile number and location.
- Date of testing and date of pile installation.
- Pile identification number and location.
- All information provided in preliminary reports not listed here.
- Hammer type, stroke length, hammer energy and other relevant details.
- Blow selected for signal matching analysis.
- Maximum compressive and tensile stresses, stroke, and resistance (i.e. capacity) versus penetration depth.
- Temporary compression.
- Pile integrity and location of damage, if any.
- Force/velocity versus time trace.
- Wave up and wave down versus time trace
- Force/velocity match curve.
- Resistance distribution along the pile.
- Detailed graphical and tabular results from blow analyzed using signal matching techniques and software.
- Narrative description of toe model used in the signal matching model and the damping model for the 72-inch-diameter pipe piles.
- Discussion of impact of the constrictor plate on the pile impedance, wave speed and any other dynamic properties of the pile for the 72-inch-diameter pipe piles.
- Discussion of match quality and impacts assumptions within the signal matching model may have had on the match quality of the signal matching results.
- Narrative describing the data, results, and their interpretation.

4.0 INCIDENTAL EQUIPMENT

At least fourteen (14) calendar days prior to the beginning of dynamic testing, provide two electronic devices to aid in recording pile hammer blows, stroke, and
energy such as an “E-Saximeter” or accepted equivalent meeting the specifications on Page 16 of this Special Note. This device will immediately become property of the Department for use on this project.

At least one (1) calendar day prior to the beginning of dynamic testing, 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 the “Dynamic Pile Testing” items and no separate payment will be made.

5.0 MEASUREMENT

Bidders are cautioned that contract quantities for bid items covered in this Special Note are based on the Department’s pre-bid estimates and are subject to increases or decreases based on the conditions encountered. Payment for authorized and accepted quantities will be at the contract unit bid price regardless of increases or decreases in quantities. The Overrun and Underrun Formulas defined in Section 104.02.02 of the Standard Specifications does not apply to the items covered in this Special Note.

DYNAMIC PILE TESTING

Dynamic pile testing on test piles and selected production piles will be measured per each. Payment for each restrike test performed will be separate from payment for each test performed during initial driving. Payment for each test will include pile driving monitoring, pile driving analysis (including wave equation and signal matching work) performed and preparation of applicable reports. Payment for the below described work, includes all material, equipment, tools, labor, reporting and any other incidental work, costs, and delays incurred by the Contractor necessary to complete these items.
5.1 Dynamic Pile Testing-On Water-Initial

Initial drive is the end of drive (EOD) condition, when the initial driving conditions defined in the Special Note for Steel Pipe Piles-Install occur. On water refers to the bridge piers where access will be from barges situated on the lake.

5.2 Dynamic Pile Testing-On Land-Initial

Initial drive is the end of drive (EOD) condition, when the initial driving conditions defined in the Special Note for Steel Pipe Piles-Install occur. On land refers to the end bents where the piles can be accessed from land.

5.3 Dynamic Pile Testing-On Water-Restrike

Restrike is applying hammer blows to the pile head after a prescribed time period to determine the pile resistance at the specified time period. Apply no more than five (5) hammer blows during restrike after the specified time period has elapsed. The cost of any re-drive dynamic testing performed immediately after restrike is incidental to the restrike test. On water refers to the bridge piers where access will be from barges situated on the lake. Include cost of all contractor equipment, labor, incidental items and delays required to perform the restrike. The Department will pay the established Dynamic Pile Testing-On Water-Restrike contract unit bid price for all restrikes.

5.4 Dynamic Pile Testing-On Land-Restrike

Restrike is applying hammer blows to the pile head after a prescribed time period to determine the pile resistance at the specified time period. Apply no more than five (5) hammer blows during restrike after the specified time period has elapsed. The cost of any re-drive dynamic testing performed immediately after restrike is incidental to the restrike test. On land refers to the end bents where the piles can be accessed from land. Include cost of all contractor equipment, labor, incidental items, and delays required to perform the restrike.
6.0  PAYMENT

Payment will be made under:

<table>
<thead>
<tr>
<th>BID ITEM CODE</th>
<th>ITEM</th>
<th>UNIT</th>
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</thead>
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<tr>
<td>23233EC</td>
<td>DYNAMIC PILE TESTING - ON WATER – INITIAL</td>
<td>EACH</td>
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<tr>
<td>23233EC</td>
<td>DYNAMIC PILE TESTING - ON LAND - RESTRIKE</td>
<td>EACH</td>
</tr>
</tbody>
</table>
Figure 1
Pile and Driving Equipment Data Form (From FHWA-HI-097-014)

Special Note for Dynamic Pile Testing
Effective with December 20, 2013 Letting
Page 16 of 17
**E-Saximeter Specifications**

**Physical:**

Size: 100mm X 190mm X 50mm (4 inches X 7.5 inches X 2 inches)
Weight: 0.54 kg (1.19 lb.)
Temperature range: 10 to 40°C (50 to 104°F) operating
Power: built-in rechargeable battery w/ 16 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 mm^2), non tactile

**Electronic:**

32 bit CICS Micro CPU up to 50 MHz
10 bit 2 channel analog to digital converter; 8 bit 2 channel digital to analog converter
Internal microphone 70 to 115 dB Standard Type A
USB drive for data transfer
8 MB internal RAM

**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
Operates in English or SI units
Full one year warranty
Technical manual included
SPECIAL NOTE FOR STEEL PIPE PILES – FURNISH

This Special Provision shall apply to all steel pipe piling. The Pile thickness shall be as indicated in the Contract Plans. It supplements information provided in Section 604 pertaining to “cast-in-place concrete piles”, “cast-in-place piles”, “cast-in-place pile shells”, “steel pipe piles”, “steel shells” or “pile shells”, except as modified herein. Where a conflict exists between this Special Note and Section 604, the provisions herein shall govern.

Section references herein are to the Department’s 2012 Standard Specifications for Road and Bridge Construction except as noted otherwise.

1.0 DESCRIPTION. This work consists of fabricating and furnishing steel pipe piles and test piles to their final length, including constrictor plates and pile shoes of the sizes required for installation and as shown on the Contract Plans. This includes performing all other incidental work as described herein and as measured in Section 8 of this Special Note. Within these provisions “final length” has the meaning defined in Section 8.

2.0 MATERIALS.

02.01 Steel Pipe Piles, including Test Piles. Piles with wall thickness greater than 1 in. shall conform to ASTM A572, Grade 50. Piles with wall thicknesses not greater than 1 in. shall conform to either ASTM A572, Grade 50, or ASTM A252, Grade 3.

The carbon equivalency in all steel pipe piles, regardless of wall thickness, shall not exceed 0.45 percent, using the following formula from AWS D1.1 to calculate the percent carbon equivalent:

\[
CE = C + \frac{(Mn + Si)}{6} + \frac{(Cr + Mo + V)}{5} + \frac{(Ni + Cu)}{15}
\]

Sulfur content in all steel pipe piles shall be limited to 0.05%.

02.02 Welded Studs. Welded studs at footing connection shall conform to ASTM A108.

02.03 Pile Shoes. Conform to ASTM A 148, Grade 90/60 or ASTM A694, Grade F60.

02.03-04 Constrictor Plate and Stiffeners. Conform to ASTM A 572, Grade 50. Steel in constrictor plates and stiffeners shall satisfy the same carbon equivalency and sulfur content limitations as required for steel pipes in Section 2.01 of this Special Note.

02.04-05 Concrete. For pipe pile concrete infill see Special Note for STEEL PIPE PILES – INSTALL.

02.05-06 Steel Reinforcement. For reinforcing steel in concrete infill see Special Note for STEEL PIPE PILES – INSTALL.
3.0 EQUIPMENT.

03.01 Equipment for Driving. Installation is not part of this Special Provision. Conform to Special Note for STEEL PIPE PILES - INSTALL in the Contract Documents.

4.0 FABRICATION.

04.01 Steel Pipe Piles. Fabrication of steel pipe piles with wall thicknesses greater than 1 in. shall conform to American Petroleum Institute Specification 2B (API 2B), including dimensional tolerances. API 2B Appendix A, Supplementary Requirements SR1 through SR4, shall not apply. Spiral welded pipe (SWP) with wall thickness greater than 1 in. shall not be permitted.

Fabrication of steel pipe piles with wall thicknesses not greater than 1 in. shall conform to either: API 2B, including dimensional tolerances; or ASTM A252, including dimensional tolerances plus these additional tolerance requirements:

- Circumference: The outside circumference at any point in a length of pipe shall be within ±1% of the nominal circumference or within ±¾ in., whichever is less.
- Straightness: The straightness shall not vary more than 0.001 times the length of the pile (1/8 in. in any 10-ft length.)
- Studs for footing connection shall be field welded and tested in accordance with AWS D1.1.

04.02 Pile Shoes. Pile shoe shall consist of cast steel or machined steel open-ended, inside flange cutting shoe of the size shown on the plans. Pile shoes shall have full contact with pile cross-section at the tip of the pipe to avoid stress concentration and possible damage to the pile during installation.

04.03 Constrictor Plate and Stiffeners. Conform to Section 607 and the Contract Plans.

04.04 Welding Procedure and Operator Qualifications. Conform to API 2B.

04.05 Shop Welding. Shop welding of steel pipe piling is defined as welding performed at the pipe manufacturer’s facility. Shop welding of steel pipe piles shall conform to API 2B.

04.06 Field Welding. Field welding of steel pipe piling is defined as welding performed after the material has been transported from the pipe manufacturer’s facility. Field welding of pipe splices (girth welds) shall conform to the requirements of API 2B and the following:

A. Girth welds shall be complete joint penetration welds conforming to AWS D1.1.

B. Welds shall be located at least 12 in. away from a skelp end weld.
C. Match marking of pipe ends at the manufacturing or fabrication facility is recommended for piling to ensure weld joint fit-up. Prior to positioning any 2 sections of steel pipe to be spliced by field welding, including those that have been match marked at the manufacturing or fabrication facility, the Contractor shall equalize the offsets of the pipe ends to be joined and match mark the pipe ends.

D. Welds made in the flat position or vertical position (where the longitudinal pipe axis is horizontal) shall be single-vee or double-vee groove welds. Welds made in the horizontal position (where the longitudinal pipe axis is vertical) shall be single-bevel groove welds. Joint fit-ups shall conform to the requirements in AWS D1.1, Section 5.22.3.1, "Girth Weld Alignment (Tubular)," and these special provisions.

E. For field welding limited to attaching backing rings and handling devices, the preheat and interpass temperature shall be in conformance with the requirements in AWS D1.1, Section 3.5, "Minimum Preheat and Interpass Temperature Requirements," and with AWS D1.1 Table 3.2, Category C.

F. The minimum preheat and interpass temperature for production splice welding and for making repairs shall be 150°F, regardless of the pipe pile wall thickness or steel grade. In the event welding is disrupted, preheating to 150°F must occur before welding is resumed.

G. Welds shall not be water quenched. Welds shall be allowed to cool unassisted to ambient temperature.

5.0 INSPECTION AND REPAIR.

Mill test reports: Furnish notarized certified mill test reports to the Engineer and Department showing that all materials furnished conform to the specifications.

Inspection and repair of welds shall conform to API 2B except Subsection 7.3 shall be modified for field splices (girth welds) as follows:

25% of each girth weld shall be examined by radiographic or ultrasonic inspection in accordance with the requirements of: Section 6, and Part E with Paragraph 6.12.3, and Part F with Paragraph 6.13.3.1, of AWS D1.1. The Engineer may select several locations on a given splice. The cover pass must be ground smooth at locations to be tested. If repairs are required in a portion of the tested weld:

1. Perform NDT on the repaired portion.
2. Perform additional NDT on untested areas on each side of the repaired portion. The length of additional NDT on each side of the repaired portion must equal 10 percent of the pipe's outside circumference.
3. After this additional 20 percent of NDT is performed, and if additional repairs are required, determine and document the total cumulative repair lengths from all NDT. If the cumulative weld repair length is equal to or more than 10 percent of the pipe's
outside circumference, then perform NDT on the entire weld.

6.0 HANDLING. Working drawings shall be submitted to the Engineer before attaching handling devices to steel pipe piling. Welds used to attach handling devices to steel pipe piling shall be aligned parallel to the axis of the pile and shall conform to the requirements for field welding specified herein. Working drawings shall include locations, handling and fitting device details, and connection details. Attachments shall not be made to steel pipe piling until the working drawings are approved in writing by the Engineer. The Contractor shall allow the Engineer 15 Business Days for review, as described for rolled steel sections in Special Note for Shop Drawings and Welding Procedures.

7.0 SUBMITTALS. Conform to Special Note for Shop Drawings and Welding Procedures. The following submittals are required:

1. Pile fabrication details
2. Pile fabrication section lengths
3. Pile field splice details and procedures
4. Constrictor plate fabrication details
5. Pile shoe fabrication details
6. Schedule for fabrication and delivery
7. Repair procedures for any fabrication defects

8.0 MEASUREMENT.

8.01 Pipe Piles - Furnish. Quantity for Furnishing Steel Pipe Piles will be measured per linear foot. Payment for the furnished piles does not include pile shoes, constrictor plates, concrete fill or reinforcement for concrete fill, but payment shall include splices and all incidental material and labor necessary to install the piles to their final length. “Final length” is defined as:

- the distance between the PILE CUTOFF ELEVATION and the LOWEST ANTICIPATED PILE TIP ELEVATION indicated in the plans at locations where the PILE TIP ELEVATION AS DRIVEN is not deeper than the LOWEST ANTICIPATED PILE TIP ELEVATION,
- the distance between the PILE CUTOFF ELEVATION indicated in the plans and the PILE TIP ELEVATION AS DRIVEN at locations where the PILE TIP ELEVATION AS DRIVEN is deeper than the LOWEST ANTICIPATED PILE TIP ELEVATION.

8.02 Test Piles (Pipe) - Furnish. Quantity for Furnishing Steel Pipe Test Piles will be measured per linear foot. Payment for the furnished test piles does not include pile shoes, constrictor plates, concrete fill or reinforcement for concrete fill, but payment shall include splices and all incidental material and labor necessary to install the piles to their final length. “Final length” is defined as:

- the distance between the PILE CUTOFF ELEVATION and 20 feet below the LOWEST ANTICIPATED PILE TIP ELEVATION indicated in the plans at locations where the PILE TIP ELEVATION AS DRIVEN is not deeper than 20 feet below the LOWEST ANTICIPATED PILE TIP ELEVATION.
the distance between the PILE CUTOFF ELEVATION indicated in the plans and the PILE TIP ELEVATION AS DRIVEN at locations where the PILE TIP ELEVATION AS DRIVEN is deeper than 20 feet below the LOWEST ANTICIPATED PILE TIP ELEVATION.

08.03 **Pile Shoes for Steel Pipe Pile.** Payment for pile shoes shall be at the contract unit price per each individual unit and shall include all material, labor and incidentals to fabricate, furnish and attach the shoes to the pile ends prior to driving.

08.04 **Constrictor Plates for Steel Pipe Pile.** Payment for constrictor plate shall be at the contract unit price per each individual unit and shall include all material, labor and incidentals to fabricate, furnish and attach the constrictor plates to the piles prior to driving.

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Pay Item</th>
<th>Pay Unit</th>
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<tr>
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<td>PIPE PILES (FURNISH – 72 IN - 2 IN)</td>
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<tr>
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<td>PIPE PILES (FURNISH – 30 IN – 1 IN)</td>
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<tr>
<td>8033</td>
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<tr>
<td>24627EC</td>
<td>OPEN END INSIDE FIT CUTTING SHOE (72 IN - 2 IN)</td>
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<tr>
<td>24627EC</td>
<td>OPEN END INSIDE FIT CUTTING SHOE (30 IN – 1 IN)</td>
<td>EACH</td>
</tr>
<tr>
<td>24628EC</td>
<td>PILE CONSTRICTOR PLATE (72 IN - 2 IN)</td>
<td>EACH</td>
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Bidders are cautioned that contract quantities for bid items covered in this Special Note are based on the Department’s pre-bid estimates and are subject to increases or decreases based on the conditions encountered. Payment for authorized and accepted quantities will be at the contract unit bid price regardless of increases or decreases in quantities. The Overrun and Underrun Formulas defined in Section 104.02.02 of the Standard Specifications does not apply to the items covered in this Special Note.
1.0 SCOPE OF WORK

The following sections provide the requirements for driven steel pipe pile installation, schedule requirements for submittals, and Contractor/Department Responsibilities. The Department will not honor any proposal submitted by the Contractor to change pile types.

1.1 Driven Pipe Pile Installation Objectives and Qualifications

The scope of work includes furnishing all labor, driving equipment, ancillary equipment necessary, templates and analyses associated with installation of driven steel pipe piles as specified in this Special Note and in general accordance with Section 604 of the Standard Specifications, except as modified by this Special Note. Driven pile installation includes installing 30-inch outside diameter, open-ended steel pipe piles with driving shoes at the end bent locations and installing 72-inch outside diameter, open-ended steel pipe piles with driving shoes and internal steel constrictor plates at the approach span pier and main span pier locations per the plans, project specifications and this Special Note. Refer to the Special Note for Steel Pipe Piles-Furnish and the Special Note for Dynamic Pile Testing for additional information regarding the manufacture/fabrication and the testing of the pipe piles.

Bidders are cautioned to expect difficult subsurface conditions at this site. Bidders are encouraged to consult available geological literature including but not necessarily limited to Fairdealing and Fenton Geologic Quadrangle Maps and the U.S. Geological Survey Professional Paper 1151-H, “The Geology of Kentucky -- A Text to Accompany the Geologic Map of Kentucky”, Edited by Robert C. McDowell. Additional geotechnical information may be available via the KYTC Division of Construction Procurement Website under “Project Related Information”. The referenced geological literature and geotechnical information are for information only and are not contract documents. However, available subsurface data are included in the bridge plans which are contract documents.
Dense chert and sand layers and residual chert interbedded with residual clay were encountered during geotechnical explorations. Some of this material was extremely difficult to penetrate using conventional geotechnical rotary drilling equipment with diamond-impregnated casing bits and carbide tricone roller bits. Although sand- and gravel-sized chert particles were sampled, it is possible that chert particles which are larger than gravel-sized will be encountered during the construction. Bidders are advised to factor any and all risks associated with the conditions at the site into their bids.

For the purposes of this Special Note, “Department” refers to the Kentucky Department of Highways and/or consultants acting on behalf of the Department of Highways. “Engineer” is defined in Section 101.03 of the Standard Specifications.

1.1.1 Bridge Pier Contractor’s Qualifications

1.1.1.1 Qualifications of Bridge Pier Pile Driving Contractor or Subcontractor: Submit qualifications demonstrating that the Contractor has at least ten (10) years experience in heavy marine construction including at least three (3) projects in heavy marine construction, and including at least two (2) projects in a marine environment installing driven cylindrical piles (steel pipe or concrete shell) at least 30 inches in diameter and driven greater than 60 feet in penetration.

1.1.1.2 Supervisor of pier pipe pile installation: Submit qualifications showing that the Supervisor of the pipe pile installation has at least five (5) years supervisory experience within the last ten (10) years in heavy marine construction, with experience on at least two (2) projects installing driven cylindrical piles (steel pipe or concrete shell) 30 inches or larger in diameter and driven greater than 60 feet in penetration. Some or all of the experience may be with a different contractor.

1.1.1.3 Employ an independent testing agency for Dynamic Pile Testing. Submit qualifications of the testing agency and personnel per Section 1.3 of the Special Note for Dynamic Pile Testing.

1.1.1.4 Employ a Professional Land Surveyor and/or Professional Engineer licensed in the State of Kentucky with at least three (3) years experience in project survey control for projects of
similar type and complexity, including preconstruction layout of bridge foundations and determining as-built locations and elevations of driven piles.

1.1.2 End Bent Construction Qualifications

1.1.2.1 Qualifications of Bridge End Bent Pile Driving Contractor or Subcontractor: Submit qualifications showing that the Contractor has had at least five (5) years experience pile driving construction, and at least two (2) projects installing driven cylindrical piles (steel pipe or concrete shell) of at least 15 inches in diameter and driven greater than 30 feet in penetration.

1.1.2.2 Supervisor of end bent pipe pile installation: Submit qualifications showing that the Supervisor of the end bent, open-ended, pipe piles has at least five (5) years supervisory experience with pile driving and at least two (2) projects installing driven cylindrical piles (steel pipe or concrete shell) 15 inches or larger in diameter and driven greater than 30 feet in penetration. Some or all of the experience may be with a different contractor.

1.1.2.3 Employ an independent testing agency for Dynamic Pile Testing. Submit qualifications of the testing agency and personnel per the Special Note for Dynamic Pile Testing.

1.1.2.4 Employ a Professional Land Surveyor and/or Professional Engineer licensed in the State of Kentucky with at least three (3) years experience in project survey control for projects of similar type and complexity, including preconstruction layout of bridge foundations and determining as-built locations and elevations of driven piles.

1.1.3 Install 72-inch outside diameter, open-ended, pipe piles with steel constrictor plates to the specified driving criteria at the locations and depths specified in the contract documents. Refer to the Subsurface Data Sheets in the plans and additional geotechnical information posted on the Division of Construction Procurement’s website for the anticipated materials that the piles will be driven through.
1.1.4 Install 30-inch outside diameter, open-ended pipe piles to the specified driving criteria at the locations and estimated depths specified in the contract documents. Refer to the Subsurface Data Sheets and additional geotechnical information posted on the Division of Construction Procurement’s website for the anticipated materials that the piles will be driven through.

1.1.5 Perform and submit wave equation analyses per Section 1.5 of the Special Note for Dynamic Pile Testing. Dynamic testing results will be used to determine the driving criteria and control the final pile tip elevation.

1.1.6 Subcontract an independent pile testing firm to perform dynamic monitoring on the test piles. Provide the pile testing firm necessary assistance including, but not limited to, crane assistance and safety equipment, and safe access to the top of the piles prior to pile driving to facilitate installation and/or repair of the instruments. Refer to the Special Note for Dynamic Pile Testing for additional details. The test piles will also serve as production piles, once the test piles are accepted.

1.1.7 Perform layout, elevation and location survey control, provide templates and support spuds, and measurement and marking in general accordance with the requirements of Standard Specification Section 201.

1.1.8 Provide and perform all field and shop pile splicing per Special Note for Steel Pipe Piles-Furnish.

1.1.9 Perform 72-hour restrike dynamic testing on each test pile indicated on the plans. Perform restrikes on additional test piles and/or production piles as selected by the Department. The target time is 72 hours but the Department will allow these restrikes to be performed between 68 to 108 hours after end of drive and this range applies to any reference to a 72-hour restrike even if not explicitly stated. The Department will determine the need of additional restrike dynamic tests based on results of the initial restrikes. The Department will pay for additional restrikes based upon the applicable established unit prices for restrikes. The Department will pay for additional restripe dynamic tests based on the applicable established unit bid prices for restrikes.

1.1.10 Perform 168-hour restrikes on designated test piles, unless additional restrikes are indicated on the plans. The target time is 168 hours but the Department will allow these restrikes to be performed between 162 to 240
hours after end of drive and this range applies to any reference to a 168-hour restrike even if not explicitly stated. Perform restrikes on additional test piles and/or production piles as selected by the Department. The Department will determine the need of additional restrikes based on results of the initial restrikes and reserves the right to add restrike testing. The Department will pay for additional restrike dynamic testing based on the applicable established unit bid prices for restrike dynamic testing.

1.1.11 Furnish and place reinforcing steel in the pipe piles to connect with the pile caps and fill the pipe piles with concrete as shown on the contract documents.

1.1.12 After completing the pipe pile cut-offs, all unused excess materials become the property and responsibility of the Contractor to legally dispose of off-site at no additional cost to the Department.

1.2 Pre-Activity Meeting

A pre-activity meeting to cover the activities in the Special Note for Steel Pipe Piles-Install and the Special Note for Dynamic Pile Testing will be scheduled and shall occur after all the submittal items in Sections 1.3 and 2.1 of this Special Note have been submitted and accepted by the Department and not later than three (3) weeks prior to commencement of pile driving testing and construction activities. As a minimum, this meeting shall be attended by representatives of the Prime Contractor and Pile Driving Sub-Contractor(s) (if applicable) including the pile driving supervisor(s), Department District personnel as designated by the Branch Manager for Project Delivery and Preservation, Central Office Construction, Geotechnical Branch, and applicable Department Consultants. No pile construction or testing activity shall be performed until the contractor’s final submittals have been accepted as having satisfactorily resolved all review comments and the pre-activity meeting has been held.

1.3 Materials

1.3.1 Steel Pipe Piles
Conform to Special Note for Steel Pipe Piles-Furnish and contract drawings and specifications.

1.3.2 Driving Shoes
Fit each steel pipe pile with a driving shoe. Conform to Special Note for Steel Pipe Piles-Furnish.
1.3.3 Constrictor Plate and Stiffeners
Pipe piles at the pier substructure locations will contain steel constrictor plates and stiffeners installed on the interior of the pipe piles as indicated in the project plans.

1.3.4 Field Splices
Conform to Special Note for Steel Pipe Piles-Furnish and applicable contract drawing details.

1.3.5 Concrete
Class A, Mod (Pipe Pile Infill) – Provide Class A Modified Concrete conforming to contract drawings and Standard Specifications.

1.3.6 Reinforcing Steel
Conform to contract drawings and Standard Specifications.

1.4 Pile Driving Equipment

1.4.1 General - Acceptance of Driving System: Furnish all accepted pile driving equipment (including the hammer, hammer cushion, drive head, pile cushion, and other appurtenances to be furnished by the Contractor). Acceptance will be based on the requirements per the Special Note for Dynamic Pile Testing. Obtain acceptance prior to mobilizing the pile-driving equipment and beginning the pile driving. Include the description for verifying hammer performance during testing and production driving.

Submit results of the wave equation analyses demonstrating that the piles can be driven to the required length and at 75 and 100% of the required nominal axial resistances (RNAR) as indicated in the plans using the selected driving system without damage to the piles.

During pile driving operations, use the accepted driving system. No changes in the driving system or equipment will be allowed unless the Contractor has submitted revised pile driving equipment data and wave equation analyses for the corresponding driving criteria and pile stresses and the Department has accepted the revised submittal.

The Department's acceptance of the pile driving equipment does not relieve the Contractor of its responsibility to drive the piles, free of
damage, as specified in this Special Note and/or other applicable contract documents.

1.4.2 Hammers:

1.4.2.1 Drive the 72-inch outside diameter steel pipe piles with hammer(s) having a rated energy of at least 589,000 ft-lbs and conforming to this Special Note and the Special Note for Dynamic Pile Testing. Select the hammer(s) to suit the conditions expected to be encountered. Repair or replace any hammer system which malfunctions and results in failure to deliver the required rated energy as determined by dynamic pile testing. If repairs do not result in the hammer’s ability to deliver the required rated energy, replace it with a different hammer of the same type or an alternate hammer type, as accepted by the Department at no additional cost to the Department. Use the same hammer(s) to drive the test piles and the production piles at each pier. Submersible hammers are permitted. The Department will allow the Contractor to drive the 72-inch outside diameter steel pipe piles with a smaller impact hammer (rated energy lower than 589,000 ft-lbs) to the Highest Allowable Tip Elevation indicated on the contract drawings, provided that the Contractor can show through wave equation analyses the Highest Allowable Pile Tip Elevation can be achieved with the smaller impact hammer.

1.4.2.2 Drive the 30-inch outside diameter steel pipe piles with hammer(s) having a rated energy of at least 100,000 ft-lbs and conforming to this Special Note and the Special Note for Dynamic Pile Testing. Select the hammer(s) to suit the conditions expected to be encountered. Repair or replace any hammer system which malfunctions and results in failure to deliver the required rated energy as determined by dynamic pile testing. If repairs do not result in the hammer’s ability to deliver the required rated energy, replace it with a different hammer of the same type or an alternate hammer type, as accepted by the Department at no additional cost to the Department. Use the same hammer(s) to drive the test piles and the production piles at each end bent.
1.4.2.3 The Contractor may use a vibratory hammer to initially install the top section of the piles at the piers, only if the proposed equipment and procedures are submitted in writing and accepted by the Department in writing. Do not use a vibratory hammer to advance the pile tip below a depth of 50 feet below the encountered mudline.

1.4.2.4 The Contractor may use a vibratory hammer to initially install the top section of the piles at the end bents, only if the proposed equipment and procedures are submitted in writing and accepted by the Department in writing. Do not use a vibratory hammer to advance the pile tip below Elevation 310 feet.

1.4.3 Hammer Cushions - Equip all impact driving equipment, where required, with a cushion of suitable material thickness to prevent damage to the pile or hammer and to ensure uniform driving behavior. Provide hammer cushions made of durable manufactured materials which will retain uniform properties during driving. Wood, wire rope, and asbestos hammer cushions will not be permitted. Place a striker plate on the hammer cushion to ensure uniform compression of the cushion material. The Department may inspect the hammer cushion prior to beginning pile driving and after each 100 hours of pile driving. Replace the hammer cushion when the thickness is less than 75 percent of the original cushion thickness. Include appropriate cushion material and thickness in the wave equation analyses.

1.4.4 Helmets – Fit piles driven with impact hammers with an adequate helmet to uniformly distribute the hammer energy to the pile head. Align the helmet axially with the hammer and pile. Fit the helmet around the pile in such a manner to prevent transfer of torsional forces during driving, while maintaining proper alignment of the hammer and pile. Cut off the pile square, and position the helmet to hold the pile in line with the axis of the hammer. Locate the helmet plane and perpendicular to the longitudinal axis of the pile to prevent eccentric impacts from the drive head.

1.4.5 Pile Cushion – Provide pile cushion, where required, with dimensions such that the hammer energy is uniformly distributed to the pile head, when a pile cushion is required. Include appropriate cushion material and thickness in the wave equation analyses.
2.0 CONSTRUCTION

2.1 Submittals: Make submittals via SharePoint software in accordance with the Project requirements for submittals. The following submittals related to the installation of pipe piles shall be submitted by the Contractor as soon as possible after award notice and no later than 15 business days prior to start of the pile installation for review and acceptance by the Department, unless the submittal date is specifically addressed in a different Special Note. The Department will respond to the Contractor regarding acceptability of submittals 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.

Conform to all submittal requirements of the Contract, including submitting the information specified herein:

2.1.1 Bridge Pier Construction Qualifications – Refer to Section 1.1.1

2.1.2 End Bent Construction Qualifications – Refer to Section 1.1.2

2.1.3 Sequence of Operations: Submit a Sequence of Operations Plan, showing the order and sequence for each pile installation, for review and acceptance by the Department prior to driving piles. Prepare the Sequence of Operations Plan to minimize impacts to adjacent construction and the existing bridge. Conform the Sequence of Operation Plan to the requirements in the contract plans and specifications and the Special Notes.

2.1.4 Shop Drawings: Submit shop drawings showing pipe pile sizes, drive shoe details, joint or splice details, welding, pick up points, and other items pertinent to the pile design and handling.

2.1.5 Pile Installation Equipment and Methods: Items to be submitted as part of this section:

2.1.5.1 The manufacturer's literature, including technical and performance literature for the pile driving hammer, the cushions, and other equipment for pile driving.

2.1.5.2 The details of the monitoring system for determination of the elevation of the pile tip during and after driving.
2.1.5.3 The details of equipment and procedures for clearing obstructions encountered during pipe pile installation such as drilling, jetting, augering, or excavation.

2.1.5.4 Provide a project hazard analysis for the pile driving operations that will be incorporated into the project safety plan that will be submitted by the Contractor.

2.1.6 Pile Design:

Items to be submitted as part of this section:

2.1.6.1 See Special Note for Steel Pipe Piles-Furnish for a list of required submittals regarding pipe pile manufacturing and materials.

2.1.6.2 Qualifications and experience of the Contractor's Licensed Professional Engineer performing the wave equation analyses conforming to the qualifications and experience outlined in the Special Note for Dynamic Pile Testing.

2.1.6.3 The results of calculations using wave equation analyses of piles performed by a Professional Engineer, per the Special Note for Dynamic Pile Testing, that demonstrate that the equipment, cushions and cap are capable of installing the pipe piles without damage to the pile due to driving stresses. See Special Note for Dynamic Pile Testing for further details and requirements.

2.1.6.4 Settlement monitoring at the End Bents is part of the causeway expansion currently under construction under a separate contract. This data is critical for determining when the end bent piles can be driven. Settlement criteria have been met at End Bent 2. Drive End Bent 1 piles after telltale readings show less than 1/8 inch (0.01 feet) of settlement over a four week period. The Department will respond regarding the driving of the end bent piles within five calendar days after reviewing the data submitted by the causeway expansion contractor.
2.1.7. Site Plan and Pile Location Data:

2.1.7.1 Submit a Site Plan including the method to access the site (barge access, timber cribbing, any trestles, etc.), the proposed equipment laydown area, the method to secure the area from unauthorized access, the method of providing temporary support of the equipment, and methods of erosion control as required per the contract plans and specifications. The plan will be subject to the review and written acceptance of the United States Coast Guard (USCG) who will coordinate other reviews with applicable governmental agencies. The review period for this USCG review can be assumed as 30 calendar days. Extension of Contract time will be administered as prescribed in Section 108.07, unless otherwise noted. Comply with the stipulations established by the applicable governmental agencies as included in applicable permits. If requested by the permitting agencies following review of the Contractor’s plan, modify the submittal and proposed methods at no additional cost to the Department. The Department will not be liable for any delay or associated costs as a result of rejection of the Contractor’s submittal by the permitting agencies.

2.1.7.2 Within ten (10) days after the completion of all pile driving at each pier or end bent location including all restrikes, submit to the Department a final as-driven pile location drawing, certified by a Kentucky Licensed Professional Land Surveyor and/or Engineer. The plan shall be to scale and include the following:

2.1.7.2.1 North arrow and graphical scale.

2.1.7.2.2 Identify each pile by a separate number consistent with the Contract Documents.

2.1.7.2.3 The elevation of each pile top to the nearest one-tenth (0.1) foot prior to and after cutting it off.

2.1.7.2.4 Deviation in feet, to the nearest one-tenth (0.1) foot, of the axial center of the pile at cutoff elevation from the design location and coordinates of the final location of the axial center of the pile at cutoff elevation.
2.1.7.2.5 The elevation to the nearest one-tenth (0.1) foot of the pile tip to the top of the internal steel constrictor plate after final driving.

2.1.7.2.6 The deviation, to the nearest ¼-inch per foot, of the pile axis from vertical.

2.1.8 Quality Control Plan for Pile Installation: Prepare a written Quality Control Plan for Pile Installation. The plan shall address all aspects of construction including materials, equipment and operations both in preparation for construction, construction, as well as related testing, monitoring and acceptance. Submit the plan to the Department for review and acceptance.

2.2 Pile Lengths and Order Lists:

2.2.1 Furnish all piles in accordance with the Contract Documents and the Contractor's accepted submittals.

2.2.2 There is no direct payment for any pile length above the cut-off elevation that the contractor requires to install the test piles or production piles. Determine the necessary test pile or pile length above the cut-off elevation depending on the Contractor's equipment, approach and schedule (i.e. means and methods) and considering potential variations in lake levels and construction schedule.

2.2.3 The Department will pay the full furnish price for test piles from the cut-off elevation to 20 feet below the lowest anticipated pile tip elevation as shown in the contract plans, provided the actual accepted test pile tip elevation is between the highest allowable pile tip elevation and 20 feet below the lowest anticipated pile tip elevation.

2.2.4 The Department will pay the full furnish price for production pipe piles from the cut-off elevation to the lowest anticipated pile tip elevation as shown in the contract plans, provided the actual accepted test pile tip elevation is between the highest allowable pile tip elevation and the lowest anticipated pile tip elevation.

2.2.5 The contractor has an option of submitting a written request to the Engineer to order production pipe piles after test piles have been driven and revised estimated pile tip elevations and lowest anticipated pile tip
elevations have been determined by the Engineer. If the Engineer allows the contractor to exercise this option, the furnish pipe pile pay length may be modified based on updated pile tip elevation estimates. The Department will not grant any extension of contract time for the Contractor to exercise this option.

2.2.6 Any splicing required to advance a test pile to 20 feet below the lowest anticipated pile tip listed in the plans or a production pile to the lowest anticipated pile tip listed in the plans will be incidental to the applicable furnish test pile or furnish pile unit price described in the Special Note for Steel Pipe Piles-Furnish. Prior to splicing it may be necessary to perform restrike dynamic testing per the Special Note for Dynamic Pile Testing to verify that the specified percentage of required nominal axial resistance and/or specified driving criteria cannot be achieved.

2.2.7 Stockpile any production pile or test pile cut-offs, 30-inch or 72-inch, 5 feet or longer for use as splices and maintain a written inventory of available splice lengths. No double payment for furnish pile quantity or furnish test pile quantity and no direct payment for storage and handling of these sections will be made by the Department for these stockpiled cut-off sections.

2.2.8 If driving test piles deeper than 20 feet below the lowest anticipated pile tip specified in the plans is required to achieve the target percentage of required nominal axial resistance, splice stockpiled cut-off sections of the appropriate pile diameter to the top of the test pile. The Department will specify the splice length, which is anticipated to be a minimum of 10 feet. “Splice Pile” (30-inch or 72-inch) payment will be per the pay item in this Special Note for each pile splice performed. Prior to splicing it may be necessary to allow the pile to set up to determine if the applicable driving criteria can be achieved. “Test Piles Install” will be per the pay item in this Special Note (30-inch or 72-inch). No payment for furnish pile will be made when stockpiled cut-offs are used.

2.2.9 If driving production piles deeper than the lowest anticipated pile tip listed in the plans is required to achieve the target percentage of required nominal resistance, splice stockpiled cut-off sections of the appropriate diameter to the top of the pile. The Department will specify the splice length, which is anticipated to be a minimum of 10 feet. “Splice Piles” (30-inch or 72-inch) payment will be per the applicable
pay item in this Special Note. “Piles-Install” (30-inch or 72-inch) payment will be per the applicable pay item in this Special Note. No payment for furnish pile will be made when stockpiled cut-offs are used.

2.2.10 If a splice is required and no stockpile cut-offs are available to splice to the test pile or production pile, furnish additional pile of the length specified by the Department for the splice length per the applicable established furnish pile contract price (30-inch or 72-inch) in the Special Note for Steel Pipe Pile - Furnish. The full length of the furnished splice length will be paid per the appropriate contract furnish price. The test pile or production pile installed will be paid per the applicable contract install pay item based upon the actual length that the splice is driven. The splice will be paid per the applicable contract splice pay item in this Special Note.

2.3 Pipe Pile Installation

2.3.1 Driving Criteria for the Test Piles: Unless directed otherwise by the Engineer, drive the test piles on which dynamic testing is performed to the highest allowable pile tip elevation at the convenience of the contractor. Then, drive piles in accordance with the following installation criteria, whichever occurs first:

2.3.1.1 The End of Driving (EOD) Resistance is 75% of the Required Nominal Axial Resistance (RNAR) or to the Estimated Pile Tip Elevation, whichever occurs first. This assumes a setup factor (SF) of 1.33 (= 100% / 75%). This setup factor may be adjusted based on the actual setup observed as testing proceeds. Note that the percentage of RNAR and Elevation criteria are subject to change if directed by the Engineer.

2.3.1.2 Driving stresses exceed 45 ksi (90% of 50 ksi yield stress) or 40.5 ksi (90% of 45 ksi yield stress).

2.3.1.3 A set of 0.07 inch/blow (i.e. a blow count of 15 blows per inch) is obtained for a sustained (1 foot) length of pile penetration and the pile is driven to at least the highest allowable pile tip elevation indicated on the project plans.

2.3.1.4 After prescribed waiting periods, perform Beginning of Restrike (BOR) tests on the designated test piles. The target 72-hour
BOR resistance is 85% of the Required Nominal Axial Resistance (RNAR). The target 168-hour BOR resistance is 90% of the Required Nominal Axial Resistance (RNAR). The Department will use data from these restrike tests to evaluate the long-term static resistance of the piles.

2.3.1.5 Unless otherwise directed by the Engineer, re-drive the test pile until the criteria is achieved in Sections 2.3.1.2 or 2.3.1.3 of this Special Note or to 18 feet below the Lowest Anticipated Pile Tip Elevation shown in the contract plans, whichever occurs first. If directed by the Engineer, perform a 72-hour (68 to 108 hours after initial drive) restrike.

2.3.1.6 If the target percentage of RNAR at EOD or BOR condition cannot be achieved prior to achieving a pile tip elevation of 20 feet below anticipated lowest pile tip elevation, the Department will specify a splice length and direct the contractor to perform the splice and continue to drive the test pile until the specified criteria is satisfied as described in Sections 2.3.1.1 to 2.3.1.4 of this Special Note.

2.3.2 Driving Criteria for the Production Piles: Drive the production piles to the highest allowable pile tip elevation at the convenience of the contractor. Upon completion of the test pile driving and submission of the dynamic testing reports for end of drive and beginning of restripe as the testing is completed, the Engineer will provide End of Driving (EOD) and Beginning of Restripe (BOR) driving criteria for the remaining production piles at each substructure within three business days of receiving the dynamic testing results.

2.3.2.1 At Piers 1 to 3 and Piers 7 to 9, drive the production piles below the highest allowable pile tip elevation with dynamic testing to the EOD criteria set in Section 2.3.1.1 of this Special Note or to EOD criteria established from the test pile at the given pier.

2.3.2.2 At Piers 1 to 3 and Piers 7 to 9, restrike the production piles at 72 hours (68 to 108 hours after initial drive) after EOD with dynamic testing to the 72-hour BOR criteria set in Section 2.3.1.4 of this Special Note or to the driving criteria established from the test pile at the given pier.
2.3.2.3 If the production piles at Piers 1 to 3 and Piers 7 to 9 do not achieve the 72-hour BOR criteria prior to reaching the lowest anticipated pile tip elevation, the Department will specify a splice length and direct the contractor to perform the splice and continue to drive the pile until the driving criteria is satisfied. Splices will first be made using the stockpiled cut-off sections of appropriate pile diameter.

2.3.2.4 At the End Bents and Piers 4 to 6, drive the production piles below the highest allowable pile tip elevation to the EOD criteria established by the Engineer from the test pile results.

2.3.2.5 If the production piles at the End Bents and Piers 4 to 6 do not achieve the established EOD or 72-hour BOR driving criteria prior to reaching the lowest anticipated pile tip elevation, the Department will specify a splice length and direct the contractor to perform the splice and continue to drive the pile until the driving criteria is satisfied. Splices will first be made using the stockpiled cut-off sections of appropriate pile diameter.

2.3.3 Inspection of Pipe Piles: Provide man-lifts, crane-lifts, or other equipment as may be required or requested. If dynamic testing or hammer blows indicate potential pile damage during driving and if directed by the Engineer, the Contractor will be required to stop driving inspect the exterior and interior portions of the pipe piles above the water surface using photographs or videos and provide the resulting documentation to the Engineer immediately. Additionally, the Contractor will be required to measure and report the elevation of the soil plug and water surface inside the pile to the Department immediately before and after each driving and/or restrike “session” that begins or ends at or below the highest allowable pile tip elevation. No pipe pile will be accepted unless the required information is submitted to and accepted by the Department.

2.3.4 Perform all work in this section in accordance with the accepted Quality Control Plan for the Pile Installation per Section 2.1.8 of this Special Note.

2.3.5 Sequence: Drive all test piles at a pier or end bent, as specified on the plans, including the restrikes, until accepted by the Department before any of the production piles at that pier or end bent are driven below the highest allowable tip elevation. Restrike indicated test piles at 72 hours and 168 hours following the end of the initial driving. The Department will provide the recommended production pile EOD and BOR driving criteria based upon the dynamic pile testing results within 3 business days of receiving the dynamic pile testing report at each substructure.
Drive the remaining production piles below the highest allowable pile tip elevation by driving those located nearest the existing bridge first and in a sequence so as to minimize the impacts on the existing bridge foundations and to reduce the potential effects of densification on the installation of the rest of the piles within a pier.

Perform a 72-hour restrike on all test piles after the end of the initial driving and any production piles selected by the Department. At each pier and end bent location, restrike the test piles and up to two (2) production piles at 168 hours (162 to 240 hours), if selected by the Department. If a submersible hammer is planned to be used below the water surface, propose a method of measuring the pile set per blow during restrike tests for review and acceptance by the Engineer.

2.3.6 Cleanout: After final driving and restrike, clean out the pipe pile removing materials to the elevation shown on the Contract Drawings. Use methods as needed and appropriate, including but not limited to excavating, augering, chiseling, air-lifting or jetting to remove the materials encountered, which do not result in damage to the driven pipe pile.

At all times during excavation, maintain the water or drill fluid level inside the pipe no more than 5 feet below the surrounding lake level including during fluctuations resulting from operation of the dam. Do not dewater the interior of the pipe pile without prior acceptance by the Department.

In no case remove any materials below the constrictor plate.

Remove soil from the interior of the pipe pile to the designated level shown on the contract drawings to create a level soil surface within the pile. Remove all loose/soft silt, clay, sand, gravel and all other soil materials above the top of the designated cleanout elevation shown on the contract drawings, unless otherwise accepted by the Department.

2.3.7 Determination of pile resistance:

Evaluate the nominal resistance of each test pile and selected production piles using dynamic pile testing as described in the Special Note for Dynamic Pile Testing.
2.3.8 Preparation for Driving:

2.3.8.1 Layout and Elevation and Location Control: Layout all pile locations. Establish a benchmark at each of the proposed driving locations on an object that is not influenced by surrounding lake levels to the nearest 0.1-foot, and is referenced to the project elevation datum and visible above maximum anticipated surrounding lake level.

Verify the tip elevation of driven piles to the nearest 0.1-foot relative to the project elevation datum. Confirm each pile tip elevation prior to and following pile restrike, and as required by the Engineer.

2.3.8.2 Templates: Pile driving templates or other acceptable means and methods proposed in writing by the Contractor and accepted in writing by the Engineer are deemed temporary works and are incidental to the construction of the permanent works. Include a description of the templates necessary to align and maintain the piles at their proper location and alignment in the Quality Control Plan for Pile Installation. Adjust the template(s) as necessary to prevent the tip of the piles from moving (i.e. “walking”) from their planned location. Securely fix the templates using temporary spud piles and/or other appropriate bracing and supports at the option of the Contractor. Situate the template configurations and spud piles so as not to injure or displace driven piles nor interfere with pile driving or other portions of the work. Use templates or other means and methods proposed in writing by the Contractor and accepted in writing by the Engineer to maintain the pile location and verticality until all piles in the pier group have been driven at least to the highest allowable tip elevation. Ensure that the location and alignment are maintained throughout pile installation and that the tolerances in Section 2.3.9.3 are achieved until the piles are accepted and incorporated into the substructure pile cap. At the end bents, the Contractor may submit a written request to the Engineer to remove portions of the templates (or other means and method proposed in writing by the Contractor and accepted in writing by the Engineer) prior
to acceptance of all piles in the end bent. Dismantle and remove the templates and temporary bracing, supports and spud piles in a manner so as not to damage, or misalign completed piling. Templates, bracing, supports, spud piles and other materials necessary to meet the requirements of this subsection remain the property of the Contractor. Repair any damage to the pipe piles as a result of the construction and removal of all materials necessary to meet the requirements of this subsection at no additional cost to the Department.

2.3.8.3 Measurement and Marking of Piles: Clearly and accurately mark all piles prior to installation at 1-foot vertical intervals and marked numerically at 5 feet vertical intervals starting at the pile tip.

Notify the Department of the total measured length of each pile and allow the Department to verify the length and accept the pile marking prior to the start of driving.

During driving, provide a graduated gauge 24 inches in length, with 1-inch increments clearly marked, and that is used as part of an elevation monitoring system situated at template (or other observable) level to allow verification of the final driving resistance for each pile driven. Secure and reference the monitoring system to an object that is not influenced by changes in surrounding lake levels.

If a submersible hammer is planned to be used below the water surface, provide a method of measuring the pile set per blow during restrike tests that is reviewed and accepted by the Engineer.
2.3.9 Pile Driving Records:

2.3.9.1 Test Pile Driving Records: For each test pile driven, keep records of the number of blows for each foot of penetration for the entire pile and the penetration (to the nearest 1/8 inch) under the final series of blows (pile set over the last 10 hammer blows). Include the type and size of hammer used, rate of hammer operation and stroke, type and dimensions of driving helmet and cushion block in the records. Include the date, starting time, total driving time, pile location and identification number, pile type and size, “ground” or “mudline” elevation from which the pile is driven, elevation of soil within the interior of the pile above the constrictor plate, and final elevation of the pile tip and butt in the records. Indicate the elevation to which soil or interior of pipe pile was removed prior to concrete placement, volume and elevations of concrete, and pipe pile fill that was placed in the pile. Provide a copy of the records to the Engineer at the conclusion of each day’s driving.

2.3.9.2 Production Pile Driving Records: Keep records for each production pile driven of the number of blows for each foot of penetration for approximately the last 10 feet of pile length (estimated upon the test pile driving results) and the penetration (to the nearest 1/8 inch) under the final series of blows to confirm the the end of driving (EOD) criteria or beginning of 72-hour restrike criteria (BOR) (pile set over the last ten (10) hammer blows and stroke, if applicable). Include the type and size of hammer used, rate of hammer operation and stroke, type and dimensions of driving helmet and cushion block in the records. Include the date, starting time, total driving time, pile location and identification number, pile type and size, “ground” or “mudline” elevation from which the pile is driven, elevation of soil within the interior of the pile above the constrictor plate, and final elevation of the pile tip and butt in the records. Indicate the elevation to which soil in the interior of pipe pile was removed prior to concrete placement, volume and elevations of concrete, and pipe pile fill that was placed in the pile. Provide a copy of the records to the Engineer at the conclusion of each day’s driving.
2.3.9.3 Driven Pile Location and Alignment Tolerances: Drive all piles at the locations and alignments shown on the Contract Drawings unless otherwise directed or accepted in writing by the Engineer. Drive piles to within an axial tolerance not to exceed 1/4-inch per foot variation from the vertical. Drive the piles such that the final position of the axial center of driven foundation piles, measured in the plane of the cut-off elevation, does not deviate from the design location by more than 6 inches. Do not manipulate the piles after driving in order to force them into a tolerable position.

Perform accepted corrective action(s), as may be required, including replacement of misaligned piles and/or furnishing materials at no additional cost to the Department. Remove, or, if space allows and as allowed by the Engineer, cut-off the misaligned piles and then redrive or replace misaligned piles to the satisfaction of the Engineer.

2.3.9.4 Pile Heave and Restriking: Determine and record the elevation of the top of each pile immediately after driving and re-striking and again after completion of the driving of all piles in the group. Redrive any pile, by either the restrike criteria or to the original tip elevation, whichever is the greater distance, which has heaved more than 0.5-inch. Restrike the piles in accordance with this Special Note.

2.3.10 Defective, Damaged or Broken Piles:

Do not subject the piles to excessive or undue injury or stresses or to splitting or excessive deformation as a result of the driving operations and procedures. Correct any defective, damaged, or broken pile(s) by one of the following methods as accepted by the Engineer:

2.3.10.1 Withdraw the pile and replace with a new, and if necessary, longer pile; or

2.3.10.2 Cut off the defective or damaged pile at an elevation accepted by the Engineer, and splice another section to provide the required final elevation.
2.3.10.3 Perform any and all such remedial materials and work at no additional expense to the Department.

2.3.11 Pile Cut-offs:

2.3.11.1 Do not cut-off piles until all piles within a group have been checked for heave and until all required restriking has been completed to the satisfaction of the Engineer. Re-drive any piles exhibiting heave of 0.5 inches or more to the required resistance or original tip elevation, whichever is deeper.

2.3.11.2 Unless otherwise specified, cut off all piles perpendicular to the longitudinal axis of the pile at the elevations specified on the Contract Drawings. Save all applicable cut-offs per Section 2.2.7.

2.3.11.3 The cut-offs may be used in splicing or building up other piles as required until all pipe pile driving is complete. Upon completion of the work, all unused or excess materials become the property of the Contractor to be legally disposed of off-site.

3.0 METHOD OF MEASUREMENT

Bidders are cautioned that contract quantities for bid items covered in this Special Note are based on the Department’s pre-bid estimates and are subject to increases or decreases based on the conditions encountered. Payment for authorized and accepted quantities will be at the contract unit bid price regardless of increases or decreases in quantities. The Overrun and Underrun Formulas defined in Section 104.02.02 of the Standard Specifications does not apply to the items covered in this Special Note.

3.1 PILES - INSTALL – 30 IN PIPE – 1 IN will be measured for payment, calculated from the bottom of pile cap elevation to the as-driven tip elevation at the end bents, inspected and accepted in accordance with the Contract Documents and/or as directed by the Engineer. Pile length from cut-off to bottom of pile cap will not be measured or paid for installation.

3.2 PILES - INSTALL - 72 IN PIPE – 1 IN will be measured for payment, calculated from the measured mudline to the as-driven tip elevation at pier locations, inspected and accepted in accordance with the Contract Documents and/or as
directed by the Engineer. Pile length from cut-off to mudline will not be measured or paid for installation. The mudline varies at the pier locations and will be defined as the mudline at each pile location which will be reported to the Engineer as measured by the Contractor in the presence of the Engineer.

3.3 TEST PILES - INSTALL - 30 IN PIPE – 1 IN will be measured for payment, calculated from the bottom of pile cap elevation to the actual driven pile tip elevation, inspected and accepted in accordance with the Contract Documents and/or as directed by the Engineer. Pile length from cut-off to bottom of pile cap will not be measured or paid for installation.

3.4 TEST PILES - INSTALL - 72 IN PIPE – 2 IN will be measured for payment, calculated from the measured mudline to the actual driven pile tip elevation, inspected and accepted in accordance with the Contract Documents and/or as directed by the Engineer. Pile length from cut-off to mudline will not be measured or paid for installation. The mudline varies at the pier locations and will be defined as the mudline at each pile location which will be reported to the Engineer as measured by the Contractor in the presence of the Engineer.

3.5 SPLICE PILES - 30 IN PIPE – 1 IN – Payment for SPLICE PILE – 30-IN PIPE – 1 IN will be at the contract unit price per each and shall include all material, labor, any cutting and incidentals to perform the splice per the project plans and the applicable section of the Special Note for Steel Pipe Piles-Furnish. Splice piles will only be applicable when the Department directs the contractor to drive the test pile to an elevation that is greater than 20 feet below the lowest anticipated pile tip elevation or directs the contractor to drive the production pipe pile to an elevation that is below the lowest anticipated pile tip elevation. Any splicing required to advance a test pile to 20 feet below the lowest anticipated pile tip listed in the plans or advance a pipe pile to the lowest anticipated pile tip elevation listed in the plans will be incidental to the applicable test pile furnish or pipe pile furnish unit price described in the Special Note for Steel Pipe Piles-Furnish.

3.6 SPLICE PILES - 72 IN PIPE – 2 IN – Payment for SPLICE PILE – 72-IN PIPE – 2 IN will be at the contract unit price per each and shall include all material, labor, any cutting and incidentals to perform the splice per the project plans and the applicable section of the Special Note for Steel Pipe Piles-Furnish. Splice pile will only be applicable when the Department directs the contractor to drive the test pile to an elevation that is greater than 20 feet below the lowest anticipated pile tip elevation or directs the contractor to drive the pipe pile to an elevation that
is below the lowest anticipated pile tip elevation. Any splicing required to advance a test pile to 20 feet below the lowest anticipated pile tip listed in the plans or advance a production pipe pile to the lowest anticipated pile tip elevation listed in the plans will be incidental to the applicable test pile furnish or pipe pile furnish unit price described in the Special Note for Steel Pipe Piles-Furnish.

4.0 PAYMENT

Payment will be made under:

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SPECIAL NOTE FOR STEEL ERECTION - ARCH SPAN

1.0 DESCRIPTION. This work shall consist of fabricating, furnishing and installing the arch span superstructure, including tied arch rib, tie girder, knuckle, hanger attachments, floor beams, stringers and bracing. (Note: This work does not cover fabrication and installation of the arch hanger system, which is covered under Special Note for Bridge Strand Hangers.) Materials and workmanship shall be in accordance with the KYTC Standard Specifications for Road and Bridge Construction, 2012 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 contractor shall retain a wind specialist to evaluate wind loads during construction which are appropriate for the proposed erection scheme chosen. The Contractor shall erect the bridge in a safe manner without over stressing 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”, S10.1-2007.

3.2 Conceptual Erection Sequence. The assumed erection sequence, as described in the General Note “Arch Erection and Camber” in the Contract Drawings, is that the arch rib, tie, bracing and floor system is constructed on blocking in the “no-load condition” with four bearing support points. The blocking is assumed to be removed only after the superstructure steel is completely erected. This would require floating in of the completed steel superstructure for placement on top of Piers 4 and 5. The Contractor may choose and develop any sequence that can safely erect the bridge without overstress or damage to the structural steel. The design of any necessary shoring / falsework and its foundations is the responsibility of the contractor.

3.3 Arch Erection And Camber. In addition to the full analysis of the completed structure, load capacity and stability of the main span arch structure has been verified for the completely erected steel superstructure, prior to deck placement. The General Note “Arch Erection and Camber” details the assumed erection and deck pour sequence that is...
consistent with the camber diagrams 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 arch 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 buffeting loads for design the final structure are given on the
Contract Drawings and are based on a project specific wind study and wind tunnel testing
performed by RWDI and corresponds to a mean hourly wind speed of 69.6 mph at deck
level. During construction, wind loads are predicted to correspond to a 10-year mean
hourly velocity of 60.5 mph at the deck level. Therefore, the given buffeting loads can be
proportioned accordingly and used for evaluating buffeting demands during construction.
The RWDI report did not evaluate any construction stage configuration of the arch. The
contractor shall retain a wind specialist to 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 described in the General Note “Arch Erection and
Camber” and 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 spans over water or active railroad/rapid transit tracks,
   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.

4.2 Erection Procedure.
**General.** The Contractor shall submit a detailed erection procedure to the Engineer for each bridge structural unit, 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 plan, 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 (l/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.
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.
SPECIAL NOTE FOR STAINLESS STEEL REINFORCEMENT

1.0 DESCRIPTION. The Contractor shall use stainless steel reinforcement bars in the concrete deck slab, curb, and sidewalk, as indicated in the plans. Reinforcement bars shown in the Plans marked with the suffix "SS" shall be stainless steel as described herein. The work shall be performed in accordance with the applicable requirements of sections 602 and 811 of the standard specifications.

2.0 MATERIALS.

   Grade and Type: The Contractor shall supply test results certifying that the materials conform to Grade 60 or 75 deformed reinforcement bars per ASTM A955, including the annex, and must conform to one of the following UNS designations; S24100, S32205, S32304, S20910, S30400, S31603, S31653, S32101, S32201, or S31803.

   All bars shall be of the same UNS designation.

   Chemical Composition: Material shall conform to that specified in ASTM A276, Table 1, Chemical Requirements.

   Heat Treatment: Bars may be furnished in one of the heat treatment conditions listed in ASTM A955, and as needed to meet the requirements of this specification.

   Finish: Bars are to be supplied free of dirt, mill scale, oil, and debris by pickling. Bars shall be fabricated and bent using equipment that has been thoroughly cleaned or otherwise modified to prohibit contamination of the stainless steel from fragments of carbon steel or other contaminants.

   Reinforcing bars displaying rust/oxidation, questionable blemishes, or that deviate from round shall be subject to rejection.

   Bending: Bending shall be performed in accordance with Section 602 of the Standard Specifications and ASTM A955.

Manufacturers: The following manufacturers are capable of producing material meeting this specification. Other suitable manufacturers may also exist. Manufacturers shall be selected from “Reinforcing Steel Manufacturers” listed in KYTC’s “List of Approved Materials” (http://transportation.ky.gov/materials/pages/List-Of-Approved-Materials.aspx). The Contractor is responsible for ensuring that all materials supplied meet the Contract requirements.


Special Note: Stainless Steel Reinforcement

Effective with December 20, 2013 Letting

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The ends of the test pieces shall be socketed with sockets of the same design as those proposed for use in the construction. The strands, in single part tests, shall develop a minimum ultimate strength equal to the value stipulated in the applicable ASTM specification for the material being used and for the size of strand or rope specified. If, after six or more tests of straight strand of each size have been made, the Engineer and KYTC find that the strength and elasticity have sufficient uniformity, one test on a straight strand of each size may be made thereafter from each manufactured length of strand of each size, instead of one from each prestressed length. The strand shall show a well-defined and uniform elastic stretch and recovery after prestressing.

C. **Hanger Assemblies.** The Contractor shall prepare at least 8-two (2) specimens of hanger of each strand size, at least 25 diameters long, with sockets (selected at random from those prepared for use) attached to each end, and these specimens shall be stressed to destruction. Under this test, the specimens shall develop the ultimate strength. Material and method of socketing shall be the same for both the tests and the actual hanger strand. The sockets in every instance shall be of sufficient strength to produce failure in the strand material. Sockets used for the tests may not be reused in the actual construction.

If an assembly should fail in the anchorage of the strand in the socket, or if a socket should break or otherwise fail at less than the specified ultimate load during the tests, six (6) additional assemblies shall be fabricated and the tests repeated. If one or more sockets fail during additional tests, the entire lot shall be rejected and new sockets furnished and tested.

Certified test reports covering all the tests specified shall be furnished to the Engineer and KYTC. No claims for delay will be considered for testing or failure to submit required testing documentation in a timely manner.

**Shop Inspection.** The Engineer reserves the right to visit the manufacturer’s fabrication shop for purposes of inspecting the manufacturing, assembly and testing of the hanger assemblies.

### 6.0 IDENTIFICATION, STORAGE & HANDLING

Identification marks shall be used on the strand to facilitate erection and the Contractor shall use suitable means to protect the strands in transit and during the handling and erection. Strands shall be properly coiled or rolled on reels. Any kinked or damaged strand will be rejected. Straightening of bent wires will not be permitted.

### 7.0 INSTALLATION

Hangers shall be installed so that the strands at each panel will be equally stressed. Necessary adjustment shall be provided through the use of threaded sockets.

The hanger strand shall be erected with sockets in the same relative position to each other as when the strands were measured and the sockets installed, with the markings along the length of the strand in a straight line.

Spacers shall be located at the intersection of network hangers. Spacers shall incorporate an elastomeric element for purposes of providing a degree of damping and shall hold the individual ropes or strands of each hanger in their correct geometric relationship.
The Engineer will confirm the procedure, opening and alignment prior to concrete placement. After confirmation, remove the finger plates or sliding plates before concreting. Cast and cure the expansion joint blockout per KYTC specifications. Place concrete under the expansion dams, vibrate until the concrete is forced through air holes, and strike off excess concrete. After the concrete has cured, clean air holes and fill with an approved sealer.

Install the fabric trough and the finger or sliding plates according to the Contract Documents and shop drawings. Do not splice the drain trough, unless indicated. If splices are indicated, use splices vulcanized by the manufacturer. Do not use longitudinal splices.

7.0 SUBMITTALS. Submit shop drawings, for each location, type and model of expansion device used. Shop drawings shall include, but not be limited to, the following:

A. Complete details of all components and sections showing all materials used in the expansion joints.
B. A listing of all applicable KYTC, ASTM and AASHTO specifications.
C. Name and address of the manufacturer, and location of the fabrication plant.
D. Name and telephone number of the manufacturer's representative who will be responsible for coordination of production, inspection, sampling and testing.
E. Welding procedures used in the expansion joint assembly manufacture clearly described and detailed.
F. Table of longitudinal offsets for installation at varying temperatures. Use 60°F as the mean temperature.

Joint shop drawings and neoprene trough shop drawings shall be coordinated to ensure that joints and troughs will fit when field assembled. Fabrication shall not commence until the approved shop drawings are in the hands of the Inspector and fabricator and the Engineer has authorized fabrication.

8.0 MEASUREMENT. Quantity for Finger Expansion Joint will be measured per linear foot from inside face of exterior traffic barriers of north traffic railing to inside face of pedestrian railing curb. The unit price for Finger Expansion Joint will be full compensation for furnishing, fabricating, installing structural steel tooth plates, roadway joint seals, drainage troughs, catch basins, downspouts, sidewalk plate, barrier and curb cover plates and all material, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents.

9.0 PAYMENT.

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<td>LF</td>
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Special Note for Finger Expansion Joint
Revised November 25th, 2013
Effective with December 20, 2013 Letting
Any proposed corrective procedure shall be submitted to the Engineer for approval before corrective work is begun.

8.0  SUBMITTALS. The Contractor shall submit details of the MBJS to be used together with installation and waterproofing plans to the Engineer for approval prior to fabrication of the MBJS.

The shop plans shall include, but not be limited to the following:

- plan and section views of the MBJS for each movement rating and roadway width, showing dimensions and tolerances.
- all center beam/support bar joints and all shop and field splices
- complete details of all components and sections showing all material incorporated into the MBJS
- all ASTM, AASHTO or other material designations
- welding procedure specifications
- corrosion protection system
- method of installation, including, but not limited to: sequence; installation gap setting for various temperatures; support during placement of the concrete; lifting locations and lifting mechanisms; and installation at curbs
- temperature adjustment devices and opening dimensions relative to installation temperature
- any required changes to the blockout reinforcement in order to accommodate the MBJS. temporary bridging plan if construction traffic is anticipated following installation
- The design and detail of the reinforcing steel shall meet or exceed the minimum requirement provided in the design plans.
- design calculations in accordance with Section 3 of this Special Note

The Contractor shall also submit the following test reports and certificates for review and approval:

- Manufacturer's certificate of compliance with the AISC Quality Certification Program, Simple Steel Bridges.
- Certification that welding inspection personnel are qualified and certified as welding inspectors under AWS QC1, Standard for Qualification and Certification of Welding Inspectors. Documentation that any personnel performing nondestructive evaluation (NDH) are certified by ASNT.
- Manufacturer's certificate of compliance for the PTFE sheeting or fabric.
- Certification that MBJS passed the Prequalification Tests required in Section 1.3.
- Certification that the bearings, springs, and equidistant devices are the same formulation, manufacturer and configuration that were used in the Prequalification Tests required in Section 1.3. In each certification, the name and address of the Manufacturer of the springs, bearings and equidistant devices shall be provided.
The Contractor shall submit for the Engineer's approval a written maintenance and part replacement plan prepared by the joint manufacturer. This plan shall include a list of parts and instructions for maintenance inspection, acceptable wear tolerances, methods for determining wear, and procedures for replacing worn parts.

Contractor shall submit details of the barrier rail conduit expansion fitting in conjunction with the modular joint barrier rail cover plate details for review and acceptance.

Fabrication shall not commence until the approved shop drawings are in the hands of the Inspector and fabricator and the Engineer has authorized fabrication.

9.0 **MEASUREMENT.** Quantity for Modular Expansion Joint will be measured per linear foot from inside face to inside face of exterior traffic barriers of north traffic railing to inside face of pedestrian railing curb. The unit price will be full compensation for furnishing, fabricating and installing MBJS, including sidewalk plate and all barrier and curb cover plates, and all material, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents.

10.0 **PAYMENT.**

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November 25th, 2013
1.0 DESCRIPTION AND SCOPE OF WORK

1.1 Perform all work in accordance with the Kentucky Transportation Cabinet, Department of Highway’s 2008 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 entire bridge. For the Special Note, the ‘arch’ is defined as all structural steel components and framing in the Span 5 superstructure, including the Rib, Tie, Knuckle, Floor Beams, Stringers, and all connections, splices and bracing thereto the above components. At a minimum the following work is included:

1.2.1 Design of a Lightning Protection System meeting the requirements of the Specifications, Plans and this Special Note.
1.2.2 Preparation and submittal for approval of shop drawings for Structure Lightning Protection System.
1.2.3 Furnishing all labor, materials, tools, and equipment necessary for installation of Structure Lightning Protection System.
1.2.4 Any other work specified as part of this contract.

2.0 GENERAL

The Structure Lightning Protection for the arch bridge superstructure shall be in accordance with the latest edition of ANSI/NFPA 780-2011 lightning protection installation standards, ANSI/UL 96 lightning protection components and UL96A installation requirements for lightning protection 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.

3.2 The Lightning Protection System shall be designed to continue to function after the design seismic event.

3.3 At a minimum, the structure shall be grounded-bonded at each of the main bearings at Pier and at End Bents 1 & 2s 4 and 5. A separate insulated grounding conductor shall be run inside the bridge piers and exothermically connected to the bridge steel piles. At each end bent, a separate grounding conductor shall be run in FRE Conduit down the face of the pier and to the ground rods, used for the connection at each main bearing point. The grounding conductors shall be run inside FRE Conduit down the face of the pier away from the shipping channel. 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 arch 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 Conductor: 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 arch or metal connected to the arch, railings barrier rails etc. 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 arch 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.

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 Drive to the required depth to reach permanent moisture but in no case less than 11'-6". In case of rock ledge or other conditions making compliance impossible, trench or 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 all work required by this note including the design, prepare shop drawings, and to provide all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified by this note. **Apportion accordingly to the work involved in respective units.**

Payment will be made under:

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<th><strong>BID ITEM CODE</strong></th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>23868EC</td>
<td>STRUCTURE LIGHTNING PROTECTION LS</td>
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The Department will consider payment as full compensation for all work required by this note.
SPECIAL NOTE FOR REMOVAL OF EXISTING BRIDGE

1.0 DESCRIPTION. The Contractor shall remove the existing Eggner’s Ferry Bridge structure to the limits indicated on the plans in accordance with KYTC Standard Specification Section 203 “Removal of Structures and Obstructions” and the following special note. Where a conflict exists between these special notes and Section 203, the provisions in these special notes shall govern.

2.0 CONSTRUCTION. Special conditions within the project permits relate to demolition and removal of the Eggner’s Ferry Bridge. Comply with the conditions stated in all permits. Bridge decks are a habitat of the Grey Bat. Perform demolition of the bridge deck between November 15th and March 15th February 28th of the same winter season.

Take ownership and dispose of all materials removed with the exception of the Span ‘E’ Truss.

Existing span ‘E’ is identified as the parallel chord truss replacement superstructure erected in 2012 after a vessel collision collapsed the original span. Salvage the steel superstructure truss of existing span ‘E’. After removing the bridge deck slab from the structural steel, lower the truss Span ‘E’ intact onto a barge and transport to the Eddyville Port Authority for storage. The Span ‘E’ truss shall remain the property of the Department.

Obtain a lease for the Department with the Port for a period of six months, on a monthly basis. The lease shall be in the Department’s name. If the Port is unavailable to store the steel span, or if the terms of the Lease are unacceptable to the Department, the Contractor shall coordinate with other potential storage location property owners and with the Department to secure an alternate lease.

The representation of existing bridge on plan sheets is for information only. The contractor is referred to the existing bridge plans to determine approximate quantities for removal. The contractor is responsible for location and protection of all existing utilities.

The production of the demolition plan and procedures is the responsibility of the contractor. The demolition plan must clearly demonstrate the safety and feasibility of all proposed operations. All submittal components must be sealed by a professional engineer licensed in the Commonwealth of Kentucky.

Obtain all necessary licenses, training and permits for the handling of and use of explosives, if used.

Blasting of superstructure steel truss spans with explosives will be acceptable to the Department. The use of explosives under water may or may not be acceptable to all governing agencies. The Contractor shall obtain all necessary permits, licenses, certifications, etc. for use of explosives. The Contractor shall contact the appropriate governing agencies prior to the use of explosives and provide confirmation to the Department that the necessary permits, licenses, certifications, etc. have been obtained.

Submit the demolition plan to the Engineer six months prior to scheduled demolition. The engineer will coordinate submission to the United States Coast Guard. Do not proceed with demolition until the engineer has received a copy of written acceptance of the demolition plan from the United States Coast Guard. Do not proceed with demolition until the demolition plan is returned by the Engineer as approved by the United States Coast Guard.

Schedule the removal of those trusses and piers obstructing the navigation channel to occur as the first activities. This is not intended to preclude the Contractor from also working at