

ARKANSAS STATE HIGHWAY COMMISSION

CONTRACT

FOR THE CONSTRUCTION OF

STATE JOB NO. 012307

FEDERAL AID PROJECT NHPP-1030(3)

DE ROCHE CREEK STRS. & APPRS. (S)

STATE HIGHWAY I-30 SECTION 14 & 21

IN CLARK & HOT SPRING COUNTY

Bound herein are the Supplemental Specifications, Special Provisions, Proposal Documents and Schedule of Items applicable to this proposed construction contract.

Applicable to this proposed construction contract, but not bound herein, are the Arkansas State Highway Commission Standard Specifications for Highway Construction, Edition of 2014, and the Construction Plans.

Arkansas Department of Transportation
Supplemental Specifications and Special Provisions Listing
State Job Number 012307

The following supplemental specifications and special provisions for this project supplement the standard specifications, edition of 2014. In case of conflict, the supplemental specifications and special provisions shall govern.

ERRATA	ERRATA FOR THE BOOK OF STANDARD SPECIFICATIONS
FHWA-1273	REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS
FHWA-1273	SUPPLEMENT - EQUAL EMPLOYMENT OPPORTUNITY - NOTICE TO CONTRACTORS
FHWA-1273	SUPPLEMENT - SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES (23 U.S.C. 140)
FHWA-1273	SUPPLEMENT - EQUAL EMPLOYMENT OPPORTUNITY - GOALS AND TIMETABLES
FHWA-1273	SUPPLEMENT - EQUAL EMPLOYMENT OPPORTUNITY - FEDERAL STANDARDS
FHWA-1273	SUPPLEMENT - POSTERS AND NOTICES REQUIRED FOR FEDERAL-AID PROJECTS
FHWA-1273	SUPPLEMENT - WAGE RATE DETERMINATION
FHWA-1273	SUPPLEMENT - TRAINING PROGRAM - JOB 012307
JOB SP	CARGO PREFERENCE ACT REQUIREMENTS
JOB SP	GOALS FOR DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION
JOB SP	DISADVANTAGED BUSINESS ENTERPRISE BIDDER'S RESPONSIBILITIES
JOB SP	BIDDING REQUIREMENTS AND CONDITIONS
JOB SP	MANDATORY ELECTRONIC CONTRACT
JOB SP	MANDATORY ELECTRONIC DOCUMENT SUBMITTAL
JOB SP	OFF-SITE RESTRAINING CONDITIONS FOR NORTHERN LONG-EARED BATS
JOB SP	ASSESSMENT OF WORKING DAYS - MAINTENANCE OF TRAFFIC
JOB SP	FLEXIBLE BEGINNING OF WORK - CALENDAR DAY CONTRACT
JOB SP	RUMBLE STRIP REMOVAL
JOB SP	NESTING SITES OF MIGRATORY BIRDS
JOB SP	SOIL STABILIZATION
JOB SP	STONE BACKFILL
JOB SP	RESTRICTIONS ON THE USE OF RECYCLED ASPHALT PAVEMENT MATERIAL
JOB SP	SUBMISSION OF ASPHALT CONCRETE HOT MIX ACCEPTANCE TEST RESULTS
JOB SP	PRICE ADJUSTMENT FOR ASPHALT BINDER
JOB SP	BROADBAND INTERNET SERVICE FOR ASPHALT CONCRETE PLANT
JOB SP	WARM MIX ASPHALT
JOB SP	CLASS C FLY ASH IN PORTLAND CEMENT CONCRETE PAVEMENT AND CLASS S(AE) CONCRETE
JOB SP	BROADBAND INTERNET SERVICE FOR FIELD OFFICE
JOB SP	MAINTENANCE OF TRAFFIC
JOB SP	MOBILE SPEED NOTIFICATION SYSTEM
JOB SP	TRAFFIC CONTROL DEVICES IN CONSTRUCTION ZONES
JOB SP	TRAFFIC CONTROL SUPERVISOR
JOB SP	PORTABLE CONSTRUCTION LIGHTING
JOB SP	CONSTRUCTION PROJECT INFORMATION SIGN
JOB SP	AUTOMATED WORK ZONE INFORMATION SYSTEM

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JOB SP	CONCRETE DITCH PAVING
JOB SP	EXTENSION FOR PIPE CULVERTS
JOB SP	MODULAR GLARE SHIELD
JOB SP	WIRE ROPE SAFETY FENCE (WRSF) SPECIFICATIONS
JOB SP	WIRE ROPE SAFETY FENCE MAINTENANCE MATERIALS
JOB SP	WIRE ROPE SAFETY FENCE (POST REPAIR)
JOB SP	ENHANCED THERMOPLASTIC PAVEMENT MARKING
JOB SP	DESIGNATED PARKING AND VIEWING AREAS
JOB SP	LATERAL BRIDGE SLIDE
JOB SP	DRILLED SHAFT FOUNDATIONS
JOB SP	NONDESTRUCTIVE TESTING OF DRILLED SHAFTS
JOB SP	BRIDGE DECK REPAIR
JOB SP	DIRECT TENSION INDICATORS FOR HIGH STRENGTH BOLT ASSEMBLIES
JOB SP	SPECIAL SAFETY REQUIREMENTS FOR BRIDGES
JOB SP	PROSECUTION AND PROGRESS WITH BID SCHEDULE
JOB SP	SITE USE (A+B+C METHOD) - CALENDAR DAY CONTRACT
JOB SP	SECTION 404 NATIONWIDE 26 PERMIT REQUIREMENTS
JOB SP	PERCENT WITHIN LIMITS
JOB SP	PARTNERING REQUIREMENTS
JOB SP	CONSTRUCTION IN SPECIAL FLOOD HAZARD AREAS
JOB SP	STORM WATER POLLUTION PREVENTION PLAN
JOB SP	VALUE ENGINEERING
JOB SP	UTILITY ADJUSTMENTS
SP 108-1	LIQUIDATED DAMAGES
SS 100-3	CONTRACTOR'S LICENSE
SS 100-4	DEPARTMENT NAME CHANGE
SS 102-2	ISSUANCE OF PROPOSALS
SS 108-2	WORK ALLOWED PRIOR TO ISSUANCE OF WORK ORDER
SS 110-1	PROTECTION OF WATER QUALITY AND WETLANDS
SS 303-1	AGGREGATE BASE COURSE
SS 306-1	QUALITY CONTROL AND ACCEPTANCE
SS 400-1	TACK COATS
SS 400-4	DESIGN AND QUALITY CONTROL OF ASPHALT MIXTURES
SS 400-5	PERCENT AIR VOIDS FOR ACHM MIX DESIGNS
SS 400-6	LIQUID ANTI-STRIP ADDITIVE
SS 410-1	CONSTRUCTION REQUIREMENTS AND ACCEPTANCE OF ASPHALT CONCRETE PLANT MIX COURSES

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Section 603 Maintenance of Traffic and Temporary Structures of the Standard Specifications, Edition of 2014, is hereby expanded as follows:

The Contractor shall provide additional traffic control through the project as defined below, in order to provide a safe and convenient traffic flow at all times throughout the limits of each work zone and the approaches thereto.

The Contractor shall assume full responsibility for the safe and efficient movement of traffic through the construction area for the duration of the project. Prior approval by the Engineer shall be required for any alterations of traffic patterns shown on the plans.

All traffic control devices shall be in accordance with the details shown in the plans or on Standard Drawings TC-1, TC-2, TC-3, TC-4, and TC-5. The Contractor will be responsible for furnishing, placing, maintaining, relocating, and subsequent removal of all traffic control devices within the limits of the project.

Except where shown on the plans, there shall be no two-way traffic operations permitted on the main lanes. Interchange ramps shall be kept operational at all times. Except where shown on the plans, work on the main lanes and ramps shall be accomplished in partial widths in order to maintain traffic.

The Contractor shall notify the Engineer a minimum of 5 full business days prior to closing a lane and 10 full days before switching traffic to a head to head configuration as allowed for in the Maintenance of Traffic plans. If the Contractor fails to give the proper notification, the lane closure will not be allowed until 5 full business days and the head to head configuration until 10 full business days after the notification was given.

When closing a lane, a Portable Changeable Message Sign shall be placed in advance of the construction signs advising motorists of the lane closure. Portable Changeable Message Signs shall be placed prior to placement of lane closure signing and at locations as directed by the Engineer.

The lane closure shall be installed such that it never exceeds the actual work area by more than $\frac{1}{4}$ mile. The Contractor shall not close any portion of a lane unless active work will begin immediately. In addition, when gainful work is not being accomplished in an area where a lane has been previously closed, steps shall be taken to return traffic to normal conditions - that is, all lanes open to traffic in each direction within 24 hours after construction operations have ceased. All additional labor, materials, and incidentals needed to return the traffic to normal conditions shall be provided, maintained, removed, and replaced, if necessary, at no cost to the Department. Traffic shall not be permitted on any milled surface.

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Failure to comply with this requirement will result in a lane use charge of \$3,000 per lane-hour until work begins in the closed lane or the lane closure is removed. A lane closure will not be considered to be removed until all advance warning devices specific to the lane closure have been removed or revised. In assessing this lane use charge any portion of an hour will be counted as a full hour.

The Contractor shall schedule his work so that no main lane closures exist and no work requiring main lane closures will be performed for the time period of the day before the Holiday through the day after the Holiday for the following Legal Holidays:

- New Year's Day
- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving Day & the Following Day
- Christmas Eve & Christmas Day

If the Legal Holiday is immediately prior to a weekend or immediately following a weekend, the weekend will be considered a part of the Holiday.

In addition, single lane closures of the I-30 main lanes will not be permitted during the following time periods:

- Sunday through Saturday: 9:00 a.m. to 7:00 p.m.

Two-way (head to head) traffic operation periods are allowed twice, once for each bridge slide. See Stages 3A and 4A of the Maintenance of Traffic plans. The allowable time for these closures shall be bid per the Site Use (A+B+C) Special Provision.

The Contractor shall schedule and perform the work, including the placement and removal of traffic control devices, to insure that all I-30 traffic lanes are open at all times, with the aforementioned exceptions.

Special events or occurrences could cause traffic to become congested. When this occurs, the Contractor shall immediately modify the work schedule, working methods, or procedures to lessen the impact of the work on traffic or as directed by the Engineer.

The Contractor will regulate the access of work vehicles and equipment to the work area while insuring safety to the traveling public and minimum damage to highway facilities. Any damage to the highway facility or vegetation caused by the Contractor shall be repaired at no cost to the Department. Unless operating within the area closed to traffic, the Contractor's work vehicles shall travel in the direction of the normal traffic flow. Only those vehicles necessary for the work

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shall be allowed in the work zone. All other vehicles shall be parked at a safe location outside the work zone, as approved by the Engineer.

General equipment storage areas or operations centers will be allowed within the limits of the right of way only where permitted by the Engineer. At the end of the work day, equipment shall be either shielded from traffic by an approved positive barrier or placed so it is not within 30 feet of any lane carrying traffic.

The Contractor shall restrict the crossing of the median to existing interchanges and overpasses. Access to the project shall be limited to existing interchanges.

The Contractor shall conduct his operations so that no equipment or personnel shall occupy any portion of the roadway that remains designated for the passage of traffic.

BASIS OF PAYMENT: There shall be no direct payment for fulfilling the requirements of the Special Provision, but compensation shall be considered included in the price bid for Maintenance of Traffic.

Traffic control devices, where shown on the plans for payment, will be paid for at the contract unit price for each item involved. All additional traffic control devices beyond the contract amount shall be provided, maintained, and replaced, if necessary, at no cost to the Department.

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CONSTRUCTION PROJECT INFORMATION SIGN

DESCRIPTION: This project includes Construction Project Information Signs to inform the public of pertinent job information. Included in this information is the job number, start date, and estimated completion date. Additional information to be included on this sign can be viewed on the special detail in the plans. Location and quantity of signs for this project is located in the Maintenance of Traffic Details.

MATERIALS: All materials incorporated into the project for this sign shall conform to the specifications pertaining to Signs in Section 604 in the Standard Specifications for Highway Construction and appropriate supplemental specifications. The numerals and letters for both date fields may be placed on separate sign blank material that can then be attached to the larger sign blank or be furnished as sections of reflective sheeting that can be used to overlay a revised date. The dimensions of the letters and numbers shall match the sizes shown in the project's special detail. The sign blank material and reflective sheeting used for the date fields shall be the same types used for the overall sign.

CONSTRUCTION REQUIREMENTS: The start date shown on the sign shall be either the date that work began on an active project or the month during which the Contractor plans to begin work on a new project. The initial estimated completion date to be placed on the sign will be either the completion date shown in the project's CPM schedule or a date based on information provided by the Contractor and agreed to by the Engineer. The Contractor will be required to update the sign's estimated completion date information, Month and/or Year, if and where directed by the Engineer throughout the duration of the project.

The Construction Project Information Sign shall be installed at the same time when all other advanced warning signs are installed on the project. The Contractor will have five (5) business days from the time the Engineer informs the Contractor to update the Estimated Completion Date on the Construction Project Information Sign. Failure to change the date on the sign after five (5) days may lead to the holding of pay estimates until the dates are updated.

METHOD OF MEASUREMENT: Construction Project Information Sign will be measured by the square foot of sign area and will be paid under the contract item "Signs". Construction Project Information Sign Update will be measured by the each, which shall consist of updating the Month and/or Year. Updates that require a change in both the month and year will not be treated separately and shall be paid as a quantity of one (1) each.

PAYMENT: **Construction Project Information Sign.** The contract unit price bid per square foot for Signs shall be full compensation for all materials, labor, equipment, tools, and incidentals necessary for installing, and for maintenance, repair, and removal of the Construction Project Information Signs.

CONSTRUCTION PROJECT INFORMATION SIGN UPDATE. The contract unit price bid for this item shall be full compensation for furnishing and installing the overlay or sign blank insert for updating the Estimated Completion Date, for all materials, labor, equipment, tools, and incidentals necessary for installing and maintaining the date field on the sign. This item will be

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paid each time the Resident Engineer requests an updated date be installed on the Construction Project Information Sign.

Payment will be made under:

Pay Item	Pay Unit
Construction Project Information Sign Update	Each

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This item shall consist of furnishing, installing, operating, maintaining, and moving from one location to another an Automated Work Zone Information System (AWIS) in accordance with the plans and these specifications. The AWIS components will be located both in and near the limits of the project.

The system shall consist of all hardware, software, and other equipment necessary to collect, process, and display traffic condition data. The data will be used to provide motorists with up-to-the-minute real-time visual traffic information verification, operating speed, and advisory messages via www.idrivearkansas.com, closed circuit television (CCTV), e-mail, and Public Notification System (PNS). All of these items shall be considered part of the AWIS.

The Automated Work Zone Information System shall consist of variable message signs (VMS), vehicle detection sensors (VDS), closed circuit television cameras (CCTV), and a Public Notification System (PNS) equipped to communicate with a monitoring system to provide traveler information through preset messages selected based upon real-time traffic information. The AWIS shall be capable of communicating by cellular data modems to the PNS. CCTV shall be available to monitor and verify traffic conditions at specified locations. The various messages and scenarios used by this system will be the responsibility of the Contractor and approved by the Engineer.

AWIS output shall push data to the Department's idrivearkansas.com website for use by the public for the viewing of all information being relayed to motorists in the construction and affected areas as well as any speed or congestion information from individual traffic sensors. The Contractor shall coordinate with the Department's Public Information Office and their duly appointed representative (i.e. website consultant) to integrate the data onto existing map(s) on the idrivearkansas.com website. The data shall be displayed as part of map layers with icons depicting all devices and at an accurate location based on the latitude and longitude of the device. When a device is relocated, the new position should be updated on the data output. Each icon, when activated, shall display the information supplied or displayed by that traffic control sensor/device. The information linked to or displayed with each icon shall be in real-time. This shall occur by the system polling each device a minimum of once every 60 seconds.

The AWIS shall include a Public Notification System in accordance with these specifications. This system shall consist of highway advisory radio (HAR), HAR alert signs, and electronic communications equipment required to disperse credible traffic information to the traveling public. The HAR alert signs shall be designed for activation by authorized Contractor personnel utilizing the communication hardware and software supplied with the HAR. The PNS shall be fully operational at all times from the day the AWIS is installed until the roadway construction in the project area has been considered substantially complete.

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SYSTEM REQUIREMENTS.

AWIS: The Automated Work Zone Information System shall be fully operational, as defined in the Operational Test requirements of this special provision, before payment/s will be made for any of the AWIS components. **Main lane closures will not be permitted until the AWIS is fully operational.** After approval of the Operational Test report by the Engineer, the Contractor shall maintain the AWIS as fully operational for 24 hours a day, 7 days a week, 365 days per year until the project is substantially complete. The AWIS shall utilize sufficient equipment to collect, monitor, and disseminate accurate and timely information about traffic and travel conditions in and near the work zone. Additional equipment deemed necessary by the Engineer in order to accomplish this shall be measured and paid for under the applicable portions of this Special Provision. All equipment will be required to communicate with the central server and software. All equipment will be portable. The central server and software shall be maintained offsite in a secure environment.

- (1) **Layout.** The Contractor shall submit a Final AWIS Layout Plan for approval that will include the location of VMS, VDS, HAR, HAR alert signs, and CCTV. The project plans shall be used as a guide in developing the Final AWIS Layout Plan. This plan will consider the placement of AWIS equipment and signs to avoid conflicts with construction or reducing the effectiveness of construction signing. The Engineer shall approve the Final AWIS Layout Plan before any AWIS equipment is deployed.
- (2) **Equipment.** All equipment components of the AWIS, including VMS, VDS, HAR transmitters, HAR alert signs, and CCTV, shall be in good working order and meet the product standards of the vendor. All equipment should be trailer mounted and solar powered. No prototype equipment will be used unless approved by the Engineer.
 - a. **Variable Message Sign.** Each VMS shall be capable of being remotely controlled by both the control server and software and by the Traffic Control Supervisor in the event of a system malfunction. The VMS used shall be a current model from the manufacturer.
 - b. **Vehicle Detection Sensors.** Each vehicle detection sensor shall be capable of monitoring traffic speed with a detection range of up to 250 feet and the ability to detect up to 10 lanes of traffic in multiple directions.
 - c. **Closed Circuit Television.** The portable CCTV shall be mounted on trailers capable of supporting the camera at a height of 30 ft. The CCTV shall include a solar powered Ethernet connection, 35X optical zoom and 12X digital zoom, IP66

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rating and be capable of H.264/Motion JPEG video compression. The CCTV will allow viewing at a minimum of 1 frame per second. The CCTV system shall contain a camera system that automatically changes from color mode to black and white mode under low light conditions in order to render a more detailed image.

The images shall be shown on any computer with a browser capable of viewing JPEG format images.

The vendor shall provide a CDN (Content Delivery Network) to aggregate the video data streams from any AWIS CCTV to a centralized location to reduce bandwidth consumption from each individual CCTV head to head end users and allow for separate controllable/configurable streams for the public and operators.

The CDN should be capable of allowing the Department to stop and start video feeds for public view while not interfering with the provided feeds for the Department's use.

- (3) Communications.** The AWIS shall be installed to provide constant communication to and from VDSs, VMSs, CCTVs, and PNS to the central server and software. The AWIS shall have a complete cycle time of less than 120 seconds that includes delivery of PNS and e-mail information. If the system is not able to operate within the 120-second cycle time, the system shall be considered inoperative. All communication platforms between the AWIS server, VMS, VDS, CCTV, and PNS shall be accomplished by digital cellular modem, radio frequency (FCC or FHWA band), or other means subject to approval by the Engineer.

The Contractor shall secure any necessary FCC and/or FHWA licenses for the operation of the Work Zone Information System, including all necessary license renewals.

Communications with the PNS shall be via digital cellular modems or wireless data interfaces as required. The AWIS shall be capable of changing the PNS broadcast automatically when preset traffic scenarios dictate an interruption in the normal broadcast information. The system shall also be capable of e-mailing information to a minimum of 10 locations, such as police agencies and broadcast media. The e-mail information shall include the scenario in effect and the message delivered to the public on the PNS.

- (4) Message Displays and Scenarios.** The Contractor shall submit to the Engineer for approval a Traveler Notification Plan detailing the messages broadcast along with the traffic scenarios used to activate the messages. The Contractor must have an

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approved plan to operate the AWIS. Modifications to this plan will be made and executed if the Engineer determines that any of the current messages or traffic scenarios in use is ineffective, that additional traffic scenarios and/or equipment are needed to adequately warn the public, or errors are found in the messages being given to the public. The term "Mile Marker" shall be displayed to the public in lieu of "Log Mile".

E-mails and/or SMS text messages shall be sent to the Engineer as well as the Contractor whenever the system detects a failure of any of the components or if the main power supply to the AWIS system controller or monitoring system is interrupted. Notification shall be sent within 10 minutes of the system detecting a problem as indicated above. This will provide notice to the Contractor of needed repairs. Failures shall be defined as any system component not checking in with the system controller as scheduled.

E-mails and/or SMS text messages shall be sent to the Engineer whenever the system detects a failure of a VMS, VDS, HAR transmitter, or a CCTV unit, or if the main power supply to the system controller or monitoring system is interrupted. This will provide notice to the Engineer that the system may not be functioning as intended and improper messages may be transmitted to the public.

If the current speed on an approaching roadway segment is at or above the speed limit, the upstream VMS will display either the following message or one approved by the Engineer:

WORK ZONE XX MILES AHEAD

DRIVE SAFELY

If the current speed drops to less than 45 MPH but greater or equal to 20 MPH, then either the following message or one approved by the Engineer will be displayed:

SLOWING TRAFFIC AHEAD

SPEEDS 20 – 45 MPH

If the current speed on the approaching roadway drops below 20 MPH then either the following message or one approved by the Engineer will be displayed:

STOPPING TRAFFIC AHEAD

SPEEDS UNDER 20 MPH

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(5) Public Notification System. The PNS shall include a sufficient quantity of portable highway advisory radio AM broadcast systems to transmit messages to motorists in both directions in and near the project areas regarding lane closures, accidents, and significant delays that may occur within the work zone.

(a) Layout. The location of the HAR systems shall be to alert drivers of conditions ahead. The HAR shall be so equipped to allow messages to be changed or transmitted by the AWIS server and software by authorized individuals. The PNS shall be capable of transmitting the messages immediately after contact is made by phone. The messages shall be in accordance with the Federal Communications Commission (FCC) Rules and Regulations Part/Section 90.242.

The Contractor shall provide for the Engineer's approval a Pre-installation Site Survey report that provides recommendations regarding the AM band radio frequency for use at each site and the estimated coverage area of the radio signal. If the location of the Highway Advisory Radios does not provide adequate coverage or provides overlapping coverage such that all the required messages are not relayed to the public, new locations or new frequencies must be selected. The Public Notification System shall not be installed at a site until the Pre-installation Site Survey report for that site has been approved.

(b) PNS Equipment. All equipment furnished under this special provision shall meet or exceed all applicable FCC requirements. The equipment furnished to operate the public notification system shall include all items necessary to operate separate advisory radio systems. Equipment shall include transmitters, antennae, antenna matching network, transmission lines, grounding systems, digital voice announcement unit, equipment cabinets, and power supplies.

All equipment specified herein shall be completely solid state.

All equipment shall have lightning protection on all input and output audio lines and antenna lines.

The equipment shall be capable of connection to the AWIS server and software for control of the transmitter and digital recorder/player. A security code or username and password shall be required to gain access to the control functions.

(c) HAR Alert Signs with Beacons. HAR alert signs shall be portable and meet the requirements of Subsection 604.02(b) and also be in accordance with the Manual on Uniform Traffic Control Devices. The message on the sign shall be approved by the Engineer prior to deployment.

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System Reports. The system shall be capable of automatically creating a log of component failures the system encounters. This log shall be submitted on a weekly basis to the Engineer. The log shall indicate the time the component failed and the time it returned to normal operation. A system activity log showing the system device displays along with the time of the display or measurement shall also be recorded and submitted to the Engineer on a bi-weekly basis coinciding with the Department's bi-weekly estimate periods. Failure to submit the System Reports as specified can result in withholding of monthly operational line items for the weeks in question.

Operational Test. The AWIS shall be in fully operational during all phases of construction. Once installed, a five-day Operational Test shall be conducted before any time will be considered for payment. The Contractor shall provide for complete operations support from the vendor during the Operational Test. If any equipment malfunctions occur for a combined period of four hours or more during this Operational Test on any day, no credit will be given for that day for the Operational Test period. Applicable time charges (Working Days and/or Site Use Days) will be assessed during the AWIS Operational Test period. Standard Specification 108.07, Failure to Complete Work on Time, will not apply.

The Contractor shall maintain records of equipment stoppages and resumptions during the five-day Operational Test for submission to the Engineer for his approval. In the event that 10 percent or more of the time similar equipment malfunctions occur that affect the proper operation of the AWIS, the Engineer may declare a system component defective and require replacement of the equipment at no additional cost to the Department. When a system component defect is declared, the five-day Operational Test shall resume after all defective equipment is replaced and the system is fully operational.

The Contractor shall submit a report to the Engineer detailing the daily activity of the system during the Operational Test. The Contractor shall indicate in the report the date and time of any activity necessary to maintain operation of the AWIS during the Operational Test period. Each entry shall include the following information:

- Identity of equipment on which work was performed
- Cause of equipment malfunction (if known)
- A description of the type of work performed
- Time required to repair equipment malfunction

Once the Operational Test Report is received and approved by the Engineer, the AWIS will be considered fully operational and time charges for the AWIS may commence.

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After the Operational Test, the term “fully operational” will be defined as all components of the system functioning as designed. **If the system (which includes e-mails and data push to www.idrivearkansas.com) is discovered to be providing inaccurate information regarding traffic flow, it shall be shut down immediately upon discovery.** If the system is corrected within 4 hours of its malfunction, the system will be classified as “fully operational”. If the system fails to provide accurate information regarding traffic backups and is not corrected within 4 hours, the system will be classified as “not fully operational”. If a component or components fail and causes a “lockup” of the system resulting in inaccurate information being given to the public via PNS elements, the system shall be classified as “not fully operational” if the lockup is not resolved within 4 hours of the initial failure.

To ensure a prompt response to incidents involving the integrity of the Automated Work Zone Information System devices and VMSSs, the Contractor shall be required to make all necessary corrections to the components of the system within 12 hours of notification by the Department. If all corrections are made within this 12-hour period and the system is brought back on-line, no pay reduction will occur. Components are the Variable Message Signs, Portable Closed Circuit Television Systems, speed and volume sensors, communications equipment, and all hardware and software required to operate the signs and the data connection to www.idrivearkansas.com. The video feeds to www.idrivearkansas.com are included in this component listing. If the 12-hour time frame expires and the components are not fully restored to proper working order, no payment will be made from the time of initial notification until the system is returned to being fully operational.

Failure to comply with these requirements after the 12 hours have expired will result in a charge calculated by dividing the Daily Road User Cost (shown in the “Site Use (A+C Method)” special provision) by 24 and rounded down to the nearest dollar. This charge will continue until all components of the AWIS are restored to a fully operational status. In assessing this charge, any portion of an hour will be counted as a full hour.

If the components of the Automated Work Zone Information System are down for more than 10 days in a month, whether they are consecutive or cumulative, then no payment will be made for that month. The Department reserves the right to deactivate the Automated Work Zone Information System components at any time if the Engineer determines that the system is not performing in accordance with these specifications, in which no further payment will be made until the system is restored to a fully operational status.

If a component of the AWIS fails to operate properly on at least 4 calendar days in a 14-day estimate period, the Engineer may declare that component defective and require the Contractor to replace the component at no additional cost to the Department.

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METHOD OF MEASUREMENT.

- (a) **AWIS Mobilization.** The Automated Work Zone Information System Mobilization will be measured as a Lump Sum item.
- (b) **AWIS Operation.** The Automated Work Zone Information System Operational Costs will be measured by the Month. After the system undergoes the Operational Test and is accepted for use, operation and maintenance of the Automated Work Zone Information System will be measured for payment by the month based on the number of days the system is "fully operational" during the project. If the AWIS is "not fully operational" as defined above, no payment will be made for that portion of the month and the penalty as defined above will be assessed.
- (c) **Furnish and Install the Vehicle Detection System, Variable Message Signs, Closed Circuit Television System and the Public Notification System.** Furnish and Install the Vehicle Detection System, Variable Message Signs, Closed Circuit Television System, and the Public Notification System will be measured by the Each.
- (d) **Device Relocation.** After the Operational Test is complete and the system is accepted for use, Device Relocation will be measured for payment by the Each. A device relocation is defined as a 20-foot or more relocation of a VDS, VMS, CCTV Camera, or PNS System. Approval of the Engineer will be required prior to each move to be eligible for reimbursement. **Final removal of any device from the project will not be considered device relocation.**

BASIS OF PAYMENT.

- (a) **AWIS Mobilization.** Work completed and accepted and measured as provided above will be paid for at the contract unit price of Lump Sum, which price shall be full compensation for furnishing the server and software; for testing the AWIS; for testing of all VDS, VMS, CCTV cameras, and PNS; for integration of the AWIS data onto the www.idrivearkansas.com website; for obtaining all FCC and/or FHWA permits and licenses; for providing all required cellular and electrical services; and for all materials, labor, equipment, tools, and incidentals necessary to safely furnish and install this system.
- (b) **Furnish and Install Vehicle Detection System (VDS).** Work completed and accepted and measured as provided above will be paid for at the contract unit price of each, which price shall be full compensation for furnishing, installing, and testing the Vehicle Detection Systems; for obtaining all FCC and/or FHWA permits and licenses; for providing all required cellular and electrical services; and for all

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materials, labor, equipment, tools, and incidentals necessary to safely furnish and install this system.

- (c) Furnish and Install Closed Circuit Television System (CCTV).** Work completed and accepted and measured as provided above will be paid for at the contract unit price of Each, which price shall be full compensation for furnishing, installing, and testing the Closed Circuit Television System; for obtaining all FCC and/or FHWA permits and licenses; for providing all required cellular and electrical services; and for all materials, labor, equipment, tools, and incidentals necessary to safely furnish and install this system.
- (d) Furnish and Install Variable Message Sign (VMS).** Work completed and accepted and measured as provided above will be paid for at the contract unit price of Each, which price shall be full compensation for furnishing, installing, and testing the Variable Message Signs for obtaining all FCC and/or FHWA permits and licenses; for providing all required cellular and electrical services; and for all materials, labor, equipment, tools, and incidentals necessary to safely furnish and install this system.
- (e) Furnish and Install Public Notification System (PNS).** Work completed and accepted and measured as provided above will be paid for at the contract unit price of Each, which price shall be full compensation for furnishing, installing, and testing the Public Notification System; for obtaining all FCC and/or FHWA permits and licenses; for providing all required cellular and electrical services; and for all materials, labor, equipment, tools, and incidentals necessary to safely furnish and install this system.
- (f) AWIS Operation.** Work completed and accepted under the item Automated Work Zone Information System operation and measured as provided above will be paid for at the contract unit price bid per Month, which price shall be full compensation for operating, maintaining, inspecting and removing all the components of the AWIS, including the Central Data server; all VMS, all VDS, all CCTV, and the PNS; for renewing all FCC and/or FHWA permits and licenses; for maintaining the data feed to www.idrivearkansas.com; for providing 24-hour access to a system programmer; for maintaining all required cellular and electrical services; and for all materials, labor, equipment, tools, and incidentals necessary to safely maintain this system during construction.
- (g) Device Relocation.** Work completed and accepted under the item Device Relocation and measured as provided above will be paid for at the contract unit price bid per Each, which price shall be full compensation for approved 20-foot or more relocation of a VDS, VMS, CCTV, or the PNS.

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Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
AWIS Mobilization	Lump Sum
Furnish and Install Vehicle Detection System	Each
Furnish and Install Closed Circuit Television System	Each
Furnish and Install Variable Message Sign	Each
Furnish and Install Public Notification System	Each
AWIS Operation	Month
Device Relocation	Each

ARKANSAS DEPARTMENT OF TRANSPORTATION**SPECIAL PROVISION****JOB NO. 012307****DESIGNATED PARKING AND VIEWING AREAS**

GENERAL: The intent of this Special Provision is to establish designated parking and viewing areas for Department or design personnel who are on site to observe or supervise during the short-term Interstate closure for both lateral bridge slide operations (Bridge Nos. A&B7427).

CONSTRUCTION REQUIREMENTS:

1. The Contractor shall propose and submit for approval a designated parking area on site to accommodate the high volume of workers and visitors during the short-term lateral slide closure.
2. The parking area shall be located outside of the roadway clear zone or behind positive protection, with a safe entrance and exit to the Interstate, using all advanced warning signs required by the current version of the MUTCD.
3. The parking area shall consist of a gravel base and accommodate 12 vehicles in addition to Contractor vehicles.
4. Portable restroom facilities shall be provided near the parking area.
5. The Contractor shall propose and submit for approval a designated viewing area of the lateral slide operation, located a safe distance away from construction activities and equipment.
6. Construction fencing (or some other suitable means) shall be provided to guide observers from the designated parking area to the designated viewing area.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT: All work, including labor, materials, tools, and equipment necessary to complete the requirements of this special provision shall not be paid for directly, but will be considered subsidiary to other items in the contract.

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Description: This work consists of furnishing all labor, equipment, material and other services necessary to move bridge superstructures into their final location using the Accelerated Bridge Construction (ABC) technique of a Lateral Slide. This work shall be completed on Bridge Nos. A7427 and B7427 in accordance with the plans and specifications.

General: The work shall include, but not be limited to:

1. Design and installation of temporary falsework.
2. Design and installation of a system for moving bridge superstructures.
3. Design and installation of a vertical jacking system for lifting and setting bridge superstructures.
4. Developing Lifting, Transporting, and Setting Plan for review.
5. Evaluating estimated and actual impacts to bridge superstructures due to moving.
6. Determining allowable superstructure deflection and twist limits for bridge moves.
7. Providing methods to monitor and record bridge superstructure deflection and twist.
8. Preparing a bridge move contingency plan and conducting a final pre-move walk through.
9. Conducting a strategic coordination meeting prior to the short-term Lateral Slide closure.
10. Moving bridge spans into their final location.

Definitions:

1. Vertical Jacking System: Specialized equipment and materials used to transfer bridge superstructures from temporary falsework to moving system.
2. Moving System: Specialized materials and equipment used to move bridge superstructures transversely from temporary to final positions.
3. Temporary Falsework: Any structure used to provide temporary support to a bridge or bridge superstructure.
4. Monitoring: The act of using equipment to measure, record and quantify changes in the geometry and condition of bridge superstructures as a result of temporary support conditions and moving operations.
5. Heavy Lifter: The Contractor or Subcontractor to provide jacking and moving equipment and operations.
6. Working Drawings: Design sheets, or similar, including supporting calculations that the Contractor is required to submit to ARDOT, such as shop drawings, erection plans, and falsework or framework plans, or any other supplementary plans or similar data which illustrate the construction of the Work required in this provision to supplement the Design Documents.
7. Superstructure: Bridge elements above the cap including but not limited to girders, deck, barriers, and diaphragms.
8. Twist: The condition where a corner of a superstructure deflects up or down relative to the plane defined by the other three corners of the supported bridge span.

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Equipment and Materials: Provide equipment and materials meeting the following requirements and specifications:

1. Temporary Falsework: Provide a temporary support capable of supporting the superstructures. The Temporary Falsework must support the anticipated design loads. Adjust design loads for the weight of construction equipment loads, and any other additional loads imposed by jacking activities. The Contractor shall exercise care when driving piling or constructing foundations for temporary falsework adjacent to newly constructed drilled shaft foundations for the proposed bridges. For additional details, see SP JOB 012307 "Drilled Shaft Foundations."

2. Moving System: Provide a system capable of supporting and moving the superstructures from temporary to final locations.

3. Vertical Jacking System: Provide a jacking system capable of lifting and lowering the superstructures from temporary and final positions respectively. The jacking system must support the anticipated design loads. Adjust vertical design loads for the weight of construction equipment loads, and any other additional loads imposed by jacking activities.

4. Superstructure Monitoring: Supply monitoring equipment to actively monitor and record deflection and twist control during the superstructure lift and move. Twist is not allowed to exceed the lesser of $W/300$ or 0.16 feet when the four monitored points are over the centerlines of the heavy lift supports during the bridge superstructure move. W is defined as the perpendicular width in feet between the centerline of the fascia beams. Use monitoring equipment capable of measuring relative movements to 0.125 inches. Halt operations immediately if deflection or twist exceeds allowable limits. Return the superstructure to temporary supports if necessary.

Submittals: The contractor shall prepare submittal packages as noted below. Submit shop drawings and design calculations to ARDOT for acceptance at each stage.

1. Heavy Lifter Qualifications: Submit proof that the Heavy Lifter's qualifications have been met including a list of similar projects completed within the last five years with names and phone numbers of owner's representatives who can verify the Heavy Lifter's participation in those projects.

2. Working Drawings for Bridge Temporary Falsework: Working drawings for the Temporary Falsework shall be prepared for preliminary and final submittals. Design shall be according to the AASHTO LRFD Bridge Construction Specifications Section 3 (Temporary Works). Provide drawings defining the geometry, materials, and member sizes of the bridge temporary works. Include foundations and details of temporary bents or abutment seats to support the span under construction, including piling, spread footings, or other foundations.

Provide calculations indicating the bridge temporary works are adequate for the proposed loads and that settlement or elastic deflections of the bridge temporary works will not adversely affect the bridge when moved. Complete and document Quality Control (QC)/Quality

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Assurance (QA) review. The design and working drawings shall be signed and sealed by a professional engineer licensed in the State of Arkansas.

3. Moving Plan: A Moving Plan shall be prepared for preliminary and final submittals. Provide details of the sliding equipment including the vertical jacking system and moving system. This plan shall include at least the following information:

- a) Weight of the system being moved.
- b) Minimum and maximum anticipated friction coefficients.
- c) Minimum and maximum capacity over demand ratio of the weakest component along the lateral force system.
- d) Stroke length and rate.
- e) Method to reverse movement along the travel path.
- f) Equipment used to control and direct the location of the bridge during the move.
- g) Step by step move procedures.
 - 1) Include operational details for the control of the lifting, moving, and setting.
 - 2) Include quality control steps the operators take to verify the system is properly set up, and that the set up matches the submitted drawings.
 - 3) Include steps to provide safety during the move.
 - 4) An hour by hour schedule of the move.

4. Monitoring Plan: Provide monitoring plan either as working drawings or as manual to include at least the following:

- a) Description and details of the move monitoring system.
- b) Measuring equipment, procedures, required measurements, and locations of geometry control reference points on the bridge and in the bridge staging area. Measurements may be elevations, dimensions, or other readings.
- c) Pre-move and move monitoring.
- d) Warning levels and absolute limit levels. Define allowable tolerances and warning levels.
 - 1) Set displacement limits to avoid damage to the bridge during the move.
 - 2) Set displacement limits that are less than or equal to the limits defined in the contract plans and this Special Provision.
- e) Minimum detectable movements and system accuracy.
- f) Potential remedial actions that must be implemented when measurements exceed the warning levels.
 - 1) Required measurements, when they are taken and recorded.

5. Contingency Plan: Provide a Contingency Plan that includes potentially disruptive events and a contingency plan for each. Address equipment breakdown, delays during the move, and any other risks. Define key personnel, their responsibilities, and their required actions if any part of the contingency plan must be implemented. List backup equipment on site and local contacts for replacement parts or service.

6. Safety and Communication Plan: Provide a Safety and Communications Plan and include at least the following:

ARKANSAS DEPARTMENT OF TRANSPORTATION**SPECIAL PROVISION****JOB NO. 012307****LATERAL BRIDGE SLIDE****a) Safety Plan**

- 1) Schedule of operations
- 2) Organization of machinery
- 3) Safety gear requirements
- 4) Operational perimeters
- 5) Communication Plan
- 6) Public impacts, methods of communication during bridge move, and lead communicator

b) Contact information for:

- 1) Bridge move supervisor (primary point of contact for the move)
- 2) Move system supervisor
- 3) Contractor supervisor
- 4) Safety supervisor
- 5) Engineer of Record
- 6) Contractor's Engineer
- 7) Heavy lift engineer
- 8) ARDOT Bridge Division representative
- 9) Resident Engineer
- 10) Public Involvement liaison

7. Contract Plan Revisions: If the Contractor proposed to modify any of the design plan details, the following must be provided to the Engineer for approval.

- 1) Provide revised plans detailing dimensional, structural, and other physical changes to the permanent structure necessitated by the construction methods.
- 2) Design and detail changes according to the current edition of the AASHTO LRFD Bridge Design Specifications
- 3) Provide supporting calculations that include at least the following:
 - a. Summary of revisions and evaluation.
 - b. Calculations showing that the proposed changes do not adversely impact the load carrying capacity of the structure.
 - c. Documentation of reductions in load carrying capacity.
- 4) Revise the move concept and proposed plan revisions if the revisions result in a load rating factor less than 1.0.
- 5) Load rating factors less than 1.0 will not be accepted.
- 6) Complete and document QC/QA procedures.
- 7) Provide the seal of a Professional Engineer (PE) or Professional Structural Engineer (SE) licensed in the State of Arkansas on plans and calculations covering the plan revisions made.

8. Post Move and Pre-Opening Work: List activities and anticipated time frames for work requiring completion before opening the bridge to traffic.

Construction Methods and Requirements:

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1. Qualifications of Heavy Lifter: The Heavy Lifter shall have a minimum of five years of experience of heavy lifting and shall have successfully completed a heavy lifting operation using the chosen system within the United States in the past five years.

2. Moving System: The proposed method for moving the structure shall conform to the following:

- a) The moving operation shall have a maximum rate of five feet per minute.
- b) The moving operation shall be monitored continuously during the move operation to ensure that each end of the span is being moved at the same rate and distance.
- c) Provide a second and equal moving system on site to be utilized in the event that the first system fails.
- d) The moving system shall be capable of reversing movement along the travel path.
- e) A survey showing that the moving system has been installed in accordance with the above specification prior to jacking shall be provided.
- f) The Contractor shall schedule a test move (for each new structure) of a minimum of 6 inches prior to the actual move day to test their systems and controls.

3. Lifting System: The proposed method for jacking the structure shall conform to the following:

- a) The Service Dead Load at the bearings is estimated to be 205,000 pounds per bearing. The jacks used shall have a minimum capacity of 2 times the Service Dead Load. The Contractor shall adjust the dead loads and jack capacity as required if the bridge is lifted from the Jacking Pockets in the End Concrete Diaphragms as shown on the plans. Jacking Pockets are located between the girder lines.
- b) The concrete diaphragm shall be jacked the minimum amount necessary to place and remove moving system. At no time during jacking shall the difference in raising between adjacent bearings exceed 0.25 inches.
- c) Suitable blocking (i.e. cribbing, shoring, shimming, falsework), independent of jacks, shall be provided to assure full support of raised diaphragm while the moving system assembly is placed and removed. Blocking shall be sized such that the overall lateral stability of the blocking is assured. Blocking shall be carefully placed to maintain lateral stability of the span being lifted. Lateral movement during the jacking operation shall be kept to a minimum.
- d) Prior to jacking, the Contractor shall verify that the vertical movement is not restricted by any anchor bolts, sliding plates, closed joints or other appurtenances.
- e) At no time shall traffic be allowed on the bridge while it is supported by jacks. If traffic is allowed on the bridge before bearing modifications are completed in accordance with the plans, and with approval of the Engineer, such blocking shall be capable of fully supporting all vertical and lateral loads (i.e. braking, dead, live, wind, etc.).

The results obtained by the use of the jacking method are the Contractor's responsibility. The Contractor shall be responsible for any damage caused by his operation in the process of jacking the structure and shall repair such damage without additional compensation.

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4. Safety and Contingency Plans: A minimum of four weeks prior to the move, conduct a safety and contingency coordination meeting involving all Contractor, Heavy Lifter, and ARDOT project level leaders. Prepare extensive safety and contingency plans for the bridge move. Identify all issues or items that have potential to impact the safety of any personnel, actual bridge move, or the bridge move schedule. Identify key contacts for decisions during the bridge move. Establish authority and communication tree for immediate issue resolution during the move. Submit these plans a minimum of 10 Working Days prior to the bridge move. Update these plans and confirm they are complete prior to the final walk through pre-move safety meeting.

Conduct a final walk through pre-move safety meeting immediately prior to moving the bridge with all Contractor, Heavy Lifter, and ARDOT project level leaders at bridge site for the bridge move. Verify all items identified in the contingency and safety plans have been completed. Perform a final inspection to verify all work has been completed for the move. Reinforce communication and authority responsibilities during the bridge move. Submit final contingency and safety plans to ARDOT a minimum of 48 hours before bridge moving operations.

5. Placement of Superstructure: Prior to setting down bridge superstructures, verify that all bridge bearing locations have been properly prepared and all elevations have been confirmed. Verify that all required shims have been placed. Lower superstructure into place and load all bearing units uniformly. Place bridges within 0.5 inches horizontally and 0.125 inches vertically of their defined final location.

Conduct check of deflected shape and survey to confirm that bridges are in tolerance at their final location. Conduct a post-move crack survey of the deck and barrier within seven days of the bridge move, and provide the crack survey to ARDOT. Repair all cracks greater than 0.020 inches wide.

Cracks between 0.020 inches (0.51 mm) and 0.040 inches (1.50 mm) in width shall be filled by the Contractor using an ARDOT approved epoxy injection system and materials. The epoxy injection operation shall be in accordance with the material and equipment manufacturer's published recommendations. All cracks shall be filled within 14 days of move. All injection ports, excess epoxy and sealing epoxy shall be removed from the concrete surface.

Concrete elements with cracks greater than or equal to 0.040 inches (1.50 mm) in width at the final bridge location shall be repaired or removed and replaced by the Contractor to the satisfaction of the Engineer. Repair work will only be allowed for cracks that do not compromise the integrity of the design or the fitness of use as determined by ARDOT. All proposed repair work shall be approved by to the Engineer and submitted to ARDOT for approval.

Method of Measurement: "Temporary Falsework", "Bridge Jacking" and "Lateral Slide" shall be measured on a lump sum basis.

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Basis of Payment: Work completed and accepted as provided above will be paid for at the lump sum price bid for “Temporary Falsework”, “Bridge Jacking”, and “Lateral Slide”, which price shall be full compensation for all design, blocking/shoring, falsework, jacking, sliding, and furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work. Payment will be made under:

Pay Item	Pay Unit
Temporary Falsework	Lump Sum
Bridge Jacking	Lump Sum
Lateral Slide	Lump Sum

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DRILLED SHAFT FOUNDATIONS

Description. This work includes the furnishing of all materials and the construction of foundations consisting of reinforced concrete shafts placed within drilled excavations. Such foundations shall be constructed in accordance with the details and governing dimensions shown on the plans, the Standard Specifications, this special provision, and as directed by the Engineer.

Specialty Contractor. The drilled shafts on this project shall be constructed by a contractor or subcontractor experienced in drilled shaft foundations. The Contractor shall employ a drilled shaft specialty subcontractor unless he can demonstrate sufficient experience in the construction of drilled shaft foundations by his own forces. Documentation containing satisfactory proof of the Contractor's or specialty subcontractor's experience with drilled shaft foundations shall be submitted by the Contractor to the Engineer for approval.

Pre-Construction Meeting. A pre-construction meeting shall be scheduled by the Engineer to be held after receipt and review of the complete work plan and specialty contractor qualification submittals. The Engineer; the Contractor, including their Superintendent; the specialty subcontractor, including the listed onsite supervisor, shall attend. Attendance is mandatory. All other parties to be involved with the construction or testing of the drilled shaft foundations may be represented. The meeting will be conducted to clarify the requirements of the work, to coordinate the construction schedule and activities, and to identify the contractual relationships and the delineation of responsibilities amongst the parties involved.

Materials. (a) Concrete. All concrete shall be Class S with a minimum 28-day compressive strength of 3,500 psi and shall conform to Section 802 unless modified herein.

The slump of the drilled shaft concrete, at time of placement, shall be 7 inches $\pm$ 1 inch for concrete placed in the dry or 8 inches $\pm$ 1 inch for concrete placed underwater. The maximum water cement ratio specified in Subsection 802.05 shall not be increased. The maximum aggregate size shall not be greater than $\frac{1}{2}$ inch. An approved admixture may be used to obtain desired workability.

Trial Batch: Each concrete mix design to be used in the drilled shafts shall be submitted to the Engineer a minimum of 10 business days prior to preparing a trial batch. A trial batch for each concrete mix design shall be prepared using the specific materials submitted in the mix design, including any admixtures such as retarders or plasticizers, that are intended for use on the job. Each submitted mix design shall meet the slump requirements at the time of placement and shall maintain a slump of 4" or greater for the anticipated placement time stated in the Contractor's Drilled Shaft Work Plan plus two hours. The Contractor shall prepare a plant batch of at least 3 cubic yards or one-third the rated capacity of the mixer, whichever is greater. The trial batch, including all sampling and testing, shall be accomplished by the Contractor under the observation of the Engineer. The Contractor and Engineer shall sample and test the trial batch for compliance

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with the specifications for slump and compressive strength. Additional sampling and testing of the trial batch for slump loss shall be according to the following procedure:

1. The proposed mix shall be prepared for the slump loss test at a temperature consistent with ambient and concrete temperatures expected during actual concrete placement.
2. After initial mixing of 70 to 100 revolutions in accordance with Subsection 802.08, the slump, concrete temperature, and ambient temperature shall be determined. The slump shall be within the required specifications. The test start time is initiated when batch water is introduced to the cement of the mixture (the normal batch time that will be recorded on each concrete delivery ticket).
3. The mix shall remain in the mixer truck, which shall spin at minimum speed for the anticipated or actual time it will take for the mixer truck to travel to the job site. After this time period the mix will again be tested for slump, concrete temperature, and ambient temperature. If a higher slump is desired based on the results of this test, water may be added in accordance with Subsection 802.08, provided that the maximum water to cement ratio and/or the slump does not exceed the limits established by the specifications. The time and amount of water added shall be recorded on the batch ticket.
4. Once the desired slump is obtained a one cubic yard sample of the mixture shall then be deposited into a plastic lined form measuring 3'x 3'x 3' in interior dimensions. A plastic-lined hole in the ground of approximately the same dimensions may be used. The surface of the concrete mixture shall be covered with plastic to prevent evaporation. The form shall not be exposed to direct sunlight for the entire duration of the slump loss test.
5. Using the concrete mixture in the form, tests shall be performed for slump, concrete temperature, and ambient temperature at intervals of 30 minutes until the slump is 4 inches or less, or for the anticipated placement time of the shaft plus two hours. In no case shall slump tests be performed for less than 4 hours. The top 6 inches of the concrete shall be thoroughly mixed using a scoop or shovel immediately prior to each set of tests. Plastic shall remain in place to cover the mixture between test intervals.

A record of the results of all tests performed, including the time of each test, along with a copy of the mix design and a copy of the batch ticket shall be submitted to the Engineer for review and approval.

(b) Reinforcing Steel. Reinforcing steel shall be Grade 60 conforming to the requirements of Section 804.

(c) Casing. Temporary casing shall conform to ASTM A252, Grade 2 or Grade 3. Permanent casing shall conform to ASTM A252, Grade 2 or Grade 3. The walls and interior surfaces of the

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casings shall be carefully washed and cleaned of all sand, gravel, bonded concrete or foreign materials before use.

All casing shall be steel, watertight and of ample strength to withstand handling and/or driving stresses and the pressure of both concrete and the surrounding earth materials. All casing shall be selected by the Contractor to control dimensions and alignment of excavations within tolerances and to execute all other construction operations.

Construction. (a) Work Plan. The Contractor shall submit to the Engineer, for information and record purposes, a Work Plan for each shaft of similar type and setting at least 30 days prior to beginning construction of the drilled shafts. Where drilled shafts are to be constructed at multiple sites, a separate Work Plan shall be submitted for each site. The Work Plan shall include:

1. A thorough and complete description of the proposed drilling equipment including cranes, drills, augers, tremies, concrete pumps, casings, etc.
2. The method of drilling and achieving shaft alignment tolerances and removing obstructions.
3. The method of installation for any permanent casings and the method of installation and removal for any temporary casings. Provisions shall be made for rigidly supporting the casings at locations where the soil that overlies rock is thin or absent or the casing extends above the ground line. The extension of permanent casing into competent rock beyond the depth required to maintain seal is not an acceptable method of rigid support.
4. Details of methods to clean and inspect the shaft excavation including the bottom of the shaft.
5. The method of supporting and centralizing the reinforcing steel.
6. The method and anticipated time required for concrete placement in each shaft.
7. The sequence of drilling and time schedule for completion of each shaft including any non-destructive testing required by the plans or special provisions.
8. Preventative measures for working around any structures, railroad tracks, and utilities in the immediate vicinity.
9. The location of any work roads, detours, and traffic control devices.
10. A pollution prevention plan that shows the method of controlling the discharge of any pollutants including any water that may be used as a drilling fluid. The Contractor's pollution prevention plan will become part of the Department's Stormwater Pollution Prevention Plan. The Contractor shall ensure compliance with Section 110 of the Standard Specifications.

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The drilled shafts shall be constructed in accordance with the Work Plan and no deviation shall be allowed without the written permission of the Engineer. Any change in the Work Plan shall be submitted to the Engineer at least three (3) business days before any work is begun. Acceptance of the Work Plan shall not relieve the Contractor of any other requirements in the Plans and Specifications.

(b) Protection of Existing Structures. The Contractor shall control his operations to prevent damage to any existing structures, utilities, and railroad tracks. Preventative measures shall include, but are not limited to, selecting construction methods and procedures that will prevent caving of the shaft excavation and monitoring and controlling the vibrations from construction activities such as the driving of casing or sheeting, or drilling of the shaft. Blasting will not be permitted.

(c) Construction Tolerances. The following construction tolerances apply to drilled shafts unless otherwise shown on the plans:

1. The center of the drilled shaft shall be within three (3) inches of plan position in the horizontal plane at the plan elevation for the top of the shaft.
2. The vertical alignment of a vertical shaft excavation shall not vary from the plan alignment by more than 1/4 inch per foot of depth.
3. After all the concrete in a shaft is placed, the top of the reinforcing steel cage shall be no more than four (4) inches above and no more than two (2) inches below plan position.
4. The top elevation of the shaft shall have a tolerance of plus one (1) inch or minus three (3) inches from the plan top of shaft elevation.
5. Excavation equipment and methods shall be designed so that the completed shaft excavation will have a planar bottom. The cutting edges of the excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of $\pm 3/8$ inch per foot of diameter.
6. The finished diameter of the shaft shall be no less than the specified diameter along the entire length of the drilled shaft.

Drilled shaft excavations and completed shafts not constructed within the required tolerances are unacceptable. The Contractor shall be responsible for correcting all unacceptable shaft excavations and completed shafts to the satisfaction of the Engineer. Materials and work necessary, including engineering analysis and redesign by a Professional Engineer licensed in the State of Arkansas to complete corrections for out of tolerance drilled shaft excavations shall be furnished without either cost to the Department or an extension of the completion date of the project.

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(d) Casings. (1) Temporary Casing. When shown in the plans or as approved by the Engineer, temporary casings shall be used to prevent caving of the excavated shaft, to exclude ground water, or to create a positive seal into impervious material so that no piping of water or other materials occurs into or from the shaft excavation. The Contractor shall remove temporary casing before completion of concreting the drilled shaft. Predrilling and/or over-reaming to beyond the outside diameter of the casing may be required to install the casing.

When temporary casings are used in conjunction with permanent casings as shown in the plans or approved by the Engineer, the Contractor shall maintain both alignment of the temporary casing with permanent casing and a positive, watertight seal between the two casings during excavation and concreting operations.

Before the temporary casing is withdrawn, the level of fresh concrete in the casing shall be a minimum of 5 feet above the hydrostatic water level in the soil or the level of the drilling fluid in the annular space behind the casing, whichever is higher. As the temporary casing is withdrawn, care shall be exercised to maintain an adequate level of concrete in the casing so that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the shaft concrete. Insofar as possible, casing extraction shall be done at a slow uniform rate by application of a steady vertical upward pull in the direction of the axis of the shaft. To facilitate extraction, tapping on the casing, exertion of temporary downward pressure, and slight rotation will be permitted provided care is taken to avoid harmful impacts or disturbances to the fresh concrete. Vibration or rodding may not be used to break the casing loose for extraction.

Temporary casings which become bound or fouled during shaft construction and cannot be practically removed shall constitute a defect in the drilled shaft. The Contractor shall be responsible to improve such defective shafts to the satisfaction of the Engineer. Such improvements may consist of, but are not limited to: removal of the shaft concrete and extending the shaft deeper to compensate for loss of frictional capacity in the cased zone, providing saddle shafts to compensate for capacity loss or providing a replacement shaft. All corrective measures, including redesign of the bent caused by the defective shaft, shall be done to the satisfaction of the Engineer by the Contractor without either compensation or an extension of time. In addition, no compensation will be made for the temporary casing left in place.

(2) Permanent Casing. Permanent casing shall be used when shown in the plans. The casing shall be continuous between top and bottom elevations as shown in the plans. The outside diameter of the permanent casing shall be as shown in the plans. When not specified, the outside diameter of the permanent casing shall be sufficient to produce a finished drilled shaft with a diameter no less than the specified diameter along the entire length of the shaft. The inside diameter of permanent casing shall not be greater than the specified diameter of the shaft plus 12 inches unless otherwise approved by the Engineer. Lengths of permanent casing shown on the plans are for estimating quantities only; actual lengths are to be determined in the field. All casings shall be

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watertight and of ample strength to withstand handling and/or driving stresses and the pressure of both concrete and the surrounding earth materials. All casings used shall be selected by the Contractor to control the dimensions and alignment of excavations within tolerances and to execute all other construction operations.

(3) Temporary Surface Casing. Temporary oversized surface casing may also be required for no more than 10 feet below top of shaft to prevent sloughing of the top of the shaft excavation. Temporary surface casings shall not be removed until after a minimum of 72 hours has elapsed since concrete placement and shall be done in a manner to not cause any damage to the finished drilled shaft.

(e) Excavations. The Contractor shall perform the excavation required for the shafts through whatever materials encountered, to the dimensions and elevations shown on the plans or required by the site conditions. The Contractor's methods and equipment shall be suitable for the intended purpose and materials encountered.

Bottom of shafts shall not be founded at an elevation above that shown on the plans without the approval of the Engineer. The depth that is to be drilled shall be considered an approximation and the Engineer may order, in writing, such changes in depth as may be necessary to secure a satisfactory foundation.

After each drilled shaft excavation has been completed to planned tip elevation, the Contractor shall drill one test hole 1 ½" diameter or larger to a minimum depth of 1.5 times the shaft diameter below planned tip elevation. If voids or soil-filled cavities are encountered within this depth below the planned tip elevation, test hole drilling shall continue from the top of competent rock below the cavity and advanced to a minimum depth of 1.5 times the shaft diameter below the cavity. Conditions encountered shall be recorded and provided to the Engineer for determination of the drilled shaft tip elevation.

At the Contractor's option, one test boring may be drilled prior to the drilled shaft excavation. The test boring shall be positioned as near as practical to the centerline of the shaft. If rock is encountered at an elevation at or above the required embedment above the planned tip elevation, core drilling shall start at the top of competent rock and advanced to a minimum depth of 1.5 times the shaft diameter below the planned tip elevation. If competent rock is encountered at an elevation lower than the required embedment above the planned tip elevation, core drilling shall start at the top of competent rock and advanced to a minimum depth of the required embedment plus 1.5 times the shaft diameter. If voids or soil-filled cavities are encountered below the planned tip elevation, core drilling shall continue from the top of competent rock below the cavity and advanced to a minimum depth of 1.5 times the shaft diameter below the cavity.

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Each test boring shall advance using rotary drilling techniques. Test borings shall use temporary casing extending through soil to the top of rock to facilitate diamond core drilling. Hollow stem augers may be considered to meet the definition of temporary casing for drilling purposes. Diamond core drilling shall be done with an NQ-size double-tube swivel-type wireline core barrel or a similar approved larger sized tube swivel-type core barrel.

A completed test boring log for each respective test boring shall be provided to the Engineer. The test boring log shall include station, offset, surface elevation, complete visual description, drilling and sampling methods; and depth of the various soil or overburden layers encountered to top of rock. The test boring log shall also include visual descriptions and conditions of the rock cores, including any voids, soil-filled cavities or other anomalies encountered; Standard Core Recovery (SCR), and Rock Quality Designation (RQD) of each core run. The rock cores shall be removed, boxed, and appropriately marked for elevation.

The test boring logs and rock core samples shall be provided to the Engineer within five business days after completion of the test boring for a determination of the drilled shaft tip elevation. If the bottom shaft elevation is lowered below planned tip elevation, additional core drilling may be required to sample rock below the new drilled shaft tip elevation.

The excavation shall be made without the use of drilling mud. Water may be used as a drilling fluid and to prevent a hydrostatic head from occurring. Drilled shaft excavation shall begin only if the Contractor can complete the excavation, perform foundation inspection and testing, and place the reinforcement and concrete as a continuous operation. If the center-to-center spacing is less than 3 shaft diameters, no two adjacent shafts shall be excavated at the same time and shafts shall not be constructed within 24 hours of the completion of an adjacent shaft. If the excavation will be subjected to vibrations from nearby activities that may cause caving, casing shall be advanced as drilling proceeds to prevent caving.

Material excavated from shafts and not used in the backfill around the compacted pier or abutment shall be disposed of in a manner approved by the Engineer and shall not be placed in a waterway or otherwise impair the efficiency or appearance of the bridge or other parts of the work. Any excavation for the shaft beyond the lines required by the plans shall be filled with Class S Concrete at the Contractor's expense.

When drilled shafts are to be installed in conjunction with embankment placement, the Contractor shall construct drilled shafts after the placement of fills unless otherwise approved by the Engineer.

When drilled shafts are to be installed in conjunction with a footing, excavation to the footing elevation shall be completed before shaft construction begins unless otherwise noted in the plans

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or approved by the Engineer. Prior to the footing pour, the Contractor shall repair any disturbance to the footing area caused by shaft installation.

No open excavation shall be left unattended. During non-working hours excavations shall be protected by the use of solid, safe covers that are firmly fastened in place.

The Contractor shall provide suitable access, lighting, and equipment for checking the dimensions and alignment of each permanent shaft excavation and for inspecting the excavation. Any mechanical equipment used within the excavation shall be operated by air or electricity. The use of gasoline driven engines or any device that produces toxic fumes or uses atmospheric oxygen, within the excavation for any purpose will not be permitted. All lighting shall be electric and precautions shall be taken in regard to potential short circuits of electric current within ground water. The Contractor shall not allow workers to enter the shaft excavation for any reason, unless both a suitable casing has been installed and adequate safety equipment and procedures have been provided to the workers entering the excavation.

The Contractor shall check the dimensions and alignment of the shaft excavation under the direction of the Engineer. Final shaft depths shall be measured with suitable weighted tape or other approved methods after final cleaning of the excavation.

No concrete shall be placed until the Engineer approves the condition of the excavation. Prior to placing concrete, the shaft excavation shall be cleaned so that a minimum of 50 percent of the base area will have less than ½ inch of sediment and at no place more than 1 ½ inch. The Contractor shall be responsible for showing that the excessive loose material has been removed from the excavation. Inspection of the bottom of the excavation shall be by camera or other suitable means approved by the Engineer. When the shaft inspection is by camera it shall be capable of viewing the bottom of the excavation at a resolution suitable for determining the bottom condition whether wet or dry construction methods are used. All expenses for inspection shall be included in the price bid for "Drilled Shaft (72" Dia.)".

If the elevation of the top of shaft is below ground level at the time of concrete placement, an oversized temporary surface casing from ground elevation to a point below the top of the shaft will be required to control caving of any substance into freshly placed concrete and to facilitate construction. The oversized surface casing shall be removed and backfill placed in accordance with Subsection 801.08.

(f) Reinforcing Steel. The reinforcing steel cage shall be completely assembled and shall be placed as a unit immediately after the shaft excavation is inspected and accepted, and prior to concrete placement. The cage will consist of the reinforcing shown in the plans, cage stiffener bars as required, spacing devices, and any other appurtenances required to maintain alignment, shape, and clearances. Any internal stiffeners shall be removed as the cage is lowered into the excavation.

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The minimum clearance between the edge of the drilled shaft and the vertical reinforcing steel and the minimum length of steel required for lap with the column steel shall be as shown in the plans.

The Contractor shall be responsible for the proper bracing of the reinforcing cage. This bracing shall be sufficient to permit assembly above ground and placing in the shaft as a unit without inducing deforming, twisting, or bending stress. Welding of reinforcing bars will not be permitted.

Concrete spacer blocks shall not be used on the reinforcing cages. Epoxy coated metal "chair" type spacers, epoxy coated bent pieces of steel bars or high density plastic alignment systems shall be placed at sufficient intervals around the steel cage and not exceeding 5 feet along the shaft to ensure concentric spacing of the cage inside the shaft. When the diameter of the longitudinal reinforcing steel exceeds 1 inch, such spacing along the shaft shall not exceed 10 feet. The spacer sizes shall be varied as necessary along the length of the shaft to maintain a concentric spacing within the cased and uncased portions of the shaft.

The cage shall be supported from the top by some positive method to minimize uplift or downward slump during concrete placement and/or extraction of the casing. A minimum of one-half of the vertical bars shall be supported from the top. The support shall be concentric with the cage to prevent racking and distortion of the steel. Setting the cage on the socket bottom without support will not be permitted.

The elevation of the top of the steel cage shall be carefully checked before and after the concrete is placed. Displacement of the steel beyond the specified tolerances will be cause for rejection.

(g) Concrete. The work shall be performed in accordance with the provisions of Section 802 and in conformance with the requirements herein.

The maximum subplot size for acceptance sampling and testing of drilled shaft concrete by the Contractor shall be 100 cubic yards or one drilled shaft.

At the time concrete is placed, the excavation shall be free from accumulated seepage water (less than 3 inches above bottom of shaft and 12 inches per hour inflow) unless an underwater pour is authorized by the Engineer. Concrete shall be placed as soon as possible after completion of the excavation, and the inspection and setting of the reinforcing cage, and shall proceed in a continuous operation from the bottom of the shaft to the required top elevation.

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After the concrete level has reached the required top elevation, it will be forced to overflow until only fresh uncontaminated concrete is left in the shaft. The concrete waste shall not enter the waterway as required by any applicable Section 404 Permits. The top 10 feet of each drilled shaft shall be vibrated except when more than 10 feet is to be exposed above the ground line or the channel bottom. When more than 10 feet is exposed, the entire exposed portion shall be vibrated. Exposed portions of each drilled shaft shall be cured and any construction joint area shall be treated as prescribed in Section 802.

Placement of drilled shaft concrete underwater shall be done only with permission of the Engineer in strict conformance with the procedures outlined below for an underwater pour.

1. Concrete Placed in the Dry. All drilled shaft concrete placed in the dry shall be placed through a tremie or by pumping to prevent segregation of materials. The tremie shall have sufficient length to discharge concrete at the shaft base and shall consist of a rigid tube with a diameter of no more than 14 inches nor less than 10 inches and be fitted with a hopper at the top. The tremie shall not contain aluminum parts that may come in contact with the concrete. The inside and outside surfaces of the tremie shall be clean and smooth to permit flow of concrete and unimpeded withdrawal. It shall be constructed and supported so that it can be moved horizontally to cover the work area and moved vertically to control the concrete flow as the level of the concrete in the shaft is raised. The bottom of the tremie or pump pipe shall be at the bottom of the shaft at the beginning of concrete placement, but will not be required to remain at the bottom of the shaft during the entire pour. The bottom of the tremie must remain below the top of the concrete at all times.

The concrete pump line shall have a minimum diameter of 4 inches with the portion of the line inside the excavation meeting the requirements above, but only that portion of the pump line in contact with the concrete will be required to be rigid. All pump equipment shall be clean and in good operating condition.

2. Concrete Placed Underwater. If it becomes apparent that pumping and other dewatering methods are not adequate to dry the holes, the Engineer may authorize underwater placement of concrete. In this case, the water in the hole shall be permitted to seek its natural hydrostatic head to prevent any possibility of pressure washing of the concrete being placed.

The tremie and pump line requirements shall be the same as specified above for concrete placed in the dry except tremie and pump lines shall be watertight and constructed so that the discharge end can be sealed closed at the start of work to prevent water from entering the tremie or pump line before the tremie or pump line is filled with concrete. If a plug is used to separate the concrete from the fluid in the hole, the plug shall be removed from

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the excavation after placement has begun. Concrete placement shall be done in one continuous operation. The discharge orifice shall be at the bottom of the shaft at the beginning of the concrete placement and shall remain at least 5 feet below the top surface of the fluid concrete. The Contractor shall provide equipment and personnel to sound the top of the concrete in the presence of the Engineer in order to verify the location of the concrete surface and the discharge orifice at all times. After concrete placement has started the concrete level in the tremie shall be maintained above the water level in the bore hole to prevent water intrusion into the shaft concrete. When lifting the pump line during concreting, the Contractor shall temporarily reduce line pressure until the orifice has been repositioned at a higher elevation in the excavation. If at any time during the concrete pour the orifice is removed from the fluid concrete and discharges concrete above the rising concrete surface, the entire drilled shaft will be considered defective. In such case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall cleaning or overreaming as directed by the Engineer, and repour the shaft.

(h) Drilled Shaft Log. A record of each shaft construction shall be furnished by the Contractor to the Engineer prior to acceptance of the shaft. This Drilled Shaft Log shall include: information about the drilling procedures and equipment; a log of the excavated material; the as constructed elevations and lengths of all vertical elements of the shaft including reinforcing and casings; depth of final excavation, founding material and bottom condition; concrete volume and a concreting curve showing depth versus volume over the length of the shaft, volume used in overflow and purging; and the date and time of pertinent operations used in constructing the drilled shaft from beginning of excavation to completion of concrete placement.

Method of Measurement. Acceptable drilled shafts, complete in place and of the specified diameter, will be measured by the linear foot as constructed to the dimensions shown on the plans or approved by the Engineer from bottom to top of shaft. No additional payment will be made for any excavation or concrete provided beyond the lines required by the plans.

Permanent casing for the specified diameter will be measured by the linear foot of the actual accepted length left in place. Measurement will be along the casing from top of casing or top of shaft, whichever is lower, to the bottom of the casing at each shaft location where permanent casing is authorized and used.

Temporary steel casing will not be measured for separate payment, but shall be included in the unit price for "Drilled Shaft (72" Dia.)".

Basis of Payment. Drilled shafts, measured as provided above, will be paid for at the contract unit price bid per linear foot for "Drilled Shaft (72" Dia.)" which shall be full compensation for making and inspecting shaft excavations; for drilling test borings and furnishing logs; for

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furnishing, placing, and removing temporary casing; for furnishing and placing all concrete and reinforcing steel; for performing mix designs; for preparing trial batches; for keeping the Drilled Shaft Log; for providing and placing necessary materials for nondestructive testing as required by those special provisions; for quality control and acceptance sampling and testing; for all backfilling; and for furnishing all tools, labor, equipment and incidentals necessary to complete the work.

When drilled shafts are carried below elevations shown on the plans at the direction of the Engineer, the additional length of drilled shaft will be measured as provided above and will be paid for in accordance with the following price schedule:

<u>Depth Below Planned Elevation</u>	<u>Price</u>
Not more than 5 feet	Contract Price
Excess of 5 feet and not more than 15 feet	Contract Price + 15%
More than 15 feet	Contract Price + 25%

Permanent casing will be paid for at the contract unit price bid per linear foot for "Permanent Steel Casing (84" Dia.)" which shall be full compensation for furnishing and placing the casing above the costs attributed to the work paid for under associated pay items.

Payment will be made under:

Pay Item	Pay Unit
Drilled Shaft (72" Dia.)	Linear Foot
Permanent Steel Casing (84" Dia.)	Linear Foot

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Description. This work shall consist of the Nondestructive Testing (NDT) of drilled shaft foundations, as described herein. All work shall be in accordance with this Special Provision, the details shown in the plans, Standard Specifications, and as directed by the Engineer.

Work to be Performed. (a) General Requirements. The nondestructive testing method known as Crosshole Sonic Logging (CSL) shall be used on each drilled shaft in this contract. The Contractor shall employ an experienced independent testing organization approved by the Engineer to perform all CSL testing. Information should be supplied showing this independent testing organization has the experience in the kind of work described in this Special Provision and also showing they have the equipment capable of performing the work.

Testing shall not be conducted until at least 72 hours after placement of concrete is concluded in the shaft. Testing of the first shaft placed shall be completed within 14 calendar days after placement of concrete in the first shaft. A preliminary report describing the integrity of the first shaft shall be provided to the Engineer within 48 hours of testing. The Contractor will not be allowed to place concrete in the remaining shafts or make additional permanent construction on the first shaft until the Engineer has approved the first shaft. The Engineer shall approve the scheduling of subsequent testing. Additional permanent construction on each subsequent shaft will not be allowed until the Engineer approves the shaft.

The approved testing organization shall provide the Engineer a preliminary report describing the integrity of each shaft within 48 hours of testing. Testing on the remaining shafts shall be completed within 14 calendar days of the last shaft placed, but no later than 45 calendar days after placement of concrete in a particular shaft. Provided the report received meets the requirements of this Specification, the Engineer will provide a response within 10 business days of receipt of report.

(b) Preparation for Testing. To accommodate the CSL test requirements, the Contractor shall install a number of pipes in each shaft. The number of pipes installed will depend on the diameter of the shaft as specified below:

Shaft Diameter	Minimum Number of Pipes	Pipe Spacing
72"	6	60 Degrees

The pipes shall be ASTM A53 Standard Weight, or an approved equivalent, steel pipe with a minimum inside diameter (ID) of 1.5 or 2 inches. The pipes shall have a round, regular internal diameter free of defects or obstructions including defects at pipe joints; in order to permit the free, unobstructed passage of 1.375 inch diameter source and receiver probes. The pipes shall be

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watertight and free from corrosion with clean internal and external faces to ensure passage of the probes inside and a good bond with the concrete outside.

Each pipe shall be fitted with a watertight shoe on the bottom and a removable cap or plug on the top. The pipes shall be securely attached to the interior of the reinforcing steel cage. The pipes shall be installed in each shaft in a regular, symmetric pattern such that each pipe is equally spaced from the others around the perimeter of the cage. Prior to construction, the Contractor shall submit their selection of pipes and proposed method of pipe installation to the approved testing organization. The pipes shall be secured to the reinforcing cage at three foot vertical intervals, such that the pipes remain in position during placement of the cage and placement of the concrete.

The pipes shall be as near to parallel as possible. **They shall extend from within 0.25 feet above the shaft's excavated bottom to at least 3 feet above the top of shaft. If the length of the excavated shaft varies from the plans, the pipes shall be adjusted to meet the above requirements.** No pipe may be allowed to rest on the bottom of a drilled excavation. Any joints required to achieve full length pipes shall be made watertight. Care shall be taken during placement of the reinforcing steel cage so as not to damage the pipes.

After placement of the cage, and before placement of concrete, the pipes shall be filled with potable water and the pipe tops shall be capped or sealed to keep debris or other foreign matter out of the pipes. In a case where conditions make rapid concrete placement imperative, the Engineer may permit the filling of the pipes to be delayed until immediately after the concrete is placed. Care shall be exercised in the removal of caps or plugs so as not to apply excess torque, hammering, or other stresses that could break the bond between the pipes and the concrete.

Upon completion of all CSL testing on a shaft, and after the acceptance of that shaft by the Engineer, the pipes shall be filled by the Contractor with a QPL approved grout such that no air pockets or impurities remain in the pipes. All water shall be removed from the access pipes. The portion of pipe extending above the top of the shaft shall be removed.

(c) CSL Test Equipment. The CSL testing equipment shall consist of all necessary supplies, support equipment and power to perform the testing and to record, analyze, and report the results in accordance with this Special Provision.

(d) CSL Testing Procedures. Before placement of concrete, the Contractor shall investigate at least one pipe per shaft to ensure there are no bends, crimps, obstructions or other impediments to the free passage of the testing probes. A record of all pipe lengths, including a measurement of the projection of the pipes above the top of the shaft shall be made. Prior to the CSL tests, the Contractor shall provide this information, shaft bottom elevations, top elevations, and construction dates to the approved testing organization and Engineer.

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The tests shall be conducted between various pairs of pipes. The approved testing organization shall test between all pairs across the central area of the shaft and between each pipe pair around the perimeter of all tested shafts. Additional pairs may be used to evaluate anomalies/defects as described below, or as required by the Engineer.

The CSL test shall be carried out with the source and receiver probes in the same horizontal plane. Any slack shall be removed from the cables prior to pulling to provide for accurate depth measurements in the CSL records. CSL measurements shall be made at increments of 3 inches or less from the bottom to the top of each shaft. The probes shall be pulled simultaneously over the depth measuring wheel, starting from the bottoms of the pipes.

Any anomalies/defects indicated by longer pulse arrival times and significantly lower amplitude/energy signals shall be reported to the Engineer. Further tests may be required to evaluate the extent of such anomalies/defects. Additional NDT methods which could be used to evaluate possible defects include: Angled Crosshole Sonic Logging, Crosshole Tomography, Single Hole Sonic Logging, Gamma-Gamma Nuclear Density Logging, and Sonic Echo and Impulse Response tests. Any additional nondestructive testing shall be provided at no cost to the Department and with no extension of the contract time.

(e) CSL Testing Results. The CSL test results shall be compiled into a shaft integrity testing report for each shaft and approved by a Professional Engineer licensed in Arkansas. The report shall summarize and analyze (a) initial pulse arrival time versus depth and (b) pulse energy/amplitude versus depth. In addition, the report shall include a plot of pulse velocity versus depth and a waterfall diagram for each pair of tubes that are tested. A CSL log will be presented for each pair of pipes tested, with any defect zones indicated on the logs and discussed in the report. The logs shall cover the full length of shaft corresponding to the measurements provided by the Contractor. The approved testing organization shall supply two (2) hard copies and one digital copy, in an approved format, of the CSL test report to the Engineer and a copy of each report shall be provided to the Contractor.

(f) Evaluation of CSL Test Results. The Engineer will evaluate the CSL test results and will determine whether or not the drilled shaft construction is acceptable. If the Engineer approves the first drilled shaft based upon the results of the CSL tests, then the shaft and the shaft site will be turned back to the Contractor and further construction may proceed.

The acceptance of each of the remaining drilled shafts shall be the decision of the Engineer, based on the results of the shaft integrity testing reports and other information of the shaft placement. If it is determined by the Engineer that any confirmed defect indicated by a NDT test may affect the structural integrity of the shaft, the Engineer may require the Contractor to verify shaft conditions by core drilling in accordance with Subsection (g), "Evaluation by Core Drilling."

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(g) Evaluation by Core Drilling. A drilled shaft that is found to be unacceptable by the CSL tests may be cored by the Contractor using double tube core barrels. Core samples shall be obtained, handled and tested in accordance with AASHTO T 24-15. At the Contractor's option a PQ size core barrel may be used. Core samples will be delivered to the Department's Materials Division where they will be visually inspected and selected samples will be evaluated for compressive strength. Selected samples with compressive strengths less than 0.85 f'c will be considered unacceptable. A core sample shall be taken from each defect location, at a length specified by the Engineer. The methods and equipment used to core the drilled shaft and grout the cored hole shall be approved by the Engineer prior to commencing coring operations. An accurate log of the core shall be kept and the core shall be crated and properly marked showing the shaft depth at each interval of core recovery. The core, along with two copies of the coring log, shall be provided to the Engineer.

If the quality of the shaft, as represented by the core samples, is determined to be acceptable by the Engineer, then the shaft and the shaft site will be turned back to the Contractor and further construction may proceed. If the quality of the shaft is determined to be unacceptable by the Engineer, then the Contractor shall proceed in accordance with Subsection (h), "Defective Shaft," below. If a defect is confirmed, the Contractor shall pay for all coring and grouting in the shaft related to a suspected defect. If no defect is encountered, compensation for all coring and grouting in the shaft will be paid for at the contract unit price bid per linear foot for "Coring Drilled Shaft." Upon acceptance of the shaft, core holes shall be cleaned and filled with a QPL approved grout such that no impurities or air pockets remain.

(h) Defective Shaft. If the Engineer determines that a shaft is unacceptable, the Contractor shall submit a plan for remedial action to the Engineer for approval. Any modifications to the foundation shaft and load transfer mechanisms caused by the remedial action will require calculations and working drawings stamped and signed by an Arkansas Licensed Professional Engineer for all affected foundation elements. This data shall be submitted to the Engineer for information and record keeping purposes. All labor and materials required to perform remedial shaft action shall be provided at no cost to the Department and with no extension of the contract time.

Method of Measurement. (a) CSL Testing. Acceptable CSL tests shall be measured per each shaft tested of a specified diameter.

(b) Coring Drilled Shafts. If no defect is encountered, the coring of shafts shall be measured by the linear foot.

Basis of Payment. CSL testing shall be paid for at the contract unit price bid per each shaft tested of a specified diameter. The price bid for each shaft tested shall be full compensation for

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furnishing all equipment and incidentals necessary to perform the required test, performing the tests, analyzing the results, and furnishing the Engineer with the shaft integrity reports, as required.

Furnishing and installing all pipes, dewatering the pipes, removing excess pipe above top of shaft, and filling the tubes with grout will be considered incidental to the unit price bid for "Drilled Shaft (72" Dia.)".

Coring for shafts where no defect is encountered will be paid for at the unit price bid per linear foot of "Coring Drilled Shaft" which price shall be compensation for furnishing all labor, materials, grout, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Crosshole Sonic Logging (72" Dia.)	Each
Coring Drilled Shaft	Linear Foot

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SPECIAL SAFETY REQUIREMENTS FOR BRIDGES

Description. This specification covers special safety requirements during the construction of Bridge Nos. A&B7427. These requirements are intended for the safety of both the traveling public and the workers. Any modifications must meet the approval of the Engineer.

Construction of New Bridge. (a) Off-loading and erection of structural steel and other activities deemed necessary by the Engineer from the existing Interstate 30 bridges shall be limited to the hours between 11:00 p.m. and 5:00 a.m. on Sunday through Saturday, but will not be permitted during legal holidays or weekends adjacent to these holidays. During this time window, all highway traffic may be stopped for short intervals of time, not to exceed 15 minutes, in order that the above activities can progress without endangering the traveling public. Between closure periods the roadway must be opened for a sufficient time to allow re-establishment of the normal flow of traffic. Time windows are subject to adjustment by the Engineer when necessary to accommodate special events or situations.

(b) Construction of bents and embankments shall be accomplished in such a manner that traffic is maintained on the highway as described above. Precast barriers shall be placed as shown on the roadway plans before work is performed. Sheet piling or other means shall be used to prevent embankment or excavated material from spilling onto the existing highway or to protect the shoulders from bent excavation. Placement of concrete shall be accomplished without construction equipment obstructing traffic.

Details of the shoring – complete with dimensions, design calculations, and kind and condition of materials – must be submitted to the Engineer for informational and record purposes prior to construction. These details must be prepared and/or approved by a Professional Engineer registered in Arkansas.

The Contractor shall construct the shoring in accordance with the details submitted to the Engineer and the results obtained by the use of the shoring design are the Contractor's responsibility.

(c) During the erection of the structural steel adjacent to the existing Interstate 30 bridges, permanent bents or sufficient falsework shall be provided for support of the steel beams. Any falsework or construction equipment required for the erection of the structural steel, or for other activities, shall be protected by precast barriers as shown on Standard Drawing TC-4. The precast barriers may be located to close a shoulder as approved by the Engineer. Appropriate signs must be in place when a shoulder is closed.

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SPECIAL SAFETY REQUIREMENTS FOR BRIDGES

Removal of Existing Bridge. (a) Removal of the existing bridges over De Roche Creek shall be limited to the time windows and restrictions for the short-term closure outlined in SP JOB 012307 "Maintenance of Traffic." Time windows are subject to adjustment by the Engineer when necessary to accommodate special events or situations.

Payment. No direct payment will be made for this work. It shall be considered subsidiary to other items in the contract.

ARKANSAS DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

JOB NO. 012307

SITE USE (A+B+C METHOD) - CALENDAR DAY CONTRACT

1. General. The process for bidding will take into account not only the contract amount bid but also the bidder's stated delivery time in which the Specified Site Use Work will be substantially complete. This method shall be used to determine the successful bidder and to establish the contract time (calendar days). It shall not be used to determine the award amount nor final payment to the Contractor when the project is completed.

2. Definition of Terms.

(a) Specified Site Use Work. Site Use Work. The specified site use work shall consist of two (2) parts: Part B and Part C:

Part B Site Use Work shall consist of the number of hours of two-way traffic (head to head) is required during the bridge slide operations.

Part C Site Use Work shall consist of all items of work in the Contract.

(b) Contract Amount. The summation of the products of the quantities shown in the bid schedule multiplied by the unit bid price.

(c) Calendar day. As defined in Subsection 101.01 of the Standard Specifications. Calendar days will be assessed in accordance with the contract Special Provision "Prosecution and Progress with Bid Schedule".

(d) Contract Time. The number of calendar days established by the bidder to complete the project.

(e) Substantially Complete. The date at which time charges cease due to the completion of all pay items. The Engineer will be the sole authority in determining when the work is substantially complete. Part C Site Use Work will be considered complete on this date.

(f) Daily Road User Cost. The amount which represents the average daily cost to the road user, including but not limited to, user delay costs, vehicle operating costs, crash costs, and emission costs.

The **hourly** road user cost for Part B is \$19000.

The **daily** road user cost for Part C is \$13500.

(g) Bid Site Use Time. The number of **hours** specified in the bid by the bidder as the time required to substantially complete the Specified Site Use Work for Part B. The number of **calendar days** specified in the bid by the bidder as the time required to substantially complete the Specified Site Use Work for Part C.

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SITE USE (A+B+C METHOD) - CALENDAR DAY CONTRACT

(h) Punch List. A list of items and/or areas of the project requiring correction, replacement, repair, or general cleanup which is furnished by the Engineer following the declaration of the project as Substantially Complete.

3. Preparation of Proposal. The bidder shall establish the number of **hours** to be used to substantially complete the Specified Site Use Work for Part B. The bidder shall establish the number of **calendar days** to be used to substantially complete the Specified Site Use Work for Part C.

The product of the number of **hours** established by the bidder for Part B multiplied by the hourly road user cost of \$19000 per hour and of the number of calendar days for Part C multiplied by the daily road user cost of \$13500 per calendar day will be added to the contract amount bid. The sum of the three amounts will be the amount used for consideration of bids for award.

4. Consideration of Bids. Each bid submitted shall consist of three parts:

(A) The Contract amount.

(B) Total number of **hours** proposed by the bidder to substantially complete the Specified Site Use Work for Part B.

(C) Total number of **calendar days** proposed by the bidder to substantially complete the Specified Site Use Work for Part C.

The successful bid will then be determined by the Department as the lowest combination of (A), (B) and (C) according to the following formula:

$$\begin{aligned} & \text{(A)} \\ & + [(B) \times (\text{hourly road user cost of } \$19000)] \\ & + [(C) \times (\text{daily road user cost of } \$13500)] \\ & = \text{Bid amount for award consideration.} \end{aligned}$$

The preceding formula shall be used only to determine the successful bidder and shall not be used to determine the contract award amount nor final payment to the Contractor, except as may be adjusted under sections 6 and 7 below.

5. Assessment of Site Use Time.

Site Use Time assessment for Part C will begin in accordance with the contract time detailed in the special provision "Flexible Beginning of Work – Calendar Day Contract". Site Use Time for Part C will be assessed on all calendar days for each **calendar day** or portion thereof beginning on the effective date of the Work Order, and continuing until the Specified Site Use Work is substantially completed.

ARKANSAS DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

JOB NO. 012307

SITE USE (A+B+C METHOD) - CALENDAR DAY CONTRACT

Site Use Time assessment for Part B will begin at 8:00 pm on the Sunday of the week in which the two-way traffic begins. Site Use Time will be assessed on all calendar days for each **hour** or portion thereof beginning at 8:00 pm on the Sunday, and continuing until the Specified Site Use Work is substantially completed and all lanes in both directions on the main lanes are opened to normal traffic.

Unless an emergency is declared or unless allowed by other job provisions, the Contractor shall not perform work that requires inspection on Sundays except for work during the Site Use Time assessment for Part B.

Unless an emergency is declared or unless allowed by other job provisions, the Contractor shall not perform work that requires inspection on legal holidays designated in Subsection 101.01 of the Standard Specifications, Edition of 2014, and Monday following a holiday on Sunday or Friday preceding a holiday on Saturday. If the Commission declares Friday following Thanksgiving Day as a Departmental holiday, the Contractor shall not perform work that requires inspection on this day. These days will be charged in a "Calendar Day" contract.

Extensions of the Bid Site Use Time for either Part B or Part C will be granted **ONLY** for the following reasons:

- (a)** The work has been delayed by any act or omission of the Commission. This includes suspension of the work when the suspension is not the fault of the Contractor.
- (b)** If the dollar value of the Specified Site Use Work, exclusive of incentives and disincentives, exceeds the dollar value for the bid Site Use Work, the time will be extended in the same proportion.
- (c)** Change Orders affecting the work that results in additional time being required to complete the Specified Site Use Work.

Requests for extension of the Bid Site Use Time shall be made in writing and shall state the reasons for the request and identify the specific days for which extension is requested.

6. Early Completion of Specified Site Use Work. The Contractor will be paid \$19000 for each **hour** the Specified Site Use Work for Part B is substantially complete before the number of **hours** stated by the Contractor in the bid for Part B, including extensions granted in accordance with paragraph 5 above. The maximum number of **hours** for which this payment will be made is 24 hours. Payment for early completion will be made after all items identified on the punch list have been completed to the satisfaction of the Engineer.

ARKANSAS DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

JOB NO. 012307

SITE USE (A+B+C METHOD) - CALENDAR DAY CONTRACT

The Contractor will be paid \$13500 for each **calendar day** the Specified Site Use Work for Part C is substantially complete before the number of **calendar days** stated by the Contractor in the bid for Part C, including extensions granted in accordance with paragraph 5 above. The maximum number of calendar days for which this payment will be made is 15 days. Payment for early completion will be made after all items identified on the punch list have been completed to the satisfaction of the Engineer.

7. Failure to Substantially Complete the Specified Site Use Work in the Time Bid. Failure to substantially complete the Specified Site Use Work within the number of **hours** stated by the Contractor in the bid for Part B, including extensions granted in accordance with paragraph 5 above, will result in the Hourly Road User Cost of \$19000 being assessed for every **hour** in excess of the stated number, up to the time in which the Specified Site Use Work is substantially complete.

Failure to substantially complete the Specified Site Use Work within the number of **calendar days** stated by the Contractor in the bid for Part C, including extensions granted in accordance with paragraph 5 above, will result in the Daily Road User Cost of \$13500 being assessed for every **calendar day** in excess of the stated number, up to the time in which the Specified Site Use Work is substantially complete.

This assessment will be deducted from any compensation due the Contractor or recovered if sufficient compensation is not due.

The Engineer will be the sole authority in determining when the Specified Site Use Work is substantially complete.

8. Contract Time and Liquidated Damages. Determination of hours and calendar days charged, extensions of Contract Time, and assessment of liquidated damages for failure to complete all work within the Contract Time limit will be made in accordance with the contract Special Provision "Prosecution and Progress with Bid Schedule". Liquidated damages under the contract Special Provision "Prosecution and Progress with Bid Schedule" are separate and in addition to the Hourly and Daily Road User Costs assessed under this Special Provision.