

May 4, 2026

ADDENDUM NO. 1

RE: Item #1, May 6, 2026 Letting - PH 0014(257)10, PCN 08LL, Lawrence County - Modify Intersection & Lighting

TO WHOM IT MAY CONCERN:

The following addenda to the plans shall be inserted and made a part of your proposal for the referenced project.

SPECIAL PROVISIONS: Please remove the Index of Special Provisions and replace with the attached Index of Special Provisions revised 5/4/26.

Please add the "Special Provision for Video Detection System", dated 5/4/26 and "Special Provision for Battery Backup System for Traffic Signal", dated 5/4/26 before the "List of Utilities".

SDEBS BID PROPOSAL: *The electronic bid proposal for this contract has been revised to include the changes associated with this addendum. Bidders must log in to the SDEBS to retrieve and incorporate these changes into their bid.*

Bid Items were added:

Bid Item 635E0050 "Breakaway Base Luminaire Pole with Arm, 50' Mounting Height"
Bid Item 635E6200 "Miscellaneous Electrical"

Bid Items were removed:

Bid Item 635E0150 "Breakaway Base Luminaire Pole with Twin Arms, 50' Mounting Height"
Bid Item 635E5405 "Electrical Service Cabinet with Secondary Disconnect"

PLANS: Please destroy sheets A1, L2, L3, L4 & L9 and replace with the enclosed sheets, dated 5/4/26.

Sheest A1 & L2:

SECTION L – SIGNAL AND LIGHTING

Bid Items were added:

Bid Item 635E0050 "Breakaway Base Luminaire Pole with Arm, 50' Mounting Height"
Bid Item 635E6200 "Miscellaneous Electrical"

Bid Items were removed:

Bid Item 635E0150 "Breakaway Base Luminaire Pole with Twin Arms, 50' Mounting Height"
Bid Item 635E5405 "Electrical Service Cabinet with Secondary Disconnect"

Sheet L3: ELECTRICAL SERVICE CABINET WITH SECONDARY DISCONNECT note was removed.
TRAFFIC SIGNAL CONTROLLER note was revised.
VIDEO DETECTION SYSTEM note was revised.

Sheet L4: ELECTRICAL SERVICE CABINET – BLACK HILLS ENGERGY & ELECTRICAL SERVICE
CABINET – BUTTE ELECTRIC notes were renamed EXISTING ELECTRICAL SERVICE –
BLACK HILLS ENERGY & EXISTING ELECTRICAL SERVICE – BUTTE ELECTRIC and revised.

Sheet L9: ESTIMATE OF QUANTITIES & EXISTING ITEMS tables were revised.

Sincerely,

Sam Weisgram
Engineering Supervisor

SW/gp

CC: Todd Seaman, Rapid City Region Engineer
Mike Carlson, Rapid City Area Engineer

REV 5/4/26

INDEX OF SPECIAL PROVISIONS

PROJECT NUMBER(S): PH 0014(257)10 PCN: 08LL

TYPE OF WORK: MODIFY INTERSECTION & LIGHTING

COUNTY: LAWRENCE

The following clauses have been prepared subsequent to the Standard Specifications for Roads and Bridges and refer only to the above described improvement, for which the following Proposal is made.

The Contractor's attention is directed to the need for securing from the Department of Environment & Natural Resources, Foss Building, Pierre, South Dakota, permission to remove water from public sources (lakes, rivers, streams, etc.). The Contractor should make his request as early as possible after receiving his contract, and insofar as possible at least 30 days prior to the date that the water is to be used.

Jonathan England is the official in charge of the Spearfish Career Center for Lawrence County.

THE FOLLOWING ITEMS ARE INCLUDED IN THIS PROPOSAL FORM:

Special Provision for Contractor Staking with Machine Control Grading Option, dated 3/23/26.

Special Provision for Video Detection System, dated 5/4/26.

Special Provision for Battery Backup System for Traffic Signal, dated 5/4/26.

List of Utilities.

Special Provision for Price Schedule for Miscellaneous Items, dated 2/18/26.

Special Provision for American Security Drone Act, dated 12/15/25.

Special Provision for Steel Beam Guardrail AASHTO M 180 Designation, dated 10/1/25.

Special Provision for Acknowledgment and Certification Regarding Article 3, Section 12 of the South Dakota Constitution, dated 8/24/23.

Fuel Adjustment Affidavit, DOT form 208 dated 11/25.

Standard Title VI Assurance, dated 3/1/16.

Special Provision For EEO Affirmative Action Requirements on Federal and Federal-Aid Construction Contracts, dated 2/5/24.

Special Provision For Required Contract Provisions Federal-Aid Construction Contracts, Form FHWA 1273 (Rev. October 23, 2023), dated 10/18/23.

Required Contract Provisions Federal-Aid Construction Contracts, Form FHWA 1273 (Rev. 10/23/23).

Special Provision Regarding Minimum Wage on Federal-Aid Projects, dated 10/24/19. Wage and Hour Division US Department of Labor Washington DC. - US Dept. of Labor Decision Number SD20260001, dated 1/30/26.

Special Provision Regarding Stormwater Discharges to Waters of the State, dated 11/5/25.
General Permit Authorizing Stormwater Discharges Associated with Construction
Activities, dated 11/1/23.

[https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/stormwater/StormWater
Construction.aspx](https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/stormwater/StormWaterConstruction.aspx)

**STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION
FOR
VIDEO DETECTION SYSTEM**

**PROJECT PH 0014(257)10, PCN 08LL
LAWRENCE COUNTY**

MAY 4, 2026

Video Detection System

This work consists of all labor, materials, equipment and services necessary to perform all operations required in the installation of a video detection system.

The video vehicle detection system shall be easily configurable and expandable to meet traffic management applications such as intersection control, traffic monitoring and incident management, traffic data collection, traffic safety applications, and traffic control during road or intersection construction.

1. System Hardware

The video detection system shall be comprised of two major hardware components: a video sensor and a communications interface panel. An optional wired input/output card shall be available for certain cabinet types.

1.1. Video Sensor

The video detection system shall include a video sensor that integrates a high-definition (HD) camera with an embedded processor for analyzing the video and performing detection.

1.1.1. Camera and Processor

1.1.1.1. The camera shall be color CMOS imaging array.

1.1.1.2. The camera shall have HD resolution of at least 720p (1280x720 pixels).

1.1.1.3. The camera shall include a minimum 10X optical zoom.

1.1.1.3.1. It shall be possible to zoom the lens as required to satisfy across-the-intersection detection objectives, including stop line and advance detection.

1.1.1.3.2. It shall be possible to zoom the lens remotely from the TMC for temporary traffic surveillance operations or to inspect the cleanliness of the faceplate.

1.1.1.4. The camera shall have direct, real-time iris and shutter speed control by the integrated processor.

1.1.1.5. The processor shall support video compression for streaming output.

1.1.2. Video Sensor Enclosure Assembly

1.1.2.1. The camera and processor shall be housed in a sealed enclosure.

1.1.2.1.1. The faceplate of the enclosure shall be glass and shall have hydrophilic coating on the exterior surface to reduce debris accumulation and maintenance.

1.1.2.1.2. The faceplate shall have a thermostatically-controlled heater applied directly on the interior surface to keep the faceplate clear of condensation, snow, ice and frost.

1.1.2.2. An adjustable aluminum visor shall shield the faceplate from the sun and extraneous light sources.

1.1.2.3. An integral aiming sight shall assist in aiming the camera for the detection objectives.

1.1.2.4. A removable rear cap and cable strain relief shall seal the power connection.

1.1.2.5. The sensor shall be self-supporting on manufacturer's mounting brackets for easier fastening during installation.

1.1.2.6. It shall be possible to rotate the field-of-view 360° without changing the angle of the visor.

1.1.3. Power and Communications

1.1.3.1. The video sensor shall operate normally over an input voltage range of 89 to 265 VAC at 50 or 60 Hz.

1.1.3.2. Power consumption shall be no more than 16 watts typical.

1.1.3.3. No supplemental surge suppression shall be required outside the cabinet.

1.1.3.4. All communications to the video sensor shall be broadband-over.

1.2. Communications Interface Panel

The video detection system shall include an interface panel in the traffic cabinet that manages communications between the video sensors, the traffic management center, a maintenance technician, and the traffic cabinet itself.

1.2.1. Video Sensor Connection

1.2.1.1. The broadband-over-power communications shall provide a throughput of 70 to 90 Mbps.

1.2.1.2. The broadband-over-power connection shall support at least 1,000 feet of cabling to the video sensor.

1.2.1.3. Each video sensor connection shall include a power switch.

1.2.1.4. There shall be an LED for each video sensor to indicate the state of the power to the sensor and an LED for each video sensor to indicate the status of communications.

1.2.1.5. Each video sensor connection shall contain a resettable fuse.

1.2.1.6. Each video sensor connection shall provide high-energy transient protection.

1.2.2. Traffic Management Center (TMC) Communications

1.2.2.1. An Ethernet port shall be provided to connect to a remote Traffic Management Center (TMC).

1.2.2.1.1. The TMC connection shall support 10/100/1000 Mbps Ethernet communication.

1.2.2.1.2. The communications interface panel shall proxy all network requests that arrive on the TMC connection to avoid unwanted network traffic from reaching the broadband-over-power network between the communications interface panel and the video sensors.

1.2.2.1.3. All communications to the video detection system through the TMC connection shall be to a single IP address.

1.2.3. Local User Communications

1.2.3.1. A wired Ethernet port shall be provided to connect the technician at the cabinet to the video detection system for setup and maintenance purposes.

1.2.3.1.1. The maintenance port shall support 10/100/1000 Mbps Ethernet communication.

1.2.3.1.2. All communications to the video detection system through the maintenance port shall be to a single IP address.

1.2.3.1.3. The maintenance port shall support DHCP to automatically assign an IP address to the user's computer, if desired.

1.2.3.2. An 802.11g Wi-Fi access point shall allow wireless connection to the video detection system at the cabinet for setup and maintenance purposes.

1.2.3.2.1. All communications to the video detection system through the Wi-Fi access point shall be to a single IP Address.

1.2.3.2.2. The Wi-Fi access point shall support DHCP to automatically assign an IP Address to the user's computer.

1.2.3.2.3. The Wi-Fi access point shall include a dipole, omnidirectional antenna.

1.2.3.2.4. A momentary pushbutton shall allow the user to turn the Wi-Fi access point on or off.

1.2.3.2.5. The Wi-Fi access point shall turn itself off automatically after a period of inactivity from connected devices.

1.2.3.2.6. An LED shall indicate when the Wi-Fi access point is enabled.

1.2.3.2.7. The Wi-Fi access point shall operate simultaneously with the wired maintenance port and with the TMC connection.

1.2.4. Traffic Controller Connection

The communications interface panel shall provide one connection to communicate to the traffic controller through the cabinet.

1.2.4.1. The traffic controller connector shall be a 15-pin female metal shell D sub-miniature type connector to support a standard NEMA TS2 or TEES SDLC cable.

1.2.4.2. The traffic controller connection shall be able to connect to a wired input/output card, which supports wired I/O in cabinets without a SDLC-capable controller.

1.2.4.2.1. The wired I/O data communications link shall support at least 24 outputs and 16 inputs.

1.2.4.3. It shall be possible to connect and use both SDLC communications and communication to the wired input/output card simultaneously.

1.2.5. USB Ports

1.2.5.1. The communications interface panel shall include two USB 2.0 ports.

1.2.5.2. It shall be possible to reinstall all system and application software from a USB memory stick without necessitating removal of the communications interface panel from the cabinet.

1.2.6. Power

1.2.6.1. The communications interface panel shall accept input voltage in the range of 89-265 VAC, 50/60 Hz power from the transient-protected side of the cabinet.

1.2.6.2. The communications interface panel shall be protected by two slow blow fuses. Spares shall be attached to the panel.

2. System Software

The video detection system shall include management software for configuration, monitoring and data collection purposes.

2.1. Management Software

2.1.1. Management software shall be a Windows-based application.

2.1.1.1. The software shall be compatible with Windows 7 and Windows 10 operating systems.

2.1.1.2. The software shall communicate with the video detection system via Ethernet.

2.1.2. The management software shall automatically determine all video sensors and communications interface panels available on the local network and populate a list of all devices.

2.1.3. The management software shall provide the user a means to name individual video sensors and communications interface panels.

2.1.4. The management software shall provide a means for the user to zoom the camera optics while viewing a live video stream.

2.1.5. The management software shall provide a means for the user to calibrate distances in the field of view.

2.1.6. The management software shall provide the user a means to create 4-sided detection zones in the field of view using either a still snapshot or live video.

2.1.6.1. The management software will overlay an outline of each detection zone over the background image.

2.1.6.2. It shall be possible for the user to place detection zones anywhere in the field of view for stop line detection and/or advance detection.

2.1.6.3. It shall be possible for the user to set the desired color of both the on and off states of the detection zone overlay.

2.1.6.4. It shall be possible for the user to alter the size and shape of any previously created zone.

2.1.6.5. It shall be possible for the user to overlap zones, either partially or fully.

2.1.6.6. It shall be possible for the user to name each zone uniquely.

2.1.6.7. It shall be possible for the user to assign each zone to detect vehicles, to detect bicycles, or to detect both, and to specify different outputs for each type.

2.1.6.8. It shall be possible for the user to assign the same output to multiple zones such that the output will be on if any of the zones are detecting a vehicle or bicycle.

2.1.6.9. It shall be possible for the user to assign a single zone to more than one output such that if a vehicle or bicycle is detected, all the assigned outputs shall be turned on.

2.1.6.10. The management software shall be capable of creating at least 99 detection zones per video sensor.

2.1.6.11. It shall be possible for the management software to retrieve all configuration parameters from video sensors or communications interface panels.

2.1.6.12. It shall be possible for the user to save all the settings for a video sensor or a communications interface panel to a laptop file.

2.1.6.13. The management software shall provide a means to read or import all the settings from a previously saved configuration file for a video sensor or a communications interface panel.

2.1.6.14. The management software shall be able to download a new version of the application software into a communications interface panel and its attached video sensors.

2.1.6.15. The management software shall provide a screen to monitor operation of a video sensor.

2.1.6.16. The monitoring screen shall include a live video stream from the video sensor with at least HD 1280x720 pixel resolution.

2.1.6.17. The monitoring screen shall show indications of detection in real time by changing the color of the detection zone.

2.1.6.18. It shall be possible for the user to configure different indications for vehicle detections vs. bicycle detections when both are configured for the same zone.

2.1.6.19. The monitoring screen shall include the following optional, configurable objects. It shall be possible for the user to size and position them anywhere on the screen and to change the color and size of text.

2.1.6.20. An indication of when an output is on or off, along with a user-configurable name for that indicator.

2.1.6.21. The current time in the video sensor.

2.1.6.22. A user-configurable title or name.

2.1.6.23. The version number of the video sensor software.

2.1.6.24. It shall be possible for the user to turn the overlay graphics on or off with a single setting.

2.1.6.25. The management software shall provide a screen to monitor operation of the intersection with a quad-view video stream from the communications interface panel.

2.1.6.26. The quad-view video stream shall have a resolution of at least HD 1280x720 pixels, where each of the sensor videos comprising the quad-view shall be at least 640x360 pixels.

2.1.6.27. It shall be possible for the user to configure the order that the sensor videos appear in the quad-view.

2.1.6.28. The real-time quad-view video stream shall be capable of displaying the overlay graphics for all four sensors simultaneously.

2.1.6.29. While monitoring the video of a single video sensor or of the quad-view, it shall be possible for the user to request a "snapshot" or single-frame image to save to a named file on a laptop.

2.1.6.30. While monitoring the video of a single video sensor or of the quad-view, it shall be possible for the user to record a period of the video to save to a named file on a laptop.

3. System Functionality

The video detection system shall provide the following features and functionality.

3.1. Detection Performance

3.1.1. The video detection system shall detect the presence of vehicles in defined zones and turn on the assigned output when the vehicle is present in the zone.

3.1.2. Stop Line Detection

3.1.3. For detection zones placed at the stop line, the probability of not detecting the presence of a vehicle shall be 1% or less under all operating conditions when the video sensor is installed and configured properly.

3.1.4. For detection zones placed at the stop line, the probability of falsely detecting a vehicle that is not present shall be 3% or less under all operating conditions when the video sensor is installed and configured properly.

3.1.5. Advance Detection

3.1.6. It shall be possible to place advance detector zones such that the farthest point of the zone is up to 600 feet from the video sensor. Advance detector zone placement shall include 2-3 car lengths of field-of-view beyond the farthest point of the zone.

3.1.7. To ensure statistical significance for the above detection performance specifications, the data shall be collected over 24-hour time intervals (so as to avoid a single lighting condition) and will contain a minimum of one hundred (100) vehicles per lane. The calculations of detection performance will not include turning movements where vehicles do not pass through the detectors, vehicle lane-change anomalies, or where they stop short or stop beyond the combined detection zones.

3.2. Failsafe Mode

3.2.1. The video detection system shall provide a failsafe mode for each video sensor. If the failsafe mode is enabled, all programmed presence detection outputs for the video sensor shall be turned on, thus placing constant calls to the controller. When failsafe mode is disabled, all outputs revert to normal on/off operations.

3.2.2. The video sensor shall continuously monitor the overall contrast in the video. If the overall contrast falls below a preset level (such as caused by dirty faceplate, severe glare, extreme fog, or temporary ice/snow on the faceplate), the sensor shall enable the failsafe mode. When sufficient contrast is restored in the video, the sensor will disable the failsafe mode.

3.2.3. The communications interface panel shall continuously monitor the connectivity status of the attached video sensors. If any video sensor goes offline

due to either electrical failure or internal software failure, the communications interface panel shall enable the failsafe mode for that video sensor. If the video sensor comes back online, failsafe mode shall be disabled.

3.3. Data Collection

3.3.1. The video detection system shall automatically collect and store traffic flow data in non-volatile memory for later retrieval and analysis. No additional hardware or software shall be necessary. The data shall include:

3.3.1.1. Vehicle counts.

3.3.1.2. Vehicle average speeds.

3.3.2. The management software shall be able to retrieve collected data for a specified period of time or for all currently stored data and save into a standard CSV file.

3.4. Operations Log

3.4.1. The communications interface panel and each video sensor shall maintain a time-stamped operations log of routine and special events in non-volatile memory for later retrieval and analysis.

3.5. Time Synchronization

3.5.1. The video detection system and management software shall provide three methods to synchronize the time of day clocks in the communication interface panel and the video sensors, as follows:

3.5.1.1. Manual time synchronization operation by the user, which sets the time to the current time on the laptop where the management software is running.

3.5.1.2. A configuration setting to allow the communications interface panel to automatically obtain time from the NEMA TS2 protocol on the SDLC channel and broadcast it to the video sensors.

3.5.1.3. A configuration setting to allow the communications interface panel to automatically obtain time from up to five Network Time Protocol (NTP) sources and broadcast it to the video sensors.

3.6. Video Streaming

3.6.1. In addition to the ability to view video streams in the management software, it shall be possible to view video from individual sensors or to view the quad-view from the communications interface panel using a third-party video player application on a tablet, smartphone or laptop computer.

4. Installation and Setup

The video detection system hardware shall be designed for flexible, fast and easy installation and setup.

4.1. It shall be possible to mount the video sensor on an intersection pole, mast arm, or luminaire arm.

4.2. No special tools or extra equipment, other than a laptop for configuration, will be required.

4.3. Once all hardware is installed, connected and functional, it shall be possible to configure the video detection system for a typical 4-approach, 8-phase intersection in 15 minutes or less.

5. Responsibilities

5.1.1. Ongoing software support by the manufacturer will include software updates of the video sensor, communications interface panel, and management software. These updates will be provided free of charge during the warranty period. The manufacturer will maintain a program for technical support and software updates following expiration of the warranty period. This program will be available to the contracting agency in the form of a separate agreement for continuing support.

5.1.2. A quick-start guide, installation guide, application notes, and other materials shall be available from the manufacturer to assist in product installation and setup for various applications. In addition, training online or in person shall be available.

5.1.3. Training shall be available to personnel of the contracting agency in application design, operation, setup, and maintenance of the video detection system.

5.1.4. Manufacturer shall provide a tech support website and an 800 number for technical support.

6. Method of Measurement

Video Detection System will be measured per each for each intersection where video detectors are furnished and installed.

7. Basis of Payment

Video Detection System will be paid at the contract unit price per each. Payment will be full compensation for furnishing and installing the video detection system including all materials, labor, equipment, tools, and incidentals required to complete this work.

8. Warranty

The video detection system shall be warranted by its supplier for a minimum of three years. Ongoing software support by the supplier shall include updates of the MVP sensor and application software. These updates shall be provided free of charge during the warranty period. The supplier shall maintain a program for

technical support and software updates following the expiration of the warranty period. This program shall be made available to the contracting agency in the form of a separate agreement for continuing support.

**STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION
FOR
BATTERY BACKUP SYSTEM FOR TRAFFIC SIGNAL**

**PROJECT PH 0014(257)10, PCN 08LL
LAWRENCE COUNTY**

MAY 4, 2026

I. DESCRIPTION

This specification describes the minimum requirements for a Battery Backup System (BBU) for Traffic Signal. The BBU System consists of three modules within an enclosed cabinet:

- Inverter/Charger
- Bypass Switch
- Battery Bank

II. OPERATING REQUIREMENTS

- A.** The BBU System shall be certified per UL 1778. All elements of the System shall comply with the applicable code sections of the NEC, NEMA, and OSHA.
- B.** The BBU System shall operate using the Line Interactive (Buck and Boost) method.
- C.** The BBU System shall be capable of operating a signalized intersection (700-watt load) for four hours of full runtime when utility power is disabled and under ambient temperatures of 25°C.
- D.** The BBU system shall switch the intersection to flash mode of operation when approximately 40% of battery charge is remaining via relay contact connection points on the front panel of the inverter/charger unit. The BBU System shall operate the intersection in the flash mode of operation (350-watt load) for an additional two hours.
- E.** The transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries, shall be less than 65 milliseconds. The same allowable transfer time shall also apply when switching from inverter line voltage to utility line voltage.

- F. The BBU system shall bypass utility line power whenever the utility line voltage is outside of the manufacturer's default or a user programmed voltage range $\pm 2V$ AC.
- G. When the utility line power has been restored to a normal operating voltage for more than 30 seconds, the BBU system shall transfer from battery back to utility line mode. The BBU shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service.
- H. The BBU system shall operate with an automatic "fail safe" mode. Should a breaker trip on the inverter/charger and/or the power transfer relay, the unit will automatically default to utility line power and bypass the BBU system.
- I. The BBU system unit shall be capable of logging up to 100 events. Events shall date and time stamp faults with AC line voltage and BBU battery voltages. The following conditions shall be recorded as an event:
 - 1. Occurrences of the utility line voltage being above or below the upper and lower control limits or manufacturer preset defaults.
 - 2. Whenever the BBU system automatically switches to battery power.
 - 3. Self-monitoring, BBU system component failures shall be recorded as an event.

III. SYSTEM COMPONENT REQUIREMENTS

A. Inverter/Charger

- 1. The inverter/charger shall be rated for 1450V AC and a power factor of 0.7 allowing 1,000 watts of continuous power from the unit.
- 2. The inverter/charger shall have the capability to deliver 120% of the maximum output rating for a period of 60 seconds. The inverter/charger shall shutdown to prevent internal damage to the unit when a 120% 60 second overload has occurred.
- 3. When utility line voltage is out of normal operating range (100V AC to 135V AC), the inverter/charger shall provide voltage regulation and/or power conditioning to the inverter line voltage using the Line Interactive (Buck and Boost) method. When utility line voltage is present, the inverter/charger shall act as a charging device for the batteries.
- 4. A minimum of 6 sets of NO and NC single-pole double-throw dry contact relay closures shall be made available on the front face of the

inverter/charger and labeled so as to identify each contact. The relay closures shall consist of:

- a. A set of NO and NC contact closures that shall be energized whenever the unit switches to battery power. The contact shall be labeled as "On Battery."
 - b. A second set of NO and NC contact closures that shall be energized whenever the battery approaches approximately 40% of remaining capacity. This limit will determine when the unit will switch from normal operation to flash. The contact shall be labeled as "Low Battery."
5. The operating temperature range for the inverter/charger shall be -34°C to $+74^{\circ}\text{C}$.
6. When battery power is used, the BBU system output voltage shall be between 110V AC and 125V AC, pure sine wave output, $\leq 3\%$ THD, $60\text{Hz} \pm 3\text{Hz}$.
7. The battery charging system shall be compensated over a range of 2.5 to 4.0 mV/ $^{\circ}\text{C}$ per cell.
8. A temperature sensor shall be used to monitor the temperature and regulate the charge rate of the batteries.
9. Should the temperature sensor fail, the inverter/charger shall not allow the BBU system to overcharge the batteries. The BBU system shall provide an alarm should the temperature sensor fail.
10. Recharge time for the batteries to 80% or more of full battery charge capacity shall not exceed 20 hours.
11. Batteries shall not be charged when battery temperature exceeds $50^{\circ}\text{C} \pm 3^{\circ}\text{C}$.
12. The BBU system shall monitor battery strings within a system and set a fault indicator if battery voltage falls below normal operating voltages.
13. The BBU system shall include a front panel display. All applicable programmable functions of the operational methods described in this specification shall be viewable through the front panel display.
14. All logging events shall be viewable from the front panel display.

15. The BBU System software shall be programmable from the front panel of the inverter/charger by means of a keyboard or momentary buttons allowing the user to step through menu driven software.
16. A 10/100 Ethernet port shall be provided on the front panel of the inverter/charger.
17. An RS232 port shall be provided on the front panel of the inverter/charger.
18. BBU System software shall be provided for the operational needs of the BBU system. The user/ operator shall be able to access all software via the Ethernet port and the RS232 port on the front panel of the inverter/charger. The user shall be able to read logged events and/or change programmable parameters from the keyboard, laptop, or local area network via the Ethernet port.
19. The inverter/charger shall have an LED or LCD status display showing the following:
 - a. Input/output Voltages
 - b. Input/output Frequency
 - c. BBU System Load
 - d. BBU System Battery Voltage
 - e. Battery Discharge Percentage
 - f. Battery Disconnected
 - g. Battery Failure
 - h. Low Input Voltage Boost
 - i. High Input Voltage Buck
 - j. Service Required
 - k. BBU System Failure
 - l. Output Overload
 - m. Output Shorted
 - n. Hour meter for operating in battery backup mode.

B. Bypass Switches

1. An automatic bypass switch shall be provided as a separate unit external to the inverter/charger unit. The automatic bypass switch shall be two position and rated at a minimum of 240V AC/20 amps. A BBU supply breaker rated at 240V AC/20 amps shall be provided for the 120V AC input to the inverter/charger.
2. When the automatic bypass switch is in the “on” position and the supply breaker is on, the BBU system is connected to utility line voltage and its output is connected to the cabinet service panel. If the utility line voltage is deactivated, the BBU system will automatically switch over to battery power.

3. When the automatic bypass switch is in the “off” position and the supply breaker is on, utility line power is provided to the cabinet service panel and the inverter/charger allowing equipment to be tested without interrupting power to the traffic signal load.
4. When the automatic bypass switch is off and the supply breaker is off, the utility line voltage will feed power directly to the traffic signal cabinet service panel and power to the inverter/charger will be deactivated allowing the user to service BBU equipment.
5. A manual bypass switch shall be provided separately from the automatic bypass switch. The manual bypass switch shall be two position and allow the user to switch utility line power directly to the cabinet service panel. When the manual bypass switch is in this mode, the user may replace the automatic bypass switch and/ or the inverter/charger without interrupting power to the intersection.

C. Battery Bank

1. Individual batteries shall be 12V type, and shall be easily replaced and commercially available for purchase as common off the shelf equal.
2. Batteries shall be AGM or gel cell types.
3. Batteries shall operate over a temperature range of -34°C to +74°C.
4. Battery interconnect wiring shall connect to the inverter/charger via modular harness with red and black cabling that terminates into a typical power pole style connector. The harness shall be equipped with mating power flag style connectors for batteries and a single insulated plug-in style connection to the inverter/charging unit. The harness shall allow batteries to be quickly and easily connected in any order and shall be keyed to ensure proper polarity and circuit configuration.
5. Insulated covers shall be provided at the connection points (post) to prevent accidental shorting.
6. Batteries weighing 50 pounds or more shall be provided with a handle or hand strap.

D. BBU Cabinet

1. The cabinet shall be an aluminum NEMA 3R type.

2. The cabinet shall have a thermostatically controlled exhaust fan and air filter.

IV. WARRANTY

- A. The manufacturer shall provide a 2-year full replacement warranty on all components of the BBU System.
- B. Batteries shall be warranted for full replacement for 5 years. Batteries shall be defined as bad if they are not able to deliver 80% of battery rating.

V. METHOD OF MEASUREMENT

Battery Backup System for Traffic Signal will be measured by actual count furnished and installed.

VI. METHOD OF PAYMENT

- A. The Contractor will be paid at the contract unit price per each for Battery Backup System for Traffic Signal.
- B. This payment shall be full compensation for all equipment, labor, and incidentals necessary to install the Battery Backup System for Traffic Signal.

ESTIMATE OF QUANTITIES AND ENVIRONMENTAL COMMITMENTS



SECTION B – GRADING

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E0010	Mobilization	Lump Sum	LS
009E3230	Grade Staking	0.660	Mile
009E3245	Final Cross Section Survey	0.330	Mile
009E3250	Miscellaneous Staking	0.330	Mile
009E3280	Slope Staking	0.330	Mile
009E3301	Engineer Directed Surveying/Staking	40.0	Hour
009E4200	Construction Schedule, Category II	Lump Sum	LS
110E0300	Remove Concrete Curb and/or Gutter	242	Ft
110E0400	Remove Drop Inlet	1	Each
110E1010	Remove Asphalt Concrete Pavement	3,184.0	SqYd
110E1100	Remove Concrete Pavement	206.4	SqYd
110E1120	Remove Concrete Median Pavement	137.1	SqYd
110E7500	Remove Pipe for Reset	8	Ft
110E7510	Remove Pipe End Section for Reset	1	Each
120E0010	Unclassified Excavation	7,539	CuYd
120E2000	Undercutting	5,090	CuYd
120E6100	Water for Embankment	75.0	MGal
230E0010	Placing Topsoil	500	CuYd
250E0020	Incidental Work, Grading	Lump Sum	LS
380E2554	4" Barrier Type Median PCC Pavement	988.4	SqYd
421E0100	Pipe Culvert Undercut	38	CuYd
450E0122	18" RCP Class 2, Furnish	16	Ft
450E0130	18" RCP, Install	16	Ft
450E3012	24" RCP Arch Class 2, Furnish	158	Ft
450E3020	24" RCP Arch, Install	158	Ft
450E4504	24" RCP Arch Flared End, Furnish	1	Each
450E4505	24" RCP Arch Flared End, Install	1	Each
450E9000	Reset Pipe	8	Ft
450E9001	Reset Pipe End Section	1	Each
462E0100	Class M6 Concrete	4.0	CuYd
600E0200	Type II Field Laboratory	1	Each
650E1090	Type F69 Concrete Curb and Gutter	1,343	Ft
670E1010	2' x 3' Type B Drop Inlet	1	Each
670E3300	Type E Frame and Grate	1	Each
700E0310	Class C Riprap	10.0	Ton
831E0110	Type B Drainage Fabric	7	SqYd
900E1080	Orange Plastic Safety Fence	1,085	Ft

SECTION C – TRAFFIC CONTROL

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
634E0010	Flagging	200.0	Hour
634E0110	Traffic Control Signs	307.2	SqFt
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
634E0275	Type 3 Barricade	6	Each
634E0310	Temporary Flexible Vertical Markers (Tabs)	3,180	Ft
634E0420	Type C Advance Warning Arrow Board	2	Each
634E1215	Contractor Furnished Portable Changeable Message Sign	2	Each

SECTION D – EROSION AND SEDIMENT CONTROL

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
110E1693	Remove Erosion Control Wattle	500	Ft
110E1700	Remove Silt Fence	15	Ft
730E0210	Type F Permanent Seed Mixture	20	Lb
731E0100	Fertilizing	1,157	Lb
732E0250	Fiber Mulching	1,543	Lb
734E0154	12" Diameter Erosion Control Wattle	500	Ft
734E0604	High Flow Silt Fence	82	Ft
734E0610	Mucking Silt Fence	17	CuYd
734E0620	Repair Silt Fence	15	Ft
734E0845	Sediment Control at Inlet with Frame and Grate	1	Each
734E5010	Sweeping	40	Hour
900E1310	Concrete Washout Facility	1	Each


SECTION F – SURFACING

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3320	Checker	Lump Sum	LS
260E2010	Gravel Cushion	1,147.3	Ton
380E0070	9" Nonreinforced PCC Pavement	4,254.9	SqYd
380E6000	Dowel Bar	1,770	Each
380E6110	Insert Steel Bar in PCC Pavement	863	Each

SECTION L – SIGNAL AND LIGHTING

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
110E1540	Remove Luminaire Pole Footing	5	Each
635E0050	Breakaway Base Luminaire Pole with Arm, 50' Mounting Height	1	Each
635E2000	Pedestal Signal Pole	2	Each
635E2140	Signal Pole with 40' Mast Arm and Luminaire Arm	1	Each
635E2145	Signal Pole with 45' Mast Arm and Luminaire Arm	1	Each
635E2155	Signal Pole with 55' Mast Arm and Luminaire Arm	1	Each
635E3700	Roadway Luminaire, LED with Photoelectric Cell	16	Each
635E4010	1 Section Vehicle Signal Head	4	Each
635E4030	3 Section Vehicle Signal Head	10	Each
635E4040	4 Section Vehicle Signal Head	2	Each
635E4080	3 Section Directional Vehicle Signal Head	2	Each
635E5020	2' Diameter Footing	60.0	Ft
635E5030	3' Diameter Footing	40.0	Ft
635E5301	Type 1 Electrical Junction Box	6	Each
635E5302	Type 2 Electrical Junction Box	4	Each
635E5313	Type 3A Electrical Junction box	1	Each
635E5430	Traffic Signal Controller	1	Each
635E5515	Battery Backup System for Traffic Signal	1	Each
635E5520	Video Detection System	1	Each
635E5560	Emergency Vehicle Preemption Unit	1	Each
635E5570	Optical Detector	3	Each
635E6200	Miscellaneous, Electrical	Lump Sum	LS
635E7500	Remove and Reset Luminaire Pole	5	Each
635E8120	2" Rigid Conduit, Schedule 40	1,730	Ft
635E8130	3" Rigid Conduit, Schedule 40	185	Ft
635E8220	2" Rigid Conduit, Schedule 80	260	Ft
635E8230	3" Rigid Conduit, Schedule 80	505	Ft
635E9011	1/C #1 AWG Copper Wire	2,125	Ft
635E9016	1/C #6 AWG Copper Wire	2,305	Ft
635E9018	1/C #8 AWG Copper Wire	3,115	Ft
635E9020	1/C #10 AWG Copper Wire	165	Ft
635E9504	4/C #14 AWG Copper Tray Cable, K2	1,610	Ft
635E9505	5/C #14 AWG Copper Tray Cable, K2	445	Ft
635E9515	15/C #14 AWG Copper Tray Cable, K2	615	Ft
635E9519	19/C #14 AWG Copper Tray Cable, K2	40	Ft
635E9600	#16 AWG Copper Twisted Shielded Pair	3,350	Ft
635E9710	2/C #10 AWG Copper Pole and Bracket Cable	1,120	Ft

SECTION L ESTIMATE OF QUANTITIES

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BID ITEM NUMBER	ITEM	QUANTITY	UNIT
110E1540	Remove Luminaire Pole Footing	5	Each
635E0050	Breakaway Base Luminaire Pole with Arm, 50' Mounting Height	1	Each
635E2000	Pedestal Signal Pole	2	Each
635E2140	Signal Pole with 40' Mast Arm and Luminaire Arm	1	Each
635E2145	Signal Pole with 45' Mast Arm and Luminaire Arm	1	Each
635E2155	Signal Pole with 55' Mast Arm and Luminaire Arm	1	Each
635E3700	Roadway Luminaire, LED with Photoelectric Cell	16	Each
635E4010	1 Section Vehicle Signal Head	4	Each
635E4030	3 Section Vehicle Signal Head	10	Each
635E4040	4 Section Vehicle Signal Head	2	Each
635E4080	3 Section Directional Vehicle Signal Head	2	Each
635E5020	2' Diameter Footing	60.0	Ft
635E5030	3' Diameter Footing	40.0	Ft
635E5301	Type 1 Electrical Junction Box	6	Each
635E5302	Type 2 Electrical Junction Box	4	Each
635E5313	Type 3A Electrical Junction box	1	Each
635E5430	Traffic Signal Controller	1	Each
635E5515	Battery Backup System for Traffic Signal	1	Each
635E5520	Video Detection System	1	Each
635E5560	Emergency Vehicle Preemption Unit	1	Each
635E5570	Optical Detector	3	Each
635E6200	Miscellaneous, Electrical	Lump Sum	LS
635E7500	Remove and Reset Luminaire Pole	5	Each
635E8120	2" Rigid Conduit, Schedule 40	1,730	Ft
635E8130	3" Rigid Conduit, Schedule 40	185	Ft
635E8220	2" Rigid Conduit, Schedule 80	260	Ft
635E8230	3" Rigid Conduit, Schedule 80	505	Ft
635E9011	1/C #1 AWG Copper Wire	2,125	Ft
635E9016	1/C #6 AWG Copper Wire	2,305	Ft
635E9018	1/C #8 AWG Copper Wire	3,115	Ft
635E9020	1/C #10 AWG Copper Wire	165	Ft
635E9504	4/C #14 AWG Copper Tray Cable, K2	1,610	Ft
635E9505	5/C #14 AWG Copper Tray Cable, K2	445	Ft
635E9515	15/C #14 AWG Copper Tray Cable, K2	615	Ft
635E9519	19/C #14 AWG Copper Tray Cable, K2	40	Ft
635E9600	#16 AWG Copper Twisted Shielded Pair	3,350	Ft
635E9710	2/C #10 AWG Copper Pole and Bracket Cable	1,120	Ft

SUPPLYING AS BUILT PLANS

If the traffic signal system or roadway lighting system is constructed differently than what is stated in the plans, the Contractor will supply as built plans to the Engineer and a copy will be sent to the Traffic Design Engineer. The as built plans may include conduit layouts, wiring diagrams, or other drawings depicting the changes from the original plans.

SHOP DRAWING AND CATALOG CUTS SUBMITTALS

The Contractor will submit shop drawings and catalog cuts in accordance with Section 985 of the Specifications.

PDF submittals will be sent to the following email addresses:

Stacy.Bartlett@state.sd.us
Joseph.Updike@state.sd.us

ON-SITE INSPECTION

An on-site inspection of the traffic signals will be conducted before acceptance of the project once the traffic signals are completed and operational. The on-site inspection will be conducted by the Project Engineer or Region Traffic Engineer with the Contractor and the Traffic Design Engineer present.

REMOVE LUMINAIRE POLE FOOTING

The footings of existing luminaire poles EL2-EL4, EL7, and EL8 will be removed by the Contractor to a minimum of 2 feet below the ground surface. Restoration of the disturbed area will be to the satisfaction of the Engineer.

All costs for removing the footings of the existing luminaire poles will be incidental to the contract unit price per each for "Remove Luminaire Pole Footing".

PEDESTAL SIGNAL POLES

Pedestal signal poles may be aluminum. Aluminum poles will conform to the following requirements:

Aluminum will conform to ASTM B221, Alloy 6061, and Temper T6.

Poles will be round with a minimum outside pole diameter of 4 inches, and the pole assembly will have a square, cast aluminum base with aluminum access door. The base will conform to the breakaway requirements of NCHRP 350 or MASH. A grounding lug will be provided in the base.

The pole to base connection will be a threaded connection; threads will be 8 TPI, NPT. A collar (integral or non-integral) to prevent wind-induced loosening of pole will be provided. All bolt and connection threads will be coated with a commercially available anti-seize compound intended for use in aluminum-to-aluminum and steel-to-aluminum connections.

The pole finish will either be brushed satin or spun. The top of the pole will be sealed by the traffic signal head mounting hardware or by an aluminum cap.

Measurement and payment for aluminum poles will be as specified in Specifications Section 635.

SIGNAL POLES

Cantilever traffic signal supports, including anchor bolts, will be designed for fatigue in accordance with Fatigue Importance Category III without galloping and truck induced gusts.

The pole fabricator will be responsible for determining the diameter, length, and number of anchor bolts.

Signal poles will have rotatable mast arms.

Luminaire extensions will have a 50-foot mounting height with 8-foot arms.

LUMINAIRE POLES

Luminaire poles L1 and REL2-REL4 will have a mounting height of 50 feet with 8-foot arms.

Luminaire poles REL7 and REL8 have a mounting height of 50 feet with twin 3-foot arms.

The pole fabricator will be responsible for determining the diameter, length, and number of anchor bolts.

The lighting design for L1, EL1, A1-A2, A4, REL2-REL4, and EL5-EL6, used the following parameters to provide 1.0 and greater average maintained foot-candles and uniformity ratios of 4:1 (average maintained to minimum maintained foot-candles) and 6:1 (maximum to minimum maintained foot candles):

Pole Setback:	5 feet
Lamp Loss Factor (LLF):	0.8
Width of Lighted Area:	64 feet
Luminaire Cycle Length:	190 feet
Configuration:	Staggered
Mounting Height:	50 feet
Arm Length	8 feet

The following luminaires, or an approved equal, will be used for this project:

- a.) Cooper ARCH-L-PA3-230-740-U-T3-AP-PR7-LLPC
- b.) Solarmax SMX-184WIE-NV-LL5-PH-4070-T302-P

The lighting design for REL7-REL8 and EL9 used the following parameters to provide 1.0 and greater average maintained foot-candles and uniformity ratios of 4:1 (average maintained to minimum maintained foot-candles) and 6:1 (maximum to minimum maintained foot candles):

Pole Setback:	22 feet
Lamp Loss Factor (LLF):	0.8
Width of Lighted Area:	48 feet
Luminaire Cycle Length:	190 feet
Configuration:	Median
Mounting Height:	50 feet
Arm Length	3 feet (Twin)

The following luminaires, or an approved equal, will be used for this project:

- a.) Cooper ARCH-L-PA3-180-740-U-T3-AP-PR7-LLPC
- b.) Solarmax SMX-134WIE-NV-LL5-PH-4070-T302-P

REPLACE LUMINAIRE FIXTURES

The contractor will remove and dispose of the existing HPS fixtures on EL1, EL5, EL6, and EL9 will replace them with the LED fixtures described in the previous note.

The existing pole and bracket wire in EL1, EL5, EL6, and EL9 will be removed and replaced.

All costs associated with the removal and disposal of the existing pole and bracket wire will be incidental to the contract unit price per foot for "2/C #10 AWG Copper Pole and Bracket Wire".

All costs associated with switching the existing luminaire fixtures from HPS to LED will be incidental to the contract unit price per each for "Roadway Luminaire, LED with Photoelectric Cell".

SIGNAL BACKPLATES

All new vehicle signal heads will have backplates with retroreflective border. The vehicle signal head backplates will have a factory applied 3-inch-wide yellow retroreflective border. Sheeting for the border will be Type XI or Type IX in conformance with ASTM D4956. Backplates will be polycarbonate, aluminum, or aluminum-composite. Minimum material thicknesses are:

Polycarbonate, 0.10-inch
Aluminum, 0.06-inch
Aluminum-Composite, 0.08-inch

Signal backplates will extend not less than 5 inches from the edge of the signal head at the top, bottom, and sides. The bottom of the backplate on Vehicle signal faces mounted directly above pedestrian signal indications will be sized to permit the separate adjustment of the vehicle and pedestrian signal indication and may be less than 4 inches.

All costs involved with furnishing and installing backplates with retroreflective border for the new vehicle signal heads will be incidental to the contract unit price per each for "3 Section Vehicle Signal Head", and "4 Section Directional Vehicle Signal Head".

TABLE OF FOOTING DATA

Site Designation	Footing Diameter	* Footing Depth	**Spiral Diameter	**Spiral Length	Vertical Reinforcement
A3, A5	2' - 0"	6' - 0"	1' - 8"	44' - 3"	8-#7 x 5' - 6"
L1, REL2-REL4, REL7, REL8	2' - 0"	8' - 0"	1' - 8"	54' - 9"	8-#7 x 7' - 6"
A1-A2	3' - 0"	13' - 0"	2' - 8"	129' - 3"	14-#8 x 12' - 6"
A4	3' - 0"	14' - 0"	2' - 8"	137' - 6"	14-#8 x 13' - 6"

* Footing depth will be below ground level.

** The size of all spirals will be #3.

SUBSURFACE

Luminaire and signal footings will be placed in a fill section of soils derived from the Spearfish Formation. In-place Spearfish Formation may be encountered at depth during placement of the signal footings. The Spearfish Formation contains thin seams to massive beds of gypsum. The Spearfish-derived fills may contain fragments of these seams. It is possible that some gypsum will be encountered during drilling of the footings. Some of the gypsum may have to be prebored with a smaller bit and then drilled to the final footing diameter.

Groundwater was not encountered in the vicinity of the intersection during a subsurface investigation conducted in May 2009, but borings caved at depths ranging from 7.8' to 17.3' below existing ground surface.

During construction of the footings, concrete placement operations will closely follow excavation procedures. The longer the excavations are left open, the more likely caving will occur.

Concrete will not be dropped through standing water. If water is present in the excavation, it will be removed prior to concrete placement, or the concrete will be tremied.

METER SOCKETS FOR TRAFFIC SIGNALS

The meter sockets provided for traffic signals by the Contractor will be a 200-amp, positive by-pass.

TRAFFIC SIGNAL CONTROLLER

The new Traffic Signal Controller will be Econolite Cobalt with EOS.

The Contractor is responsible for programming controller with the signal timings provided in these plans.

The controller and flasher are not required to have dimming capability.

Anchor bolts for the traffic signal cabinet may have hooked ends.


All costs for the detector units necessary to operate the signal as shown in these plans, constructing the concrete pad and footing, materials, labor, and furnishing and installing the controller cabinet will be incidental to the contract unit price per each for "Traffic Signal Controller".

BATTERY BACKUP CABINET

The Contractor will supply a cabinet with a concrete pad and footing for housing the battery backup system for traffic signal systems. The cabinet will be an aluminum NEMA 3R type. The cabinet will have a thermostatically controlled exhaust fan.

The cabinet will be securely attached to the concrete pad with steel anchors and to the back wall of the controller cabinet using chase nipples as approved by the Engineer. Anchor bolts for battery backup cabinet may have hooked ends.

All costs for constructing the concrete pad and footing, materials, labor, and furnishing and installing the battery backup cabinet will be incidental to the contract unit price per each for "Battery Backup System for Traffic Signal."

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SPECIALTY VISORS FOR SIGNAL HEADS

Signal heads 9 and 13 will have 45° angled visors (louvers) installed to prevent visibility of the traffic signal indications by adjacent traffic lanes. The 45° visors on signal head number 13 will be oriented to prevent drivers on the I-90 Off Ramp (Eastbound) from seeing the illuminated signal head intended for US Hwy 85 (Southbound) traffic. The 45° visors on signal head number 9 will be orientated will be oriented to prevent drivers on US Hwy 85 (Southbound) from seeing the illuminated signal head for I-90 Off Ramp (Eastbound) traffic.

All costs involved with furnishing and installing specialty visors for the new vehicle signal heads, and ensuring that they block the view from the appropriate lanes, will be incidental to the contract unit price per each for "3 Section Vehicle Signal Head", and "4 Section Directional Vehicle Signal Head".

VIDEO DETECTION SYSTEM

The following video detection system will be used:

<u>Product</u>	<u>Manufacturer</u>
Autoscope Vision or OptiVu	Econolite Anaheim, CA 92807 Phone: 1-714-630-3700 www.econolite.com

All cabling and hardware necessary to make the detection system operational will be incidental to the contract unit price per each for "Video Detection System".

REMOVE AND RESET LUMINAIRE POLE

Existing luminaire poles EL2-EL4, and EL7- EL8 will be removed and reset as REL2-REL4 and REL7-REL8 as shown on the plan sheets.

The poles were originally installed with Project IM 0901(101)10, Drawing No. 80B865 for REL7-REL8 and 10B471 for REL2-REL4 as shown in the Special Details.

Millerbernd Manufacturing
P.O. Box 98
Winsted, MN 55395
Phone: (320) 485-2111

Shop drawing records show that the existing anchor bolts are 1 ¼ inch diameter and 48 inch length with a bolt circle diameter of 17 inches, and a 4 inch bolt projection. The replacement anchor bolts will be in conformance with the Specifications.

Luminaire poles and luminaires damaged during removal or resetting will be repaired or replaced by the Contractor at no cost to the State.

All costs involved with removing and resetting the existing luminaire poles including new anchor bolts with associated hardware, will be incidental to the contract unit price per each for "Remove and Reset Luminaire Pole".

All costs associated with disconnecting and pulling back existing wires, exposing the existing conduit, modifying the existing conduit, placing the new junction boxes, and re-pulling and connecting wires will be incidental to the contract unit price per each for "Remove and Reset Luminaire Pole".

WIRE SPLICING FOR LIGHTING

All wire splices for lighting will be made using TE Connectivity GTAP connectors, NSI Industries Polaris Blue connectors, or an approved equal.

MULTICONDUCTOR CONTROL CABLE FOR SIGNAL CIRCUITS

The Conductor Jackets for the multiconductor control cables will be color coded in accordance with ICEA S-73-532 Table E2.

WIRING IN EL9

The existing wires and conduit on the north side of EL9 will be removed and replaced by new conduit and wires as indicated on the plans. The wires and conduit connected on the east side of EL1 will not be disturbed during construction.

New wires to EL9 will be connected to the existing wires in EL9. The Contractor will ensure all lights are operational.

All costs associated with the removal and disposal of the existing pole and bracket wire will be incidental to the contract unit price per foot for "1/C #1 AWG Copper Wire".

EXISTING ELECTRICAL SERVICE – BLACK HILLS ENERGY

The Contractor will be responsible for coordinating the connection of traffic signals advance warning signal and luminaire poles L1, REL2-REL4 to the existing electrical service. The Contractor will contact Black Hills Energy at least 2 weeks prior to needing the signal and new/relocated luminaires added to the electric service. The contact for Black Hills Energy is Ken Meirose at 605-206-2968, ken.meirose@blackhillscorp.com.

The Contractor will install a NEMA 3R rainproof, 60 amp rated, non-fused safety switch (with lock) adjacent to the traffic signal cabinet. The secondary disconnect will be mounted on a galvanized steel post in accordance with standard plate 635.41.

All cost for contacting the utility company and coordinating service connections for the new/relocated luminaires and installing a secondary disconnect will be incidental to the contract lump sum price for "Miscellaneous Electrical."

EXISTING ELECTRICAL SERVICE – BUTTE ELECTRIC

The Contractor will be responsible for coordinating the reconnection of luminaire poles EL6, EL9, REL7 & REL8 to the existing electrical service. The Contractor will contact Butte Electric at least 2 weeks prior to needing the luminaires reconnected to the existing electrical service. The contact for Butte Electric is Brett Fosheim at 1-800-928-8839, brett@butteelectric.com.

All cost for contacting the utility company and coordinating the electrical service reconnections will be incidental to the contract lump sum price for "Miscellaneous Electrical."

ADVANCE WARNING SIGNAL

Two 1 Section Vehicle Signal Heads will be installed above each new "PREPARE TO STOP" sign, YL1 and YL2. The Advance Warning Signals will be installed as shown in the Special Details. Wires providing power to these signals will be connected to the signal controller cabinet. The traffic signal controller cabinet will be programmed to set the advance warning signal to flash in a wig-wag pattern 7-seconds prior to the start of the yellow phase and will continue to flash throughout the duration of the yellow and red phases.

All cost associated with the installation of the signal heads, and ensuring they operate as intended, will be incidental to the contract unit price per each "1 Section Vehicle Signal Head".



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SECTION SHEET

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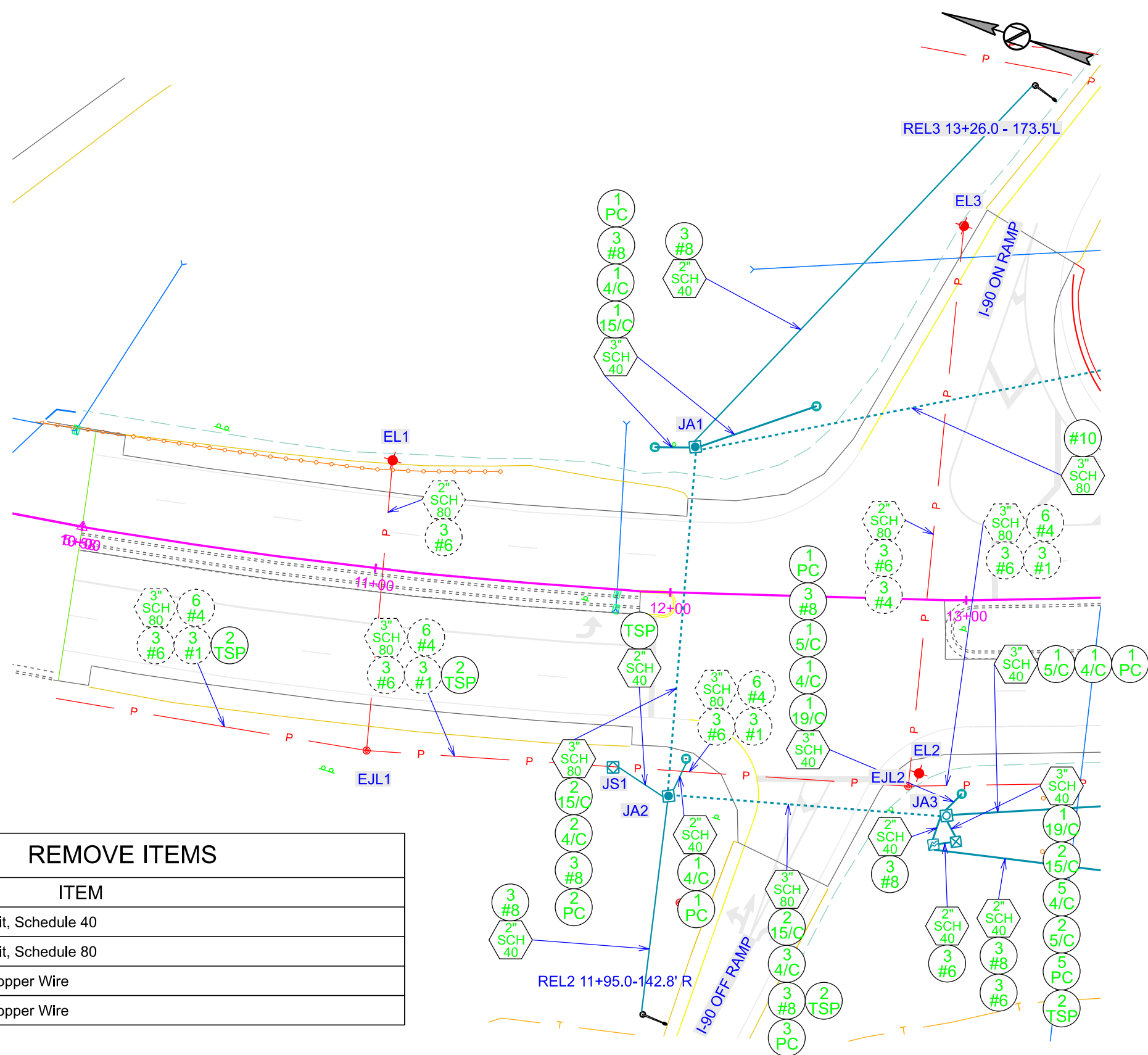
ESTIMATE OF QUANTITIES

KEY	ITEM	EST QUANT	UNIT
◆	Remove Luminaire Pole Footing (EL2-EL4, EL7-EL8)	5	EACH
◆	Remove and Reset Luminaire Pole (EL2-EL4, EL7-EL8)	5	EACH
—	Breakaway Base Luminaire Pole w/8' Arm 50' Mounting Height (L1)	1	EACH
●	Roadway Luminaire, LED with Photoelectric Cell (L1, EL1, A1-A2, A4, REL2-REL4, EL5-EL6, REL7-REL8, EL9)	16	EACH
○	3' Diameter Footing (A1, A2, A4)	40	FT
○	2' Diameter Footing (L1, A3, A5, REL2-REL4, REL7, REL8)	60	FT
⊠	1 Section Vehicle Signal Head (YL1-YL2)	4	EACH
⊠	Type 1 Electrical Junction Box (JA6-JA7, JL1-JL2, JS1-JS2)	6	EACH
⊠	Type 2 Electrical Junction Box (JA1-JA2, JA4-JA5)	4	EACH
⊠	Type 3A Electrical Junction Box (JA3)	1	EACH
⊠	Secondary Disconnect (Not a Bid Item)	1	EACH
⊠	Traffic Signal Controller	1	EACH
⊠	Battery Backup System for Traffic Signal	1	EACH
○	2" Rigid Conduit, Schedule 40	1,730	FT
○	3" Rigid Conduit, Schedule 40	185	FT
○	2" Rigid Conduit, Schedule 80	260	FT
○	3" Rigid Conduit, Schedule 80	505	FT
○	1/C #1 AWG Copper Wire	2,125	FT
○	1/C #6 AWG Copper Wire	2,305	FT
○	1/C #8 AWG Copper Wire	3,115	FT
○	1/C #10 AWG Copper Wire	165	FT
○	4/C #14 AWG Copper Tray Cable, K2	1,610	FT
○	5/C #14 AWG Copper Tray Cable, K2	445	FT
○	15/C #14 AWG Copper Tray Cable, K2	615	FT
○	19/C #14 AWG Copper Tray Cable, K2	40	FT
○	2/C #10 AWG Copper Pole & Bracket Cable	1,120	FT
○	Preemption Cable (Not a Bid Item)	1,170	FT
○	Twisted Shielded Pair #16 AWG Copper Wire	3,350	FT

EXISTING ITEMS

KEY	ITEM	EST QUANT	UNIT
◆	Roadway Luminaire Pole EL1, EL5, EL6, EL9	5	EACH
○	Junction Box (EJL1-EJL7)	4	EACH
○	Electrical Service Cabinet (EM1)	1	EACH
○	2" Rigid Conduit, Schedule 40	260	FT
○	3" Rigid Conduit, Schedule 40	505	FT
○	1/C #1 AWG Copper Wire	2,125	FT
○	1/C #4 AWG Copper Wire	1,610	FT
○	1/C #6 AWG Copper Wire	2,305	FT
○	Electrical Service Cabinet	1	EACH

CONDUIT LAYOUT US HWY 85 / NORTH AVE



KEY	ITEM	EST QUANT	UNIT
○	2" Rigid Conduit, Schedule 40	1,730	FT
○	2" Rigid Conduit, Schedule 80	260	FT
○	1/C #1 AWG Copper Wire	2,125	FT
○	1/C #6 AWG Copper Wire	2,305	FT