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GOVERNOR

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0016

DAVID A. COLE
COMMISSIONER

May 12, 2008
Subject: **Norridgewock**
Project No. BH-6900(01) X
Pin No.006900.01
Amendment No. 4

Dear Sir/Ms:

Make the following changes to the Bid Documents:

In the Bid Book, in the "SCHEDULE OF ITEMS" on page 13, **REMOVE** Line No. 1160, Item 626.22, "NON-METALLIC CONDUIT". Make this change in pen and ink.

In the Bid Book, under "SPECIAL PROVISION, SECTION 634, HIGHWAY LIGHTING, (Bridge Lighting)" on page 205 of the Bid Book **ADD** the attached "SPECIAL PROVISION, SECTION 634, HIGHWAY LIGHTING", 12 pages dated May 8, 2008, to the existing SPECIAL PROVISION.

In the Bid Book, after "SPECIAL PROVISION, SECTION 634, HIGHWAY LIGHTING" (12 pages), **INSERT** the attached "SPECIAL PROVISION, Section 634 and 643, Highway Lighting and Traffic Signal"

In the Bid Book, after page 212, **ADD** the attached "SPECIAL PROVISION, SECTION 638, BRIDGE LIGHTING, (Embedded Work in Structures)", 3 Pages Dated May 6, 2008.

In the Plans, on Sheet 2 of 134, under "ESTIMATED QUANTITIES", **REMOVE** Item No. 626.22, "NON-METALLIC CONDUIT". Make this change in pen and ink.

In the Plans, on Sheet 78 of 134, "SIDEWALK / CURB EXPANSION DAM SECTION" **CHANGE** the diameter of the hole closest to the bridge rail **from 4 ¾" to 2 ½."** **ADD** the following note to the hole closest to the bridge rail, "Not required at Abutment No. 2." Make this change in pen and ink.

In the Plans, on Sheet 82 of 134, on the "TRANSVERSE SECTION SPAN 1" **CHANGE** the diameter of the utility duct closest to the bridge rail on the right side of the section from 4" to 2". **CHANGE** the note "7 - 4"φ PVC Utility Ducts, 6 ~ by Others, 1 ~ for Lighting" **TO READ** "6 - 4"φ PVC Ducts by Others and 1 ~ 2"φ PVC Conduit for



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Lighting.” Label the small circle in the deck above the left exterior girder “2” ϕ PVC Conduit for Lighting.” Make this change in pen and ink.

In the Plans, on Sheet 82 of 134, under “SUPERSTRUCTURE NOTES”, **ADD** note 7. to read “The single 2” diameter conduit is for lighting.” Make this change in pen and ink

In the Plans, on Sheet 82 of 134, under “PLAN – LIGHT STANDARD BASE”, **ADD** “As required” to the note “CL 2” ϕ PVC Conduit” Make this change in pen and ink

In the Plans, on Sheet 83 of 134, on the “TRANSVERSE SECTION SPAN 3”, **CHANGE** the diameter of the utility duct closest to the bridge rail on the right side of the section from 4” to 2”. **CHANGE** the note “7 – 4” ϕ PVC Utility Ducts, 6 ~ by Others, 1 ~ for Lighting” **TO READ** “6 – 4” ϕ PVC Utility Ducts by Others, and 1 ~ 2” ϕ PVC Conduit for Lighting” Label the small circle in the deck above the left exterior girder “2” ϕ PVC Conduit for Lighting.” Make this change in pen and ink.

In the Plans, on Sheet 83 of 134, **ADD** the following note to the sheet, “The single 2” diameter conduit is for lighting.” Make this change in pen and ink.

In the Plans, on Sheet 83 of 134, under “PLAN – STANDARD LIGHT BASE”, **ADD** “As required” to the note “CL 2” ϕ PVC Conduit”. Make this change in pen and ink.

In the Plans, on Sheet 83 of 134, on the “SECTION A-A” **CHANGE** the diameter of the utility duct closest to the bridge rail on the right side of the section **from 4” to 2”**. Make this change in pen and ink.

In the Plans, on Sheet 110 of 134, under the “C.I.P DECK SECTION ON SPAN 2” and “TYPICAL DECK SECTION ON SPAN 2”, **CHANGE** the diameter of the utility duct closest to the bridge rail on the right side of the section **from 4” to 2”**. **CHANGE** the note “7 – 4” ϕ PVC Ducts by Others” **TO READ** “6 ~ 4” ϕ PVC Ducts by Others and 1 ~ 2” ϕ PVC Conduit for Lighting” Label the small circle in the deck above the left exterior girder “2” ϕ PVC Conduit for Lighting.” Make this change in pen and ink.

In the Plans, on Sheet 120 of 134, On the “ELEVATION – HANGER MOUNTED DOWN-LIGHT BRACKET TYPE PT-1A” detail, **CHANGE** the note “Secure conduit to the hanger every 2’-0”” **TO READ** “Secure conduit to the hanger every 3’-0.”” Label the conduit from the junction box, “ $\frac{3}{4}$ ” ϕ conduit.” Make this change in pen and ink.

In the Plans, on Sheet 120 of 134, On the “UP-LIGHTS ON TIE GIRDER TYPE SG-2” detail, **CHANGE** the note “2” ϕ conduit” **TO READ** “ $\frac{3}{4}$ ” ϕ conduit” and change the diameter of the utility duct closest to the bridge **from 4” to 2”**.

The following questions have been received:

Question: Are the aerial power (telephone and cable) river crossings, located upstream of the existing bridge, going to be removed? If so, when and how many days will be required?

Response: The aerial utilities (Somerset Telephone, Time Warner Cable & Central Maine Power) located upstream of the existing bridge will be moved after the construction contract is award. Somerset Telephone and Time Warner Cable will temporarily cross the river approximately 300' downstream and CMP will move approximately ½ mile downstream. The estimated total working time for the aerial utilities on the project is listed in Special Provision Section 104 as 45 working days.

Question: On Plan Sheet 54, the designer's assumed the construction sequence. Please confirm that the membrane and base pavement on the bridge has to be completed before placing the concrete deck closure sections.

Response: Yes, the purpose is to apply all significant dead loads to the structure before the final deck closure.

Question: On Plan Sheet 54, the designer's assumed the construction sequence. When did the designer think the contractor would build the modular gravity wall located on the northeast corner of abutment #2?

Response: Part of the modular gravity wall will need to be built before traffic is transferred to the new bridge. The approach slab is on top of portions of the moment slab, which is supported by the modular gravity wall. The limits of the modular gravity wall also extend under the approach slab. It would likely be preferable to build enough of the modular gravity wall and moment slab to support the full construction of the approach slab and paving of the mainline approaches to the bridge before transferring traffic to the new bridge. To facilitate staged construction one construction joint is allowed in the moment slab and the modular gravity wall. The remainder of the modular gravity wall and moment slab would likely be built after the temporary bridge is removed.

Question: What does the note on Plan Sheet 61 mean that states the "Back of wall (design by others)?"

Response: The note "back of wall designed by others" on sheet 61 means that the modular gravity wall is designed by the contractor, as stated in note 1. The limits shown are conceptual only.

Question: On Plan Sheet 71, under which item number are Steel Jacking Plates paid?

Response: The steel jacking plates paid for under Item 523.5404, Laminated Elastomeric Bearings, Expansion, Span 2.

Question: Reference Plan Sheet 98; under which item number is the cast-in-place concrete top section (on top of the tie girders) paid?

Response: The top section of the Tie Girder is paid for as part of the Tie Girder, Item 502.381.

Question: How is the geometry for the end floor beams set to accommodate the camber set for the arch end connections? Are these built vertical, sloped to match intermediate floor beams or set to match camber? Will these be built offset from their final position to account for shortening of the tie girder? What concrete strength is required before post-tensioning?

Response: After the bridge is complete, the end floor beams, intermediate floor beams, tie girder, and arch end connection (AEC) are sloped to match the roadway grade (0.6%). Camber given on Sheet 102 takes into account all deflections of the arch superstructure that occur throughout construction with the exception of deflections caused by falsework. The slope of the end floor beams shall be the same as the slope of the AEC once they are connected to the AEC. The Contractor has a choice of when to apply camber of this section (end beams / AEC) per Note 3 on Sheet 102, however the camber shall be accurate at the time of casting the tie girder. The spacing of the end floor beams shall be set with respect to the geometry of the AEC and the entire section (end beams / AEC) shall be translated in the 'X' direction (horizontal camber) according to the camber specified on Sheet 102. Concrete strength required before post-tensioning is per AASHTO = $0.6 f_c = 0.6 (6,000) = 3,600$ for end beams.

Question: Regarding span 2 bridge bearings – Is the horizontal position prior to construction able to accommodate rotation of the arch end connection throughout the construction process and at final geometry? How does this fit with camber provided on the drawings? Sheet 71 indicates the bearings are to be vulcanized to the embedded sole plate. Is this the intent?

Response: The bearings are able to accommodate the arch rotation throughout construction and in the final condition. This rotation was found to be small, and does not significantly affect the camber of other members. On Sheet 71, the bearings are incorrectly shown to be vulcanized to the embedded sole plate.

Question: The contract drawings allow options on constructing the arch end connection. Is geometry set to suit camber provided on the drawings or rotated to camber after construction of the element? This would affect the construction geometry for the end floor beams and jacking systems.

Response: See the response to question 7. Also, to be clear, there are not options for constructing the AEC but only options for when camber is applied (Note 3 on Sheet 102), and camber shall be accurate at the time of casting the tie girder. Since the AEC is considered a rigid element (deformation during construction is negligible) its geometry is that given on Sheets 87, 88, and 92.

Question: Is there a minimum age requirement for the precast floor beams before being installed?

Response: There is no minimum age requirement considered in the design. Section 535 of the Standard Specifications shall apply.

Question: What is the required concrete strength for Phase 1 post tensioning of the tie girders? When will the forms be stripped?

Response: The tie girder concrete strength for Phase 1 PT shall meet the requirements of Post Tensioning Notes 3 and 4 on Sheet 101. It is assumed the AEC (cast before tie girder) concrete strength will have met full design strength. Stripping of forms will be according to MaineDOT Standard Specifications.

Question: What concrete strength is required for step 18 – sequentially release falsework below arch ribs and transverse bracing?

Response: Required strength is full compressive strength of all components.

Question: Is there a required construction sequence for the Span 2 deck? Is there a minimum age requirement for the precast form panels?

Response: See note 4 of Sheet 82, Superstructure Notes. These notes apply to all spans. There is no minimum age requirement considered in the design. Notes from Standard Detail 502(12) shall apply.

Question: Regarding note 3 on Plan Sheet 87. Assuming the construction joints are used as shown, how much is the shrinkage lessened by this? What time delay was assumed between placements to assess the shrinkage differential between components? Is there a time delay required between stressing of the tie girders and arch placement?

Response: The inclusion of construction joints and enough time delay between placements to significantly reduce shrinkage forces on the arch were assumed in the design. Reasonable assumptions were made, but all the possibilities a Contractor might

choose to construct the arch could not be checked, such as determining the precise timing of the placements or location of the construction joint. Deviations from our assumptions are expected, and if significant, will be reviewed once the Contractor submits their detailed Construction Procedure.

Question: There are no pay items for temporary concrete barriers, temporary pavement marking, and the removal of pavement markings. Should these items have been included in Item 652.39, Work Zone Traffic Control?

Response: Temporary concrete barriers, temporary pavement markings and removal of temporary pavement markings are considered incidental to Item 652.39 Work Zone Traffic Control.

Consider these changes and information prior to submitting your bid on **May 21, 2008**.

Sincerely,



For - Scott Bickford
Contracts & Specifications Engineer

SPECIAL PROVISION
SECTION 634
HIGHWAY LIGHTING

The following shall supplement Section 634.

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electrical identification needs for the Norridgewock Bridge Lighting.
 - 1. Identification of power and control cables.
 - 2. Identification for conductors.
 - 3. Underground-line warning tape.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2-inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2-inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8-inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16-inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and hand holes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied for sizes larger than No. 8 AWG.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6-inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Install instructional sign including the color code for grounded and ungrounded conductors using adhesive-film-type labels.

- C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, to disconnect switches and protection equipment, central or master units, and control panels. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2-inches high.
 - b. Outdoor Equipment: Engraved
 - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following for the Norridgewock Bridge Lighting:
 - 1. Building wires and cables rated 600 V and less.

2. Connectors, splices, and terminations rated 600 V and less.
3. Instrumentation and Control Conductors
4. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types Listed Below

2.2 CONNECTORS AND SPLICES

- A. Manufacturers:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.
 4. 3M; Electrical Products Division.
 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW, single conductors in raceway.
- B. Exposed Feeders: Type XHHW single conductors in raceway
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type XHHW, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type XHHW single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type XHHW single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type 1, THWN in raceway.
- J. Class 2 Control Circuits and Instrumentation Cables: Power-limited multiconductor cable, or tray cable installed in raceway. Cable shall be manufactured by Belden or an Engineer approved equivalent.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

- D. Identify and color-code conductors and cables accordingly. Each panel circuit number shall be identified with the circuit designation. Each control circuit or instrumentation cable shall be labeled with the end device they are connected to and the respective control panel terminations.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- F. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- G. Wiring at Outlets: Install conductor at each outlet, with at least 6-inches of slack.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Test Report: Prepare a written report to record the following:
 - 1. Test procedure used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action to achieve with requirements.
- C. Remove and Replace malfunctioning units and retest as specified above.

PANELBOARDS and DISCONNECTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards, disconnects and control cabinets for the Norridgewock Bridge Structure lighting.
- B. Contractor shall install a weatherproof dimmer switch and photo eye for the circuits shown on the electrical drawings. Devices shall interface within the NEMA 4X control cabinet. Each switch or photo-eye shall be rated 277 Volts, and 20 amps.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard, disconnect and control panel, and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.
- C. Field quality-control reports.
- D. Panelboard schedules for installation in panelboards.
- E. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 years from date of Project Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Surface -mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R (Disconnect and Panelboard)
 - b. Control Boxes shall be rated NEMA 250 Type 4X.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Incoming Mains Location: top
- C. Phase, Neutral, and Ground Buses: Hard-drawn copper
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity
 - 2. Main and Neutral Lugs: Compression type.
 - 3. Ground Lugs and Bus Configured Terminators: Compression type.
- E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers.
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.

- 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains: Circuit breaker
- E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Main Panel Overcurrent Protective Devices: Molded Case Circuit Breaker

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
 - 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 16 Section "Fuses."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories.
- B. Mount top of trim above finished grade unless otherwise indicated.
- C. Mount panelboard cabinet plumb and rigid without distortion of box per Central Maine Power guidelines and height requirements.
- D. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.

- F. Install filler plates in unused spaces.

3.2 IDENTIFICATION

- A. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.

SPECIAL PROVISION
Section 634 and 643
Highway Lighting and Traffic Signals

Section 634.09 testing of highway lighting, the first sentence shall be amended as follows:

Before acceptance of the work, the contractor shall cause the following tests to be made on all lighting circuits, by a licensed electrician.

The tests do not need to be performed in the presence of the Resident, but the test results shall be recorded on the Highway Lighting Quality Control Check List and submitted to the Resident by the Contractor for acceptance. The form shall be signed by the licensed electrician certifying that the highway lighting meets the requirements of section 634.09.

Subsection 634.14, field testing of Traffic Signals, the first sentence shall be amended as follows:

Before acceptance of the work the contractor shall cause the following tests to be made on all traffic signal equipment and circuits, by a licensed electrician.

The tests do not need to be performed in the presence of the Resident, but the test results shall be recorded on the Traffic Signal Quality Control Check List and submitted to the Resident by the Contractor for acceptance. The form shall be signed by the licensed electrician certifying that the signal equipment and circuits meet the requirements of section 634.14.

Highway Lighting Quality Control Checklist

Subsection 634.09 Field Testing

Project Pin # _____

Location (if multiple services, please be specific)- _____

Grounding Electrode Resistance at service _____

Number of Circuits _____

Hand-Off-Auto Switch? _____

Circuit #1

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

Circuit #2

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

I, _____, certify that this work was done in accordance with subsection 643.14 and current NEC _____ guidelines, and when tested, was functioning as intended. (YEAR)

Electrician's Signature _____

Electrician's License # _____

Highway Lighting Quality Control Checklist

Subsection 634.09 Field Testing

Project Pin # _____

Location (if multiple services, please be specific)- _____

Grounding Electrode Resistance at service _____

Number of Circuits _____

Hand-Off-Auto Switch? _____

Circuit #3

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

Circuit #4

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

I, _____, certify that this work was done in accordance with subsection 643.14 and current NEC _____ guidelines, and when tested, was functioning as intended. (YEAR)

Electrician's Signature _____

Electrician's License # _____

Traffic Signal Quality Control Checklist

Subsection 643.14 Field Testing

Project Pin # _____

Grounding Electrode Resistance at service _____

ID tags on loop amps / detector cards? _____

Location _____

Street Approach	_____		
Loop #	Resistance		_____
Phase #	Meg to ground		_____
L,C, or R Lane	Amount of bondo covering loop		_____
Pulse or Presence			_____

Street Approach	_____		
Loop #	Resistance		_____
Phase #	Meg to ground		_____
L,C, or R Lane	Amount of bondo covering loop		_____
Pulse or Presence			_____

Street Approach	_____		
Loop #	Resistance		_____
Phase #	Meg to ground		_____
L,C, or R Lane	Amount of bondo covering loop		_____
Pulse or Presence			_____

I, _____, certify that this work was done in accordance with subsection 643.14 and current NEC _____ guidelines, and when tested, was functioning as intended. (YEAR)

Electrician's Signature _____

Electrician's License # _____

SPECIAL PROVISION
SECTION 638
BRIDGE LIGHTING
(Embedded Work in Structures)

Description: This work shall consist of furnishing and installing conduit, junction boxes, anchor bolts, wiring, and all incidentals for bridge lighting in structures from abutment to abutment as shown on the plans and described herein.

This work shall also include furnishing and installation of the anchor bolts for light standards. Light standards will be paid for separately.

Materials and Methods

(a) Installation of Raceway System

The Contractor shall install conduits to complete the raceway system as shown on the plans.

The conduit embedded in concrete shall be Schedule 40 PVC meeting the requirements specified in Subsection 715.03 and shall be approved for the intended use by the National Electrical Code and labeled with the Underwriters Laboratories listing unless otherwise shown on the plans.

Conduits embedded in concrete shall be secured in such a way as to ensure that there is no movement during the placing of concrete. Immediately after concrete has been placed, the Contractor shall inspect the complete raceway system to ensure that all conduits are clean and free of all obstructions.

Conduits on the bridge not embedded in concrete shall be rigid metallic conduit (RMC), and shall be galvanized.

At Abutment No. 1, an expansion coupling shall be used to join the PVC conduits. Provide one 2" PVC expansion joint with gasket capable of 4" of total expansion.

When directed by the Resident, a mandrel not less than 1 foot long and having a diameter of 1/4" less than the diameter of the conduit shall be pulled through each run to remove all sand and other foreign matter. A pull wire (or other approved substitute) shall be installed by the Contractor, unless otherwise indicated. The ends of all conduits shall be plugged after cleaning.

At the completion of the installation of the raceway system, the covers shall be secured to the junction boxes, complete with gaskets.

Immediately after concrete has been placed, the Contractor shall inspect the complete raceway system to ensure that all conduits are clean and free of all obstructions.

(b) Anchor Bolts

Anchor bolts, nuts and circular steel washers shall be carbon steel conforming to the requirements of ASTM A325M and hot-dipped galvanized in accordance with ASTM A153M. Washers shall be hot-dipped galvanized.

Anchor bolts shall be spaced and supported by means of a suitable template. The template shall be supplied by the Contractor to fit the bolt circle, and positioned in such a manner that is true and level.

Immediately after the template is removed, and the projecting threads of the pole anchor bolts shall be grated and protected with a conduit sleeve, held in position with the nuts and washers required for holding down the lighting poles. This thread protection shall remain in place until the pole is erected.

(c) Junction Boxes Embedded in Structures

Junction boxes shall be located and secured such that when complete, the covers shall be flush with the finished concrete surfaces unless otherwise specified. All openings in the boxes not used in this installation shall be plugged.

The cast iron box shall be outside flanged, recessed cover type, suitable for flush mounting and listed by the Underwriters Laboratories, Inc., as rain tight and watertight of zinc, neoprene gasket or an approved equivalent, and stainless steel cover screws. The inside dimensions and wall thickness shall meet the specifications of the National Electrical Code, latest edition.

All junction boxes located on the sidewalk surface shall be cast iron and capable of supporting pedestrian loads.

The cast iron junction box shall be installed as shown on the plans.

Non-metallic – PVC (polyvinyl chloride) junction boxes may be used in place of cast iron when approved by the Resident. Non-metallic junction boxes shall be Underwriters Laboratories, Inc. approved.

Method of Measurement

The quantity to be measured for payment for Embedded Work in Structures will be the lump sum unit.

Basis of Payment

The accepted quantity of Embedded Work in Structures will be paid for at the contract lump sum price for the complete installation of embedded conduits, non-embedded

conduits, junction boxes, expansion couplings, wiring, and anchor bolt assemblies in structures and will be full compensation for all labor, materials, equipment, and all incidentals necessary to acceptably complete the work.

Light standards will be paid for under Section 634.

Pay Item	Embedded Work in Structures	Pay Unit
638.01	Embedded Work in Structures	Lump Sum