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

Janet T. Mills
GOVERNOR

Bruce A. Van Note
COMMISSIONER

December 11, 2024
Subject: Traffic Cameras on I-95 & I-295
State WIN: 026130.00
Location: **Statewide**
Amendment No. 2

Dear Sir/Ms.:

Make the following changes to the Bid Book:

Remove pages 86 through 93 (8 pages) titled Special Provision Section 654 Intelligent Transportation Systems (Camera Connection) dated November 4, 2024 and **Replace** with the attached Special Provision with the same title dated December 6, 2024 (7 pages).

Remove pages 94 through 103 (10 pages) titled Special Provision Section 654 Intelligent Transportation Systems (Closed Circuit Television Pole and System Equipment) dated November 4, 2024 and **Replace** with the attached Special Provision with the same title dated December 6, 2024 (10 pages).

The following questions have been received:

Question: Pertaining to the portion of the lowering device responsible for ensuring consistent and high-quality signal reaching the camera while being subject to the extreme environmental situations while both latched and unlatched... On page 99, section 17, in 654.023 "Support Pole and Lowering Device", it reads "the female and male socket contact halves of the connector block shall be made of... synthetic rubber or approved equivalent." For the purposes of this bid/project, is "PLASTIC" an approved equivalent? A plastic connector is cheaper than a molded rubber contact block, therefore...will it be equivalent and acceptable to provide a connector block made of molded plastic?

Response: While the intent of the specification is for a durable material such as synthetic rubber, the Contractor may propose an alternative material to be considered for approval as an equivalent. However, the equivalency will be evaluated based on the resiliency of the material under the extreme environmental conditions that are experienced in Maine each summer and winter. The final decision on the equivalency of an alternative product or material rests with MaineDOT. Ultimately, the Contractor will not be granted additional compensation if he proposes an alternative material that is not approved.

Question: Page 100, Item 23, regarding the Portable Lowering Tool, shall 1 or more than 1 be provided for the project? If it is more than one, please specify how many are required.

Response: MaineDOT only requires one Portable Lowering Tool for the project, associated with the CCTV mounted to the steel pole.

Question: Page 100, item 654.025 CCTV Cables, Item 2 says "all free-hanging Ethernet cable shall be plenum type". Please confirm that this is correct, Plenum cable is typical what would be used inside buildings and not for this type of application. Typically, outdoor and/or direct burial rated Cat6 cable is used for an installation like this.

Response: Outdoor-rated or direct burial Category 6 cable will be acceptable. Reference to plenum cable has been removed from the Special Provision 654 Intelligent Transportation Systems, Closed Circuit Television Pole and System Equipment.

Question: Page 89, Item 13 of the specification is saying the External Mount devices on the wood poles and overhead sign structure will have Portable Lowering Tools, but on Page 87, Item 5.a the specifications state that the lowering device shall have a winch box with a permanently mounted winch with crank. Please clarify whether the External Mount systems will be serviced by a permanent winch in the lower winch box or serviced by the same type of portable lowering tool as used with the 60' steel pole.

Response: To clarify, the steel pole mounted CCTV with a lowering device will require one portable lowering tool with one portable drill. The wood pole and overhead sign structure mounted CCTVs will require a permanently mounted winch and not require a portable lowering tool however, they will each require a portable drill in addition to the hand crank. See revised Special Provision 654 Intelligent Transportation Systems, Camera Connections for more details.

Question: Page 97, item 654.023, item 4 says the 60' CCTV Pole shall be designed for the loading of a dual camera lowering system. The plan drawings show a single Camera lowering system with a single CCTV camera. Please confirm that while the pole is to be designed to accommodate 2 Camera lowering system and two CCTV Cameras, it is to be supplied with only 1 camera lowering system and one CCTV Camera.

Response: Correct, the steel pole shall be designed to accommodate two camera lowering devices with two cameras located at 90 degrees offset from each other. However, this project only requires one lowering device with one camera for each mounting support.

Question: Page 87, item 654.024, items 4 and 5 talk about the External Mount CLD. The specifications state that the Upper Box and the winch box are to be STAINLESS STEEL in 4a. Please confirm that this is correct or that other materials such as aluminum or steel can be used here.

Response: The Upper Mounting Box shall be stainless steel. The Winch Box should be aluminum. See the revised Special Provision 654 Intelligent Transportation Systems, Camera Connections for more details.

Consider these changes and information prior to submitting your bid on **December 18, 2024**.

Sincerely,

George M. A. Macdougall P.E.
Contracts & Specifications Engineer

SPECIAL PROVISION
SECTION 654
INTELLIGENT TRANSPORTATION SYSTEMS
(Camera Connection)

Special Provision 654 ITS BASE SPECIFICATION is amended as follows:

654.01 Description

The following paragraph is added:

This item shall consist of furnishing and installing a mounting system with lowering device, and conduit for a highway traffic camera, also referred to as a Closed-Circuit Television, to be mounted directly to infrastructure such as an existing high mast light pole lowering ring, an existing overhead sign structure or a new wood pole. The Contractor is responsible for developing final connection details for extension arms with lowering devices.

654.021 Materials

The following section is added:

654.022 Camera Connection – CCTV Camera Mount

1. The CCTV camera mounting bracket and hardware shall be of the type recommended by the CCTV manufacturer, such that the CCTV camera can be securely affixed to the structure and resists movement from environmental forces that may shift the camera out of alignment.
    a. When mounting to a pole or other rounded support structure, the mounting shall include a notched or curved baseplate such that the baseplate maintains a minimum of two points of contact to the curved surface.
2. The CCTV camera mount shall be manufactured of aluminum, or similar approved non-corrosive material, and powder coated white or light gray in color unless otherwise directed.
    a. Pipe style mounts shall include an internal manufacturer recommended pipe seal to protect against insect, water, and dust intrusion.

654.023 Camera Connection – High Mast Light Lowering Ring Mounting - General

1. The Contractor shall furnish and install a stainless-steel junction box (highway traffic camera box).
    a. The stainless-steel junction box material shall meet the requirements specified in Section of Division 700, Material Details, Metallic Junction and Fuse Box 715.05.
2. The Contractor shall furnish and install a counterweight to maintain the balance of the lowering ring after attachment of the CCTV camera on the lowering ring.
3. The Contractor shall furnish and install a weatherhead on the conduit stub at the base of the high mast light pole foundation as shown in the Plans.

654.024 Camera Connection – Overhead Sign Structure and Wood Pole Mounting - General

1. The Contractor shall furnish 2-inch diameter galvanized steel conduit. The conduit material shall meet the requirements specified in the following Sections of Division 700, Material Details, Steel Conduit 715.02.
2. The Contractor shall furnish 1-inch minimum stainless-steel strapping for supporting the conduit to the mounting structure.
3. The Contractor shall furnish a lightning dissipater attached to a #6 AWG stranded bare copper for grounding.
    a. The lightning dissipater shall be attached using manufacturer's recommended clamps or banding that shall rigidly hold the lightning dissipater in winds up to 130 mph.
4. The Contractor shall furnish a camera lowering device mounting box (upper mounting box) and winch box as shown on the plans and as recommended by the lowering device manufacturer.
    a. The upper mounting box shall be stainless steel and material shall meet the requirements specified in Section of Division 700, Material Details, Metallic Junction and Fuse Box 715.05.
    b. The winch box should be aluminum and material shall meet the requirements specified in Section of Division 700, Material Details, Service Equipment 715.11.
    c. The winch box shall be sized to support the winch and include space for a winch crank handle.
5. The Contractor shall furnish a lowering device system designed to support, lower and raise the CCTV camera without damage.
    a. The lowering system shall consist of a winch box with a permanently mounted winch with crank, an upper mounting box, suspension contact unit, divided support arm, and camera connection box.
    b. All external components of the lowering device shall be made of corrosion-resistant materials in accordance with manufacturer's specifications and procedures.
    c. The lowering device shall have a locking mechanism between the fixed and moveable components.
    d. The lowering device cable shall be stainless steel and contained in a conduit system that does not include the camera’s power and communication cables.
    e. The lowering device unit shall have a minimum temperature rating of -40°F to 160°F.
    f. The camera lowering device shall be mounted within three feet of the top of a wood pole mounting structure.
    g. The camera lowering device shall be mounted a minimum of 10 feet above the top chord of an overhead sign structure truss but not more than 18 feet above the bottom chord of the overhead sign structure truss.

654.025 Camera Connection – Structural

1. All camera connections (except camera connections mounted to wood poles) shall be designed and stamped by a Professional Engineer licensed in the State of Maine in

accordance with the current edition of AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Standard Specifications 504 except as noted below:

a. Basic Wind Speed: 1700-year Mean Recurrence Interval (MRI) basic wind speed of 130 mph (209 km/hr)

654.026 Camera Lowering Device System

1. The camera lowering system shall be designed to support, lower for access, and raise to mounting height an IP driven CCTV camera, lens, housing, pan-tilt-zoom (PTZ) mechanism, cabling, connectors, and other supporting field components without damage or causing degradation of the camera operations.
2. The lowering systems shall consist, at a minimum, of a suspension contact unit, divided support arm, and mounting hardware for attachment to the support structure identified in the plans.
3. The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and ensure the contact unit cannot twist under high wind conditions.
4. The support arms shall be designed such that the arm will be locked in place to withstand camera support arm rotation under high wind conditions by either geometry, through-bolt construction, or other means.
5. Suspension Contact Unit: The suspension contact unit shall have a load capacity of 600 pounds with a 4 to 1 safety factor. There shall be a locking mechanism between the fixed and moveable components of the lowering device. The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.
6. The camera lowering device shall withstand wind forces of 130 mph with a 30 percent gust factor using 1.65 safety factor.
7. The prefabricated components of the lift unit support systems shall be designed to preclude the lifting cables from contacting the power or video cabling. The lowering device manufacturer shall provide conduit mount adapters for housing and isolating the lowering cables inside the pole.
8. The lowering device unit shall be equipped with multiple contact connector designed and tested for Ethernet Fed IP Cameras with or without POE. The Contact Connectors shall be designed for extreme environmental outdoor use.
9. The female and male socket contact halves of the ethernet connector block shall be made of a UL94, V-0 rated thermosetting synthetic rubber. Plastic ethernet contact blocks will not be permitted.
10. All electrical and communication connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent moisture infiltration and degradation of the electrical contacts.
11. The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits and 1 volt peak-to-peak video signals as well as the power requirements for operation of dome camera environmental controls.

12. The interface and locking components shall be made of stainless steel and/or aluminum. All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment. The corrosion resistance materials shall be as per manufacturer's specifications and procedures.
13. Portable Lowering Drill: The manufacturer shall provide a variable speed, heavy-duty reversible drill motor with a clutch mechanism.

654.03 Construction

The following sections are added:

654.031 CCTV Camera Connection – High Mast Light – Camera Mounting

1. The CCTV Camera shall be mounted to the high mast light support arm or lowering ring.
2. The mounting of the CCTV camera shall not interfere with the lowering/raising of the high mast lighting lowering ring.
3. The Contractor shall attach a counterweight on the high mast light lowering ring that offsets the CCTV camera and mounting to provide balance to the lowering ring. Balance shall be demonstrated by lowering and raising the lowering ring with only incidental contact between the ring and the pole.

654.032 CCTV Camera Connection – High Mast Light – Cabling

1. All equipment shall be supplied with the manufacturer's recommended cables.
2. All free-hanging Ethernet cables shall be exterior grade suitable for wet environments and UV resistant.
3. All cables shall be installed in a continuous run. Splicing will not be permitted.
4. CCTV cables shall be wrapped helically around the high mast light pole with sufficient slack to allow the camera lowering ring to lower and raise freely.

654.033 CCTV Camera Connection – Overhead Sign Structure – Camera Mounting

1. Camera wiring shall be installed in a conduit system independent of the lowering support cable conduit. The conduit system shall provide a watertight installation and prevent moisture damage to the CCTV and to the ITS Equipment cabinet.
2. Contractor shall design, furnish, and install a support system for mounting the camera lowering device to the overhead sign structure. A sample of a potential system is shown in the Plans.
3. The mounting system shall permit the camera to be mounted at 45 degrees from parallel to the direction of the overhead sign structure truss. The Contractor shall ensure there is a clear vertical pathway for the camera to be lowered to ground that avoids having the camera come down directly above someone at the winch box.
4. The Contractor shall furnish and install U-bolt connections, or the manufacturer recommended connection to mount the lowering device vertical mounting post to the overhead sign structure. Field drilling the overhead sign structure is prohibited.

5. The Contractor shall supply two 2-inch rigid steel conduits pathways to the upper mounting box.
    a. One 2-inch rigid steel conduit shall house the stainless steel lowering cable. This conduit shall be a direct connection between the upper mounting box and the winch box.
    b. The 2-inch rigid steel conduit between the winch box and upper mounting box that contains the lowering stainless-steel cable shall be installed plumb and not have any bends or kinks.
    c. The second 2-inch rigid steel conduit shall house the power and communications cable for the CCTV. This conduit shall enter the upper mounting box but shall not enter the winch box. This conduit shall be connected to the ITS Equipment cabinet.
6. Stainless steel banding straps shall be installed a maximum of 5-feet apart to support the conduit for the height of the overhead sign structure upright support.
7. The Contractor shall furnish and install stand off brackets for the two 2-inch rigid steel conduits that feed the upper mounting box.
8. When lowered the camera shall be a minimum of 4 feet behind guardrail.
9. The Contractor shall install the lightning dissipater to be above and offset from the camera to protect the installed equipment without interfering with the functionality of the equipment. The lightning dissipater shall be connected to the grounding system.

654.034 CCTV Camera Connection – Wood Pole Mounting

1. Camera wiring shall be installed in a conduit system independent of the lowering support cable conduit. The conduit system shall provide a watertight installation and prevent moisture damage to the CCTV and to the ITS Equipment cabinet.
2. Contractor shall design, furnish, and install a support system for mounting the camera lowering device to a wood pole. A sample of a potential system is shown in the Plans.
3. The Contractor shall supply two 2-inch rigid steel conduits pathways to the upper mounting box.
    a. One 2-inch rigid steel conduit shall house the stainless steel lowering cable. This conduit shall be a direct connection between the upper mounting box and the winch box.
    b. The 2-inch rigid steel conduit between the winch box and the upper mounting box that contains the lowering stainless-steel cable shall be installed plumb and not have any bends or kinks.
    c. The second 2-inch rigid steel conduit shall house the communications cable for the CCTV. This conduit shall enter the upper mounting box. This conduit shall not enter the winch box. This conduit shall be connected to the ITS Equipment cabinet.
4. Stainless steel banding straps shall be installed a maximum of 5-feet apart to support the conduit for the height of the overhead sign structure upright support.
5. The Contractor shall furnish and install stand off brackets for the two 2-inch rigid steel conduits that feed the upper mounting box.
6. The Contractor shall ensure there is a clear vertical pathway for the camera to be lowered to ground that avoids having the camera come down directly above someone at the winch box.

7. The 2-inch rigid steel conduit between the winch box and the upper mounting box that contains the lowering stainless-steel cable shall be installed plumb and not have any bends or kinks.
8. The Contractor shall install the lightning dissipater to be above and offset from the camera to protect the installed equipment without interfering with the functionality of the equipment. The lightning dissipater shall be connected to the grounding system.
9. The Contractor shall install a collar between the banding straps and the wood pole at both points where the lowering device upper mounting box and the winch box are mounted to the wood pole to ensure the straps and/or junction boxes do not damage or become embedded into the wood pole.

654.035 Installation of the Camera Lowering System

1. The lowering system shall be provided and installed with all components as per manufacturer's specifications and procedures.
2. The Contractor shall arrange for the Manufacturer's factory representative to be present on site to assist with the assembly, installation and testing of the camera lowering system.
3. Camera lowering devices shall be installed to provide unobstructed camera views along the mainline roadway.
4. Weights and/or counterweights shall be provided by the Manufacturer as necessary to assure that the alignment of pins and connectors are proper for the camera support to be raised into position without binding. The lowering unit shall have sufficient weight to disengage the camera and its control components for lowering.
5. The Contractor shall provide a sealant between the lowering device and the camera assembly to assure water tightness of the camera assembly.

654.036 Grounding System

1. All camera sites shall be grounded to a minimum of 25 ohms to ground. If other national, state, or local grounding requirements are more stringent than those of the manufacturer, the applicable national, state, or local codes shall apply.
2. The Contractor shall install solid copper or copper-clad ground rods (minimum of four each at ¾-inch x 10-foot) along with #4 AWG ground wire and fittings at the base of the camera system. The Contractor shall install additional ground rods required to meet the minimum grounding requirements.
3. The ground wire shall be exothermically welded to each ground rod installed with all ground rods attached to every other ground rod via the ground wire.
4. The camera grounding system shall be bonded to the controller enclosure bus-bar and the support structure in accordance with National Electric Code (NEC) requirements.
5. The camera support shall be supplied with an air terminal that is bonded by an insulated wire to the earth terminal-wire attachment at the base.
6. The camera lowering systems shall be grounded to the same system as the camera system.

654.07 Method of Measurement

The following paragraphs are added:

Camera Connection – Mast Arm shall be measured by each mounting system furnished, installed, and accepted in place on a wood pole.

Camera Connection – High Mast Light shall be measured by each mounting system furnished, installed, and accepted in place on a high mast light pole lowering ring.

Camera Connection – Overhead Sign Structure shall be measured by each furnished, installed, and accepted in place on an existing overhead sign structure.

The following section is added:

654.08 Basis of Payment

The accepted quantities of Camera Connection – Mast Arm will be paid for at the contract unit price each complete in place. Payment shall be full compensation for furnishing and installing all mounting brackets, mounting hardware, camera lowering system with portable lowering drill, junction boxes, rigid steel conduits, flexible conduit, lightning dissipaters, grounding systems, cables, tools, materials, incidentals, and labor necessary to provide a complete mounting system.

The accepted quantities of Camera Connection – High Mast Light will be paid for at the contract unit price each complete in place. Payment shall be full compensation for designing, furnishing and installing all mounting brackets, mounting hardware, counterweights, junction boxes, conduits, flexible conduit, weatherhead, grounding systems, cables, tools, materials, incidentals, and labor necessary to provide a complete mounting system.

The accepted quantities of Camera Connection – Overhead Sign Structure will be paid for at the contract unit price each complete in place. Payment shall be full compensation for designing, furnishing and installing all mounting brackets, mounting hardware, camera lowering system with portable lowering drill, junction box, flexible conduit, rigid steel conduits, lightning dissipaters, grounding systems, cables, tools, materials, incidentals, and labor necessary to provide a complete mounting system.

Payment will be made under:

Pay Item	Description	Pay Unit
654.101	Camera Connection – Mast Arm	Each
654.102	Camera Connection – High Mast Light	Each
654.103	Camera Connection – Overhead Sign Structure	Each

SPECIAL PROVISION
SECTION 654
INTELLIGENT TRANSPORTATION SYSTEMS
(Closed Circuit Television (CCTV) Pole and System Equipment)

Special Provision 654 ITS BASE SPECIFICATION is amended as follows:

654.01 Description

The following paragraphs are added:

This work shall consist of furnishing, installing, integrating, and testing Highway Traffic Cameras, also referred to as Closed Circuit Television (CCTV), systems and equipment.

This specification also includes furnishing and installing new galvanized steel poles with steel reinforced concrete foundations. The work shall include furnishing and installing all camera equipment and accessories as defined in this specification onto new steel poles with a lowering device mount. The work shall include the testing of all equipment function, all software function, and camera capabilities.

This specification also includes the work necessary to integrate the camera image and video data obtained by the CCTV camera into the Maine Department of Transportation (MaineDOT) Advanced Transportation Management System (ATMS) called New England Compass (Compass). Compass was developed by the Southwest Research Institute (SwRI) and is used by Maine, New Hampshire and Vermont for their respective Transportation Management Centers. The CCTV shall be integrated into MaineDOT's Axis Camera Station software.

654.02 General

The following paragraphs are added:

If any of the following hardware-specific requirements listed in the following sections cannot be met by a willing Bidder, but the Contractor believes that strict conformance to the given requirement is unnecessary or may be accomplished differently, the Contractor shall provide a list of the requirements that cannot be strictly met along with a justification for how the Contractor's proposed CCTV System Equipment may be considered functionally equivalent in accordance with Special Provision 103.

If the Contractor proposes to provide a new CCTV software, the Contractor shall provide a licensed copy of the software to the MaineDOT Transportation Management Center (TMC) for review. MaineDOT reserves the sole authority to determine if the proposed software may be considered functionally equivalent in accordance with Special Provision 103.

CCTV System data integration shall be accomplished with minimal interruption to the existing MaineDOT TMC operations or the existing Axis Camera Station software in use at the TMC.

Any required downtime of Compass shall be approved by the Resident at least seven (7) days in advance.

654.021 Materials

The following sections are added:

654.022 CCTV System Equipment – General

1. The CCTV camera shall be compatible with the existing Axis Camera Station software at the MaineDOT TMC. Alternatively, the Contractor may provide a different camera control software; however, if the Contractor elects to provide an alternative software, the Contractor shall also provide software licenses for all existing MaineDOT CCTV cameras, re-integrate all existing CCTV cameras into Compass, and provide 24/7 technical software support for a period of two years following project approval.
2. The CCTV camera shall be Underwriter's Laboratory (UL) approved. UL certification shall be provided with the catalog cuts in the Technical Submittal.
3. The CCTV camera shall weigh no more than 10 pounds.
4. The CCTV camera shall be digital, IP addressable and Ethernet ready.
5. The CCTV interface shall be an RJ45 type connector for 10BASE-T/100BASE-TX, and shall include an IP66-rated RJ45 connector kit.
6. CCTV System Image Requirements:
    a. The CCTV shall have the following image setting functionalities: Wide dynamic range (WDR), manual shutter time, compression, color, brightness, sharpness, white balance, exposure control, exposure zones, backlight compensation, fine tuning of behavior at low light, rotation, text and image overlay, 32 individual 3D privacy masks, image freeze on PTZ, electronic image stabilization and automatic defog.
    b. The CCTV shall provide a camera imaging system that automatically shifts from daytime mode to nighttime mode, and shifts from color mode to a black-and-white mode under very low light conditions, in order to render a more detailed video image.
    c. The CCTV shall provide automatic and manual control of camera imaging characteristics (such as exposure and contrast).
7. The CCTV shall return operational status and report system faults to Compass.
8. The CCTV shall receive and process camera positioning and camera configuration commands received from Compass.
9. The CCTV shall have the capability to be viewed, controlled, and tested locally at the camera site utilizing a laptop computer with OEM software. This shall include the capability to locally retrieve operational status and fault data for the CCTV.
10. The CCTV camera dome shall be constructed of clear polycarbonate with a sun shield.
11. The lower exterior dome shall be made of seamless polycarbonate, optically clear with no distortion, optical discontinuities, or anomalies of any type in any portion of the dome up to 20-degrees above horizontal.
12. The CCTV camera dome drive system shall consist of an integral camera pan-tilt assembly with a variable high speed drive unit with continuous 360-degree rotation, CCD camera, optical and digital zoom, auto focusing, motorized zoom lens and integral camera control receiver.

13. The CCTV shall have user-defined "pre-sets" for position, zoom, exposure and focus, to be defined by the TMC operators.
14. The CCTV shall have a minimum Pan/Tilt/Zoom functionality of: 100 preset positions, 360° endless pan at a speed of 0.05 - 450°/sec; Tilt - 220° at a speed of 0.05 - 450°/sec.
15. TMC control of CCTV PTZ features shall have a latency of no greater than one second.
16. The CCTV shall have an automatic variable pan-tilt speed adjustment operating as a function of degree of zoom.
17. The CCTV shall have a minimum 30x optical zoom and 12x digital zoom, total 360x zoom.
18. The CCTV shall have alarm triggers from multiple sources including intelligent video, PTZ position.
19. The CCTV shall have a minimum 1/3-inch progressive scan CCD image sensor.
20. The CCTV shall have a minimum illumination of: Color: 0.2 lux at 30 IRE; B/W: 0.04 lux at 30 IRE.
21. The CCTV shall have minimum resolution range of: HDTV 320x180 up to 1920x1080, 1080p.
22. The CCTV shall provide H.264 (MPEG-4 Part 10/AVC) and Motion JPEG video compression formats.
23. The CCTV shall have a minimum frame rate of: H.264 25/30 frames per second (fps) (50/60 Hz) in all resolutions, M-JPEG: up to 25/30 fps (50/60 Hz) in all resolutions.
24. The CCTV shall be capable of multi-streaming in H.264 and Motion JPEG formats: Multiple individually configured streams in maximum resolution at 30/25 (60 / 50 Hz) fps. The frame rate and bandwidth shall be controllable.
25. The CCTV shall have the following security features: password protection, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, digest authentication, user access log.
26. The CCTV shall support the following protocols: IPv4/v6, HTTP, HTTPS, QoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, SNMPv1/v2c/v3 (MIB-II), DNS, DynDNS, and NTCIP.
27. The CCTV shall conform to the ONVIF Profile S standard and have an open Application Programming Interface (API) for software integration.
28. The CCTV camera shall be able to process, at a minimum, the following alarm events:
    a. File upload: FTP, HTTP, and network share.
    b. Email notification: email, HTTP and TCP.
    c. Data transmitted from CCTV camera: PTZ preset, guard tour, video recording to edge storage, auto-tracking, day/night mode, and pre- and post-alarm video buffering.
29. The CCTV installation shall include two (2) in-line transient voltage surge suppression (TVSS) to protect against transients and surges carried by the associated Ethernet cable. One unit shall be placed within 5 feet of the camera enclosure and the second internal to the ITS cabinet before the associated Ethernet switch port.
30. The CCTV shall be powered by an industrial grade Power Over Ethernet Injector (POEI).

a. The POEI shall provide operating power and Ethernet data to the CCTV. The POEI power consumption shall not exceed 60 watts.
b. The POEI shall include integral TVSS to protect against transients and surges on the incoming power and data (Ethernet) connections to the POEI, as well as to protect against transients and surges on the outgoing data (Ethernet) connection to the camera. The TVSS shall be a product approved by the CCTV manufacturer for use with the camera.

31. The CCTV shall be housed in an environmentally hardened aluminum enclosure suitable for continuous outdoor use and shall feature an internal temperature regulation system. The CCTV shall be IP66-, NEMA 4X- and IK09-rated and shall have an operating temperature range of -40°F to +122°F, minimum.

654.023 CCTV Support Pole and Lowering Device

1. The CCTV support pole and all associated members shall be designed by a licensed Professional Engineer and designed and fabricated in accordance with the current edition of *AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* and MaineDOT *Standard Specifications Section 504*, except as noted below:

Basic Wind Speed:	1700-year Mean Recurrence Interval (MRI) basic wind speed of 130 mph (209 km/hr)
Fatigue Importance Category:	Cantilevered Category II (poles with distance to roadway > height of pole)
Fatigue Importance Category:	Cantilevered Category I (poles with distance to roadway ≤ height of pole)

2. The pole shaft shall be one or two-piece construction and shall conform to ASTM A595 Grade A with a minimum yield strength of 55 ksi or ASTM A572 with a minimum yield strength of 55 ksi.
3. The pole shaft and all associated ancillary members shall be steel, galvanized in accordance with the current *AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* and MaineDOT *Standard Specifications Section 720*.
4. The CCTV support pole shall be designed to support the CCTV camera, dual lowering devices (even if the proposed structure only requires one lowering device), and ancillary equipment in the quantities and locations indicated on the CCTV Detail plan sheets. If only one lowering device is shown on the CCTV Detail plan, the design calculations shall account for a second lowering device located at 90 degrees from the proposed device. Close consideration shall be given to the effective projected area of the complete lowering system and equipment to be mounted on the pole along with the weight of attached hardware when designing the pole to meet the specified deflection performance criteria, including consideration for all possible loading combinations; and the factored design forces and resistances for all components which comprise the proposed structure. The top of the pole total deflection shall not exceed the following:
    a. 1 percent of pole height due to 90 MPH (non-gust) winds; and
    b. 1 inch due to 30 MPH (non-gust) winds.
5. The calculations shall include a pole, base plate, and anchor rod analysis (embedded length shall be confirmed by the Engineer designing the foundation). The pole

calculations shall be analyzed at the pole base and at 5-foot pole intervals along the full height of the pole. At each of these locations, the following information shall be provided by the Contractor:

a. The pole's diameter, thickness, section modulus, moment of inertia, and cross sectional area.
b. The centroid, weight, projected area, drag coefficient, velocity pressure, and wind force of each trapezoidal pole segment.
c. The factored axial force, shear force, primary moment, total moment, axial resistance, bending resistance, and capacity demand ratio (CDR) at each elevation.
d. The pole's angular and linear deflection at each location.

6. Hand Holes: The hand hole openings shall be reinforced with a minimum 2-inch wide hot rolled steel rim. The nominal outside dimension is 6 inches x 27 inches. The hand hole shall have a galvanized steel cover secured with a clip on lock and tamper proof bolts. The hand hole shall have a tapped hole for mounting a portable lowering tool. The hand holes shall be fully compatible with the portable lowering tool.
7. Weatherhead: A two-inch galvanized steel weatherhead shall be factory installed in the camera pole for wire access near the top of the pole as shown on the support pole plan details. No field drilling will be permitted.
8. Pole Top Tenon: The pole shall have a plate-mounted tenon that allows the field modification of the arms/camera orientation up to 360 degrees. The Engineer can then make slight orientation modifications to the camera mounts to allow optimum viewing in case of future road development; change in terrain or a change in the viewing needs priority. The tenon shall have mounting holes and slot for the mounting of the camera-lowering systems. The tenon shall be of dimensions necessary to facilitate dual camera lowering device component installations. Each slot shall be parallel to the pole centerline for mounting the lowering devices.
9. Cable Supports / Wire Eyes and Park Stands: Two wire eyes and three park stands shall be located within the pole. One wire eye shall be positioned 2 inches below the hand hole and the other shall be positioned one inch directly below the top of tenon. Two park stands shall be positioned a maximum of 2.0 inches below the top of the hand hole and located at 90 and 270 degrees from the hand hole. A third park stand shall be located in the center of the upper inside edge of the hand hole as shown on the drawings. These park stands shall be a minimum of ¼ inch O.D. and a max 3/8-inch O.D.
10. Base Plate: Base plates shall conform to ASTM A36 or A572 Grade 42.
11. Lightning Dissipater: The CCTV support pole shall be supplied with a lightning dissipater, consisting of a series of at least four spot dissipaters in a candelabra arrangement with a single mounting assembly. The lightning dissipater system shall include surge suppressor devices of the type recommended by the lightning dissipater manufacturer, and shall properly interface with the pole mounted dissipater, and the size and type of cables used for communication and control of any installed equipment.
12. Camera Junction Boxes: The camera junction boxes shall be of clamshell design with one hinge side and one latch side to facilitate easy opening. The general shape of the box shall be cylindrical to minimize the EPA. The Camera Junction Boxes shall have

stabilizing weights on the outside of the box to increase room on the interior. The boxes shall be capable of having up to 40 pounds of stabilizing weights. The bottom of the Camera Junction Boxes shall be drilled and tapped to accept industry standard dome housings and be able to be modified to accept a wide variety of other camera mountings. The junction boxes shall be gasketed to prevent water intrusion. The bottom of the box shall incorporate a screened and vented hole to allow airflow and reduce internal condensation per the manufacturer's specifications.

13. Camera Lowering Systems: The camera lowering systems shall be designed to support and lower an IP driven CCTV camera, lens, housing, pan-tilt-zoom (PTZ) mechanism, cabling, connectors and other supporting field components without damage or causing degradation of camera operations. The lowering systems shall consist, at a minimum, of a pole, suspension contact unit, divided support arm, and a pole adapter for attachment to a pole top tenon, pole top junction box, and camera connection box. The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and ensure the contact unit cannot twist under high wind conditions. The support arms shall be designed such that the arm will be locked in place to withstand camera support arm rotation under high wind conditions by either geometry, through-bolt construction, or other means.
14. The camera-lowering devices shall withstand wind forces of 100 MPH with a 30 percent gust factor using a 1.65 safety factor.
15. Suspension Contact Unit: The suspension contact unit shall have a load capacity of 600 pounds with a 4 to 1 safety factor. There shall be a locking mechanism between the fixed and moveable components of the lowering device. The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.
16. The prefabricated components of the lift unit support systems shall be designed to preclude the lifting cables from contacting the power or video cabling. The lowering device manufacturer shall provide conduit mount adapters for housing and isolating the lowering cables inside the pole.
17. The female and male socket contact halves of the connector block shall be made of a UL94, V-0 rated thermosetting synthetic rubber or approved equivalent. The female barrel contacts and the male pin contacts shall be encased into the connector block body.
18. All electrical and communication connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent moisture infiltration and degradation of the electrical contacts.
19. The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits and 1 volt peak-to-peak video signals as well as the power requirements for operation of dome environmental controls.
20. The interface and locking components shall be made of stainless steel and/or aluminum. All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive

environment. The corrosion resistance materials shall be as per manufacturer's specifications and procedures.

21. The camera assembly manufacturer shall provide the power and signal connectors for attachment to the bare leads in the pole top and camera junction boxes.
22. The camera assembly manufacturer shall provide a mounting flange sufficient for mounting their respective camera assembly to the bottom of the camera connection box.
23. Portable Lowering Tool: The manufacturer shall provide a variable speed, heavy-duty reversible drill motor and a lowering tool. The lowering tool shall be made of durable and corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment. This tool shall be compatible with accessing the support cable through the hand hole of the pole. The tool shall support itself and the load assuring lowering operations and shall provide a means to prevent freewheeling when loaded. The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load.
24. The lowering tool shall be provided with an adapter for operating the lowering device by a portable drill using a clutch mechanism. The lowering tool shall be equipped with a positive breaking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling.

654.024 CCTV Foundation. The foundation for the CCTV pole shall be constructed in accordance with Section 626 for drilled shaft foundations.

654.025 CCTV Cables

1. All equipment shall be supplied with the Manufacturer's recommended cables.
2. All free-hanging Ethernet cables shall be exterior grade suitable for wet environments and UV resistant..

654.03 Construction

The following sections are added:

654.031 CCTV System Construction Requirements

The Contractor shall install the CCTV system equipment in accordance with the Plans. The Contractor shall be responsible for all other work to provide a fully functional, operational, and integrated CCTV System at the locations identified in the Plans.

The Contractor shall install, configure, and test the CCTV image and video data in Compass and the MaineDOT Axis Camera Station software. The Contractor shall provide the first year software license for the new camera.

1. Power Requirements
    a. Each CCTV location shall be supplied with adequate power to meet the site and sensor design loads. The power may be AC (public utility power as provided by others) or DC (solar power system) as required by the Plans.

b. Where solar power is provided, the Contractor shall furnish, install, configure and test the solar power system equipment to provide the required power to the CCTV equipment.

2. Grounding, Bonding and Transient Voltage Surge Suppression System Requirements
   a. All CCTV sites shall be grounded to a minimum of 25 ohms to ground. If other national, state, or local grounding requirements are more stringent than those of the manufacturer, the applicable national, state, or local code shall apply.
   b. The Contractor shall install solid copper or copper clad ground rod (minimum of four each at ¾-inch x 10-foot) along with #4 AWG ground wire and fittings at the base of the CCTV equipment pole. The Contractor shall install additional ground rods required to meet the minimum grounding requirement.
   c. The ground wire shall be exothermically welded to each ground rod installed with all ground rods attached to every other ground rod via the ground wire.
   d. The CCTV grounding system shall be bonded to the controller enclosure bus-bar and the steel support structure in accordance with National Electric Code (NEC) requirements.
   e. The Contractor shall furnish and install Transient Voltage Surge Suppressor (TVSS) devices for all power and communications conductors installed.
      i. The Contractor shall provide and install a TVSS between the AC power mains and all installed equipment.
      ii. The CCTV shall include integral TVSS to protect against transients and surges on all incoming power and data connections to the CCTV. The TVSS shall be a product approved by the CCTV manufacturer for use with the CCTV.
   f. The CCTV support pole shall be supplied with an air terminal that is bonded by an insulated wire to the earth terminal-wire attachment at the base of the pole.
   g. The CCTV support pole shall be supplied with a lightning dissipater that is attached to a #6 AWG stranded bare copper wire bonded to the ground terminal.
   h. The lightning dissipater system shall include surge suppressor devices of the type recommended by the lightning dissipater manufacturer, and shall properly interface with the pole mounted dissipater, and the size and type of cables installed in the CCTV support pole.
      i. The lightning dissipater shall be attached to the CCTV support pole using manufacturer-recommended clamps that are attached to the pole. These clamps shall rigidly hold the lightning dissipater to the CCTV support pole in winds up to 100 MPH.
      ii. The lightning dissipater shall be offset from the CCTV support pole and provide protection for the site above any installed equipment without interfering with the functionality of any equipment or sensors.
   i. The CCTV lowering systems shall also be grounded to the same system as the CCTV support pole. The CCTV support pole shall also include provisions to allow for grounding connections of CCTV cameras through a lug located in the camera junction box. All installed CCTV cameras, lowering systems, and any other installed equipment shall be grounded.

3. Communications Requirements
    a. The CCTV system shall transmit image and video data to Compass and MaineDOT's Axis Camera Station software currently in operation.
    b. The Contractor shall provide all necessary equipment, cables, hardware, and ancillary equipment to capture the CCTV image and video data and transmit the data to Compass and to the Axis Camera Station software at the MaineDOT TMC.
    c. The communication system shall allow for configuration control and trouble-shooting of the CCTV equipment through both a local onsite connection and through a remote connection to the controller.

4. CCTV Support Pole with Lowering Devices.
    a. The Contractor shall supply and install internal conduits inside the pole to isolate and separate the lowering cables from all other equipment cables. These conduits shall interface with the lowering device through Manufacturer supplied mounting adapters. Only the lowering cable shall be permitted to move within the pole or lowering device during lowering or raising operations.
    b. The lowering system shall be provided and installed with all components as per manufacturer's specifications and procedures. The Contractor shall arrange for the Manufacturer's factory representative to be present on site to assist with the assembly, installation and testing of the lowering system.
    c. Camera lowering devices shall be installed to provide unobstructed camera views along the mainline roadway.
    d. Weights and/or counterweights shall be provided by the Manufacturer as necessary to assure that the alignment of pins and connectors are proper for the camera support to be raised into position without binding. The lowering unit shall have sufficient weight to disengage the camera and its control components for lowering.
    e. The Contractor shall provide a sealant between the lowering device and the camera assembly to assure water tightness of the camera assembly.

5. ITS Cables
    a. All equipment shall be installed using the Manufacturer's recommended cables.
    b. All cables shall be installed in a continuous run. Splicing will not be allowed.

654.04 Software and Integration Requirements

The following paragraphs are added:

If the Contractor proposes to supply equipment that is not fully compatible with Compass or the current Axis Camera Station software, the Contractor shall be required to fully integrate the non-compatible equipment into Compass and the Axis Camera Station software so that the new equipment operates in the programs in the same manner as the existing CCTV cameras. All costs associated with software development, coordination with the SwRI, and for all integration services shall be the responsibility of the Contractor. After the first year license, Axis Camera Station Software licensing fees will be paid by MaineDOT.

The Contractor shall ensure that Compass and the Axis Camera Station software reporting functions include and incorporate the new CCTV sites installed on this project.

654.07 Method of Measurement

The following paragraphs are added:

Highway Traffic Camera shall be measured by each installed, tested, operational, and accepted.

Closed Circuit Television (CCTV) Systems will be measured for payment by the lump sum complete in place per site, satisfactorily installed, tested, operational, and accepted.

654.08 Basis of Payment.

The accepted quantities of Highway Traffic Camera will be paid for at the contract unit price each complete in place. Payment shall be full compensation for furnishing and installing all Highway Traffic Cameras, Ethernet cables and associated communication equipment, power over Ethernet injectors (POEI), grounding and TVSS equipment, integration and software modifications, software licensing, system testing, training, warranties and guaranties, and all appurtenances, labor, tools, materials, transportation and incidentals required for a complete and functional installation.

Closed Circuit Television (CCTV) Systems will be paid for at the contract lump sum price for each location. Such price will be full compensation for furnishing and installing all materials, including but not limited to the CCTV camera; CCTV controller; support poles and foundations; lowering device system; mounting brackets and hardware; flexible and internal conduits; Ethernet cables and associated communication equipment; power over Ethernet injectors (POEI); grounding and TVSS equipment; integration and software modifications; software licensing; system testing; training; warranties and guaranties; and all appurtenances, labor, tools, materials, transportation and incidentals required for a complete and functional installation. Payment shall include all design calculations, submittals, and shop drawings for the support pole.

Payment will be made under:

Pay Item		Pay Unit
654.10	Highway Traffic Camera	Each
654.211	Closed Circuit Television (CCTV) System	Lump Sum