

## ITB 33957 - Attachment B - Specifications

**2018 OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION:** The 2018 Oregon Standard Specifications for Construction ("Standard Specifications") include detailed technical specifications in Sections 00200 and beyond that apply to this ITB and any resulting Contract. Some sections of the technical specifications may be identified and modified in the Plans and Specifications. Sections of the technical specifications not identified in the Plans and Specifications remain applicable to the Contract according to their original terms.

Sections in Part 00100 of the Standard Specifications (General Conditions) are not applicable to the Contract unless they are specifically identified in the Plans and Specifications as being applicable. However, if a Part 00100 specification that has been identified as applicable or a technical specification (Parts 00200 and beyond) references a section from Part 00100 that has not been identified as applicable, that section from Part 00100 applies to the Contract for purposes of supporting and giving full effect to the specification that referenced it. The Standard Specifications are available online at:

[http://www.oregon.gov/ODOT/Business/Pages/Standard\\_Specifications.aspx](http://www.oregon.gov/ODOT/Business/Pages/Standard_Specifications.aspx)

### **SPECIAL PROVISIONS:**

#### **SUBSECTION 00160.20 Preferences for Materials (a) Buy America**

While no federal funds will be used to pay the Contractor for work under this Contract, the larger bridge project includes federal funds; therefore, Contractor shall comply with Standard Specifications subsection 00160.20 (a) regarding Buy America provisions.

#### **SECTION 01320 INDEPENDENT WEST TOWER MAINTENANCE LIGHTING SYSTEMS**

**Section 01320**, which is not a Standard Specification, is included in this project by Special Provision.

**01320.00 SCOPE -** This work involves demolishing the existing electrical system on the South Tower of the East Interstate Bridge (in preparation for major mechanical repairs by others) in an organized manner that provides minimum interference with ongoing movable bridge operations.

This work involves the installation of new equipment and new electrical systems to mitigate the loss of the equipment and systems currently located on the South Tower that must be removed prior to mechanical repairs being conducted. After the mechanical repairs (by others) additional work will then be conducted (by others) to restore the South East Tower Electrical Systems of the Interstate Bridge that are removed by work performed under this specification.

This work includes the following general work items:

1. Install new West Bridge Lighting Controls. Install a new lighting transformer disconnect, lighting transformer, custom built lighting controller, electrical feeders, wiring, complete with associated equipment mounting structures.

2. Separate co-mingled receptacle services. Remove the existing 120 volt general purpose receptacles and receptacle conductors from the existing S.W. tower 480 volt lighting system conduits feeders. Install new receptacles with new dedicated feeders. Install Fused Switch, Circuit Breakers, Conduit feeders, Mounting Structures.
3. Install a new West Bridge Aviation Beacon and Radio Cabinet. Remove the existing S.W. Bridge Aviation Beacon feeder from the East Bridge and install a new feeder from this new S.W. beacon flasher cabinet. Install a new beacon flasher in this new cabinet. Re-locate existing East Bridge Radio Equipment and antenna to this new cabinet.
4. Install a new temporary East Bridge Aviation Beacon Flasher and lighting control cabinet on the S.W. Bridge Tower for the purpose of temporarily maintaining the S.E. tower Aviation Beacon and East Bridge Lighting System through an upcoming "Trunnion Replacement" project (to be performed by others). Install as indicated in drawings.
5. Re-wire maintenance lights for 208 volts. Re-wire the existing S.W (and S.E.) bridge tower lights for 208V service. Disconnect the existing S.W. Bridge tower maintenance lighting system from its current electrical supply located on the S.E. Bridge Tower. Remove the existing lighting transformers and controls currently located on the South Tower of the East Bridge. Wire the S.W. lights to the new "West Bridge" lighting controller. Install plugs and cords on the S.E. Maintenance Lights.
6. "Relocate and re-conductor S.E. tower electrical feeders ". Demolish the existing S.E. tower electrical systems. Remove Panelboards, Cabinets, and Transformer T-SEG. Install a new Junction Box on the S.E. tower stairway. Break existing vertical tower conduits and install a new feeder from walkway above. Re-conductor existing conduits extending from the S.E. tower to the South Gatehouse as indicated in drawings.

This work must be scheduled to maintain movable bridge operations and vehicular road traffic at all times. Plan to use the existing maintenance walkways and stairs on the Bridge unless specific arrangements are otherwise made.

**01320.01 Definitions and Abbreviations** - In addition to the definitions and abbreviations included in Part 00100 of the Standard Specifications, the following are defined for use in Part 01320:

Approved - Means approved by the Engineer  
 EMT - Electrical Metallic tubing  
 NEC - National Electric Code  
 NRTL – Nationally Recognized Testing Laboratory

**01320.02 Codes and Standards** - The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only:

American Society for Testing and Maintenance of Materials (ASTM)

ASTM A 123 Zinc (Hot dip Galvanized) coatings on iron and steel products  
 ASTM A 153 Zinc Coating (Hot Dip) on Iron and Steel  
 ASTM A 475 Guy Strand

Institute of Electrical and Electronic Engineers  
IEEE C57.12.80 Dry Type Distribution and Power

NEC National Electrical Code NFPA 70 (2017 edition)

National Electrical Manufacturers Association (NEMA)

NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)  
NEMA AB 1 Molded Case Circuit Breakers and Molded Case Switches  
NEMA ICS 1 Industrial Controls and Systems  
NEMA ICS 2 Industrial Control Devices, Controllers and Assemblies  
NEMA ICS 6 Enclosures for Industrial Control Systems  
NEMA PB1 Panelboards  
NEMA WD 1 General Requirements for Wiring Devices  
NEMA ST20 Dry-Type Transformers for General Applications

National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code

Underwriters Laboratories (UL)

UL 6 Rigid Metal Conduit  
UL 20 General Use Snap Switches  
UL 67 Panelboards  
UL 198B Class H Fuses  
UL 198D Class K Fuses  
UL 467 Grounding and Bonding Equipment  
UL 486C Splicing Wire Connectors  
UL 489 Molded Case Circuit Breakers and Circuit Breaker Enclosures  
UL 510 Electrical Insulating Tape  
UL 514A Metallic Outlet Boxes  
UL 541B Fittings for Conduit and outlet Boxes  
UL 651 Rigid PVC conduit and HDPE conduit  
UL 687 Non Metallic Sheathed Cables  
UL 797 Electrical Metallic Tubing  
UL 845 Motor Control Centers

**01320.03 Coordination & Compliance** - Coordinate with Agency Personnel, U.S. Coast Guard, the Federal Aviation Administration and both the Local and State Agencies of both Oregon and Washington. Investigate and comply with all Federal, State, and Local regulations that may apply. Comply with all environmental, safety, and other regulations that may apply.

**01320.04 Timing** - The Contractor shall sequence and schedule this work to expeditiously complete the work with the least possible delay and to minimize the impact on both vehicular and marine traffic. The scheduling of any work that prevents or limits operation of the drawbridge must be approved by the Coast Guard and the Engineer before beginning construction.

All marine traffic closures require 30 day notice to the Coast Guard.

**01320.05 Materials Approval** - Equipment submittals shall include manufacturer's description and technical data sheet. Also, if applicable include schematic diagrams, equipment layout, anchorage, and special instructions.

**1320.06 UL or NRCL listing** – Unless specifically listed as a “Certification Exempt Traffic Management System Components (Red Sheets)” all electrical components and assemblies shall either be UL listed or shall conform to a nationally-recognized testing agency. An Underwriters Laboratories Inc. label shall be evidence that materials or equipment conform to the applicable standards. In lieu of this label or listing, submit a statement from a nationally-recognized testing agency indicating UL standards conformance. For other than UL standards, a manufacturer's statement or advertised conformance to the standard is acceptable.

**01320.07 Procedure Approval** - Submittals shall contain sufficient procedural detail to show compliance with drawings and specifications.

**01320.08 As-Built** - Furnish two sets of as-built electrical drawings. Submit the most recent drafts to the Engineer 10 days prior to the appropriate equipment operation demonstration. Submit final copies 30 days prior to project acceptance walk-through.

Shop Drawings shall include a reference to material specifications for each item used in the design or construction of any unit furnished as part of the machinery under this contract, including material specification, detail drawings and dimensions of principle elements.

**01320.09 Permits** - Obtain all required electrical permits and pay all fees to obtain these permits.

## **Materials**

**01320.10 General** - Provide materials and equipment which are the standard product of a manufacturer regularly engaged in the manufacture of the product and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

Verify that the all system components are compatible with the equipment installed and in compliance with NEC. Verify that all equipment is either UL listed, NTRL listed, or is specifically exempted traffic control equipment contained in the "ODOT Red Sheets". Comply with all Local Electrical Codes.

Where manufacturer's catalog numbers are included with material specifications, they are for the Contractor's convenience in determining acceptable materials. Verify these numbers prior to ordering. In all cases, the material specifications shall take precedence over catalog number references. If uncertainty remains, obtain clarification from the Engineer. An equivalent from another manufacturer may be substituted for any items allowing an approved equal, subject to approval by the Engineer. Make substitutions at no additional cost. Permanently mark all equipment with manufacturer's name.

**01320.10(a) Product Condition** - All products, except those shown or specified as requiring rehabilitation and reinstallation, shall be new. All similar items shall be from the same manufacturer and of the same quality.

**01320.10(b) Transportation and Storage** - Protect all materials from damage and corrosion during shipping and storage. At the Engineer's discretion, either replace or repair all equipment damaged by corrosion or improper handling at no cost to the state.

**01320.10(c) Name Plates** - Identification nameplates are required on all equipment as shown and shall be made of laminated plastic with black outer layers and a white core. Chamfer edges. Fasten plates with black-finished round-head drive screws or approved non-adhesive, metal fasteners.

Minimum height in inches of the lettering shall be as follows:

Cabinets - 3/4

Compartments - 3/4

Function and indicator lighting - 1/4

**01320.11 Electrical Conductors** - All single-conductor wiring shall be XHHW insulated wire rated for 90 Deg C operation in dry locations and 75 Deg C operation in wet locations. Size and group are indicated in the panel and conduit schedules.

Power Circuit Color-coding - Provide color-coding for all conductors. Service, feeder, and branch conductors shall conform to wiring standards.

120/208Y	Black (A), red (B), and blue (C)
277/480Y	Brown (A), Orange (B), Yellow (C)
120/240	Black and Red
Grounding	Green

Neutral - white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe.

Larger conductors, #6 AWG or larger, shall be identified by use of half-lapped bands of colored tape around the insulation wrapped for a minimum of 3 inches length near the end and in all junction and conduit boxes.

**01320.12(a) Outdoor Electrical Enclosures** - Provide Type 16 gauge 316 stainless steel NEMA 4X rated enclosures locations unless specifically stated otherwise (on drawings or in this specification). Enclosures containing routinely-accessed equipment such as breakers, amplifiers, power supplies, etc., shall be hinged. Exception: Small outlet boxes serving as junction boxes in lighting and general-purpose receptacle services may be a water-tight gasketed cast-iron-type complying with UL 514A.

**01320.12(b) Device Boxes** – NEMA 1 Sheet Steel device boxes may be used in conjunction with EMT conduit only within the confines of the Operators Bldg. Use NEMA 4X Type 316 stainless steel UL or NRCL listed device boxes conforming to the UL 514A and UL 514B standards on all exterior boxes not specifically identified in contract drawings or in these specifications.

Provide NEMA 4X device boxes with both covers and screws of type 316 stainless steel and with neoprene gaskets temperature rated to a minimum of 100 deg C. Provide device boxes with approved threaded NEMA 4X conduit hubs on conduit feeders to light fixtures, switches and receptacles exterior to the Operators Building.

**01320.12(c) Conduit Expansion Fittings** - Provide an approved conduit expansion fitting with insulating bushings and bonding jumpers. The conduit fitting shall be a UL listed (File No. E-11853) and SA certified (File no. 11584), weatherproof hot dip galvanized malleable iron type fitting suitable for use with rigid steel conduit. It shall provide a minimum of 4 inches of total movement and 2 inches in either direction. Insert between span sections, between pier and span sections, and on conduit runs in excess of 100 feet in length at intervals not exceeding 200 feet.

**01320.12(d) Reducer Couplings** - Do not use reducer couplings.

**01320.12(e) Conduits and Distribution Feeders** - Use Rigid galvanized conduits conforming to the UL-6A standard unless specifically stated otherwise in drawings or this specification. Install all power distributions feeders indicated in drawings. Reference the drawings for feeder type and location.

**01320.12(f) Conduit hubs** - Provide hubs on all exterior and NEMA 12 cabinets such as junction boxes, fused switches, and panelboards, except where threaded conduit hubs are integral to that equipment. These shall be die cast zinc, insulated and gasketed NEMA 4X, UL listed, CSA certified, conduit hubs complete with grounding screws.

**01320.13(a) Strut System** – Unless otherwise indicated in drawings, submitted and approved the conduits, junction boxes, panelboards, and transformers will be installed upon an approved manufactures “Strut System” consisting of 1-5/8 inch wide channels along with pre-manufactured channel nuts, clamps, and other hardware specifically designed for the propose of assembling equipment of the type previously described. The properties of this “Strut System” being as follows:

- (a) The Strut shall be hot dipped galvanized type fabricated from Structural Steel meeting the minimum mechanical properties of ASTM A1011 33,000 PSI min. yield, mill galvanized coating designation G90.
- (b) The Strut shall be hot dip galvanized after fabrication in accordance with ASTM 123.
- (c) Fittings shall be manufactured from steel meeting ASTM A1018 30,000 PSI min. yield and hot dip galvanized after fabrication in accordance with ASTM A123.
- (d) All hardware shall be Stainless Steel (Type 304 or 316).
- (e) Channel supporting for conduits and small junction boxes shall be a 1-5/8 inch wide by 1-5/8 inch deep 12 gauge type min.
- (f) Channel supporting small junction boxes, small panelboards unless specifically stated otherwise in this specification or otherwise indicated in drawings shall be a minimum 1-5/8 inch wide 3-1/4 inch deep 12 gauge minimum type and approx. 3.05 lbs. / foot in weight
- (g) Channel Structures supporting panelboards Transformers and lighting controllers shall be a dual back to back channel type approx. 1-5/8 inch wide by 6-1/2 inch deep and approx. 6.1 lbs. / foot.

**01320.13(b) Channel Conduit Clamps** – Use approved one hole Hot Dip Galvanized (conforming to ASTM A123 or A153) steel conduit clamps specifically designed for the channel used and for the trade size of the conduit being supported. The minimum steel gauge and minimum design loads shall be as follows:

Conduit Size	Gauge	DESIGN LOAD
½ Inch	16	400 Lbs.
¾ Inch	16	400 Lbs.
1 Inch	16	400 Lbs.
1-1/4 Inch	16	400 Lbs.
1-1/2 Inch	12	750 Lbs.
2 Inch	12	750 Lbs.
2 ½ Inch	12	750 Lbs.

**01320.13(c) Channel and Beam Clamps** – U-Bolts and Beam Clamps used to secure galvanized steel channels to the bridge structures and railings shall be approved hot dip galvanized type conforming to ASTM 123 unless otherwise submitted and approved.

**01320.13(d) Conduit Hangers** - Exterior Conduit Hangers, unless otherwise submitted and approved, shall be a heavy gauge type 316 Stainless Steel hanger meeting the requirements of the ASTM A167 Standard. All threaded rods, concrete anchors, and other hardware associated with the hangers shall be type 316 Stainless Steel. Interior Conduit Hangers located within the confined of heated buildings may be approved Zinc Plated Steel.

**01320.13(e) Conduit Bodies** – use approved UL listed hot dip galvanized grey iron alloy type conduit bodies with gasket and iron alloy type clamp-on covers conforming to the requirements of the UL 514B Standard.

**01320.13(f) Covers & Screws** - Cover Screws on Conduit bodies shall be an approved “Clip-On” Grey Iron/Zinc Electroplated type suitable for use with the Malleable Iron type Conduit Type Outlet Bodies .

**01320.14 Receptacles & Outlet Boxes** - In all areas exterior to the operators building, located within the control cabinets SWT, or in Camera Cabinet #2; install receptacles in approved FS or FD iron alloy type outlet boxes with minimum 3/4 inch integral threaded conduit hubs, mounting lugs, and NEMA 4X rated cover plates. Receptacles located inside the operators building or indicated NEMA 4X cabinets may be standard UL listed 15 amp receptacles installed in standard NEMA 1 sheet steel receptacle boxes.

Non-locking single 125 Volt 15 amp rated NEMA type 6-15 type Receptacles with a single lift cover shall be used on all outdoor receptacles unless otherwise indicated in drawings or this specification.

Exceptions shall include the temporary service installed for the SW aviation beacon and the temporary 208 volt lighting plugs which shall be of similar construction but shall have a locking type receptacle voltage rated as indicated in drawings.

**01320.15 Circuit Breakers** - Provide molded case bolt-on type with thermal-magnetic trip type circuit breakers. All Circuit Breakers shall be from the same manufacturer and of the same frame size that comply with the applicable NEMA standards listed in this specification.

**01320.16 Transformer T-SWML** – Provide a 15KVA 3 phase 480V Delta Primary – 208Y/120V Secondary Stainless Steel NEMA 3R non-ventilated epoxy-resin encapsulated transformer dimensionally suitable for mounting in the channel structure and area indicated in contract drawings. Design was based on a 300 lb. transformer approx. 14.75 inches in height, 19.5 inches in width, 12.25 inches in depth.

**01320.17(a) Fused Switch FS-SWL** – Install a 3 Pole 30A 600V 10K AIC rated NEMA 4X 316 Stainless Steel type UL or NRCL listed fused Switch with 3 each 30A Class R5 fuses installed. Mount on Channel Steel Frame as indicated in Drawing. Design was based on an approx. 15 inch high, 8-3/4 inch wide (with handle), 5-14 inch deep fused switch.

**01320.17(b) Fused Switch FS-TSW** – Install a 3 Pole 30A 600V 10K AIC rated NEMA 4X 316 Stainless Steel type UL or NRCL listed, fused Switch with 3 each 30A Class R5 fuses installed. Mount on Channel Steel Frame as indicated in Drawing. Design was based on an approx. 15 inch high, 8-3/4 inch wide (with handle), 5-14 inch deep fused switch

**01320.18 Lighting Controller CC-SWML** - Shall be an approved custom designed NEMA 3R hardened junction box with the exterior portions constructed out of 10 gauge type 316 Stainless Steel. This custom fabricated junction box and lighting control assembly incorporates the functionality and features of existing ODOT traffic type lighting control junction boxes currently being used.

It shall be fabricated in a facility licensed to attach a UL or other Nationally Registered Testing Agency's certification. Reference the contract drawings. The dimensions indicated on the contract drawings are approximate. Coordinate with the fabricator and adjust as required to meet UL and NEC safety requirements and provide the following parts and features.

- A. Provide a vertically swinging and locking front door with locking hasp, integral 1 inch bottom conduit hub and a stainless steel back panel that is dimensionally suitable for mounting the electrical the equipment indicated in drawings.
- B. Provide a hinged front panel that provides a dead front type access to the circuit breakers when the vertical front panel door is open. Construct this hinged panel to open and provide maintenance access to the internal components behind. Mount a switch on this panel as indicated in drawings.
- C. Install 3 each 2 pole 20 Amp UL listed Molded Case Bolt-on type Circuit Breakers rated to interrupt a minimum of 10KA @ 240Vac. The circuit breaker shall be dimensionally suitable for the enclosure. Design was based upon a circuit breaker 6.3 inches high, 2.8 inches wide and 3.4 inches deep designed to mount directly upon the back panel.
- D. Install 2 each UL type 3 Pole 20a electrically held lighting contactors with 120Vac coils and built-in normally open aux contacts. A 4 Pole contactor may be used in lieu of the 3 pole with aux contacts They shall be specifically manufacturer rated for tungsten, high Intensity discharge lighting (including high pressure sodium), and other general propose loads.



- E. Install 2 each UL Listed, CSA certified 60A min, 150 Deg C min rated, 600V Min rated Phenolic type 6 circuit terminal block complete with cover rated to accept up to 2 each #14 - #10 AWG min range copper conductors at each terminal having overall dimensions of approx. 1-1/2 inches wide by approx. 4 inches long to accommodate surface panel mounting as indicated in drawings.
- F. Install 1 each isolated copper ground bar rated at a minimum of 40 amps with screw terminals capable of accepting a minimum of 6 each #10awg copper conductors as indicated in drawings.
- G. Install 1 each solidly bonded copper ground bar rated at a minimum of 40 amps with screw terminals capable of accepting a minimum of 6 each #10awg copper conductors as indicated in drawings.
- H. Install an approved 600V 60A min rated 3 terminal power distribution block suitable for connection and wiring to the 3 phase 15KVA directly below it (ref contract drawings).
- I. Wire the lighting controller as indicated in drawings and make all connections indicated in drawings.

**01320.19(a) Control Cabinet CC-SWT** – Shall be a single door UL or NTRL listed, NEMA 4X rated type 304 or 316 Stainless Steel Floor Mount and Free Standing Cabinet type enclosure approximately 72 inches high, 30+ inches Wide, and 24 inches in depth constructed with minimum 14 gauge steel. It shall have a continuously hinged door on one side with quarter-turn latches on the other side. It shall have bonding provisions on the door. It shall be provided complete with a minimum 60 inch high, 26 inch wide steel back panel suitable for mounting electrical and electronic equipment as indicated in drawings. Install approved Ventilation and Fan on front door of enclosure as indicated in drawings.

**01320.19(b) Junction Box JB-SNE** - Shall be an a 12 inch high, 10 inch wide, 6 inch deep, UL or NTRL listed, NEMA 4X type 316 14 gauge stainless steel junction box with an approx. 10.75 by 8.88 inch back panel approx. 5.5 inches from the front junction box door. It shall have a stainless steel clamp type cover with 4 each stainless steel screws and clamps. It shall have bonding provisions both on the door and body of the junction box.

**01320.19(c) Junction Box JB-SNE Power Distribution Block** - Shall be a UL or NTRL listed, 175 Amp min rated 3 pole power distribution block rated for a minimum of 175 amps having 3 line side connectors capable of accepting a wiring range of #14 awg to #2 awg and 3 load side connectors with 4 each wire connection points per pole. The load side connectors shall be capable of accepting wires in the range of #14 to #4 awg conductors It shall be provided complete with a block cover. Design was based on overall dimensions of 2.75 inches across all 3 poles, 2.88 inches wide and 1.88 inches in height. It shall be UL listed and CSA certified

**01320.19(d) Junction Box JB-WSET** - Shall be an a 24 inch high, 20 inch wide, 6 inch deep UL or NTRL listed, NEMA 4X type 316 14 gauge stainless steel junction box. It shall be provided with an approx. 21 by 17 inch back panel mounted approx. 5.5 inches from the front junction box door. It shall be a surface mounting type with 4 each integral mounting tabs top and bottom allowing it to be bolted to a surface without penetrations of the junction box. It shall have bonding provisions on the door and a grounding stud on the body. It shall have a continuously hinged front panel door with 4 bolt type Stainless Steel Clamps and bonding provisions both on the door and

junction box. Mount 2 each approved power distribution blocks on the back panel as indicated in drawings.

**01320.19(e) Junction Box JB-WSET Power Distribution Blocks** - Install two each UL or NTRL listed, approved 3 pole "Power Distribution Blocks" on the Back Plate of Junction Box JB-SNE. This terminal block shall have an approved shield or cover to prevent accidental contact with the terminals. The Voltage rating of the Block shall not be less than 480Volts.

Each of the 3 poles of the block shall have provisions for accepting 2 each input terminal copper conductors and 2 each output conductors and the terminals shall be copper. Each of the four total terminals on each pole of the 3 pole terminal block of shall be capable of accepting copper wires in the range of 250mcm - #6 AWG range and each terminal shall have a current rating of not less than 200 amps with each pole on the block rated at a minimum of 450 amps. Design was based upon a 3 pole horizontally stacked terminal block assembly of one pole elements having an overall dimension of 6.66 inches by 3.75 inches.

**01320.19(f) Junction Box JB-NRC** - Shall be an either 10 or 12 inch high, 10 inch wide, 6 inch deep UL or NTRL listed, NEMA 4X type 316 14 gauge stainless steel junction box without a back panel.. It shall have a stainless steel clamp type cover with 4 each stainless steel screws and clamps. It shall have bonding provisions both on the door and body of the junction box.

**01320.19(g) Junction Box JB-OB1F, JBOB2F, JBOB3F** - Shall be a UL or NTRL listed, NEMA 1 screw cover type minimum 16 gage galvanized sheet steel type junction box without Knockouts. They shall have mounting holes on the back of the junction box. They shall be a minimum of 8 inches square and a minimum of 4 inches deep.

**01320.20 Incandescent Type Aviation Beacon Flasher** - Provide 2 each Incandescent Type Aviation Beacon Flasher systems that are compliant with Federal Aviation Administration FAA AC 150/5345-43F and fully compactable with the exiting incandescent Aviation Beacons currently installed on the Interstate Bridge. The Aviation Beacon Flasher shall be specifically listed as being suitable for use on a structure height in the 150 to 350 foot range and having an Input Voltage of 120 Volts. The Aviation beacons flashers provided shall be contained in a Manufactures NEMA 4X rated enclosure. The Beacon Flasher shall be dimensionally suitable for installation both inside the Cabinet and outside as indicated in contract drawings. Design was based on an approximately 16 inch square 6 inch deep size unit.

## **Construction**

**01320.40 General** – Protect all equipment in the process of being installed from physical damage by moisture and dirt. Protect electrical conductors from dirt and grease during the installation process.

**01320.41 Electrician** - Use a licensed electrician for electrical construction. Portions of the Interstate Bridge electrical system are located both in the State of Washington and the State of Oregon. Investigate and verify that all applicable licenses, both State and Local, have been obtained.

**01320.42 Drilling of Structural Steel** – Obtain Agency approval before drilling, welding, heating, or performing any action which could weaken the Structural Steel of the bridge. Use approved clamps and other approved means to run conduit and mount cabinets whenever possible.

**01320.43 Construction Scheduling** – Schedule construction to minimize the interruption of both highway and river traffic and to minimize or eliminate the interruption of critical bridge safety, control and maintenance systems. Specifically schedule both demolition and construction such that:

- (a) The existing Aviation Beacons currently operating on the top of both the South West and South East bridge towers shall remain operational at all times, except for single scheduled short interruption when the electrical power is transferred from their existing “Aviation Beacon Flasher” located in Camera Cabinet #3 to the new “Aviation Beacon Flashers” to be installed on the South West bridge tower as indicated in drawings. Notify Agency Personnel in writing and obtain Agency approval before proceeding with that transfer.
- (b) Install the new “Up River” Video camera system as indicated in drawings and described in section 01330 of this specification prior to the demolition of any electrical systems, fiber optic cables, enclosures or equipment that would render existing “Up River” camera inoperative. Submit written notification to Agency personnel stating when that the new “Up River” video camera system is functioning properly and obtain Agency approval to proceed before any demolition that would render the existing camera inoperative.
- (c) Schedule the installation of the new West Bridge maintenance lighting “Control Cabinet CC-SWML”, Transformer “T-SWML”, fused switch “FS-SWL” along and associated wiring and conduits feeders prior to removing the existing electrical feeder from Camera Cabinet #3 located on the S.E. bridge Tower.
- (d) Complete the installation of the new West S.W. tower bridge lighting system prior to demolition of the existing East bridge S.E. tower bridge maintenance lighting system. Schedule work in in an approved manner that minimizes the interruption of the west bridge maintenance lights.
- (e) Complete the installation of the new temporary East bridge South tower lighting controller prior to demolition of the existing East Bridge S.E. tower bridge maintenance lighting system. Schedule work in in an approved manner that minimizes the interruption of the East Bridge South Tower maintenance lights.
- (f) Schedule the removal of the individual of the S.E. maintenance lights from the existing S.E. tower electrical system to maintain as much of that lighting system to remain functional as possible. In general re-configure the lights for 208 Volt operation and install plugs on each fixture one at a time.
- (g) Coordinate with Agency personnel minimize the downtime of existing Panelboard P-PR4\_M when removing the existing and installing new conductors in the existing conduit C-NEF2. Coordinate with Agency Personnel and install and provide a temporary approved 480V 3 phase Power Cord feed from within the South Gatehouse to Panel PR4-M upon Agency request

**01320.44 Vertical Raceway Support** - Support shall be installed at the top of all vertical conduit runs that exceed 30 feet. Re-Establish Vertical Raceway Support when replacing the conductors in conduits C-NEF2 and C-SEG as indicated in drawings.

**01320.45 Camera Cabinet #3 Fiber** – Remove the existing fiber-optic cable from Camera cabinet #3, pull it back to the junction box as indicated in drawings, coil and support it from the connecting walkway in an approved manner. Remove it in a manner that will allow the end portion of the cable to be cut back and the fibers in it to be spliced to new fibers. Take care not to damage the cable more than necessary and seal the end in an approved manner.

**01320.46 Access** – Primary Access to the Catwalks at the top of the South East and South West Towers is via Stairs located on the West side on the South East Tower (Reference Drawings). Subject to Agency scheduled times and conditions however both the counterweights and movable span of both the East and West Interstate Bridges can be used to transport materials to these catwalks. See Specification Section 01320.102

**01320.47 Scheduled Bridge Lifts** – Any and all requests for scheduled bridge lifts, for the purpose of delivering supplies and materials to the top of the “East Interstate Bridge Towers” shall be made by directly contacting “Mark Gross” (Interstate Bridge Supervisor), either in person or via his cell phone (503-880-4126).

In addition to the verbal contact submit either a written or e-mail notification to both Mark Gross and the Agency representative stating that such contact was made, documenting the time, date and by whom that contact was made, and giving a summary of the conversation that ensued. Obtain either direct written or E-Mail conformation from either Mark Gross or the Agency representative before proceeding.

Both the telephone and E-Mail (or other written document) shall be made a minimum of 24 hours prior to the desired lift time. All scheduled lifts will be done at night (8:00 PM to 5:00 AM) and any lane closure will need to be done by either by Contractor or an approved subcontractor.

**01320.48(a) Removal of Electrical Equipment** - Keep essential drawbridge equipment in operation except during scheduled outages. Remove enough of the existing electrical conduit and wiring to allow installation of new equipment while maintaining the integrity of the circuits. Where equipment and enclosures, listed in this specification, are to be removed and delivered to Agency Personnel keep damage to that equipment and those enclosures to a minimum.

**01320.48(b) Delivery of removed equipment to Agency** – The following equipment and enclosures are to be removed from the bridge and delivered to Agency Personnel.

- a. Camera Cabinet #3 complete with all equipment mounted in it.
- b. The existing “Up River” Camera and Camera Cabinet on the S.E. Bridge Tower.
- c. Existing Panel P-SEG on the S.E. Bridge Tower Walkway.
- d. The existing Lighting Panel on the S.E. Bridge Tower Walkway.
- e. Transformer T-SEG below the S.E. Tower Walkway.
- f. Existing S.E. Tower Lighting Transformer below Walkway
- g. Lighting Transformer Fused Disconnect S.E. Tower Walkway
- h. Fused Switch FS-STH on S.E. Tower Walkway.

Schedule a meeting with Agency Personnel a minimum of 2 weeks in advance of removing these items to establish removal procedures and responsibilities. Coordinate and schedule one or more bridge lift (as required) with Agency Personnel. Make provisions to either off-load indicated equipment from the S.E. Bridge Tower counterweight to Agency Trucks, proximate to roadway level, or to deliver them to an agency storage yard at the west end of the bridge (at contractor's discretion). Secure any and all equipment (such as cranes, cables, etc). Provide all equipment and labor required to do this.

**01320.49 Testing Installed Electrical Equipment** - Perform continuity and insulation tests on all panelboards, fuse-unfused switches and power circuits. Perform continuity tests on all instrumentation conductors and insulation tests on all instrumentation conductors in a common raceway with 480 volt power conductors. Perform continuity and insulation tests after installation and before energizing equipment. Submit the recorded values referencing the equipment label, location and dates to the engineer before energizing the equipment.

Conduct insulation tests on 480 volt equipment using a 1000 volt insulation-resistance test set. Record a reading after three equal and consecutive readings have been obtained. Resistance between phase conductors and between phase conductors and ground shall be 50 megohms or greater.

Conduct insulation tests for equipment rated 300 volts or less using a 500 volt insulation-resistance test set. Record the reading after the value remains constant for 15 seconds. Resistance between conductors and conductors and ground shall be 25 megohms or greater.

### **Measurement**

**01320.90 Lump Sum Basis** - There will be no measurement of work performed under this Section.

### **Payment**

**01320.95 Lump Sum Basis** - Each item amount shall be full payment for all equipment, materials, labor, and incidentals to complete the "Maintenance Lighting" work as directed.

Payment for the bid item "West Bridge Lighting Controls" includes installing fused switch FS-SWL, transformer T-SWL, lighting control cabinet CC-SWML, all associated equipment structures, and all associated electrical conduit feeders south of the center of the South tower connecting walkway.

Payment for the "Separation of co-mingled receptacle Service" Bid Item includes demolition of existing west bridge receptacles, feeders and wiring. Installing new South West Bridge Tower receptacle's, electrical feeders and new circuit breakers (in existing panelboards). It also includes the Installation of Fused Switch FS-TSW complete with its conduit feeder and mounting structure.

Payment for "West Bridge Aviation Beacon and Radio Cabinet" Bid Item includes the installation of the control cabinet CC-SWT, the installation of a S.W. tower Aviation Beacon Flasher in that cabinet, and installing new conduit feeder. It includes the fabrication and installation of the mounting structure on which the cabinet is to installed, the bridge railing modifications, the

Installation of new circuit breakers in existing panelboards, and all associated feeders, receptacles, wiring. It also includes the re-location of the radio equipment to be installed in it.

Payment for the "Temporary East Bridge Beacon and Lighting Controls" Bid Item includes the installation of a temporary East Bridge aviation beacon flasher, a temporary East bridge maintenance lighting controller, associated equipment mounting, conduits, wiring, and the installation of circuit breakers in existing panelboards

Payment for the "Re-Wire Maintenance Lights for 208 Volts" Bid Item includes re-configuring and rewiring the entire existing S.W. bridge tower lighting system and installing plugs and cords on all of the S.E. bridge tower lighting fixtures.

Payment for the "Relocate and re-conductor S.E. tower electrical feeders " Bid Item includes demolishing the S.E. tower electrical systems, Installing junction boxes JB-SNE and JB-WSET, replacing existing conductors and installing new conduits in their associated feeders.

Payment for "Permits" Bid Item includes all fees, materials, and labor associated with obtaining them.

## **SECTION 01330 CAMERA SYSTEM RELOCATION**

Section 01330, which is not a Standard Specification, is included in this project by Special Provision.

**01330.00 SCOPE** – This work includes installing a new 4K Ultra High Definition (4K UHD) Digital Ethernet Video Camera Bridge Operations and Security Camera System for the Interstate Bridge complete with 1 each new UHD 4K “Up Stream Camera”, 1 each high performance custom designed Personal Computer with specialized ultra-high performance video and network cards, an approved operating system, specialized “Open Source” Video Management Software, a large (60 inch minimum) UHD video display, a Joystick type camera controller, Allen Bradley Ethernet IP network switches, fiber-optic media converters, and all other equipment, cabling and wiring required to provide a complete and fully functioning Bridge Operations and Security Camera System.

The Agency design drawings and specifications describe the single PC (Personal Computer) custom built with sufficient memory, processing power, high speed memory, specialized network cards, specialized video cards, and specialized software and the proprietary network switches that will be used to serve as the “Backbone” of a future system to which additional future network cameras can be added. This system shall accommodate major camera manufacturers ONVIF-S compliant Network cameras (Axis, Panasonic, Bosh, Sony, etc.) and all major VMS software (Milestone XP Protect Express, ONNSI Ocularis, Qognify Nice Vision, Etc.)

The video system backbone equipment and equipment interfaces is complex and the services of an approved experienced “Systems Integrator” with approved manufacturer certified installers is required to approve all network interfaces and assure that all components are compatible.

The proprietary Allen Bradley IP network installation in this specification will require the Systems Integrator to have access to a “CISCO CCNA Industrial” certification. ONVIF (Open Network Video Interface Forum) certified manufacturers of video cameras, camera control equipment and “Video Management Software” will require the Systems Integrator to have access to manufacturers certified suppliers and installers as well. Submit for approval a documented listing of these certifications and individuals/organizations involved.

The “Video Management Software” shall provide basic motion detection and also allow for more complex “Analytic” capabilities such as “Moving Water Vessel” detection. Provide the latest versions available. Use manufacturers approved and certified software suppliers to load, setup this software. Provide on-site Video System software configuration and testing. Use approved manufacturer certified installers on all installed Fiber Optic equipment, connectors, terminations, testing, etc. Provide all software licenses required, in the Agencies name,

This work Includes the installation of new equipment and new electrical systems to mitigate the loss of the future loss of video equipment and systems currently located on the South Tower of the Interstate bridge. This new system must be installed and fully functional prior to the removal of the existing “Up Stream Camera” located on the S.W. tower of the Interstate Bridge. This work must be scheduled to maintain movable bridge operations and vehicular road traffic. Comply with all environmental, safety, and other regulations that may apply.

This work includes the installation of both and exterior rigid steel and interior EMT conduits, junction boxes, mounting structures, wiring, receptacles, etc. Reference and comply with applicable paragraphs of Specification Section 01320 in the installation of all conduits, junction boxes, and electrical work required.

**01330.01 Definitions and Abbreviations** - In addition to the definitions and abbreviations included in Part 01320 of the Specifications, the following are defined for use this section.

Approved - Means approved by the Engineer

4K UHD - "Ultra High Definition" means a Video Resolution of minimum 3840 X 2160 pixels.

E-ATX – (Extended ATX) is a de-facto industry standard configuration of "Asus Tek Inc"

EMT - Electrical Metallic tubing, Rigid means conforming to UL-6 Standard.

FCoE – "Fibre Channel over Ethernet" "Fibre Channel" allowing 10 Gigabit Ethernet networks

GPU – "Graphics Processing Unit" A programmable logic chip (processor) specialized for video

HDMI - "High-Definition Multimedia Interface." digital interface for transmitting Video and Audio

IP – "Internet Protocol" a communications protocol for datagrams across network boundaries.

ONVIF – "Open Network Video Interface Forum" a standard for IP-based security products

NEC - National Electric Code.

PC – Personal Computer

PCI – "Peripheral Component Interconnect" local bus standard developed by Intel Corporation

SATA – "Serial ATA" interface connects host to mass storage devices (hard disk drives etc.)

SFF+ "small form-factor pluggable" a compact, hot-pluggable optical module transceiver

VMS – Video Management Software

USB – "Universal Serial Bus" common interface that enables digital communication with PC.

**01330.02 Codes and Standards** - The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Due to the rapid development of Computer Technology it has been necessary to include some very commonly used and generally well understood "de-facto" industry standards and abbreviations in the specifications which follow. Contact agency personnel if additional clarification is required.

American Society for Testing and Maintenance of Materials (ASTM)

ASTM A 123 Zinc (Hot dip Galvanized) coatings on iron and steel products

ASTM A 153 Zinc Coating (Hot Dip) on Iron and Steel

ATX (Advanced Technology eXtended) - is a de facto – Motherboard configuration specification developed by Intel in 1995. The most recent update April 4, 2014.

E-ATX – (Extended ATX) is a de-facto - configuration of "Asus Tek Inc" and generally refers to 12"x 13" Motherboard Dimensions however it is commonly extended to 12" x 10.1", 12"x10" and 12" x 10.7" sizes as well. It is necessary to verify the screw hole configurations and motherboard dimensions are compatible with the Case in all cases however.

NEC National Electrical Code

National Electrical Manufacturers Association (NEMA)

NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA ICS 1 Industrial Controls and Systems

NEMA ICS 2 Industrial Control Devices, Controllers and Assemblies



NEMA ICS 6 Enclosures for Industrial Control Systems  
NEMA WD 1 General Requirements for Wiring Devices  
National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code

Underwriters Laboratories (UL)

UL 6 Rigid Metal Conduit  
UL 20 General Use Snap Switches  
UL 467 Grounding and Bonding Equipment  
UL 486C Splicing Wire Connectors  
UL 510 Electrical Insulating Tape  
UL 514A Metallic Outlet Boxes  
UL 541B Fittings for Conduit and outlet Boxes  
UL 651 Rigid PVC conduit and HDPE conduit  
UL 797 Electrical Metallic Tubing

JEDEC Solid State Technology Association: - DDR4-2666 JEDEC Memory Standard.

International Committee for Information Technology -SATA (Serial ATA) interface Standard:

SATA-IO is affiliated directly to INCITS (Inter-National Committee for Information Technology) and indirectly via INCITS to ANSI. See Serial ATA Revision 3.0 June 2, 2009

The Small Form Factor Committee: - SFF+ Standard : See following note:

The small form-factor pluggable (SFP) is a compact, hot-pluggable optical module transceiver used for both telecommunication and data communications applications. The Small Form Factor Committee is an ad hoc electronics industry group formed to quickly develop interoperability specifications (as a complement to the traditional standards process).

**01330.03 General Descriptions of work items** – This Section involves the following:

1. Secure the services of an approved and experienced “Systems Integrator” to Custom design and assemble the high performance Personal Computer (PC) with specialized high performance components including but not limited to its Case, Power Supplies, Mother-Board, Processor, high speed memory, Solid State Drives Network cards, Video Graphics Cards meeting the requirements described this specification. Submit documentation showing the qualifications and experience of the “Systems Integrator” for approval prior to proceeding to performing this work.
2. Secure the services of an approved CISCO “CCNA Industrial “ certified Installer and Install and configure the proprietary Allen Bradley Ethernet IP Industrial Distribution Network Switches, proprietary fiber optic media converters, cabling and fiber-optic work required to form the Backbone IP ONVIF camera network indicated in drawings and described in this specification. Submit documentation showing the qualifications of this installer for approval prior to performing this work.

3. The Custom Designed PC (see 1 above) in combination with the proprietary Allen Bradley Network Switches and wiring must be capable of becoming the backbone for several dozen future ultra-high definition network cameras over the IP industrial network installed in this specification. Submit for approval documentation stating a CISCO CCNA certified network installer has reviewed the PC described in paragraph #1 above and the Network described in paragraph 2 above. The equipment provided will have the capacity of supporting a minimum of 41 additional ONVIF compliant IP high resolution Video Cameras with PZT controls along with the Ultra High 4K UHD "Up Stream Camera".
4. Purchase a minimum 1 year Allen Bradley Software Support Package in the name of the Oregon Department of Transportation at the location of its "Technical Leadership Center 4040 Fairview Industrial Dr. SE, Salem, OR 97302". Then install the most recent updates to the two copies of "Rockwell Studio 5000" and the one copy of "Factory Talk View Studio" that are currently installed and licensed on two each Laptop Computers owned by ODOT. Have this done under the direction of the approved "CCNA Certified Installer" (see Paragraph 2 above).

If it is not possible, for any reason, to upgrade the Agency software as described in the paragraph above, purchase the latest versions of that software, license it to the Agency and install it on the Agency's computers, complete with a 1 year support agreement for that software.

5. Install an approved "Micro-Soft" PC operating system complete with an approved "Video Management Software" capable of accepting "Open Source Digital Network Cameras" in that custom designed PC.
6. Install proprietary Allen Bradley Ethernet IP Industrial Distribution Network Switches, proprietary fiber optic media converters, cabling and fiber-optic work to form the Backbone of a new IP camera network and connect the single new Ultra-High definition 4k "Up Stream" Pan Zoom Tilt Camera in this specification to that network.
7. Install Rigid Steel and EMT type conduits and Junction, as indicated in contract drawings, inside the operators building and upon the top of the North Tower of the East Bridge to provide for the routing of video and control cables. This work involves drilling through concrete and installing conduits at high elevations as required.
8. Install an approved high resolution (4K UHD) IP digital camera digital and IP Pan-Tilt-Zoom camera mount, on a custom designed vibration resistant camera mount, on the north tower of the Interstate Bridge as indicated in contract drawing.
9. Install an approved 60 inch minimum high resolution (4K UHD) Video monitor in the control room of the Interstate bridge as indicated in drawings along with the installation of an approved joy stick type camera control unit.

**01330.04 Scheduling** - The Contractor shall sequence and schedule the work to expeditiously complete the work with the least possible delay of both vehicular and marine traffic. Unless otherwise submitted and approved this work shall not impede either road or marine traffic on the Interstate Bridge. Coordinate this work with the demolition requirements of section 01320 as the camera installation in this specification must be completed prior to the demolition of the existing "Up River" camera demolished in that specification section.

**01330.05(a) Materials Approval** - Equipment submittals shall include manufacturer's description and technical data sheet. Also, if applicable include schematic diagrams, equipment layout, anchorage, and special instructions.

**1330.05(b) UL or NRCL listing** – Unless specifically listed as a “Certification Exempt Traffic Management System Components (Red Sheets)” all electrical components and assemblies shall either be UL listed or shall conform to a nationally-recognized testing agency. An Underwriters Laboratories Inc. label shall be evidence that materials or equipment conform to the applicable standards. In lieu of this label or listing, submit a statement from a nationally-recognized testing agency indicating UL standards conformance. For other than UL standards, a manufacturer's statement or advertised conformance to the standard is acceptable.

**01330.05(c) Procedure Approval** - Submittals shall contain sufficient procedural detail to show compliance with drawings and specifications.

**01330.06 As-Built** - Furnish two sets of as-built drawings. Submit the most recent drafts to the Engineer 10 days prior to the appropriate equipment operation demonstration. Submit final copies 30 days prior to project acceptance walk-through.

Shop Drawings shall include a reference to material specifications for each item used in the design or construction of any unit furnished as part of the machinery under this contract, including material specification, detail drawings and dimensions of principle elements.

**01330.07 Permits** - Obtain all required electrical permits and pay all fees to obtain these permits.

**01330.08 Electrician** - Use a licensed electrician for electrical construction. Electrical construction includes the installation of any conduits containing only low voltage limited power cables, instrumentation cable, etc.

## **MATERIALS**

**01330.10(a) General** - Provide materials and equipment which are the standard product of a manufacturer regularly engaged in the manufacture of that product. Unless specifically stated otherwise in this specification; these shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

Verify that the all system components are compatible with the equipment installed and in compliance with NEC. Comply with all Local Electrical Codes and regulations (includes the States of Oregon, Washington, and Federal Agencies).

Where manufacturer's catalog numbers are included with material specifications, they are for the Contractor's convenience in determining acceptable materials. Verify these numbers prior to ordering. In all cases, the material specifications shall take precedence over catalog number references. If uncertainty remains, obtain clarification from the Engineer. An equivalent from another manufacturer may be substituted for any items allowing an approved equal, subject to approval by the Engineer. Make substitutions at no additional cost. Permanently mark all equipment with manufacturer's name.

**01330.10(b) Product Condition** - All products, except those shown or specified as requiring rehabilitation and reinstallation, shall be new. All similar items shall be from the same manufacturer and of the same quality.

**01330.10(c) Transportation and Storage** - Protect all materials from damage and corrosion during shipping and storage. At the Engineer's discretion, either replace or repair all equipment damaged by corrosion or improper handling at no cost to the state.

**01330.10(d) Name Plates** - Identification nameplates are required on all equipment as shown and shall be made of laminated plastic with black outer layers and a white core. Chamfer edges. Fasten plates with black-finished round-head drive screws or approved non-adhesive, metal fasteners.

**01330.10(e) Testing Installed Electrical Equipment** - Perform continuity and insulation tests on all conductors. Perform continuity and insulation tests after installation and before energizing equipment. Submit the recorded values referencing the equipment label, location and dates to the engineer before energizing the equipment

**01330.11(a) Outdoor Electrical Enclosures** - Provide Type 16 gauge 316 stainless steel NEMA 4X rated enclosures for all outdoor locations unless specifically stated otherwise on drawings or in this specification. Small outlet boxes may be a water-tight gasketed cast-iron-type complying with UL 514A.

**01330.11(b) Conduits, Channel Strut and Conduit System Components** - Reference section 01320 of this specification. Unless specifically indicated otherwise all conduit systems installed under this specification shall meet the requirements of that section. In general

1. Rigid Steel conduits conforming to the UL-6A standard.
2. EMT conduits conforming to UL 797 or ANSI C80.3-2015.
3. Channel Strut hot dip galvanized after fabrication in accordance with ASTM 123 meeting the minimum mechanical properties of ASTM A1011 33,000 PSI min. yield, mil galvanized coating designation G90.
4. Channel System fittings manufactured from steel meeting ASTM A1018 30,000 PSI min. yield and hot dip galvanized after fabrication in accordance with ASTM A123.
5. Provide conduit hubs on all exterior and NEMA 12 cabinets and junction boxes. These shall be die cast zinc, insulated and gasketed NEMA 4X, UL listed, CSA certified, conduit hubs complete with grounding screws.
6. Conduit Bodies – use approved UL listed zinc plated grey iron alloy type conduit bodies with gasket and iron alloy type clamp-on covers conforming to the requirements of the UL 514B Standard.

**01330.11(c) Electrical Power Conductors** - All single-conductor wiring shall be **XHHW** insulated wire rated for 90 deg C operation in dry locations and 75 deg C operation.

Power Circuit Color-coding - Provide color-coding for all conductors. Service, feeder, and branch conductors shall conform to wiring standards.

120/208Y	Black (A), red (B), and blue (C)
120/240	Black and Red
Grounding	Green
Neutral	White

**01330.11(d) Cat6 Ethernet Cable** - use an approved Double Sheath Outdoor Cable meeting or exceeding the TIA/EIA-568C2 and IEC 60603-7-4 Standards. The cable shall be manufacturer listed as being an outdoor UV resistant Cat6 cable able to transmit 1 Gigabit at a frequency of 250Mhz and being suitable for both 100Base-TX (Fast Ethernet) and 1000 Base-T/tx (Gigabit Ethernet).

**01330.12(a) Up Stream Video Camera** - Shall be a Ultra High-Sensitivity 4K Network Camera with a 12 Mega-Pixel 35mm Full Frame Sensor. This camera produce and transmit via the installed fiber optic IP Ethernet network equipment and media converters installed under this specification, a 4k min (3840x2160 pixel) image for display on the 4K video monitor installed under this specification

This camera shall meet the following specifications:

- (1) Ultra High Resolution Video (4K UHD minimum 3840 X 2160 pixels).
- (2) Have a minimum 12 Mega-Pixel 35mm Full Frame Sensor.
- (3) Have Ultra High Sensitivity .006 lux rated minimum 50 ire (ISO409.6 1/30s 1.4 and proportionally higher at 4.0).
- (4) Have a minimum 24-70 mm Zoom Lens with a Horizontal Field of View (HFOV) of min 74 to 29 degrees range and an Aperture (F) not greater than 4.0.
- (5) Camera lens shall be of the same manufacturer as the camera and specifically indicated as being designed for use with the camera provided.
- (6) Manufacturer listed as having built in "Intelligent Cropping" to simultaneous observe up to 4 regions of interest (2 @ 1920x2160 or 4 @ 640x480) and "Intelligent Coding" that allows specific areas of interest to be maintained at high quality while allowing higher compression in other areas.
- (7) Operation with POE (Power over Ethernet) AC 24V or DC 12V operation.
- (8) Operating Temperature 23 deg F to 122 deg F
- (9) Contain a Network Port 10BaseT/100BaseT (RJ-45)
- (10) Digital Video Output via HDMI (Type D)
- (11) ONVIF (Open Network Video Interface Forum) Conformance Profile S.
- (12) compliant with the H.264 or H.265 Video Compression Standard.
- (13) Suitable for PC Operating Systems Windows 7, Windows 8.1 Pro, Window 10Pro.

- (14) Suitable for use with Video Management Software installed under this specification (Reference Section 01330.15).
- (15) Suitable for use with all PC and video equipment (Processor, Motherboard, Video Card, IP Network Equipment, etc.) installed under this specification.

**01330.12(b) Camera Vibration Isolation Unit -** Provide either an approved custom designed or approved manufactured isolation assembly as indicated in drawings. Design was based upon a threaded pole mount consisting of two threaded floor flange type pipe mounts bolted to two sheet steel plates that uses low frequency compression ring type mounts as indicated in drawings. The mounts shall be designed for low frequency vibration compression type isolation of light loads. The Isolation unit shall be designed to accommodate the combined weight of the Pan-zoom-tilt and camera unit as indicated in drawings.

**01330.12(c) Outdoor Full IP PZT unit -** Install the “Up-Stream Video Camera” listed in Specification paragraph 01330.12(a), in an approved outdoor IP Ethernet controlled Pan-Zoom-Tilt unit, that conforms with ONVIF-S IP protocols and in combination with the open source “Up-Stream Camera” control functions integrate with both the “Pan-Zoom-Tilt” capabilities this unit and the specified ONVIF-S compliant Open Source Video Management Software (in the PC type computer) installed in section paragraph 01330.15 of this specification.

This Full IP Pan-Zoom-Tilt camera enclosure unit shall meet the following specifications:

- (1) Is a manufacturer listed full IP Pan-Zoom-Tilt unit that is compliant with the IP ONVIF – Profile S Standard.
- (2) Manufacturer listed as conforming with the ONVIF-S IP protocols and suitable for used with the Open Source Video Management Software” installed under this specification.
- (3) Manufacturer listed as conforming to the NEMA 4X and IP66 weatherproof and corrosion resistant enclosure standards.
- (4) Temperature rated for operation over a minimum temperature range of -40 deg C to 65 deg Centigrade (-40 deg F to 149 deg F).
- (5) Manufacturer listed as wind resistant to minimum 135 MPH.
- (6) Capable of min 60 Mbit/s Video Stream for 4K Cameras
- (7) Be fully compatible with the “Motorized Zoom Lens” installed under this specification.
- (8) Provide direct access to third party cameras via a browser, for setup and diagnosis as a single IP address.
- (9) Manufacturer listed as providing a full 360 degree Horizontal Rotation capability.
- (10) Manufacturer listed as providing a variable minimum horizontal rotation speed to 60 degrees/sec
- (11) Minimum Positioning Accuracy of .05 degrees

- (12) Provide approved Temperature Control and a de-misting system.
- (13) Provide an Anti-Icing system with Heated Glass (approx 7 watts)
- (14) Have an Integrated Wiper
- (15) Housing equipped with forced air ventilation for de-fogging
- (16) Supply Voltage 24VAC @ +/- 10%
- (17) Maximum Power consumption 97 Watts.

**01330.13(a) Full Tower PC case (eATX)** - Provide a full size (eATX) Personal Computer case suitable for the installation of PC equipment indicated in the contract drawings and described in this specifications that meeting the following requirements:

- (1) Supports Motherboard types ATX, E-AT and GIGABYTE XL-ATX
- (2) Maximum VGA Card Length 13.5 Inches and CPU Cooler Height 7.5 inches
- (3) Power Supply Type Standard ATX PS2
- (4) Space for concurrent installation of six (6) each 5.25 inch drives along with five (5) each 3.5 inch HDDs and two (2) each 2.5 inch devices.
- (5) A Minimum of two (2) each USB 3.0 Ports and two (2) each 2.0 USB ports on front Panel.
- (6) A minimum of nine (9) each expansion slots.
- (7) Capability of installing a 230mm fan in the front of the case, A 200mm fan on both the top and side of the case and a 120mm fan on the back.
- (8) A side panel cooling fan duct capable of giving exclusive cooling to the GPU (Graphical Processing Unit) to be installed.
- (9) Minimum size 9 inches wide, 23 inches high, 21 inches deep

**01330.13(b) PC case Redundant Power Supply** - Install two each mini-redundant hot-swap capable PS2 form Factor redundant power supplies (2 each individual hot swappable power supplies in 1 each combined redundant unit) in the "Full Tower PC Case" supplied in this (reference specification 01330.13(a)). This Power Supply shall meet the following requirements.

- (1) Power Supply input voltage range (88 – 264) volts.
- (2) Output Power 800 Watts Max, +3.3 & +5V 200Watt Combined Max, +12V Combined Current Max 65A.

- (3) Operating Temperature Range 5 deg C to 40 deg C on 250W Continuous Output Load Min
- (4) Mean Time between Failures 100,000 on Maximum Load at 25 Deg C
- (5) Rise Time 50ms max, Holdup Time > 20ms min at nominal voltage.
- (6) Outputs 24 Amps at +5 Volts, 24 Amps at + 3.3 Volts, 16.5 Amps at +12V(#1), 16.5 Amps at +12V (#2), 16.5 Amps at +12V(#3), .16.5 at 12V(#4), .8A at -12V.
- (7) ATX Connector 24 (20 + 4) pin x 1, Connector EPS 12V 8 Pin x 1, Connector EPS 12V 8 pin (P4 x 2), Connector PCIE 6 Pin x 1, Connector PCIE 6+2 pin x 1, Connector SATA 15 pin x 9, Connector Molex 4 Pin x 3
- (8) Maximum weight < 50lbs

**01330.13(c) PC Motherboard** - Install an Air Cooled Motherboard with a minimum of 64GB (4 x DDR4 – 2666 min) Memory with the following :

- (a) an approved motherboard suitable for installation in the “Full Tower PC Case (reference specification section 01330.13(a)), using the approved processor (reference specification section 01330.13(e)), and the approved power supply (reference specification 01330.13(b)).
- (b) an approved motherboard suitable for installation of the PC Graphics or Video Card (reference specification 01310.13(f) and the network card (reference specification 01330.13(d)).
- (c) supports a minimum of 2 each Scalable Link Interface (**SLI**) multi-**GPU** video **cards** or 3 each CrossfireX Video Cards with the Video Card having a minimum of 32GB HBM2 memory on it.
- (d) Having at least at least 3 each PCIe 3.0 x 16 expansion slots for the graphics and Ethernet cards. Two of the ports supporting (x16, x8/x8, x4+x4) . (Verify bandwidth capacity of third slot to support 10gbs Network Card to be used.
- (e) Have 6 each minimum 6GB/s SATA Ports.
- (f) Capable of supporting both NVIDIA 2-way/Quad and AMD 3 Way/Quad CrossFireX Trademark Technologies.
- (g) Having 1xM.2 PCI Express NVMe Storage Capacity.
- (h) Supports 2 each USB 3.1 Gen2 ports: 1X front, 1X type-C, 1X Type-A.
- (i) Supports 4 each USB 2.0 ports in addition to the USB 3.1 Ports
- (j) Having 1 Optical S/PDIF out.
- (k) Having 5x (min) fan headers with 1x High-High Amperage Fan Header.



- (l) Supporting a FCLGA1151 Socket or an approved equivalent socket type capable of supporting an approved 4Ghz processor base frequency, 6 core, 12 thread processor with a Max Memory Bandwidth of 41.6 GB/s or greater.

**01330.13(d) Dual SFPT+ 10GB Ethernet Network Adapter** - Install an approved dual 10 Gigabyte Network Interface Card that is compatible with the optional 10GE SFE+ Ports of an Allen Bradley Stratix 5410 switch with the following features:

- (a) Manufacturer listed as being specifically designed for Multi-Core Processors”.
- (b) Specifically Manufacturer Listed has having support for Receive Side Scaling, Low Latency Interrupts, and 10GB Connectivity.
- (c) Specifically Manufacturer Listed as supporting PCIe v2.0(5GT/s) support and providing a Maximum of 20Gbps bi-directional throughput per port on a single dual port card.
- (d) Specifically Manufacturer listed as supporting (FCoE) or “Fiber Channel over Ethernet” and including FCoE Boot.
- (e) Listed SFP+ connections support for 10GBASE-SR, 10GBASE-LR, and SFP+ Copper Direct attach physical Media.
- (f) Buss Type PCI Express 2.0(5 GT/s) Buss Width 4 Lane PCI Express and 8 Lane PCI Express.

**01330.13(e) Motherboard PC Processor** - Install an approved 64bit, 6 Core, 12 Thread, 4Ghz Base Frequency Processor with a minimum of 12 MB of on board cash suitable for use the Mother Board (Reference Specification Section 01310.54). This processor shall

- (a) use 14nm (Minimum) Lithography technology
- (b) be suitable for use with a minimum of 64 GB of DDR4-2666 Memory.
- (c) Accommodate a minimum of 2 memory channels and have a maximum memory bandwidth of not less than 41.5 GB/s,
- (d) Have processor graphics with 4K (HDMI 1.4) support (4096x2304) with a dynamic frequency not less than 1.2GHZ and be able to support 64GB of Graphics Video Memory.
- (e) Support PCI Express Revision 3.0 with PCI Express Configurations up to 1x16,2x8,1x8+2x4 with 16 PCI Express Lanes.
- (f) Shall have a nominal TDP rated at approx. 95 Watts.

**01330.13(f) PC Graphics card** - Install an approved high performance video graphics card with the capacity to drive 4 each 4K ultra high resolution video monitors at high speeds that meet the following requirement:

- (a) Manufacturer listed as having a minimum of 32GB of HBM2 High Bandwidth Memory
- (b) Manufacturer listed as having a maximum memory bandwidth of up to 870GB/s.
- (c) GPU operating frequency > 1100 MHz, Memory Clock > 800 MHz
- (d) Manufacturer listed as having double-precision performance of not less than 7.4 TFLOPS.
- (e) Manufacturer listed as having a PCI express 3.0x16 Buss interface.
- (f) A Manufacturer listed maximum power consumption of not more than 250 Watts
- (g) Manufacturer listed as having a minimum of 4 each Display Port (1.4 Min) connectors
- (h) Manufacturer listed as being capable of supporting 4 each Video Monitors each with Ultra High Display Resolutions of 4096 X 2160 at 180Hz with 30 bit color.
- (i) A Dual-Slot Full Height Video Card Form Factor compatible with both the case and motherboard of the PC in which it is to be installed.

**01330.13(g) - Solid State Drive** – Install 2 each approved 2-1/2 inch form factor 4 tetra-byte Solid State Drives (SSD) suitable for use in the specified PC case and with the specified motherboard. (See Specification Section .01330.13(a) & .01330(c)) each with

- (a) A minimum manufacturer listed storage capacity of not less than 4 tetra-bites.
- (b) A 6 gigabyte per second SATA (Serial ATA) interface conforming to the “Serial Advanced Technology” Specifications.
- (c) Having manufacturer listed sequential Read capabilities of not less than 500 Mega-Bytes
- (d) Having a manufacturer listed endurance (Total Bytes Written) listing of not less than 4,000 tetra-bites.

**01330.13(h) – 60 inch (min) Display Monitor** – shall be an approved commercial or industrial type 60+ inch display monitor, complete with all required cables and connectors, suitable for installation as indicated in drawings and meeting the following requirements:

- (a) Manufacturer listed as being specifically designed for 24/7 hours operation in a minimum 0 to 40 deg C temperature range and minimum 10% to 80% humidity range environment.
- (b) Manufacturer Listed as having both a vertical and horizontal viewing angle of not less than 175 degrees.
- (c) Manufacturer Listed as having a rated brightness of not less than 500 nit (500 cd/square meter), and a static contrast ratio of not less than 3,000.
- (d) Manufacturer listed as having and supporting a minimum (4K UHD) Resolution (minimum 3860 X 2160) at not less than 60hz (regardless of input source).

- (e) A minimum 16.7 Million colors (or min 8 Bit color resolution) covering a color gamut not less than 70%.
- (f) Manufacturer rated Maximum Pixel Frequency of not less than 590 MHZ.
- (g) Having both HDMI 2.0, and DP 1.2 port connectivity suitable for use with the specified video card (see specification section 1330.60) and minimum USB 2.0 Connectivity as well.
- (h) A highly glossy screen is not acceptable; the monitor shall have a higher type "HAZE" rating (not less than 25%) or have other approved measures or special coatings that aid in minimizing reflections in the near daylight environment in which this monitor must operate.
- (i) Manufacturer rated maximum power consumption of not greater than 200 Watts.
- (j) HDMI 2.0 loop out output.

**01330.14(a) Industrial Distribution Switch** - Install an Allen Bradley Stratix 5410 Model 1783-IMS28RAC industrial Distribution Switch in the existing equipment rack indicated in contract drawings. Install all cables and equipment required to connect the Dual SFP+ 10GB ports of the Ethernet Network Adapter card (reference specification section 01330.58) to the ten GB SFP ports of this Industrial Network Switch. Install all of the Allen Bradley Add-on Profiles (AOPs) in the existing Agency studio 5000 Profile (reference specification section 01330.03 #4). Configure this switch as required to work with the approved "Open Platform" Video Management Software to be installed (Reference specification 01330.15).

**01330.14(b) Industrial Media Converter** - Install a minimum of 4 each "Black Box" brand 10-/100-/1000-MBS Copper to 1000-MBS Duplex Single Mode Fiber Converters, minimum two (2) in the Operators Building and minimum two (2) in Camera Cabinet #2 as indicated in drawings. Install complete with any (ST to SC) fiber adapters required and establish the Ethernet Links indicated in drawings. Establish communication links between the Industrial Distribution Switch (see 01330.14(a) above) and both the Video Camera and the Pan-Zoom-Tilt units (see specification sections 01330.12(a) and 01330.12(c) above) complete with any fiber and cable adapters required. Install Black Box POE Giga-Bit Ethernet Injectors as required to power both the Video Camera and Pan-Zoom-Tilt Unit.

**01330.15 Video Management Software** - Install approved network "Video Management Software" (VMS) in the PC that will enable the Interstate Bridge Operators to monitor and control a minimum of 48 IP Pan-Zoom-Tilt 4K Ultra-High-Definition (UHD) network video cameras on a dedicated IP network. This software shall enable the Interstate Bridge Operator to setup, select, and view multiple cameras on multiple monitors, to rapidly switch between different multiple camera views, to control the PZT functions of any camera, and meet the following requirements.

- (a) Be compatible and function with all components of Personal Computer as listed in other sections of this specification. This includes but is not limited to the Video-Card, Network Card, and USB type Joy-Stick PZT camera controller installed under this specification

- (b) Shall be compatible and function with the “Allen Bradley” network switches and the media converters installed in this specification. This includes but is not limited to the PC Dual SFPT+ 10GB Ethernet Network Adapter and the Allen Bradley Stratix industrial Distribution Switch listed in this specification.
- (c) Manufacturer listed as “running of off the shelf PC hardware, supporting modern 64 bit PC components and being able to run on the “Windows 7 through Windows 10” operating systems versions.
- (d) Manufacturer listed as having ongoing support for Camera Drivers from major camera providers including Bosh, Cannon, FLIR, Panasonic, Samsung, Sony, THK, and others to allow new model replacement IP cameras to be installed whenever necessary.
- (e) Manufacturer listed built-in support of the ONVIF and ONVIF Profile S industry standards to provide for use of multiple camera vendors’ products.
- (f) Manufacturer listed support for major video compression standards specifically including H.265, H.264, and MPEG-4.
- (g) Manufacturer listed as allowing the operator to continue to view live stream cameras while concurrently performing all basic PZT camera controls, camera switching, and of allowing viewing of video playback without switching to another dedicated investigation mode.
- (h) Manufacturer listed support for a minimum of 6 independently controlled displays (from the single work station installed under this specification). Manufacturer listed “local Video Wall support” for all locally connected display monitors.
- (i) capable of supporting up to 4 each future 60 inch (min) 4K UHD Video Display Monitors meeting the requirements of paragraph 01330.65 and driven by video card (Reference Specification Section 01330.13(f)) of this specification (Only 1 video card and 1 monitor is included under this specification). The support shall enable the full listed monitor resolution at 60hz.
- (j) Manufacturer listed as supporting motion detection from both camera-based analytics and from dedicated security devices, in regions of interest, each with their own sensitivity and threshold adjustments.
- (k) Manufacturer listed as providing the ability to create “Event Actions” (including Move to PZT Preset and alarming). These events to be based upon motion detection, camera image analytics, and security devices. It shall include the ability of the operator to enable/disable these “Event Actions”. It shall have the ability to create composite event alarms such that several conditions must exist before alarming.
- (l) Manufacturer listed as supporting “USB Joystick type PZT controllers”.
- (m) Having the ability to create operator initiated “Snap Shot Still Images” complete with the ability to create, print and save reports (in PDF, JPG, etc file formats) to, at the minimum, an external USB storage devices and internal Hard Drive File.

- (n) Having a "Video Buffer" supporting the recording of video immediately prior and immediately subsequent to an alarm or event.
- (o) License the "Video Management Software" in the Agencies Name. Purchase a minimum of 1 year of support. The software license shall contain no requirements for the Agency purchase additional support in order to continue to use the originally installed software indefinitely. The Agency, at its discursion, will purchase continuing support. Provide all information required for the Agency to, at its discursion, to continue or renew any software support.

Make provisions that will allow the Oregon Department of Transportation to Uninstall the Software installed under this specification and replace it with future software from any another major VMS Software provider including but not limited to Milestone XP Protect Express, ONNSI Ocularis, Qognify Nice Vision etc. at its discretion.

**01330.40 General** – Schedule construction to minimize the interruption of both highway and river traffic. Protect all equipment in the process of being installed from physical damage by moisture and dirt. Protect electrical conductors and control cables from dirt, grease, and abrasion during the installation process.

**01330.41 Scheduled Bridge Lifts** – Any and all requests for scheduled bridge lifts, for the purpose of delivering supplies and materials to the top of the "East Interstate Bridge Towers" shall be made by directly contacting "Mark Gross" (Interstate Bridge Supervisor), either in person or via his cell phone (503-880-4126).

In addition to the verbal contact submit either a written or e-mail notification to both Mark Gross and the Agency representative stating that such contact was made, documenting the time, date and by whom that contact was made, and giving a summary of the conversation that ensued. Obtain either direct written or E-Mail conformation from either Mark Gross or the Agency representative before proceeding.

Both the telephone and E-Mail (or other written document) shall be made a minimum of 24 hours prior to the desired lift time. All scheduled lifts will be done at night (8:00 PM to 5:00 AM) and any lane closure will need to be done by either by Contractor or an approved subcontractor.

**01330.42 System Integration requirements** – Secure the services of an approved and experienced "Systems Integrator" with documented access to the manufacturer certified individuals/organizations used to select, assemble, and install the complex IP video camera shown in drawings as described in this specification. Secure the services of an approved certified "CISCO CCNA Industrial network installer".

Submit documentation showing the following within 30 days of Notice to Proceed.

- a. The name and address of the Systems Integrator with documentation showing a minimum of 2 each previous IP network security camera installations, similar in nature to the one specified, each involving not less than 24 high resolution IP network cameras, several in each installation mounted in environmentally controlled IP outdoor PZT enclosures, with an associated IP Network, with network switchers, a personal computer (PC), Video Management Software, HD Monitor and PZT controller, at a single on-site facility within the past 2 years.

- b. The Name/Organization of the certified "CISCO CCNA Industrial network installer" who will be overseeing and approving IP network equipment interfaces installed in this specification.
- c. Secure the services of an approved ONVIF certified camera manufacturer's representative and the approved ONVIF certified PC "Video Management Software" manufacturer's representative. Provide the Agency with the names of these Individuals/organizations along with contact numbers to facilitate agency approval of their products and make inquiries concerning their product installation recommendations.

Within 60 days from notice to proceed submit for approval the following:

- d. Submit for approval the dual 10 Gigabit SFP+ Network Card and all connectors that will enable the Person Computer to connect to the Industrial Type IP 10 Gigabit network and "Allen Bradley" Ethernet switch installed under this specification along with a statement from the CCNA network associate verifying its compatibility.
- e. Submit for approval the "Video Management Software" to be installed in the Personal Computer (PC) along with documentation indicating its conformance with the requirements of this specification, its conformance with the ONVIF standard, and a statement from the CCNA network associate verifying its compatibility all network equipment installed under this specification
- f. Submit for approval the IP Video Camera to be installed along documentation demonstrating its compliance with the requirements of this specification, the Video Management Software's support of it, and a statement from the CCNA network associate verifying its compatibility with all network equipment installed under this specification.
- g. Submit for approval the IP Video Camera enclosure and PZT unit to be installed along with documentation demonstrating its compliance with the requirements of this specification, the Video Management Software's support of it, and a statement from the CCNA network associate verifying its compatibility all network equipment installed under this specification.
- h. Submit for approval all components to be used to assemble the high performance Personal Computer (PC) including (but not limited to) the Case, Power Supplies, Mother-Board, Processor, high speed memory, Solid State Drives Network cards, Video Graphics Cards. Submit sufficient documentation to demonstrate that they meet the requirements set forth in this specification.
- i. Submit for approval the qualifications and certifications of the individuals/organizations involved in Fiber Optic terminations and Fiber Optic Testing.
- j. Submit documentation from a CISCO CCNA certified network installer stating that the PC network card "Video Management", IP Camera, IP PZT camera enclosure, and all network components as submitted has been reviewed for compatibility with each other and with all Network Equipment installed under this specification.
- k. Secure the services of an approved certified manufacturer's representative of the approved 60 inch minimum high resolution (4K UHD) Video monitor to be installed in this specification. Submit documentation demonstrating that this Video Monitor is fully

compatible with the PC Video Card and any and all high bandwidth active cabling components used to connect it (given the distances involved).

**01330.43 Fiber Optic Installation and Testing Requirements** - Secure the services of an approved organization/individual certified to install, terminate, and test the optical fibers and connectors used in the optical fiber link between the first floor of the operators building and the Camera Cabinet #2 as shown in drawings. Perform the following tests on this link prior to the connection and testing of any other equipment that will be utilizing the fiber optic links.

- a. End to end insertion loss using the TIA-526-7 Standard using certified equipment.
- b. Optical Time Domain Testing shall be performed by approved trained personnel using certified equipment designed for the purpose. The technicians performing these tests shall be trained not only in the operation of the ODTR equipment but in the interpretation of the ODTR traces as well.

**01330.44 Camera System Network Testing** - Under the direction of an approved certified "CISCO CCNA Industrial network installer" perform appropriate network testing including mbps bandwidth, packet loss, round trip time, etc. Then

- a. Establish an appropriate network bandwidth testing protocol, perform and establish baseline measurements that the Agency can employ, both in the present and in the future, to quantify the performance on the network so as to obtain advance warning of any deterioration in its performance that may occur.
- b. Establish this protocol under the assumption that this Network will be expanded in the future to 48 (minimum) cameras across the bridge.
- c. Submit this information in a separate approved bound document and provide a minimum of 5 each copies of that document to the agency.
- d. Include the Fiber-Optic tests (see paragraph 01330.43) in this submittal.

**01330.45 Mockup and demonstration of Camera System** - Schedule a meeting, prior to installing any equipment at the Interstate Bridge, at an approved location for the purpose of demonstrating the following:

- a. Demonstrate the ability of the combined video monitoring and security camera equipment to control the combined IP "Up-Stream Video Camera" and IP Pan-Zoom-Tilt unit and to display that 4K image upon the 60 inch monitor.
- b. Obtain and connect 2 additional IP Pan-Zoom-Tilt test cameras, each from a different manufacturer than the one installed under this specification, to the combined video and security camera equipment. Demonstrate the software procedures required to add

a new camera to the Network. Demonstrate the ability to create custom screen layouts, camera groups, and name camera groups.

- c. Demonstrate the ability of the combined video monitoring and security camera equipment purchased to display, in 2 smaller windows (1/8 size or less), their video images on the 4K video monitor along with the original 4K Video Monitor. Demonstrate the ability of the system to control all of the PZT cameras
- d. Demonstrate the basic motion detection and alarming ability of the combined video monitoring and security camera system. Demonstrate detection and alarming upon of movement in pre-set zone at a pre-set Pan-Zoom-Tilt setting. Demonstrate directional line crossing with filters for both direction and speed of motion.
- e. Demonstrate a video buffer subsequent to an alarm (such as a "Line Crossing" alarm) that allows the recording of video immediately prior to that alarm. Demonstrate the defining of alarms and events.
- f. Demonstrate the ability of the system to manually obtain and record "Snap-Shots" images from cameras under operator control and to export those images to a "USB" thumb drive in a commonly used picture format such as a Bit-Map or JPEG image.

Upon request and with a minimum of 30 days notification and subject to Agency Scheduling; the Agency will provide access to an Agency conference room for a minimum of 24 hours proximate to the Interstate Bridge for this demonstration.

**01330.46 Final Installed Camera System Submittal** - Submit 5 copies of a "final installed camera system submittal" information on all component parts installed under this specification. Each copy shall be organized in approved 3 ring binders with section dividers and a table of contents and shall contain manufacturer's owner and installation manuals, operator's instructions, installation instructions, part numbers etc.

The information contained in this submittal shall specifically include, but not be limited to, all components specifically listed in this submittal such as the PC case, Motherboard, Network Cards, Cameras, PZT units, Software Manuals, etc. It shall also include the results of all fiber-optic testing, Network Testing, and the names and contact numbers of the equipment manufacturer's representatives.

**01330.47 Final System Demonstration and Operator Training** - Schedule a minimum of a one single 8 hour day for an on-site demonstration of the installed Operational Video and Security system and for operator and maintenance training. Obtain and temporarily connect a minimum of 2 additional IP cameras into the system Provide both written instructions and demonstrations on procedure's including the setting up of single and multi camera displays on the video monitor, controlling individual PZT cameras, turning on-off alarms. Creating event actions, etc.



## Measurement

**01330.90 Lump Sum Basis** - There will be no measurement of work performed under this Section

## Payment

**01330.95 Lump Sum Basis** - Each item amount shall be full payment for all equipment, materials, labor, and incidentals to complete the "Camera System Relocation" work as directed.

Payment for the bid item "4K Camera w/ housing & vibration resistant mount" shall include all parts and labor required to assemble an approved 4K video camera complete with an zoom lens an approved combined weatherproof enclosure and Pan-Zoom-Tilt unit, all meeting the requirements of this specification. This assembly to be installed at the mounting location located on the North Tower of the East Interstate Bridge as indicted in Contract drawing. This bid item does not include parts and labor associated with mounting it at it final location however.

Payment for the bid item "Custom Designed PC" includes all parts and labor associated with the purchasing the component parts (PC case, power supply, motherboard, processor, memory, Hard Drives, video & network cards, and all other components listed in this specification), assembling them in the single functioning unit dimensionally suitable for installation at the location, indicated in drawings, and then installing and configuring the software in accordance with the requirements of this specification.

The Bid Item "Video Conduit Systems" include parts and labor required to install the rigid steel and EMT conduits both inside of the operators building and on the top of the North Tower of the East Bridge as indicated in contract drawing. It also includes the concrete drilling, Junction boxes, and all wiring and cabling installed within these conduits along with all connectors and cables used to power and control the equipment they supply.

Payment for bid item "Operators Display & Camera Controls" include both the parts and installation of the fully mounted 60 inch {minimum} UHD video display (as indicated in drawings), the camera controller, keyboard, and all associated wiring , connectors and other misc. parts required to provide a fully functional display.

Payment for the bid item "Video Network System Equipment" includes all parts and labor involved with the component parts, installation, wiring and configuration all network switches, media converters and other equipment involved with the transmitting of the Video Camera system installed in this specification.

Payment for the bid item "Video Network System Equipment" also includes the configuration (and testing) of the video management software and PC Software interfaces to all network equipment (including software support purchases and software installation for the existing ODOT PLC Software), in a manner that allows the entire system to function as described in this specification. It also includes the parts, labor and testing of all fiber optic components listed under this specification.

Payment for the bid item "Mockup and Training" includes all parts and labor involved in the equipment demonstrations and operator training included under this specification.