STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS FOR
AESTHETIC LIGHTING CONTROLS, FURNISH & INSTALL
SUM-8-0175 (PID NO. 91710)
October 07, 2022

01 DESCRIPTION

01.1 Summary

A. Section Includes:

1. Work of this Section includes all labor, materials, equipment, and services necessary to furnish, install, and place in permanent operating condition the Static White Lighting Controls as shown on the Contract Drawings and specified herein. Control system provided must be compatible with provided luminaires to perform as specified in this Section.

B. Related work specified in other Sections of the Specification includes:

1. Related Electrical Sections
2. Aesthetic Lighting Luminaires, Furnish and Install Sections.

01.2 Standards

A. Codes: Material and installation shall be in accordance with the latest revisions of the National Electrical Code and any applicable Federal, State, and local codes and regulations.

B. Listings: All Control equipment shall be manufactured in strict accordance with the appropriate and current requirements of the National Electric Code as verified by Underwriters' Laboratories, Inc., or other testing agency as acceptable to local code authorities. Such a listing shall be provided for each component and the appropriate label or labels shall be affixed to each component in a position concealing it from normal view

01.3 Lighting Control Systems Integration

A. General

1. Provide Lighting Control Systems Integration (LCSI) services including:

   a. All equipment listed in this section.

   b. Furnish a complete working system, meeting the intent of this Technical Special Provision.

   c. Coordinate delivery schedules and installation of equipment.

   d. System programming as directed by the Lighting Designer and Design Engineer.

   e. System record drawings.

   f. Commissioning and final testing of the system.

   g. Training of the Department's personnel as required by this Technical Special Provision.

   h. Custom user website style interface for remote manual control of the lighting system.

   i. Programming of system content and scheduling of content as dictated by the Lighting Control Narrative developed as a result of stakeholder meetings

   j. The Lighting Control Systems Integrator (LCSI) shall provide a dedicated Project Manager. The LCSI's Project Manager shall be the main contact between the Systems Integrator, Manufacturers, Lighting Designers, Engineers and Contractors from contract award to sign off. The LCSI's Project Manager shall be the same person throughout the entire course of the project, unless otherwise approved by the Department or Engineer

   k. The LCSI's Project Manager shall attend a Kick-Off Meeting at the project site office or a place to be designated. The objectives of the Kick-off Meeting are:

      1) Introduce the Project Team Members

      2) Review the Project Schedule

      3) Review the Scope of Work and any additional materials and documents not in the Scope of Work

      4) Explain the creative intent of the Project.

B. Description

1. Lighting Controls System Integrator shall be an authorized dealer for the DMX controller.

2. Provide documentation that the Lighting Controls System Integrator holds advanced certification for the commissioning and programming of the lighting control system equipment from the manufacturer of that equipment.

3. Provide a complete working system meeting the requirements of this Technical Special Provision.

4. Any warranty service provided under this Technical Special Provision must be provided by factory certified technicians for equipment in this section

C. Lighting Control Systems Integration Companies shall be one of the following

1. Barbizon Lighting Company
   31 Draper Street
   Woburn, MA 01801

2. Candela Controls
   751 Business Park Blvd. #101
   Winter Garden FL 34787

01.4 Quality Assurance

A. Entities manufacturing lighting control equipment and networking components specified herein, and as shown on the Contract Drawings, shall have a minimum of five years of manufacturing experience and shall demonstrate prior experience on at least two projects involving complexities similar to those required under this Contract.

B. Cabinets, enclosures and all related components for which there is a nationally recognized standard shall be safety tested and bear the conformance labeling of the third party inspection authority, such as Underwriters Laboratories Inc. (UL, ETL, Factory Mutual or approved equal), certifying that the equipment is listed as suitable for the purpose specified and shown on the Contract Drawings.

C. Electrical Components, Devices, and Accessories: Listed and labeled by a qualified testing agency, and marked for intended location and application.

D. Materials and equipment, as well as workmanship, shall conform to the highest commercial standards and shall be as specified and as indicated on the Contract Drawings.

E. Lighting Control Systems Integrator providing Lighting Control Systems Integration Services shall have a minimum of ten years' experience and shall demonstrate prior experience in the design, commissioning, and programming of at least two projects involving complexities similar to those required under this Contract.

01.5 Submittals

A. Product Data: Provide additional information as required by the Lighting Designer to verify compliance with specifications and full system submittals, quantity as required by Contractor. Product Data must include:

1. Full set of printed technical data sheets.

B. Services Provided: Submit a list of training, commissioning and programming services to be provided including an estimated number of trips with personnel.

C. Shop Drawings: Include plans, diagrams, details and attachments to other work.

1. Control System Equipment: submit shop and installation drawings, one-line diagrams showing connections between the luminaires and the controls and schedules showing all information necessary to explain fully the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation. They shall be approved by the Lighting Designer before fabrication, installation, or erection has begun. Such approval does not relieve the Contractor of the responsibility of providing equipment in accordance with the specifications. Any deviations from the specifications shall be "starred" and noted in 3/8-inch high letters. Only deviations that are equal to, or that upgrade the quality of, the equipment, or that respond to field conditions, will be considered.

2. Lighting Management System: submit schematic wiring diagrams, component specifications, enclosure dimensions, installation details, operation manual, and approvals of respective standards.

3. Control System Components: submit schematic diagrams, component specifications, enclosure dimensions, installation details and approvals of respective standards.

01.6 Maintenance Material Submittals

A. Furnish shelf stock that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. CBOX Lumenpulse Fixtures: One for every 25 of each type installed. Furnish at least one of each type.

2. Data Power Integration Hub Cable Fixtures: One for every 25 of each type installed. Furnish at least one of each type.

3. Data and Power Jumper Cable: One for every 25 of each type installed. Furnish at least one of each type.

4. Data and Power Leader Cable for Cable Fixture: One for every 25 of each type installed. Furnish at least one of each type

5. Blackbox LEH1104-2SFP Industrial Ethernet Switch with a spare fiber SFP: One for every 15 switches and sleds of each type installed. Furnish at least one of each type.

6. Ethernet cable: One for every 5 cables in the control equipment rack. Furnish at least one of each type.

01.7 Training

A. Coordinate and schedule a minimum of 1 Day of training for a maximum of 8 hours per day with the necessary operations and maintenance personnel. Training shall include instruction on running and maintaining the system including but not limited to how to schedule looks in the future, monitor system, override scheduled looks, maintain controls and data connections, review steps for expanding the number of looks, and initiate troubleshooting procedures.

01.8 Product Delivery, Storage and Handling

A. Control equipment shall be wrapped for protection during delivery, storage, and handling.

B. Deliver materials in manufacturer's original, unopened, protective packaging.

C. Store materials in original packaging in a manner that prevents soiling and physical damage prior to installation. Wet or damp wrapping shall be removed, disposed of, and replaced with dry wrapping materials to prevent damage.

D. Handle in a manner to prevent damage to finished surfaces.

E. Where possible, maintain protective covering until installation is complete and remove such coverings as part of final clean up.

01.9 Warranties

A. Prior to acceptance, provide all registered manufacturer warranties for control system equipment.

02 MATERIALS

02.1 Control Components

A. Equipment Rack

1. General:

a. The rack shall be an NEMA 4X 19” rack acceptable manufacturer is American Products or equal:

2. Physical:

a. 32” T x 24” W x 18” D; 16RU Total Equipment Space, 19” Adjustable Rack; 53 lbs.

b. Constructed out of .090” thick 5052-H-32 Aluminum. All surfaces powder coated light textured beige, outdoor rated TGIC. Designed and built to NEMA 3R Standards.

c. Rack rails are constructed out of 12 gauge galvanized steel and powder coated matte black and labeled with RU designations. Rails designed to EIA standards.

d. All cabinet fasteners, handles & latching mechanisms are stainless steel.

e. Gasket material is UL 94 rated for gasketing & sealing applications under UL50 and UL508.

f. .040 thick 300 series stainless steel continuous hinge. 1.25” open, .50” knuckle and 3/32” diameter stainless pin.

g. Mechanical knock-outs in the bottom of each bay equipment chamber are laser cut to facilitate easy break-out slug access.

h. 6AWG braided cable door grounding strap secured to masked studs for each cabinet door. 5 position aluminum terminal strip mounted to interior bottom, mounted to stand-offs for easy access.

i. Custom door wind guards constructed out of 304 stainless steel. Holds door open at approximately 95°, lift to close.

j. (2) duplex 20 amp 5-20R receptacles mounted in 4” junction boxes in cabinet. Wiring done by others in the field.

k. Plinth is constructed out of .125 thick 5052-H32 aluminum. All surfaces powder coated light textured beige, outdoor rated TGIC. Front & rear access panels are secured with 216 hex head security screws. Hex key provided with this option.

3. Rack shall be sized to accept:

a. Horatio RDM System Monitor

b. Blackbox LPB3208A Gigabit Ethernet Managed Switch

c. DANBox Industrial Remote Access Gateway (Firewall & Secure Remote Access Gateway)

d. Patch panel

e. Brush Grommet Panel

f. Blank RU Panel (3@1RU)

g. ETC Unison Mosaic MSC-4 Show Controller

h. 1500VA Uninterruptible Power Supply

4. Rack Accessories

a. Provide the following accessories for the equipment rack:

1) 1000BTU A/C-w Heater Unit Kit

2) Insulation Pkg - 32X24X18

3) Isolated Copper Ground Bar

4) Mounting bracket or pedestal appropriate for final location

5) 24 Port Patch Panel w/ matching connectors

6) Brush Grommet Panel 1U

7) 1500VA Battery Backup UPS.

B. Unison Mosaic MSC-4 Show Controller for 4 universes, and Rack Mount Kit with Power Supply.

1. General

a. The Unison Mosaic Show Controller 4 (MSC4) Controller shall be a microprocessor-based system specifically designed for control of lighting and other related systems in an architectural or entertainment application. A personal computer running emulation software shall not be acceptable.

b. The Controller shall be provided with a 5 year manufacturer warranty.

2. Mechanical

a. Enclosure and mounting shall comply with DIN43880 and EN60715 (35/7.5) respectively

b. The controller shall be an 8 unit DIN enclosure (143.5mm x 90.0mm x 58.0mm)

c. The Controller shall have a recessed switch for resetting the unit without removal of power.

d. There shall be visual indicators on the Controller showing status of the controller and its interfaces.

e. The controller shall be entirely solid-state with no moving parts, fans or hard disc drives

f. The controller shall operate in a temperature range from 0°C to 50°C (32°F to 122°F)

3. Electrical

a. The Controller shall be designed to support the following wire terminations (Camden Electronics CTB9208 5.08mm plug-in rising clamp terminals):

b. The Controller shall support a multi-mode full-duplex RS232/half-duplex RS485 Serial Port

1) RS232/RS485 serial input/output

2) 3-pin rising clamp terminal Camden connector

3) The Controller shall be capable of receiving DMX512 for triggering using the serial port.

c. The Controller shall support eight local inputs capable of digital, analog or contact closure operating mode

1) 16-pin rising clamp terminal Camden connector

2) Isolated digital/ analog inputs

3) 8 tri-mode inputs: active high, active low or contact closure

d. The controller shall support a MIDI input and a MIDI output interface for use in triggers and for MIDI time code

1) 5-pin DIN socket for MIDI In

2) 5-pin DIN socket for MIDI Out

3) 3-pin 9V to 48V DC Power

e. In addition there shall be the following standard connectors:

1) RJ45 socket for 10/100Base-TX Ethernet

2) USB-B Socket for USB 1.1

f. The Controller shall be able to receive power over Ethernet as an alternative to direct DC power (IEEE 802.3af PoE powered device).

g. The Controller shall be ETL/ cETL listed and CE compliant

4. Functional

a. The Controller shall store show data in non-volatile solid-state memory. This memory shall be removable for purposes of backup or disaster-recovery.

b. Show data may be downloaded from a remote personal computer over an Ethernet or USB connection.

c. The Operating Software of the Controller shall be stored in a dedicated non-removable non-volatile solid-state memory. It shall be possible to update the Operating Software by download from a remote personal computer over an Ethernet or USB connection.

d. The Controller shall commence show playback automatically on receiving power without additional external inputs.

e. The Controller shall have an internal real-time clock that continues to operate when external power is absent. It shall be capable of adjusting for Daylight Saving Time automatically and can be updated over the Internet using the Network Time Protocol

(NTP).

f. The Controller shall be able to calculate sunrise and sunset times based on longitude and latitude information, and use these as triggers for events.

g. The Controller shall have a capacity of 2048 channels of network DMX protocols including streaming ACN (ANSI E 1.31), ETCNet2, Philips KiNet, Pathway XDMX and Art-Net II protocols with one protocol active per 512 channels.

h. The Controller shall support DMX512 output with RDM for up to 1024 channels.

i. The Controller shall operate a web server on its Ethernet interface. This shall allow status information, control and configuration options to be accessed remotely.

j. The appearance and content of the web interface may be customized by the user.

k. The Controller shall allow lighting to be programmed as separate zones, with independent triggering and manual intensity control.

l. The Controller shall support multiple timelines, crossfades and effects running concurrently.

m. The Controller shall support playback of video media with individual pixels mapped to lighting fixtures in an array.

n. The Controller shall support multiple remote modules connected via Ethernet for support of additional show control interfaces, such as contact closures, analog inputs, relay outputs, serial audio input, linear time code, MIDI and DALI.

o. The Controller shall support multiple remote button stations connected via Ethernet for use as triggers and user feedback

p. The Controller shall support multiple streams of linear timecode and audio data within a single networked system.

q. The Controller shall have an internal security feature that will restart the unit in the event of program failure.

r. Multiple Controllers shall automatically synchronize and share triggers when programmed as part of a single show and linked via Ethernet during playback.

s. The Controller shall support conditional logic and execute user-defined Lua scripts to support advanced show control operations.

t. The Controller shall be supported by programming software running on either a PC or Mac platform. Programming features shall include:

    1) Comprehensive architectural and automated fixture library

    2) Drag and drop placement of fixtures on plan

    3) Drag and drop patching of fixtures to output addresses

4) Import of any media for mapping to fixture arrays

5) Timeline-based programming and playback

6) Extensive range of editable effect presets

7) Drag and drop placement of effect presets and media on timeline

8) Variety of triggering options for firing system-wide events

9) Each trigger event may be configured to initiate one or more lighting or show control action

10) Each trigger event may be configured to test one or more conditions before executing its actions

11) Simulation of individual timelines, and entire project with triggers

12) Live output from software for programming verification purposes

13) Controller and network management tools

14) Export CSV reports for all aspects of programming

15) Tools for remote management of content and show programming

5. Protection and Patents

   a. The Mosaic Controller is protected under license by the following patents:

      1) U.S. Patents: 6,016,038; 6,150,774; 6,166,496; 6,211,626; 6,292,901; 6,340,868; 6,459,919; 6,528,954; 6,548,967; 6,577,080; 6,608,453; 6,624,597; 6,636,003; 6,717,376; 6,720,745; 6,774,584; 6,777,891; 6,781,329; 6,788,011; 6,801,003; 6,806,659; 6,869,204; 6,883,929; 6,888,322; 6,897,624; 6,936,978; 6,965,205; 6,967,448; 6,969,954; 6,975,079; 7,014,336; 7,031,920; 7,038,398; 7,038,399; 7,042,172; 7,064,498; 7,113,541; 7,132,635; 7,132,785; 7,132,804; 7,135,824; 7,139,617; 7,288,190; 7,231,060

      2) Canadian Patent: CA 2,302,227

      3) Hong Kong Patent: HK 1025416

      4) Australian Patent: AU 757000; AU 2003203584

      5) European Patents: EP 1 016 062 B1; EP 1 224 845 B1; EP 1 234 140 B1; DE 698 07 092 C0; DE 600 21 911 C0; DE 600 23 730 C0

6. Software

   a. The Controller shall be supported by programming software running on either a PC or MAC Platform . Programming features shall include:

      1) Comprehensive architectural and automated fixture library

2) Drag and drop placement of fixtures on plan

3) Drag and drop patching of fixtures to output addresses

4) Import of any media for mapping to fixture arrays

5) Timeline-based programming and playback

6) Extensive range of editable effect presets

7) Drag and drop placement of effect presets and media on timeline

8) Variety of triggering options for firing system-wide events

9) Each trigger event may be configured to initiate one or more lighting control action

10) Each trigger event may be configured to test one or more conditions before executing its actions

11) Simulation of individual timelines, and entire project with triggers

12) Live output from software for programming verification purposes

13) Controller and network management tools

14) Export TSV reports for all aspects of programming

C. Blackbox LPB3028A: Control Rack Network Switch

1. General

a. Provide ODOT approved 28-port Network switch, with AC power supply.

b. Switch shall contain 24 - Gigabit Ethernet Ports, 4 – SFP Slots. .

c. The switch shall be furnished with Blackbox LFP412 Gigabit (1.25-Gbps) Extreme Temperature SFP with Extended Diagnostics with LC connectors.

d. Provide one additional SFP Module.

2. Mechanical

a. The Switch housing shall be constructed of a cast aluminum shell and sheet aluminum face panels.

b. The Switch shall be designed to withstand rough handling and usage without damage to the housing or internal components.

c. Switches shall be of pleasing appearance, suitable for high-visibility locations.

d. Switches shall be designed to mount in a single 19 inch rack unit and shall include all necessary mounting hardware for this purpose.

e. The Switch housing shall be finished in satin black textured powder-coat.

3. Management Features

a. Switches shall provide IGMP V1/V2/V3 Snooping, IGMP Querier and IGMP Proxy

b. Switches shall provide Rapid Spanning Tree (RSTP) 802.1w

c. Switches shall provide Multiple Spanning Tree (MSTP) 802.1s

4. Provide the following Switches and Accessories;

1 28 Port switch with 4 Gigabit fiber ports

4 Fiber transceiver input/output compatible with switches.

6 RJ-45 CAT5 RJ-45 male to RJ-45 male 1.5 foot patch cable, grey.

1 BU-1 Brush Grommet 1U.

D. Blackbox LEH1104A-2SFP Industrial Ethernet Switch, LFP412 SFP 2K (x2): Fiber to Copper Switch

1. General

a. 10/100/1000 Mbps.

b. (4) 10/100/BASE-T autonegotiating RJ-45, full-/half-duplex, auto-MDI/MDI-X; (2) 100-Mbps SFP slots (compatible SFPs include LFP401, LFP402, LFP403, LFP411, LFP412, LFP415, LFP416)

c. (2) DIP switches for setting (2) power failure relay alarms (enable/disable): (2) SFP speed DIP switches for setting 10/1000 Mbps speeds

2. Mechanical

a. 2.85"H x 5.6"W x 6.8"D (7.1 x 14 x 17 cm)

b. IP30 rated aluminum alloy case

3. Electrical

a. Redundant power inputs: Terminal block: 47 to 57 VDC, DC jack: 47 to 57 VDC; Power consumption: Device 15 W max. (without PoE), PoE power budget: 181.6 W max., PoE power output: Ports 1–4: IEEE 802.3at: Up to 30 W/port, 50–57 VDC

b. Removable 8-pin terminal block, 12-48 VDC redundant inputsIncludes reverse polarity protection.

4. Management Features

a. Switches shall provide IGMP V1/V2/V3 Snooping, IGMP Querier and IGMP Proxy

b. Switches shall provide Rapid Spanning Tree (RSTP) 802.1w

c. Switches shall provide Multiple Spanning Tree (MSTP) 802.1s

5. Thermal

a. IP30 metal enclosure for use in harsh indoor environments.

b. Operating temperature range of -40 to +167° F (-40 to +75° C).

6. Provide the following Switches and Accessories

12	Staineless Steel NEMA 4X Enclosure suitable for switches and acillary equipment
12	LEH1104A-2SFP Network Switch
24	LFP412 SFP Gigabit (1.25-Gbps) Extreme Temperature SFP with Extended Diagnostics
12	AC/DC Power Supply 48V, 240W Output
	All mounting hardware, patch blocks, patch cables, and other accessories to complete a working network system.

E. Ben Peoples Industries HORATIO: Rack mount RDM monitor

1. General;

a. ARP and TCP based device monitoring

b. RDM monitoring through nodes (Pathway and ArtNet)

c. sACN, Pathway, and ArtNet monitoring

d. RDM sensor logging

e. CITP (Media Server) monitoring

f. Lyntec RPC breaker status and current monitoring

g. System log server, with upload to remote servers

2. Electrical;

a. 100-240VAC to 5VAC adapter, 10Wmaximum

3. Mechanical;

a. 1RU (19”x1.75”) x 6”D

b. No fans, passive cooling

4. Thermal

a. Operating temperature range from 0°C to 50°C (32°F to 122°F).

F. DANBox Remote Access Gateway

To ensure the highest level of security and ease of use, all specifications listed below must be met by the remote access gateway:

1. The remote access device must be inherently independent of subnets of the remote sites, for both on-demand access and static connections without any additional configuration.
2. The device must be able to provide secure remote access and secure tunneling capability with the same device.
3. Remote Client software must be secured with 3 factor authentication which must include User name and password, X509 Security Certificate, Optional SMS pin code.
4. Central administration login must be secured with 3 factor authentication which must include User name and password, X509 Security Certificate, Optional SMS pin code.
5. The Central Administrator solution must be able to differentiate and provide access to different equipment for different users through the same access gateway through “drag and drop” capability into different sub domain folders for ease of use.
6. Client access software must allow access to USB equipment.
7. Client access software must allow access to Serial equipment by simulating COM ports for supporting native programming software without the need for additional modules but integrated as part of the core offering.
8. The central M2M gateway must be available as a standalone own hosted server, either as hardware or software or 3rd party cloud based (i.e. Amazon Web Services, MS Azure, etc..) as an alternative to just a cloud hosted server, to ensure the highest security possible.
9. To meet the highest level of security, the Company must be able to provide documents that are certified by a recognized independent 3rd party security audit firm, that the solution conforms or exceeds documented recognized IT security standards that must include certification to modified NIST SP800-115 & OSSTMM, Concept Audit: BSI Grundschutz Catalog, IEC 62443-3-3, IEC62443-4-2.
10. To meet future requirements, the same device that can provide remote access must also be able to collect data through standard protocols such as OPC-UA, Modbus IP, Rest, and deliver them via MQTT, REST, AMQP to 3rd party cloud providers including Azure, AWS, Machine Advisor, Cumulocity as well as optionally provide access to a another Hosted Cloud.
11. The remote access device used must not have any data limitations orlimitations on remote users that could incur any recurring cost or “subscription” fees.

12. The M2M gateway and device components must not deploy “open source VPN” technology but must utilize proxy or relay technology to ensure maximum security.

03 CONSTRUCTION REQUIREMENTS

03.1 General

A. It is the responsibility of the Contractor to coordinate the equipment specified with the area to be installed, regardless of any catalog numbers shown. Any discrepancies should be brought to the attention of the Design Engineer and Lighting Designer immediately.

B. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before the static white lighting controls.

C. Coordinate with other Contractors in advance of the installation of the lighting controls to provide them with sufficient time for installing items included in their contracts that must be installed with or before the static white lighting controls

03.2 Control Components

A. Verify field and product dimensions and coordinate conduit entry and all other mounting conditions with the entity manufacturing lighting fixtures.

B. Install all lighting control and dimming equipment in accordance with approved shop drawings.

C. No power is to be applied to the system until specifically authorized by the factory-certified technician for the control system equipment.

D. Upon completion of the installation, including testing of load circuits, notify the factory-certified technician that the dimming system is available for formal checkout. Notification shall be provided in writing two weeks prior to the time factory trained personnel are needed on the job site.

04 PROGRAMMING AND NARRATIVES

A. Narratives will be provided. The factory-certified programmer will program 1 static look into the control system under the direction of the Lighting Designer.

B. Preprogramming submittal reviews will be submitted, commented on and returned at least 30 days before commissioning.

05 RECORD DRAWINGS AND MANUALS

A. Record Drawings

1. Submit two sets of 11 inch x 17 inch Record Drawings along with a digital searchable and indexed PDF copy to the Design Engineer and Lighting Designer for final acceptance. These drawings shall be fully revised and reflect the actual finished installation. The drawing set shall be 100% complete and shall include all schematics, details and Bill of Materials for future maintenance and repair of all systems supplied by the Contractor under this specification.

    a. Each drawing shall be dated and stamped as a Record Drawing.

    b. Prints shall be full sized, stapled into sets. They shall be fully legible.

    c. Any future revisions or modifications by the Design Build Team shall require that the Department's Record Drawings be updated.

B. Manuals

1. Manuals shall be bound in loose-leaf binders and labeled with tabbed dividers for easy reference.

2. Provide two sets of Instructions and Maintenance manuals to the Department along with a digital searchable and indexed PDF copy. The manuals shall consist of, but not be limited to:

    a. System Description

    b. User Operation Instructions including operation of the customized interface.

    c. User Maintenance Instructions

    d. Catalogue Cut Sheets from all equipment purchased

    e. Spare Part Listing

    f. 11 inch x 17 inch assembly drawings needed to perform system maintenance.

    g. Laminated short-cut guide outlining; remote access, system log-in process, system override activation, trouble shooting.

    h. Listing of all the addresses for each luminaire.

06 METHOD OF MEASUREMENT

The quantities to be paid for will be the quantities of all required components as specified in these Technical Special Provisions and shown on plans.

END OF SECTION