Request for Proposal
Informal

BID NO. **6-97648062**

TITLE: **Porter Ridge High Auditorium Stage Lighting Upgrade**

PROCUREMENT LEAD:
Lynn Elms
UCPS Purchasing Department
facilitiesbids@ucps.k12.nc.us

BID/QUOTE SUBMITTAL

Bids will be received no later than: 2:30, local time on Tuesday, May 14, 2026

All proposals must be submitted via email to:

facilitiesbid@ucps.k12.nc.us

Please include the following exactly in the email subject line:

"Bid # 6-97648062 Proposal"

PREBID MEETING

Nonmandatory

10:00 am, April 27, 2026, Front Doors of Porter Ridge High School, 2839 Ridge Road, Indian Trail, NC 28079

It is the sole responsibility of the Bidder, Contractor to familiarize themselves to all aspects of this project. Failure to meet this requirement will not justify a change order.

COMMUNICATION

During the bid process, all communication relating to this bid shall be directed to the Procurement Lead identified above. Failure to meet the requirement may consider your bid non-responsible.

All questions relating to this project shall be directed to the Procurement Lead identified above in the form of an email no later than **2:30pm on Thursday, May 7, 2026. Please include the following in the subject line: "Bid#6-9768062 Questions".** Answers will be provided to all bidders in the form of an addendum which will be posted on UCPS website: https://www.ucpsnc.org/about/purchasing-and-contracts and NC State website: https://evp.nc.gov/solicitations/?status=0

DESCRIPTION OF PROJECT:

Union County Public Schools seeks quotes/informal bids for the above referenced Project.

The Scope of Work, Specifications and Drawings are attached as Exhibit 1.

AWARD:

UCPS desires to promptly approve and sign a contract after a decision has been made to award. Company awarded the contract is expected to promptly sign the contract in the form attached hereto as Exhibit A. Any requested changes to this contract form should be provided with your response.

UCPS reserves the right to award this project in a method considered to be most advantageous. This includes the right to issue single award, multiple awards, or reject all bids. UCPS is not required to award a contract.

REQUIREMENTS:

HUB PARTICIPATION

Pursuant to North Carolina General Statue G.S. 143-48, it is UCPS policy to encourage and promote the use of small, minority, physically handicapped, and women contractors in purchasing Goods and Services. As such, this RFP will serve to identify those Vendors that are minority owned or have a strategic plan to support UCPS Historically Underutilized Business program by meeting or exceeding the goal of 10% utilization of diverse firms as 1st or 2nd tier subcontractors. Vendor shall complete Attachment B: HUB Supplemental Vendor Information.

E-VERIFY AND IRAN DIVESTMENT ACT NOTICE
Pursuant to North Carolina law, the successful bidder will be required to comply with the E-Verify requirements set forth in Article 2 of Chapter 64 of the North Carolina General Statutes and the Iran Divestment Act set forth in N.C.G.S. 147-86.58.

BIDDERS CHECKLIST

- Executed Cost Proposal
- Good Faith Efforts (Affidavit A, B, Identification of Minority Participation Form)
-

RECOMMENDATION OF AWARD

- Certificate of Insurance (meeting the requirements stated within Attachment A).
- Good Faith Efforts (Affidavit C or D)
- 100% Performance and Payment Bond (within 10 days of award).
- E-Verify Affidavit
- Iran Divestment Certification

No Contract shall be executed, and no work shall commence, until all required documentation has been received and approved.

Exhibit 1

SCOPE OF WORK

Reference the Specs and Drawings Sections

The contractor shall provide a complete, turnkey solution and shall furnish all labor, materials, equipment, supervision, coordination, permits (if applicable), and services necessary to perform the work in accordance with the attached specifications, which are hereby referenced and made part of this agreement.

The work shall include all activities required for proper execution, startup, testing, and completion of the work, whether or not each item is specifically described in the Specifications, but which are reasonably required to provide a complete and functional end result.

All work shall be performed in compliance with applicable codes, regulations, and the requirements of the Specifications. In the event of a conflict between this Scope of Work and the Specifications, the Specifications shall govern.

BID SET

PORTER RIDGE HIGH SCHOOL AUDITORIUM LIGHTING DESIGN

UNION COUNTY PUBLIC SCHOOLS
CITY, STATE

Moseley

6210 ARDREY KELL ROAD • THE HUB AT WAVERLY, SUITE 425 • CHARLOTTE, NC 28277
PHONE (704) 540-3755 FAX (704) 540-3754
MOSELEYDESIGNS.COM

DRAWING INDEX - VOLUME 1

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PHONE (704) 540-3755 FAX (704) 540-3754
MOSELEYDESIGNS.COM

DIGITAL SIGNATURE LOCATION

PORTER RIDGE HIGH SCHOOL
AUDITORIUM LIGHTING DESIGN

UNION COUNTY PUBLIC SCHOOLS
2839 RIDGE RD, INDIAN TRAIL, NC 28079

PROJECT NO: 838074 DATE: MARCH 24, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE:	DESCRIPTION:

COVER

G0.1.1

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. RACEWAY: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires or cables. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, and electrical metallic tubing.
1. Cables such as MC, AC, or Greenfield are NOT raceways.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cerro Wire LLC.
2. General Cable; General Cable Corporation.
3. Southwire Company.
4. Encore Wiring Corporation.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

1. Aluminum Conductors above 100 amperes in current rating are permitted only when specifically indicated on the drawings. An alternate feeder schedule for aluminum conductors shall be indicated on the drawings.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

D. Multiconductor Cable:
1. Shall only be allowed where specially indicated on the drawings.
2. Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. Hubbell Power Systems, Inc.
3. ILSCO.
4. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Cooper unless Aluminum specifically indicated on the drawings
1. When aluminum feeders are allowed, provide Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

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

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, conductors in raceway or Type XHHW-2, single conductors in raceway. Type SE or Type USE multiconductor cable are not allowed.

B. Exposed Feeders: Type THHN-2-THWN-2, conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2 conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, conductors in raceway

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, conductors in raceway, Type XHHW-2, conductors in raceway.

H. Feeders and Branch Circuits are not permitted to be installed in Cable Tray

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Branch Circuits Concealed in Casework: MC cable may be used to feed to outlet boxes fish concealed in built-in casework. Route cable supported tight in upper inside corners of casework, not in conflict with drawers or cabinet doors.

G. Branch Circuits Concealed Existing to Remain Drywall Partitions: MC cable may be used to feed to outlet boxes fish concealed in the drywall partition. Convert to conduit and conductor with 3' of exiting the partition.

H. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

I. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
   1. Type MC Cable or FMC, with minimum #12AWG copper THHN/THWN and full size equipment grounding conductor. Maximum whip length 72".
   2. MC Cable and FMC shall be supported within 24" of fixture connection so that whip is not in contact with ceiling or grid. Securing to fixture support wires with batwings is acceptable but not to ceiling support wires.
   3. Do not connect fixture whips from fixture to fixture (daisy chain). No more than 4 whips shall be connected to any one junction box.

J. AC cable is not acceptable in any application.

K. All single-phase circuits shall include a dedicated neutral (grounded) and grounding conductor, unless specifically noted otherwise.
   1. The intent of this is to eliminate multiwire branch circuits and allow disconnection of one circuit without requiring disconnection of other(s) as would be required to comply with NEC 210.4(B). Per NEC 310.15(B)(b) each of these neutral (grounded) conductor is not considered to be load-bearing so derating is not required.

L. Contract drawings are based upon a maximum of 3 current-carrying conductors in a conduit. Contractor may rework indicated circuitry to install a maximum of (6) L-N circuits (120 or 277V) in a single conduit. There shall be no more than 2 each A, B, C phase conductors per homerun. Each shall have dedicated neutral (grounded) conductor.
   1. Do not group L-L circuits in a homerun, unless specifically indicated on the drawings.
   2. Where there are more than 3 current-carrying conductors in a conduit, derate conductor ampacities in accordance with NEC Table 310.15(B)(2)(a).
   3. When running more than 3 ungrounded conductors in a raceway, increase size of conduits beyond those indicated in contract documents, as required to not exceed NEC Chapter 9, Table 1 conduit-fill requirements. As-built drawings shall clearly indicate which circuits are grouped in homeruns.

M. Unless otherwise indicated, minimum conductor size shall be 12 AWG.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors where permitted.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning cables and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Galvan Industries, Inc.; Electrical Products Division, LLC.
4. ILSCO.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Grounding Electrode Conductors: For the main service and transformers within the building shall be bare stranded copper and shall be sized no smaller than that indicated on the drawings or in the NEC table 250-66.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, tele-data rooms and elsewhere as indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

C. Metallic Fences:.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. When provided, Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 QUALITY ASSURANCE

A. Comply with 2005 NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Two Hole Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Thomas & Betts Corporation.
d. Unistrut; an Atkore International company.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101 and as required by NEC except in secure areas, the distance between supports shall be one half that specified by NEC. (twice as many supports as required by NEC).

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces shall be tamperproof include the following:

1. Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

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SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RGS: Rigid Galvanized Steel conduit.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. NBR: Acrylonitrile-butadiene rubber.

H. RNC: Rigid nonmetallic conduit.

I. ACCESSIBLE: Conduit less than 12' above the finished floor that is capable of being exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building. Example: Conduit below 12' AFF that is above a removable ceiling tile is considered "Accessible"

J. RACEWAY: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires or cables. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, and electrical metallic tubing.
   1. Cables such as MC, AC, or Greenfield are NOT raceways.

1.3 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Allied Tube & Conduit.
2. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
3. Robroy Industries.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT: Steel compression type.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AFC Cable Systems, Inc.
2. Electri-Flex Company.

3. RACO; Hubbell.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled NEMA 3R, Flanged-and-gasketed type, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect].

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. MonoSystems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. EGS/Appleton Electric.
2. Erickson Electrical Equipment Company.
3. Hoffman; a brand of Pentair Equipment Protection.
4. Hubbell Incorporated.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
6. RACO; Hubbell.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal.
2. Shape: Rectangular.
3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Gangable boxes are not prohibited.

2.6 FLOOR BOXES AND SERVICE FITTINGS

1. Floor boxes mounted in grade slabs shall be manufactured from cast-iron and be approved for use on grade and above grade floors.

2. Floor boxes not in grade slab shall be manufactured from stamped-steel and be approved for use on above-grade floors.

3. All floor boxes shall have four independent wiring compartments that allow capacity for up to four duplex receptacles and/or communication services. The box shall provide two 1" and two 1 1/4" conduit hubs. The box shall be fully adjustable...

4. Activation covers shall be available in flanged and flangeless versions of cast aluminum. Covers shall be available with options for tile or carpet inserts, flush covers, or furniture feed. Unless indicated otherwise, provide the following cover configurations:
    1) Power/Telecom Outlets: Brushed aluminum flanged with blank lid flush with floor and NO carpet/tile cutouts.
    2) Furniture Floor Feed: Brushed aluminum flanged with 1" trade size screw plug opening and one combination 1 1/4" and 2" trade size screw plug openings.
    3) Color and materiel shall be selected by the Architect
    4) The activation cover shall be listed by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.

2.7 POKE-THRU ASSEMBLIES

1. 8” Poke-thru devices provide an interface between power, communication and audio/visual (A/V) cabling in an above grade concrete floor and the workstation or activation location where power, communication and/or A/V device outlets are required. These devices provide recessed device outlets that will not obstruct the floor area.

2. Insert: Insert body shall recess the devices a minimum of 2-3/4 inches (69mm) and have a polyester based backing enamel finished interior; ivory color. Furnish with necessary channels to provide complete separation of power and communication services. Provide compartments that allow for up to four duplex receptacles and/or communication ports

3. Body consists of an intumescent firestop material to maintain fire rating of the floor slab. Provide insert with a retaining feature to hold the poke-thru device in the floor slab without additional fasteners. Poke-thru insert shall also consist of a 3/4-inch trade size conduit stub that is connected to the insert body and a stamped steel junction box for wire splicing and connections. Stamped steel junction box shall also contain the means necessary to electrically ground the poke-thru device to the system ground

4. Activation Cover: Manufactured of die-cast aluminum alloy; finished in powder-coated color selected by the Architect. Provide with gaskets to maintain scrub water tightness. Provide cover with spring-loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Concealed in Masonry Walls: GRC or NMC grouted solid after installation.
4. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Concealed in Masonry Walls: EMT or NMC grouted solid after installation.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Damp or Wet Locations: GRC.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
   Concealed conduit to the greatest extent possible.

E. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
1. Above non-removeable ceilings, junction boxes are not acceptable. Provide conduit between the fixtures.
2. Above accessible ceilings provide FMC or MC connection whips in maximum length of 6'-0".

F. AC is not acceptable in any application

G. Do not install aluminum conduits, boxes, or fittings.

H. Install surface raceways only where indicated on Drawings.

I. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. All conduit shall be tight to the structure and securely with steel conduit straps.

C. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. All conduit to be installed on exterior masonry shall not run continuously within the wall cavity.

J. Support conduit within 6 inches of enclosures to which attached.

K. Raceways Embedded in Slabs are not permitted, except as required for entry into recessed floor boxes. Conduits shall be routed below the slab within the porous fill and stub-up at the required location. Transition from RNC to RGS with RGS elbow before rising above the floor. After RGS elbow, stub-up conduit shall be type indicated in Part 3.1 above. RNC shall not be permitted exposed above the floor

L. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

N. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Special Fittings and Installations:

1. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.Install each expansion-joint fitting with position, mounting, and piston

setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements and also refer to Architectural elevations. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box. Retain the fire rating of any fire rated wall or assembly

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

3.5 CONDUIT COLOR CODING

A. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined below. This includes covers on boxes above lift-out and other type accessible ceilings, where identification shall also include branch circuit designation.

1. Blue for 120/208-volts normal conduit.
2. Black for 277/480-volts normal conduit
3. Bright red for all conduit related to fire alarm system.
4. Dark red (burgundy) for all conduit related to security.
5. Green for all conduit related to NEC 701 and 702 emergency systems
6. Orange for all conduit related NEC 700 emergency systems
7. Brown for all conduit related to data systems.
8. White for all conduit related to paging systems.
9. Purple for all conduit related to TV systems or other LV systems.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Maintain the fire rating of all fire rated walls and assemblies in which electrical raceway or boxes are installed.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Advance Products & Systems, Inc.
b. Metraflex Company (The).
c. Proco Products, Inc.

2. Sealing Elements: Rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Connecting Bolts and Nuts of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's

wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."

D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

I. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER HIGH VOLTAGE WIRING."

D. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

F. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.5 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

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

B. Color and Printing:

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

C. Warning Tape:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

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

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and

size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

1. Warning labels and signs shall include, but are not limited to, the following:
   a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
   c. Arc Flash Hazard Warning: Refer to Section 260574 for requirements.

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

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

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

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes

where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Grounded (Neutral): White.
5) Ground: Green.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Grounded (Neutral): Gray.
5) Ground: Green.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes or self-adhesive, self-laminating polyester labels with the conductor designation.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

J. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

K. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

M. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

N. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchboards.
   e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   f. Emergency system boxes and enclosures.
   g. Enclosed switches.
   h. Enclosed circuit breakers.
   i. Enclosed controllers.
   j. Variable-speed controllers.
   k. Push-button stations.
   l. Power transfer equipment.
   m. Contactors.
   n. Remote-controlled switches, dimmer modules, and control devices.
   o. Battery-inverter units.
   p. Power-generating units.
   q. Monitoring and control equipment.
   r. UPS equipment.

END OF SECTION 260553

SECTION 260961 - PERFORMANCE POWER, CONTROLS, AND LIGHTING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Architectural controls.
   1. Paradigm.
   2. Emergency Control Products.
   3. Response.

B. Power Controls.
   1. Power control enclosures (Sensor, Sensor IQ, DRd, ERP, ERPA, ERP-FT).
   2. Distributed power controllers (Foundry Zone Controllers, Foundry Mini Panels, Foundry F-Drive, ColorSource Relay).

C. Entertainment controls.
   1. Eos.

D. Software. (Eos)

E. Entertainment LED luminaires.
   1. ColorSource.

F. Quantities

1.2 RELATED SECTIONS

A. Section 26 27 16 - Electrical Cabinets and Enclosures.

B. Section 26 09 43 - Network Lighting Controls.

C. Section 41 67 19 - Plant Safety Equipment. Building integrator shall provide integration of the lighting control system with Building Automation Systems.

D. Section 16130 - Wiring Devices Receptacles.

E. Section 16570 - Wireless Lighting Commercial Controls.

F. Section 13800 - Integrated Automation. Building integrator shall provide integration of the lighting control system with Building Automation Systems

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each type, size, pattern, and color.

D. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience with projects of similar scope and complexity.
   1. One company shall be responsible for furnishing and installing all equipment under this section.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Standards Compliance: Luminaire testing is by nationally recognized third-party labs in compliance with IES LM-84.

1.5 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. All equipment shall be sized to fit properly. The exact measurements are the responsibility of the Contractor. If there are discrepancies in the specifications, the Contractor shall ask for a clarification from the Owner. If no clarification is requested, the Owner's judgment shall rule.

1.8 WARRANTY

A. Manufacturer's standard limited warranty unless indicated otherwise.
   1. Unless Specified Otherwise: Fixtures: 5 years. LED Arrays: 10 years.

B. The Contractor shall warranty all work performed under this contract, including all materials and workmanship, for a period of one year from the date of full acceptance of the work.

C. Warranty does not cover any product or part of a product subject to accident, negligence, alteration, abuse or misuse. Warranty does not cover any accessories or parts not supplied by the manufacturer.

1.9 PRE-APPROVED INTEGRATION CONTRACTORS

A. One company shall be responsible for the installation of all aspects of the equipment as specified in this section. This shall include but not be limited to all tracks, control, stage lighting fixtures, stage/house dimming, and dimming controls and miscellaneous equipment.

B. The following companies have prior approval as INTEGRATORS:

C. To be considered as an Integrator on this project, each Contractor requesting approval must submit to the Architect at least fifteen (15) days prior to the date of bid opening a letter expressing his intent to bid. This letter shall include a list of at least five (5) projects of similar size and scope completed by this firm within the last five (5) years. Inspection of one completed installation may be requested by the Architect/Architect's Representative prior to consideration of request to bid. The stage equipment contractor shall have been in business under the same name for five (5) full years preceding the date of this bid doing work similar to the type specified. The decision of the Architect as to the capability of the Bidder to successfully complete and maintain the system, based on this pre-qualification information shall be final.

SCOPE OF CONTRACTORS WORK			
Scope of Work Item	**Integration Contractor**	**Electrical Contractor**	**Notes**
Mounting of dimming and equipment enclosures		X	
Provide power feeds to dimming and equipment racks		X	
Provision and pulling of low voltage wire		X	
Provision, pulling and termination of line voltage wire		X	
Termination of low voltage wire	X		
As submittal and as-builts of Theatrical System	X		
Two site visits for Theatrical / Architectural programming not to exceed one day each. Warranty visits are not considered site visits.	X		
Network and Low Voltage terminations to all Theatre devices. Equipment rack Cat5 terminations.	X		
Create DMX schedule and program for a base of operation.	X		
Installation of rigging system	X		Coordinate with Electrical Contractor
Tie in of plug boxes and FOH connector strips		X	Coordinate with Theatrical Contractor
System commissioning	X		
Fixture hang and focus	X		
Ladders, Lifts, access to all devices required for a complete and working installation		X	
Training for the rigging, theatrical LED fixtures, architectural system and theatre console.	X		Provide One Day of onsite training.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: ETC, Inc., which is located at: 3031 Pleasant View Rd., P. O. Box 620979; Middleton, WI 53562-0979; Phone: 608-831-4116; Email: mail@etcconnect.com; Web:www.etcconnect.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

1. Standards Compliance: Luminaire testing is by nationally recognized third-party labs in compliance with IES LM-84.

2. Warranty Unless Specified Otherwise: Fixture: 5 years. LED Array: 10 years.

2.2 ARCHITECTURAL CONTROLS - PARADIGM

A. Touchscreens:

1. Product: Unison Paradigm Portable Touchscreen by ETC, Inc.

a. Model P-TS7-PE: 7 in Portable Touchscreen (NetConnect/Ethernet).

2. Standards Compliance: UL and cUL LISTED. CE Compliant.

3. Functional:

a. Built-in setup interface, separate from user configured pages.

b. Configuration Upload from the Following Sources:

1) LightDesigner software.

2) USB Flash Drive, via built in USB port.

3) SD media.

c. Ability to store multiple configurations and to select which configuration is active from an on-screen menu.

d. Allows at least 30 separate control pages.

e. Control Functions:

1) Individual zone control.

2) Preset record and selection.

3) Room Combine Controls.

4) Preset, color, sequence, macro, and custom function activation.

5) Change, initiate, or override timed events.

6) Multi-level electronic lockout.

f. Custom controls configured from LightDesigner software.

g. Custom graphics configured from ControlDesigner software.

h. Supports Windows 7 and newer HID compliant Touchscreen Displays.

i. Software controlled lock-out and control visibility using up to 5 unique passcodes.

4. Mechanical:
    a. LED-backlit, color LCD display with touchscreen interface.
    b. Aluminum enclosure in black anodized finish.
    c. Adjustable brightness and contrast for low light conditions.
    d. 7 inch WVGA display (800x480) with 24-bit color.
    e. LCD touchscreen covered by lid when in closed position.
    f. 10 ft removable cable (NetConnect model only).
    g. 1U 19 inch Rackmount kit.
5. Electrical:
    a. Connection to Unison Paradigm control system using Unison Heritage portable plug-in stations (UH1RS) or Ethernet Stations (UH-NET).
    b. Linkconnect Network uses Topology free and polarity independent Class 2 control network over Belden 8471 plus two No. 16 for 24 VDC AuxPower and one No. 14 ESD drain wire.
        1) Wiring may be buss, loop, home-run, or any combination of these.
    c. NetConnect wiring uses standard Ethernet Infrastructure over twisted pair ethernet.
        1) Star topology using standard PoE Ethernet Switches.
        2) PoE Class 2 Device (6 W).
6. Operating Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
7. Relevant Humidity Non-Condensing: 0 to 90 percent.

B. Unison Control Series:
1. Product: Paradigm Architectural Control Processor by ETC, Inc.
    a. Model P-ACP-D Mk2: DIN.
        1) Enclosure Assembly: DIN14-P-ACP/SPS/NET: DIN14 Enclosure w/ P-ACP-D, P-SPS-D. and a Mosaic Network Switch.
    b. Standards Compliance: cULus Listed. CE Compliant. UKCA Compliant.
    c. Functional:
        1) Capacity:
            a) Channels of Control: 2,048.
            b) Stations: 128 per control processor.
                1) Each P-SPM-E can support 63 stations.
                2) Each P-SPS-D can support 63 stations.
                3) Each P-NSPS-D can support 63 stations.
                4) Maximum (1) P-SPM-E or P-SPS-D and (5) P-NSPS-D per control processor for a total of 128 stations per processor.
        2) System:
            a) Net3 system interoperability including sACN.

b) Network Time Protocol for real-time clock synchronization supporting real and astronomical events.

c) Supports two universes of DMX.

d) Provides configuration of DRd dimming operations (P-ACP-E only).

e) Up to 12 control processors per project.

f) Up to 64 control proecssors across multiple projects when using a Central Control Server.

g) Addition of processors to a system proportionately increases the overall capacities.

3) RS-232 Serial Input/Output:

a) Eight-bit word length, parity selection and one or two stop bits.

b) Configurable baud rates from 9600 to 115,200 bps.

c) Fully customizable input and output messages.

d) Bi-directional.

4) Configuration Data:

a) Remote upload from a connected PC running LightDesigner or another connected Paradigm Processor or Paradigm Server in the system.

b) Stored in removable solid-state memory for easy transfer to another Paradigm Processor.

5) Local User Interface:

a) Front panel color graphic LCD display.

b) Backlit alpha-numeric direct entry buttons (P-ACP-E only).

c) Backlit menu navigation buttons (P-ACP-D only).

d) Front panel status LEDs.

e) Control functionality for control channels, zones, fixtures, groups, presets, macros, walls, and sequences.

f) Ability to schedule timed events (edit/delete).

g) Transfer of configuration using USB removable media.

h) Transfer of configuration to and from touchscreen stations using removable media.

6) User Access Controls: Two user accounts: Administrator and User. Local to each processor.

7) Web User Interface:

a) Internal web server accessible via Ethernet port.

b) Activate and deactivate presets.

c) Schedule timed events (add/edit/delete).

d) Displays status information and log files.

e) Configuration of processor settings.

f) Supports configurable user login security options.

8) Diagnostics: Standard and Critical Event logging.

9) Stations:

a) Connected to a Paradigm processor via topology-free LinkPower, or star-topology network connection (Touchscreen Stations only).

b) Discovery and binding accomplished from the local user interface or LightDesigner Configuration Software.

10) Operation:

a) Configurable DMX output refresh rate.

b) Support for 16-bit DMX attributes.

c) User configurable arbitration for multiple internal and external source data.

d. Mechanical: Common.

1) Microprocessor-based, solid-state technology provides multi-scene lighting and building controls.

2) Fanless.

3) Tool-free installation.

4) Front-panel user interface with backlit 128x160 pixel color graphic display.

5) Front-panel status indicators for Power, DMX, Errors, and Ethernet.

6) RJ-45 Ethernet network and Universal Serial Bus (USB) host port on front panel.

7) Recessed reset button.

e. Mechanical: P-ACP-D Specific.

1) Durable aluminum housing, IP20 listed and UL2043 plenum rated.

2) Designed for installation on 35 mm symmetric DIN rail compliant with DIN EN60715 (TS-35/7.5 and TS-35/15 rail).

f. Electrical:

1) Button stations, button/fader stations, touchscreen stations, sensors, and third party LonMARK compliant products.

2) System configuration and programming information stored in onboard microSD memory card.

3) Support of ESTA BSR E1.17 Advanced Control Networks (ACN) and ESTA BSR E1.31 (sACN) Protocols.

4) Supports EIA-RS232 serial protocol for bi-directional command and communication with third-party equipment.

5) Compliant with IEEE 802.3i for 10/100/1000 BASE-T, Auto-MDI.

6) Two discrete ESTA DMX512A ports, configurable as input or output ports.

a) When used in a Dimming Enclosure, the second DMX port is always an output.

b) DMX/RDM termination switches per port (IN= 120 ohm termination, OFF= no termination (the DMX signal passes through), OUT= Paradigm is the source).

7) User Datagram Protocol (UDP) messaging input and output for control of Paradigm or external systems.

g. Thermal: P-ACP-D.

1) Operating Temperature Range: 32-113 degrees F (0-45 degrees C).

2) Relevant Humidity Non-Condensing: 10 to 95 percent.

C. Paradigm Controls Series:

1. Product: Unison Paradigm Inspire Control Stations.

a. Model PI1004: Inspire 4-Button Control Station.

b. Model PI1008: Inspire 8-Button Control Station.

2. Standards Compliance: UL and cUL Listed, CE compliant.

3. Functional:

a. Zone or preset control from any station.

b. RGB button illumination for activity status.

c. Button functions: preset selection, record mode activation, station lockout, raise, lower, macro activation, zone on/off control, timed-event override, and wall open/close or toggle.

d. Custom button functionality programmable via LightDesigner configuration software.

e. Programmable Electronic Lockout Levels:

1) Allows for programming of individual lockout levels.

f. Fader Functions: Zone or group intensity, color control, variable white control.

4. Mechanical:

a. Configurations with 1, 2, 4, 6 and 8 buttons or 4 buttons with rotary fader.

b. Gangable with Inspire stations for custom applications.

c. Enclosed electronics assembly.

d. Cantilevered switch arrays with removable button caps.

e. No visible means of attachment.

f. Flush-mount in industry standard backbox, RACO 690 or equivalent.

g. Surface-mount backboxes available from ETC upon request.

h. Constructed of injection-molded, ABS plastic in four RAL standard colors.

i. Unison Heritage Locking Cover.

5. Electrical:

a. Connect via LinkConnect two-wire control network utilizing low-voltage Class 2 wiring.

1) Topology-free and polarity-independent wiring over Belden 8471 and one No. 14 ESD drain wire.

2) Wiring may be bus, loop, homerun, or any combination of these.

b. All station terminations utilize removable connectors.

6. Operating Temperature Range: 32 to 104 degrees F (0 to 50 degrees C).

7. Relevant Humidity Non-Condensing: 10 to 90 percent.

2.3 ARCHITECTURAL CONTROLS - EMERGENCY CONTROL PRODUCTS

A. Product: DMX Emergency Bypass Controller by ETC, Inc. Where required to trigger special-purpose lighting presets and bypass normal lighting controls during emergency or panic situations.

1. Model DEBC-6: DMX Emergency Bypass Controller, 6-output.

2. Capable of overriding a single universe of DMX512 control signals from "Normal" to "Bypass" when a trigger signal is detected via a contact closure trigger input.

a. Output to a single DMX output or up to six optically-isolated DMX outputs.

b. Poll bypass trigger input after a power loss and react upon start up.

c. Recalled immediately on restart if trigger is also applied at restart.

3. Capable of recording a single DMX preset (snapshot) of 512 channels for recall during "Bypass" mode.

4. Internally accessible, labeled DIP switches for configuration of:

a. DMX Record Mode: 512 channels. Selected channels, snapshot.

b. Contact Input Type: Normally open (default). Normally closed.

c. Wait Time for Restore incoming DMX; Bypass Trigger Removed: 0 Seconds (default). 10 second wait. 30 second wait. 10 minute wait.

5. Single Bypass Input Using Two Input Modes:

a. Bypass Triggering: Via a maintained contact input configurable for normally open (N.O.) or normally closed (N.C.) operation.

b. Contact Input: 12 VDC wet input for interface with fire alarm or secondary trigging systems.

6. Mechanical:

a. Surface Mounted Enclosure. Removable Front Cover: 16-gauge, formed steel.

b. Single Bi-Color LED Indicator: Visible from exterior of enclosure.

1) Normal State: Green light when Power and DMX are present.

2) Off indicates Power or DMX are not present.

3) Bypass State: Red light. Includes bypass input contact trigger or 'test' active.

c. Test Button: Front enclosure accessible without removing panels.

1) Triggers bypass state if it is held down. Releases bypass state upon button release.

a) Button: Momentary only. Recessed to prevent accidental triggering.

d. Single, internally accessible button for DMX Record (snapshot) with an indicator LED for record action.

1) Record Button: Momentary only and held for 3 seconds before activation to prevent accidental recording.

2) LED indicator: Flashes rapidly when record function is active and illuminate steady when record function is complete.

7. Electrical: Internally pre-wired by Manufacturer.

a. Contractor to provide input feed and control wiring to terminals.

1) Input Power: 100 to 277 V, 50/60 Hz, 150 mA maximum current.

b. Labeled terminations for two 24 to 0 AWG solid or stranded power wires.

c. One Grounding Lug for 24 to 14 AWG solid or stranded ground wire.

d. Labeled, socketed termination connections for DMX Input and Output wiring.

1) Terminations support Belden 9729, 1583A Category 5 cable, or equivalent.

e. Labeled, socketed termination for bypass contact input.

1) Termination to support two, 30 to 12 AWG low-voltage wires.

2) Bypass Input: To maintained normally open (N.O.) or normally closed (N.C.) dry contact input.

3) Wet Contact Input: 12 VDC for fire alarm system interface.

4) Socketed DMX transceiver chips.

a) Spare chip in labeled, inactive socket.

f. Internally switch from normal DMX input (pass through) to bypass DMX output using electromechanical relays when triggered.

1) Non-Volatile Memory: For storage of single recorded sequence of 512 channels.

a) Recorded sequence to persist through power outages.

b) Default Sequence: 512 channels at "full" if no sequence is recorded.

2) DMX Baud Rate: "Slow," 20 packets per second for increased compatibility during bypass DMX output.

g. Two versions capable of output to a single DMX line or up to six optically-isolated DMX lines.

h. Standards Compliance: UL and cUL Section 924 Listed for interaction with similarly listed products.

8. Room Operating Temperature: 32 to 104 degrees F (0 to 40 degrees C).

a. Humidity Non-Condensing: 10 to 95 percent.

B. Product: Emergency Bypass Detection Kit by ETC, Inc. To detect loss of normal power and trigger special-purpose lighting presets.

1. Model EBDK: Emergency Bypass Detection Kit.

2. Standards Compliance: UL and cUL Section 924 Listed.

3. Surface Mounted Enclosure. Removable Front Cover: 16-gauge, formed steel.

a. Finish: Fine textured, scratch-resistant, powder coat paint.

4. Breaker: 3 pole, 10 amp for local over-current protection and simulation of normal power loss.
5. Lockable Door: Limits access to over-current protection breaker.
6. Components to be properly treated and finished.
7. Discrete high and low voltage wiring compartments with voltage barrier.
8. Accessories:
    a. Emergency Bypass Detection Tap Kit (EBDK-TAP): For normal power loss sensing within an ETC Unison DRd Enclosure.
        1) Fused over-current protection for sense feed wiring without need for external circuit breaker.
        2) Install within an ETC Unison DRd Enclosure.
9. Electrical:
    a. Input Power: 100 to 277 V. Field configurable for single-phase, bi-phase, and three-phase operation without additional components.
    b. Phase Loss Detection Circuitry: 0.5 second delay to prevent nuisance tripping.
    c. Integrated Circuit Breaker: Over-current protection and normal power loss simulation.
    d. Isolated Outputs: For connection to multiple dimming products simultaneously.
        1) Three Isolated Contacts: Each support connection of four dimming products.
    e. Pre-wired by Manufacturer. Contractor to provide input feed and control wiring.
    f. Control Wire Connections: Terminated via factory provided connectors.
        1) Support 12 to 22-gauge wiring.
        2) Emergency Lighting Input: Support load shedding.
    g. Bypass Detection Kit: Proves a normally-closed input for interface with fire alarm systems. UL and cUL Section 924 Listed for interaction with similarly listed dimming and switching panels.
10. Operating Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
    a. Humidity Non-Condensing: 10 to 90 percent.

2.4 ARCHITECTURAL CONTROLS - RESPONSE

A. Gateway Series:

1. Product: Response Mk2 DIN Gateways by ETC Inc. DIN Gateway provides data distribution using the quality and reliability of ETC's network technology. Built for Net3 using industry-standard sACN, DMX and RDM.
    a. Model: RSN-DMX4-DIN Response MK2 4-port Gateway - DIN Rail.
    b. Standards Compliance: cETLus Listed, CE compliant, EAC certified, RoHS compliant, WEEE.
    c. Functional:
        1) Supports Net3/ACN (ANSI E1.31 and E1.17), RDM (ANSI E1.20), and USITT DMX512-A (ANSI E1.11).

2) Compliance: USITT DMX512 and ANSI E1.11 DMX512-A.

3) Flexible Output Patch: Allows a 512-address universe to begin at any output address.

4) Advanced Input Patch.

5) Support for per-address- or per-universe-level priority.

6) Delay Time from Input to Output: Not greater than one packet time.

7) Selectable DMX Refresh Rate: Maximum of 40 Hz.

8) Supports 255 total RDM devices.

d. Mechanical:

1) Intuitive four-button interface.

2) Onboard display for identification, status, and configuration.

3) Molded plastic enclosure.

4) Mounting: Complies with DIN43880 (35/7.5 rail).

5) DIN installation enclosure available.

6) Network, power, and data activity LED indicators.

a) Blue power indicator, green network activity indicator.

b) Bi-color DMX activity indicator.

7) RJ45 connector for connection to lighting network.

8) Reset button for hard reset or forced reboot.

e. Environmental:

1) Ambient operating temperature: 32 to 104 degrees F (0 to 40 degrees C).

2) Operating Humidity: 5 to 95 percent non-condensing.

3) Storage temperature: -40 to 158 degrees F (-40 to 70 degrees C).

f. Electrical:

1) Compliant with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet.

2) Power Input: 12-24 VDC for use with non-PoE systems.

3) Maximum seven watt current draw.

4) Pluggable clamp style terminals for solid and stranded cable provided.

g. Configuration:

1) Local configuration options.

2) Remote configuration by Net3 Concert.

a) Supports 512 DMX addresses per port.

b) Supports 63,999 Streaming ACN universes.

3) DMX data input or output configurable by user.

4) Multiple sources may be combined to the network with each source or address allowed an independent priority.

5) Individual port start address and offset.

6) User-configurable labeling.

2. Product: Response Mk2 One-Port Gateway by ETC Inc.

a. Standards Compliance: cETLus Listed, CE compliant, EAC certified, RoHS compliant, WEEE.

b. One-Port Gateways - Portable

1) Model: RSN-DMX1-O-P-_ Portable 1-port Gateway - 1 Output

c. Color: As determined by the Architect from the Manufacturer's offering.

d. Functional:

1) Supports Net3/ACN (ANSI E1.31 and E1.17), RDM (ANSI E1.20), and USITT DMX512-A (ANSI E1.11).

2) Compliance: USITT DMX512 and ANSI E1.11 DMX512-A.

3) Flexible Output Patch allows a 512-address universe to begin at any output address.

4) Advanced Input Patch.

5) Support for per-address- or per-universe-level priority.

6) Maximum delay time from input to output not greater than one packet time.

7) Selectable DMX refresh rate: At least 40 Hz.

8) Supports 255 total RDM devices.

e. Mechanical:

1) Intuitive four-button interface,

2) Onboard display for identification, status, and configuration.

3) Enclosed electronics assembly and faceplate.

4) No visible means of attachment.

5) Flush-mount in industry standard backbox, RACO 690 or equivalent. Surface-mount backboxes available

6) Construction: Injection-molded, ABS plastic.

7) Green LED: For network activity indication.

8) RJ45 connector for connection to lighting network.

9) Reset button: For hard reset or forced reboot.

f. Environmental:

1) Ambient operating temperature: 32 to 104 degrees F (0 to 40 degrees C).

2) Operating Humidity: 5 to 95 percent non-condensing.

3) Storage temperature: -40 to 158 degrees F (-40 to 70 degrees C).

g. Electrical:

1) Compliant with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet.

2) Power Input: 12-24 VDC for use with non-PoE systems.

3) Maximum Current Draw: 4 W.

h. Configuration:

1) Local configuration options.

2) Remote configuration by Net3 Concert.

a) Supports 512 DMX addresses per port.

b) Supports 63,999 Streaming ACN universes.

3) DMX data input or output configurable by user.

4) Multiple sources may be combined to the network with each source or address allowed an independent priority.

5) Individual port start address and offset.

6) User-configurable labeling.

B. Opto-Splitter Series:

1. Product: Response Opto-Splitter by ETC Inc. Provides quality and reliable DMX data distribution using industry-standard DMX and RDM.

a. Model: RSN-OPTO-8DIN. 8 Port DIN rail - Terminal.

b. Standards Compliance: cETLus Listed, CE compliant, EAC certified, RoHS compliant, WEEE.

c. Functional:

1) No configuration required.

2) Supports DMX512, DMX512 (1990), DMX512-A, ANSI E1.20 Remote Device Management (RDM).

3) Supports 256 total RDM devices

d. Mechanical:

1) DIN rail form factor:

a) Molded plastic enclosure.

b) Mounting complies with DIN43880 (35/7.5 rail).

c) Unit is 9 DIN units wide.

d) DIN installation enclosure available.

2) Power and data activity LED indicators.

a) Blue power indicator.

b) Green DMX activity indicator.

e. Environmental:

1) Ambient operating temperature: 32 to 104 degrees F (0 to 40 degrees C).

2) Operating Humidity: 5 to 95 percent non-condensing.

3) Storage temperature: -40 to 158 degrees F (-40 to 70 degrees C).

f. Electrical:

1) Supports DMX input and DMX thru.

2) Provides optically isolated DMX/RDM outputs.

3) DIN rail form factor:

a) Power Input: 12-48 VDC power input.

b) Power Draw: 8 W max

c) Wiring connections use pluggable clamp style terminals for solid and stranded cable.

2.5 POWER CONTROL ENCLOSURES

A. Product: Sensor IQ Intelligent Breaker System by ETC Inc. Provides 120/208 V, 120/240 V, or 277/480 V mains-fed power distribution for up to 48 branch circuits. Combines high inrush rated overcurrent protection, switched power control, and power usage/breaker status reporting in a single device. Integrated DMX and Ethernet connectivity. Optional 0-10 V dimming, DALI output, contact inputs, and isolated ground bar for audio loads.

1. IQ48 Enclosure: 48 branch breaker slots, 3-phase 120/208 V mains feed.

2. Mechanical:

a. Construction: 16-gauge steel.

b. Finish: black, fine-textured, scratch-resistant powder coat paint.

c. Removable outer panel includes integral locking door to limit access to electronics, breakers, and local relay overrides.

d. Full front access with no side clearance required.

e. Removable covers for access to Class 1 and Class 2 wiring.

f. Complies with California building code - seismic zone four.

3. Electrical:

a. Mains feed power input to support 120 / 208 V three-phase four-wire or 120 / 240 V bi-phase three-wire plus ground.

b. Max current input: 100 A at 12 circuits, 200 A at 24 circuits and 400 A at 48 circuits.

c. Quiescent draw: < 10 W with relays at steady state.

d. Optional isolation between chassis and equipment grounding.

e. Short-circuit current rating: 22,000 A or 65,000 A symmetrical.

f. Overloads occurs at 50 operations of 600 percent of rated current.

g. Feeder entry supported at top or top side.

1) Bottom or bottom side entry supported by rotating enclosure during installation.

h. Load wire entry supported on top, sides, or bottom.

4. Thermals:

a. Operating Temperature: 32 to 104 degrees F (0 to 40 degrees C).

b. Humidity: 5 to 95 percent non-condensing.

5. Branch breakers:

a. Trip mechanism: Hydraulic magnetic.

b. Bus connection type: Stab on.

c. Inrush-pulse tolerance: 25 times rated current for half-cycle.

d. Load lugs accept 14-6 AWG load wiring.

e. Integral current sensing.

f. Integral trip sensing.

g. Control and status provided by contact pads directly at bottom of the breaker case. No external wires or connections required for control or feedback.

h. Visible state indication:

1) LED On, Handle On: Output active.

2) LED Off, Handle On: Remotely controlled off (Smart breakers only).

3) LED Off, Handle Off: Breaker tipped/Manually off.

i. Remote Feedback for breaker state, breaker type, current draw, and phase voltage.

6. Smart Breakers:

a. Integral mechanically held air gap relay.

b. Integrated hall-effect sensors detect contact positions.

c. Integrated solenoid for remote operation.

d. Supports manual reset using breaker handle without power.

7. Breaker Operational Ratings:

a. No load-remote switching (Smart Breakers): 1,000,000 cycles.

b. Electronic Load: 15 A, 100,000 cycles.

c. Handle operations: 10,000 cycles.

d. Duty cycle of 6 full cycles (12 operations) per minute.

e. Supports voltage isolation of 4000 V RMS.

f. Utilizes latching state, mechanically held relays (Smart Breakers only).

8. Breaker Models:

a. Breakers: 120 V Smart.

1) 1-Pole: 15 A, 20 A, or 30 A.

9. Control:

a. User interface:

1) Graphical display with LED backlight.

2) Button Interface With: 0 to 9 number buttons.

3) Navigation Buttons: Up, down, back and enter.

4) "Light bulb" test button for local preset activation, sequence and set level overrides.

5) USB interface: For upload of setup and software updates.

b. Control Wiring Terminations:

1) Control Terminals: Accept 12 AWG wire.

2) Control Wiring Exiting Panel: Class 2.

3) Control Terminations: Utilize removable connectors.

c. Relay Modes: Normal (priority/HTP), latch-lock or last-action.

d. Configurable DMX on/off threshold.

e. Status feedback for breaker state, relay state, current drawer circuit, phase voltage and energy usage per circuit.

f. Presets and sequences:

1) Sixteen spaces with 64 presets per space configurable via local UI.

2) One 16 step sequence per space.

g. UL924 Listed emergency control bypass.

h. Configurable Data-Loss Behavior: Play preset; Hold last look; Wait and fade.

10. Standards Compliance:

a. Breakers: Listed to UL 489.

b. Enclosures: Listed to UL 67, UL 508, UL 924.

c. Complies with ANSI DMX512-A and ANSI E1.31 streaming ACN standard.

d. Complies with ESD immunity to IEC standard 1000-4-2.

11. Quantities and configurations of Sensor IQ enclosures, branch circuit breakers, and accessories to be supplied as shown on project drawings.

2.6 DISTRIBUTED POWER CONTROLLERS

A. Product: Unison Foundry Zone Controllers by ETC Inc. DMX controlled, single- or dual-channel power controllers. Mount to an electrical junction box.

1. Model: UFD-277 - 277 VAC, 600 W phase-adaptive dimmer - ELV, fluorescent or incandescent loads only. Single-channel output.

2. Mechanical:

a. Construction: Injection-molded ABS plastic.

b. External heat sink.

c. Rated ambient room temperature: 32 to 122 degrees F (0 to 50 degrees C).

d. Rated ambient humidity: 5 to 95 percent non-condensing.

e. Half-inch conduit knockout mounted.

f. Mains voltage wiring exits through knockout mount.

g. DMX wiring connects to side of controller.

3. Electrical:

a. Mains Power Input Connections:

1) Power Input: 120 to 277 V, 50/60 Hz.

2) Hot (black wire): 4 sq mm (12 AWG).

3) Neutral (white wire): 2.5 sq mm (14 AWG).

4) Ground (green/yellow wire): 4 sq mm (12 AWG).

b. Dimmed Output Connection (red wire): 4 sq mm (12 AWG).

c. DMX Input Port: Optically isolated from controller electronics.

1) Withstands fault voltages of up to 250 VAC.

2) Integrated DMX/RDM termination.

4. Remote Configuration: Available via RDM controllers including:

a. ETC DMX/RDM gateway networked to a device running ETC Concert software.

b. ETC Control Console with RDM functionality.

c. 3rd party configuration and control products.

d. Manual Configuration: Available via local button interface with LED indicators.

e. Set starting DMX address on the controller.

5. Standards Compliance: Listed: cULus. Conforms to UL 508 and UL 2043, USITT DMX512-A (ANSI E1.11), and RDM (ANSI E1.20). Rated for plenum installation. Relays suitable for plug-load control (UFR2 and UFR2-LV only).

6. Models and quantities of Foundry Zone Controllers to be supplied as shown on project drawings.

2.7 ENTERTAINMENT CONTROLS (EOS)

A. Product: Ion XE as manufactured by ETC Inc.

1. Model Ion Xe 2K: Ion Xe console, 2,048 outputs, base.

2. Power consumption: Approximately 2 A at 120 V or 230/240 V.

3. Ambient Room Temperature: 32 to 95 degrees F (0 to 35 degrees C).

4. Ambient Humidity: Up to 90 percent non-condensing.

5. Regulatory Compliance: CE compliant, cETLus listed, UKCA marked, FCC compliant, RoHS compliant, and WEEE.

6. Hardware and Interfaces:

a. Supports two external display port monitors (1920 x 1080 min, 3840 x 2160 max). Optional single-touch or multi-touch screen control and DDC/CI support.

b. Main Playback with two 100 mm standard faders.

c. Four encoders for non-intensity parameter control.

d. Dedicated high-resolution intensity level wheel.

e. Backlit Eos keypad.

f. Built-in keyboard tray.

g. Dedicated macro buttons.

h. Solid-state hard drive.

i. IEC Power Input: 100 to 240 VAC at 50/60 Hz, fused mains power switch, locking regionalized power cable included.

j. Two individually configurable Gigabit Ethernet ports, RJ45 connectors.

k. One 802.11ac Wi-Fi Ethernet adapter. To be enabled with future software.

l. Bluetooth 5.1 for connecting input accessories. To be enabled with future software.

m. sACN and Art-Net network output protocols.

n. Four DMX-512 / RDM 5-pin XLR ports.

o. Contact closure triggers via D-Sub connector.

p. USB 3.1 ports, for flash drives, pointing devices, keyboards.

1) USB-A Ports: 5. USB-C Ports: 2.

q. One Littlite XLR port.

r. One Kensington lock port.

s. Multiple MIDI and/or SMPTE timecode inputs, MIDI In and Out, Analog/Serial Inputs, OSC transmit/receive, UDP transmit/receive through network interface or Response Gateways.

2.8 SOFTWARE FOR ENTERTAINMENT CONTROLS (EOS)

A. Lighting Control Desk: A microprocessor-based system providing control of stage, studio, and entertainment lighting systems.

1. Console Model: Ion Xe 2k as manufactured by ETC Inc.

2. Output: Ion Xe 2k: 2,048.

3. The following items may be contained in non-volatile electronic memory and stored to an onboard solid-state hard drive or to any USB storage device.

a. Cues: 100,000. Cue Lists: 999. Groups: 10,000. Presets: 10,000 presets. Palettes: 4 x 10,000 (Intensity, Focus, Color and Beam). Macros: 99,999. Effects: 10,000. Curves: 10,000. Color Paths: 10,000. Snapshots: 10,000.

4. Recorded cue lists: May be played back simultaneously on up to 200 faders.

a. HTP/LTP intensity flags, assert, proportional, intensity master or manual master fade control and priority status may be placed on each cue list.

b. A cue list may contribute to playback background states or to withhold such contributions.

5. Channels: Are to, by default, respond to cue information by last instruction, with discrete rate control provided for all cues.

6. The desk may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required.

7. Control and programming features for automated fixtures: Include the following.

a. Standard library of fixture profiles. The ability to copy and edit existing profiles and create new profiles. Patch displays including channel and output addressing. 24-bit fade resolution. Color characterization allowing color mixing and matching to color media data.

8. Displays: Three user definable work spaces, providing individually configured frames, with size/scaling controls.

9. Help Feature: Context sensitive. Explain and provide operation examples of system features. To be integrated into the on-board user manual via hyperlinks.

10. A fully integrated Virtual Media Server feature shall allow the user to map images and animations to a rig array. Forty such maps may be created, each with twelve layers.

Systems that rely on external hardware or software for this functionality shall not be acceptable.

11. Fully integrated 3D visualization and programming environment included. Includes tools for programming fixed-focus and moving fixtures, including ability for straight-line focus moves, click-to-focus, and integration with personal device apps that allow finding the devices' location in real space and automatically adjusting moving fixtures to point at the location. The 3D environment receives its data from the internal programming of the lighting controller, not by monitoring the output levels being sent to the lighting system. The 3D environment displays a replica of live output to the lighting system, and displays recorded states in Blind, for the user to preview and modify the lighting states without changing live output to the lighting system.

12. Software Upgrades: By user via USB flash drive. Install software updates in all desks, processor units and video remotes from one device over the network.

13. The device operating software shall be loaded into program execution memory from the internal hard drive when the desk is powered. In the event of an uncontrolled shutdown, the device shall return to its last output state when power is restored. Devices requiring a UPS to provide such protections shall not be acceptable.

14. Output shall be distributed over a 100/1000/10000 Mbps Ethernet network using Streaming ACN (sACN), and/or Art-Net protocols. The user shall be able to control the application of protocols at an individual address level.

15. Output shall additionally be allowed via local ports utilizing the USITT DMX512-A output protocol, where the lighting console has these ports installed.

16. The system shall support full bi-directional RDM communication with compatible devices via ETC Net3 and Response DMX/RDM Gateways. RDM communication shall adhere to ANSII standard E1.20-2006 Entertainment Technology RDM Remote Device Management Over DMX512 Networks. Supported RDM features shall include:

    a. Discovery and Identification of RDM-capable devices.

    b. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM.

    c. Viewing of sensor data as provided by connected devices.

    d. Error reporting as provided by connected devices.

17. Integrated power control monitoring features shall be provided to allow indication of power control system status, error states and circuit load monitoring. Adjustment of circuit configuration from the console shall also be supported. Communications with the power control system shall utilize ANSI E1.17 2006 Entertainment Technology Architecture for Control Networks.

18. Show data may be created and modified on a personal computer, using Windows 7 64-bit or higher operating systems, with a free offline editing application. The offline editor may also run natively on Macintosh platforms using OS 10.14 (Mojave) or later. The program shall also allow output to visualization software supporting the same protocols as the lighting system, without the need for additional keys or hardware. Systems that do not offer visualization output from a personal computer without additional keys or hardware shall not be acceptable.

19. PC: Windows 7, 64-bit or higher. Macintosh computer: OS 10.14 running a client software application. Connect to a control system via the network and view or modify current show data in an independent display environment, using an ETCnomad license key. When connected without the key, the computer shall operate in Mirror Mode, with the device to be mirrored selectable by the user.

20. Synchronized backup shall be provided via another full desk on the network, a processor unit or a PC/Mac using ETCnomad. The backup unit shall maintain synchronized playback with the host controller and shall take over control of the lighting system upon loss of communication with the host controller, either automatically or upon user confirmation. Use of two processor units to service and backup system output is also supported.

21. A maximum of 99 users may access and interact with show data simultaneously. Each user shall have an individual workspace. User identification may be assigned to more than one control device, allowing users to work in tandem, or allowing a designer/ALD to mirror the current display format, mode, and command line of the associated programmer. Partitioned control allows discrete control of channel/parameter groupings by user. Partitioned control may be easily enabled and disabled with no need to merge show data from multiple users.

22. Show files are saved across the system to all available integral hard drives simultaneously.

23. Support 32 individual simultaneous Time Code inputs or Event lists.

24. Controls and Playback:

    a. Manual Control and Programming Section:

        1) The programming keyboard shall be grouped by function. Major groupings shall be recording target functions, numeric keys, level assignment functions, display navigation functions and controls, as well as non-intensity parameter controls.

        2) The command keypad shall be fully interactive with the virtual controls, such as color pickers and direct selects. The command keypad shall allow navigation of virtual fields on displays and in dialogues, reducing the need for a pointing device.

        3) Provide direct select virtual controls, which provide "one touch" selection of channels, groups, palettes, presets, effects, snapshots, magic sheets, and macros. Labels and icons may be applied to the targets for quick reference, with a stock library of common images included, and custom images easily importable. The user shall be able to create custom direct selects, with any arrangement and combination of controls.

        4) Non-intensity parameters may be set numerically via an extensible keypad on the main display. This control shall be fully interactive with the page-able encoders. The display associated with the encoders shall display the current encoder function. The touch screen shall also access available modes for each parameter type, min, and max values for each parameter as applicable, as well as home position on a parameter basis.

        5) Only those parameters available for control in the active lighting system shall be displayed for control. Displays shall lowlight parameters not available to selected channels. Alternatively, the encoders may be placed in a state allowing parameters not applicable to the current selection to be suppressed.

        6) Lamp controls provide direct access to luminaire functions such as striking and dousing arc lamps and calibrating entire fixtures or individual mechanisms of fixtures, as provided by the luminaire manufacturer. User access to these features is normalized across all manufacturers for ease of use. Use of a "control channel" for accessing these functions shall not be required and systems requiring use of control channels for these

functions shall not be acceptable.

7) Fan functions shall be provided both via command line operation and through encoder controls.

8) Highlight shall be supported, with user definable highlight values. Lowlight conditions may be defined for selected, but not specified channels. Rem Dim commands, at specific levels by channel, may be optionally and automatically called with the highlight command.

9) Fixtures with color mixing may be set with direct additive or subtractive encoder controls or the command line, as well as via the color pickers. Six optional color spaces are supported, as well as tinting tools, and spectrum tools for systems with more than two color mixing elements. Color may also be set directly to a gel match via a graphic selection tool or from the command line. The gel picker shall support tools for identifying similar colors, show favorites, and graphic indications of gel locations. Color Path tools, with intensity dampening, shall be provided.

10) The Virtual Media Server function shall allow the user to create two-dimensional layouts of devices, identified as pixel maps. Media content (images, movies, text, and procedurally generated effects) may then be applied, manipulated and stored. Stock content is provided and the user may import custom imagery and animations.

11) Macros shall allow the user to create strings of commands, and replay them manually or triggered by a cue, a submaster, or an outside source via OSC or sACN input. By default, macros triggered manually shall post to the command line, but those executed via cue lists shall run in the background. The user may override this behavior by defining the macro to always execute in the foreground or background, regardless of the recall method. Startup, Shutdown and Disconnect macros may also be defined.

12) Playback Section

13) Up to 1,000 playback faders may be defined on the fader array, on pages of ten faders each.

14) Faders may be grouped for playback, with sliders and button action defined by the user.

15) Instantaneously halt an active cue, back to the previous cue, manually override the intensity fade or manually override the entire fade or go to a cue at a specified percentage of completion.

16) Cue list to contribute to background state or for the contents of each cue list to be withheld from such.

    a) Priority and background priority states may be established.

17) Playback Faders: To have the following associated controls:

    a) Freeze: Halts fader output

    b) Stop Effect: Stops action of an effect.

    c) Filter: Assigns fader filter states.

    d) Go To Cue 0: Reset a cue list.

    e) Off: Turns off contents of a playback, releasing control to the background state or to set to null.

f) Assert: Replays an active cue.

g) Release: Releases control to background and resets the cue list.

h) Timing Disable, channel filters and independent status may also be defined.

i) The potentiometer shall be configurable as a proportional master, an intensity master, or manual master. Support for rate, effect rate, effect size and Master Only controls is also provided. Filtered manual timing masters and effects masters may be configured.

j) Rate Override / Fader Paging: Supported with associated controls.

b. Submasters:

1) Up to 999 proportional, fully overlapping additive, effect or inhibitive submasters may be defined. Submasters shall use system-defined colored graphics and LEDs, where available, to indicate submaster status. Each submaster may have fade up, dwell and down fade times. Submasters may be set to priority and background priority status.

2) Submasters may be set to HTP or LTP intensity. Non-intensity parameters on submasters shall be LTP only.

3) Exclusive mode for a submaster shall prohibit the live contribution of that submaster from storing to cues or other submasters. Shield mode prohibits access of associated channels from any other playback or manual control operations.

4) A submaster potentiometer may be defined as proportional, master only or intensity master. When set as an Intensity Master, a mark and unmark feature is supplied.

5) Motorized faders shall set submasters to required positions as fader pages are changed. Upon a page change, non-motorized faders shall blink the associated indicator LED, and display an arrow graphic to indicate the direction the user must move the fader to match the newly mapped content. The user shall not gain control of the content until the non-motorized fader has matched the content's value.

6) The submaster blind buffer shall be linked directly to live playback.

7) Set submaster values directly from the command line.

8) LTP submasters may be set to fade to background or to minimum value when the fader is returned toward zero.

9) Submaster values may contribute to the background state or be withheld.

c. Grand Master Fader

1) The location of the Grand Master shall be user definable. The grand master shall have associated blackout and blackout enable buttons.

2) Blackout shall send all associated intensity outputs to zero. Non-intensity outputs shall not be affected.

3) Lighting control devices with motorized faders shall set the grand master to required positions as fader pages are changed.

4) If the Grand Master Fader is set below 100 percent, the system shall display a virtual fader on all monitors, for access when the Grand Master is located on a fader page that is not visible.

25. Display Controls:
    a. Format shall change the view of selected displays.
    b. It shall be possible for the user to choose which parameter categories or parameters they wish to display. Parameters and categories shall have adjustable column widths.
    c. Flexichannel modes shall change which channels are viewed in selected displays, as follows:
        1) No modes
        2) Parent channels only / cell channels only
        3) Use Partitions
        4) Flexichannel states shall change which channels are viewed in selected displays, modified by the flexi modes, as follows:
            a) All channels
            b) Patched channels.
            c) Show channels.
            d) Active/Moved channels.
            e) Selected channels.
            f) Manual Channels.
            g) View channels; user identified list.
            h) Channels with discrete timing.
    d. Expand shall extend the selected view sequentially across connected displays.
    e. "Time" depressed shall display discrete timing data. "Data" suppressed shall display absolute values of referenced data. These controls may be latched.
    f. Displays may be toggled to show stored data currently manually overridden, the source of the current parameter data, output level, patch assignment, part structure and referenced marking data. These controls may be latched.
    g. User definable magic sheets shall provide alternative display of and access to channels and record targets. Multiple magic sheets may be created, each with a variety of zoom and placement factors for rapid recall of the required view. User-definable, interactive displays may be created. These displays, which can be used in live and blind operating modes, allow graphical layout of channels, desk buttons and programming tools. Standard symbols are provided, and the user may import their own symbols or graphics. Each symbol may be individually defined with data feedback characteristics. Non-interactive status information, such as a mirror of other user's command lines, may also be included in the display. A graphical browser is provided for fast selection of these views. Multiple zoom factors and placements may be stored and recalled for each display.
    h. Playback status displays are provided with a variety of different formats. Indications are provided per cue for live moves, lights fading from zero and moving non-intensity parameters, and dark moves, inactive lights which have stored non-intensity parameter moves. The user may select a static or dynamic time display in the cue list itself.
    i. Display content including which of the workspaces is in focus on any of the

monitors and what views are docked in those workspaces may be instantly recalled using snapshots.

26. Operating Modes:

    a. Live Mode:

        1) Channel lists may be constructed using the +, -, and Thru keys as well as the direct selects. Channel selection is fully interactive, regardless of the method used.

        2) Levels may also be set with the keypad, level wheel and non-intensity encoders. "Selected" channels shall be those last addressed and under keypad control. Controls are provided for single button access to the last selected channel list, all channels with manual levels and all active channels.

        3) Channels may be set at a user defined default level using the Level key. + percent and percent keys adjust channels quickly by user definable values.

        4) Channels and/or channel parameters may be captured. Capture mode shall allow the user to selectively capture channel data at specific levels. Captured data shall be indicated on the Live display.

        5) Sneak is used to restore specified channels to background states, default values, or send them to specified values, in user specified times.

        6) Selected channels may be set at a level or held to current values while other channels are set to zero using Rem Dim. Toggling Rem Dim restores unselected channels to original levels. The Rem Dim level shall be user definable via the command line or with a default setup value.

        7) Channels may be recorded into groups for fast recall of commonly used channels. 10,000 groups shall be available. Groups shall store selection order and subgrouping functions. The Offset function supports rapid creation of ordered groups, including reverse and random order.

        8) Parameter Settings: Stored to Intensity, Focus, Color, Beam Palettes, and to Presets. Referenced data may be stored to whole numbers or up to thousandths decimal places between each whole number.

        9) The following conditions may be placed on a channel or channel parameter to be included with a cue record action.

            a) Discrete fade time and/or delay.

            b) Block flag.

            c) Assert flag.

            d) IFCB Filters, which may be set at a parameter level.

            e) Release and restore.

        10) 999 cue lists may be stored. Cues may be recorded in any order. Up to thousandth decimal cues may be inserted between any two whole number cues. Each cue may contain a maximum of twenty parts.

        11) It shall be possible to record cues and cue parts with the following information:

            a) Any collection of channel data, as determined using "Record", "Record Only" or selective store commands, combined with

parameter filters - including Effects.

b) Cue Level timing and delays for Intensity Up, Intensity Down, Focus, Color and Beam.

c) Follow or hang time.

d) Link instruction.

e) Loop value.

f) Block, Assert, Preheat, Release, and/or Mark Flag.

g) Curve.

h) Rate.

i) Allfade.

j) Label and note.

k) Alert countdown time.

l) Timecode playback stamp.

m) Scene label; cues only, not cue parts.

n) Execute commands to trigger other activity; execute cue lists, cues, macros, snapshots, OSC and UDP strings, and MIDI raw commands.

o) Cue list partitions shall be available to filter list content.

12) Channel parameters may be stored with an effect instruction. Effects may contain relative offsets from current value, or absolute instructions. Effects may be progressive actions or on/off states. Entry and exit behaviors modify the channel parameters activity when beginning and ending the effect. Channel and cue level overrides are provided.

13) Non-intensity channel parameters may be marked (pre-set), in two ways. Automark pre-sets any parameter transitions in the cue just prior to intensity becoming active. Automark may be disabled on a cue or cue part basis, enabling a "live" move. Alternatively, non-intensity parameters may be marked to a specific cue with a single command instruction. It shall not be necessary to store or update these parameters directly into the cue in which the movement is to occur.

14) Update may be used to selectively add modified parameter data quickly to that parameter's current source. Trace may be used to modify the data to the original source of its move instruction. It shall be possible to update inactive record targets. A context sensitive display provides detailed information regarding the results of the update command.

15) Recall From quickly pulls specified data from record targets or other channels into the current view. Recall on an HTP basis shall be provided.

16) Copy To quickly copies selected data to specified channels or other record targets.

17) Address and channel check functions shall be provided.

18) Channel parameters may be "parked" at levels. Those levels are not added to any live record operations, nor may they be changed until the parked element is "unparked". Scaled park provides real time proportional adjustment of stored intensity values. Address Park shall

also be provided.

19) About shall provide detailed status of selected channels or specified record targets. This shall include current source, current value, discrete timing, parked value, marked to and for indications. Background levels and current DMX output are also displayed. Channel usage indicates submaster and cue information and provides a "dark moves" report on a per channel basis.

20) 10,000 snapshots may be stored which instantly recall specified front panel and display configurations.

21) Query shall allow selection of channels by their current or possible state. Keywords and fixture types shall allow quick access to fixtures.

22) User definable home positions, on a per channel basis, may be defined.

23) Undo shall be used to sequentially step back through manual operations or to undo record and delete actions. It shall be possible to undo multiple commands in one action.

b. Blind Mode:

1) The Blind display allows viewing and modification of all record targets without affecting stage levels.

2) Record target data may be displayed in a summary view, a detailed table orientation or a spreadsheet view, which allows quick data comparisons, move, and replace functions.

3) Changes to blind data shall be automatically stored. Range selection of both record targets and channels shall be supported.

c. Staging Mode:

1) Staging mode shall allow temporary changes to be made to the lighting system, which are only displayed on Live and Blind displays and represented in the 3D environment, without changing the live output to the lighting system, so that the user may preview changes before committing them to output.

2) Staging mode shall be accessible in Live or Blind mode, and the user shall be able to abandon or commit changes to the live output or to the stored database separately. The user may leave Staging mode, and the buffer shall remain until the user clears the changes.

d. Patch Display:

1) Patch shall be used to display and modify the system control channels with their associated library data.

2) Each channel may be provided with a proportional patch level, curve, label, swap and invert functions, Live/Dark flag enable/disable, as well as keywords to service Query.

3) A full library of profiles is provided, with the ability for the user to define "favorites" for fast selection. The user may also modify library profiles or create new profiles, to function with any controlled device.

4) Offset functions in patch shall allow selection of channel ranges and shall allow the user to establish a "custom" footprint for any device output.

5) Custom color wheels, color scrolls and gobo wheels shall be defined in patch. These devices shall be created with a simple table and graphical

user interface supported by images of major manufacturers.

6) The user may define or modify color configuration for parameters of color-changing fixtures, allowing the color picking tools to accurately control a fixture's color system.

7) RDM discovery, patching and device monitoring shall be supported.

8) Copy to, Swap and Move functions shall be supported in patch.

e. Setup/Browser:

1) Access system, user, and device configurations.

2) Possible to partially merge show files. Users may select as much or as little of the show file as required, with renumber tools.

3) Import ASCII and Lightwright data files. Export as ASCII or .csv.

4) Access for show data storage, import, export, print to .pdf and clear functions, as well as show data utilities.

5) Support programming and playback of real time clock events, including cue, submaster and macro execution at specific times of specified days or at a time based on astronomical events.

6) Control screen: For network configuration, selecting date/time, software update controls, selecting functional language and/or keyboard for labeling option, and other system level tools.

7) Languages for prompts, advisories, and help: English, Bulgarian, German, Spanish, French, Italian, Polish, Slovenian, Russian, Japanese, Chinese simplified, Chinese traditional, and Korean.

8) Supported keyboards: Latin American, American International, United Kingdom, French, German, Italian, Korean, Norwegian, Russian, Slovakian, Turkish, Swiss, Swedish, Finnish, and Bulgarian.

27. Output and Integration of Power Control Monitoring and Configuration:

a. Lighting Control System: Provides communication with an ETC Sensor+ and Sensor3 dimming systems for remote monitoring and configuration of show specific functions from within the software application.

b. Circuit Level Configuration and Monitoring Functions Not Limited To:

1) Control mode; dimmable, switched, latch-lock, always on, off or fluorescent.

2) Curves.

3) Control threshold.

4) Min and Max Scale Voltage.

5) Preheat.

6) Scale load.

c. Rack status messages Not Limited To:

1) State of UL924 panic closure.

2) DMX port error/failure.

3) Network error/failure.

4) A, B, C Phase below 90 or above 139 volts and headroom warning.

5) Ambient temperatures out of range.

d. Circuit status N limited to:

1) Module type and location.

2) Output level.

3) Control Source.

4) Overtemp.

e. Advanced circuit feedback Not limited to:

1) Load higher or lower than recorded value.

2) DC detected on output.

3) SCR failed on/off.

4) Breaker trip.

5) Module has been removed.

6) Load failure.

7) Shutdown due to Overtemp.

2.9 ENTERTAINMENT LUMINAIRES (COLORSOURCE)

A. Basis of Design: ColorSource CYC as manufactured by ETC Inc. A dedicated cyclorama fixture for creating beautiful, smooth washes of light on a cyclorama or wall. Five-color mix of red, green, blue, lime, and indigo for expanded range and color control.

1. Standards Compliance:

a. Listed: cETLus, UL 1573, and CSA C22.2 No. 166.

b. Compliance: CE and EAC.

2. Source:

a. LED Details: 42 Lumileds LUXEON C LEDs.

b. Max Lumens: 4117.

c. Lumens per Watt: 31.

d. L70 rating: greater than 50,000 hours.

3. Color:

a. Colors Used: Red, Green, Blue, Indigo, and Lime.

b. Color Temperature Range: Range.

c. Calibrated Array: Yes.

d. Red Shift: No.

4. Optical:

a. Beam Angle Range: DMX-512 via 5-pin XLR connector

b. Gate Size: N/A.

c. Aperture Size: N/A.

d. Pattern Projection: No.

e. Pattern Size: N/A.

f. Camera Flicker Control/Hz Range: Default: 1,200 Hz. RDM: 25,000 Hz.

g. The ColorSource CYC has a built in accessory for spill control.

5. Control:

a. Input Method: DMX-512 via 5-pin XLR connector. Protocols: DMX.

b. Modes (Footprint): 5 channel: IRGBS (5). Direct: IRGBILS (7). 1 channel: (1). RGB: RGB (3).

c. RDM Configuration: Yes.

d. User Interface Type: 7-segment address display, local level control via UI.

e. Local Control: Yes.

f. Onboard Presets: Yes, 12. Onboard Sequences: Yes, 5. Onboard Effects: No.

g. FixtureLink support: Yes.

6. Electrical:

a. Voltage: 100 to 230 VAC, 50 to 60 Hz.

b. Input Method: PowerCON in and thru.

c. Inrush First Half-Cycle: 39 A at 120 V. 74 A at 240 V.

d. Fixtures per Circuit:

1) 9, using power thru connector.

2) 10, per 20 A switched circuit, R20 module or similar.

e. Wattage (Typical/Standby): 133 / 1.4 W at 120 V. 116 / 1.2 W at 230 V.

f. Current Draw: 1.11 A at 120 V. 1.11 A at 230 V.

7. Thermal: Operating Temperature: 32 to 104 degrees F.

a. Fan: No. db Range: 18.5 dBa average at 39 inches.

b. Droop Compensation: Yes.

c. BTUs/hour: 453.

8. Physical: IP Rating: IP-20.

a. Materials: Die-cast aluminum. Colors: Black, white, silver, or custom.

b. Mounting Options: Yoke and floor.

c. Included Accessories: Hanging yoke, power cable.

B. Basis of Design: ColorSource PAR V Zoom as manufactured by ETC Inc. An affordable high quality wash fixture with manual zoom. Uses RGBIL color system.

1. Standards Compliance:

a. Listed: cETLus, UL 1573, CSA C22.2 No. 166.

b. Compliance: CE and EAC.

2. Model ColorSource PAR V Zoom: Black.

3. Arrays:

a. RGBIL (Red/Green/Blue/Indigo/Lime).

4. Source:
   a. LED Details: 34 Lumileds LUXEON C LEDs.
   b. Max. Lumens: 5,780.
   c. Lumens per Watt: 36.
   d. L70 rating: Greater than 54,000 hours.
5. Color:
   a. Color temperature Range: Color mixing.
   b. Calibrated Array: Yes.
   c. Red Shift: No.
6. Optical:
   a. Beam Angle Range: 19.1 to 40.8 degrees.
      1) Manual zoom.
   b. Gate Size: N/A.
   c. Aperture Size: 7 inches.
   d. Pattern Projection: No.
   e. Pattern Size: N/A.
   f. Camera Flicker Control/Hz Range: Default: 5kHz. RDM: 25,000 Hz.
7. Control:
   a. Input Method: DMX-512 via 5-pin XLR connector. Protocols: DMX512, RDM, City Theatrical Multiverse, NFC.
   b. RDM Configuration: Yes.
   c. NFC Configuration: Yes.
   d. User Interface Type: 7-segment 3 button, single encoder interface.
   e. Local Control: Yes.
   f. Onboard Presets: Yes, 12. Onboard Sequences: Yes, 5. Onboard Effects: No.
   g. Fixture-to-Fixture Control: Yes.
   h. 15-bit virtual dimming engine.
8. Electrical:
   a. Voltage: 100 to 240 VAC, 50 to 60 Hz. Input Method: PowerCON True1 in and thru.
   b. Inrush First Half-Cycle:
   c. Fixtures per Circuit:
      1) 20 Amp Power-Thru Connector: Quantity of 5.
      2) R20 Module or Similar: Quantity of 6.
      3) Wattage at 120 Volts: 162 W.
      4) Wattage at 240 Vol: 160 W.
      5) Current Draw at 120 Volts: 1.27 Amps.

6) Current Draw at 240 Volts: 0.70 Amps.

9. Thermal: Operating Temperature: 32 to 104 degrees F.
   a. Fan: Yes. Not controllable. dB Range: 21.2 dBA average at 39 inches.
   b. Droop Compensation: Yes.
10. Physical: IP Rating: IP-20.
   a. Materials: Die-cast aluminum. Colors: Black, white, silver, or custom.
   b. Mounting Options: Yoke.
   c. Included Accessories: Power cable and hanging yoke.
   d. Seven-segment, three-button Interface.

C. Basis of Design: ColorSource Spot V and ColorSource Spot VXT as manufactured by ETC Inc. Brings together a five-color light engine with the build-quality and support of an ETC product. Uses a mix of red, green, blue, indigo and lime LED emitters. ETC optics, adapters, and accessories.
1. Standards Compliance:
   a. Listed: cETLus, UL 1598, UL 924, CSA C22.2 No. 250.0.
   b. Compliance: CE.
2. Model ColorSource Spot V with shutter barrel, black.
3. Source:
   a. LED Details: 60 Lumileds LUXEON Rebel and LUXEON C LEDs.
   b. Max Lumens: 9300.
   c. Lumens per Watt: 47.2.
   d. L70 Rating: Greater than 54000 hours.
4. Colors:
   a. Colors Used Spot: Red, green, blue, indigo, lime.
   b. Color temperature Range: Color mixing.
   c. Calibrated Array: Yes.
   d. Red Shift: No.
5. Optical:
   a. Beam Angle Range: 5 to 90 degrees. Swappable lens tubes.
   b. Gate Size: 80 mm.
   c. Aperture Size: 6.25 to 14 inches depending on lend tube.
   d. Pattern Projection: Yes.
   e. Pattern Size: A or B.
   f. Camera Flicker Control/Hz Range: 5 kHz and 25 kHz.
6. Control:
   a. Input Method:
      1) DMX-512 via 5-pin XLR connector. Protocols: DMX512, RDM.

2) City Theatrical Multiverse. Protocols: DMX512, RDM.

b. NFC Configuration: Yes, via Set Light app.

c. RDM Configuration: Yes.

d. User Interface Type:

1) ColorSource Spot V: 7-segment 3 button interface.

e. Local Control: Yes. ColorSource Spot V only.

f. Onboard Presets: Yes, 12. Onboard Sequences: Yes, 5. Onboard Effects: No.

g. Fixture-to-Fixture Control: Yes.

h. 15-bit virtual dimming engine.

7. Electrical:

a. Voltage: 100 to 240 VAC, 50 to 60 Hz.

b. Input Method: powerCON True1 TOP in and thru.

c. Inrush First Half Cycle: 55 A at 120 V. 59 A at 240 V.

d. Fixtures per Circuit:

1) Eight. (R20 module or similar).

8. Thermal: Operating Temperature: 32 to 104 degrees F.

a. Fan: Yes. Controllable.

b. Droop Compensation: Yes.

c. BTUs/hour: 671.77.

9. Physical: IP Rating: ColorSource Spot V: IP-20. ColorSource Spot VXT: IP-65.

a. Materials: Die-cast aluminum. Colors: Black, white, silver, or custom.

b. Mounting Options: Yoke.

c. Included Accessories: Hanging yoke, 39 inch power cable, soft-focus diffuser in an A-size gobo holder.

2.10 CANTO ASTRO 600 FOLLOWSPOT - ENTERTAINMENT LUMINAIRES ADD ALTERNATES

A. The basis of this design shall be the Canto Astro 600 LED follow spotlight, as marketed by CantoUSA.

B. Physical

1. The unit frame and enclosure shall be constructed of formed cold rolled steel and sturdy aluminum extrusions, free of burrs and protected by a black powder coat finish.

2. Handles shall be provided to facilitate smooth operation and to lift the unit.

3. The unit shall be mounted on a stable, folding three-point floor stand, with:

a. Easy height adjustments,

b. Horizontal Swing Control Lever and

c. Vertical Tilt Control Lever

4. The Power Supply shall be integral to the followspot.

5. Weight of Head, including power supply, shall not exceed 54 pounds.

6. Length of head unit with color changing boomerang shall not exceed 41".
7. A sliding panel shall provide access to lenses without the use of tools.
8. LED lamp house head must be of a modular design for servicing and be fully upgradeable to an higher output LED engine by the removal of 8 screws. **Any alternate fixture that does not comply with this requirement must be rejected.**

C. Controls
1. The Lamphouse shall as a minimum incorporate the following:
   a. Silent and adjustable fan cooling system;
2. The body of the unit shall, as minimum incorporate the following:
   a. Optical dimmer iris mechanism for smooth manual dimming;
   b. Optional Four shutters mounted on two planes, for both vertical and horizontal masking
   c. Drop-in Nichrome steel iris
   d. Drop-in Gobo Holder
   e. Zoom focus controls with calibrations silk screened on followspot body.
      1) With the iris fully open this followspot shall be capable of producing a continuous range of field angles from 10.6 degrees in spot to 19.2 degrees in flood.
      2) At any field angle the beam shall be adjustable between soft and sharp edges.
3. The front of the unit shall house a five color or six color, self-canceling boomerang with color filters

D. Optical
1. The unit's optical train shall consist of
   a. Modular mounted LED 600 watt or higher LED engine, with the following features:
      1) 3,200K or 5600K color temperature;
      2) CRI greater than 82 in 3000K or 80 in 6000K;
      3) 25000 hour average life on LED engine.
      4) Upgradeable LED light engine.
   b. Fixed Optical Quality glass reflector and double condenser lens;
   c. Variable focus lens system utilizing Optical-quality glass;
   d. Iris/Gobo Holder, Shutters for beam shaping control;
   e. Optical slide dimmer Iris;
   f. Five or six color boomerang.
2. The zoom focus shall increase light intensity as it decreases the spot diameter.

E. Electrical
1. Lamp system input shall be 90-265 V.AC, 50/60 Hertz, single phase.
2. 0-100% dimming either by DMX input or handle mount potentiometer control.

3. Unit to have rear information panel.

F. Performance

1. The Field diameter at a 60 foot throw shall be continuously adjustable from 20.3 feet in Flood focus to 11.2 feet in Spot focus. With full iris the Field diameter in spot focus shall be less than 15”.

G. Furnish: (_) #K01607170 / 3000 or #K01607170 / 6000 Canto Astro LED followspots, complete with Iris, Gobo Holder, Color Changer, Stand and all necessary accessories.

2.11 HIGH END LONESTAR PRIME – ENTERTAINMENT LUMINAIRES ADD ALTERNATES

A. General - White-light, Light Emitting Diode FRAMING Moving head fixture

1. The fixture shall be a high-intensity white-light fixture with Cyan, Magenta, and Yellow subtractive color mixing and framing shutters. The fixture shall be a Lonestar by ETC or approved equivalent.
2. All LED moving light fixtures shall be provided by a single manufacturer to ensure compatibility.
3. The fixture shall be UL 1573 listed for stage and studio use and comply with EN60598-2-17 standard per CE certification
4. The fixture shall comply with the USITT DMX-512A standard

B. Physical or Mechanical

1. The fixtures structural framing shall be constructed of rugged, 1/8” aluminum, free of burrs and pits and finished with a matte black powder coating.
2. Outer covers of head and yoke shall be constructed of ABS plastic with fine textured black surface and fastened to the head frame with quarter turn fasteners.
3. The fixture dimensions shall be
   a. 600 mm (23.6”) from base of the enclosure, to the tip of the lens baffling. Fixtures that are longer than this dimension shall not be deemed acceptable.
   b. 367 mm (14.5”) across the exterior dimensions of the yoke
   c. The Electronics enclosure shall be 220 mm (8.7”) Wide
   d. Head length 409 mm (16.1 ”)
   e. Fixtures shall weigh 22.7 kg (50 lbs)
4. The fixture shall be able to be either truss mounted or set upright on a stable surface. Fixture shall be suitably designed for operation over or under mounted on a truss perpendicular to the ground as well as outrigged parallel to the ground.
5. The following shall be provided:
   a. Shutter assembly shall be a four plane system capable of rotating +/- 30° on and fully crossing the beam on each individual shutter blade. Additionally the entire Shutter assembly must rotate +/- 60° .
   b. The fixture must include nine (9) interchangeable rotating gobos with 17.5 mm outside diameter and 13 mm image area. Fixtures that have less than nine rotating gobo patterns shall not be deemed acceptable.
      1) Rotating gobo systems must be able to index to any point on the 360° positioning of the gobo.
      2) Rotating gobos must be interchangeable with glass and metal gobo patterns without permanent or semi-permanent modification to the wheels or cartridges.
   c. CMY (Cyan Magenta Yellow) subtractive color mixing system

d. Ten (10) interchangeable colors including red, blue, green, yellow, orange, purple, TM-30 filter, lavender, half CTO, full CTO, and dark blue. Capable of split colors and linear indexed positioning. Fixtures without color wheels shall not be deemed acceptable.

e. Electronic Linear CTO from Native Color temperature minus 4800 K

f. Fixture shall have 540 degrees of pan and 251 degrees of tilt. Pan and tilt must be controlled with 16bit control and utilize encoder sensors to guarantee correct step position.

1) Fixture shall have a pan speed of 2.30s for 360 degree movement

2) Fixture shall have a tilt speed of 1.26s for 180 degree of movement.

3) Pan and tilt locks that stop at 0, 45, and 90 degrees for service and handling. Pan and tilt locks are not intended to be engaged during transport in pre-rigged truss.

g. A 15 leaf iris which reduces the projection area by 96%.

h. Frost system with two different diffusion media that soften the edges of the projection on a surface and allows for variation in insertion speed. Fixtures that do not have two or more diffusion media shall not be deemed acceptable.

i. Automated 3.8-55° zooming lens system. Fixtures that can not achieve a hard focus on the gate at less than 4° degrees shall not be deemed acceptable.

j. Animation wheel that allows for continuous and uninterrupted motion in two directions and can be moved in/out of the beam.

k. Two prisms including five facet prism and four facet linear.

1) Prism are index able, and continuously rotatable in both clockwise and counterclockwise directions.

2) Both prisms must be able to be inserted in the beam simultaneously. Fixtures that can not insert two prisms into the beam simultaneously shall not be deemed acceptable.

6. The yoke arms must have collapsible, spring loaded, handles for fixture handling and manipulation.

7. Power supply, cooling and electronics shall be integral to each unit.

8. The unit shall ship with:

a. 5’ Neutrik True1 PowerCon™ to wire ferrule as standard

b. Two (2) brackets that facilitate attaching standard brackets to the fixture base via ¼ turn thumb screws.

C. Optical

1. The light emitting diode engine shall produce 7000K white light within +/-400K out of the front lens of the luminaire

2. The light engine shall be create color rendering at greater than 70 CRI

3. The fixture shall produce a maximum of 12,000 or greater field lumens while thermally stable and at full intensity. Luminaires that reach 12,000 lumens only by integrating sphere or total lumen testing shall not be deemed acceptable.
4. The unit shall provide, but not be limited to:
    a. Low gate and beam temperature
    b. Sharp imaging through a four-plane shutter design
    c. Sharp Imaging on all gobo Planes and Iris planes
5. The unit shall provide, but not be limited to:
    a. 3.8 through 55 degree field angles
    b. High-quality pattern imaging throughout zoom range
    c. Sharp shutter cuts without halation. Shutter systems that suffer from warping and burnout in normal use shall be deemed unacceptable.
        1) No more than 5% distortion curvature on framing blades when measured in the widest possible zoom with sharp edge framing shutters. Systems that have more than 5% curvature shall be deemed unacceptable.
6. Fixture shall have two diffusions, one light and one medium, and have an option for a third diffusion, heavy, to be added without removing either of the other two diffusion options.

D. Environmental and Agency Compliance

1. The fixture shall be ETL and cETL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.
2. The fixture shall be ETL LISTED to the UL1573 standard for stage and studio use
3. The fixture shall be rated for IP-20 dry location use.
4. When the fixture is stationary, and at full intensity, the fixture may not produce noise in excess of 35 dBA. A fixture that produces noise in excess of 35 dBA when stationary and at full intensity shall be deemed unacceptable.
    a. At no time may the fixture produce noise in excess of 43.5 dBA.
        1) All dBA numbers above are tested in a test chamber with background noise level of 16.3 dBA.
5. Fixture shall have linear fan control that allows a user to select fan speed level. When this feature is active the luminaire may budget output as is necessary to maintain safe operating temperatures but may not change fan speed. Fixtures that do not have linear fan control in this manner shall be deemed unacceptable.

E. Thermal

1. Fixture shall be equipped with a heat pipe radiant cooling system.
2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use
    a. Fan speed will adjust automatically based on thermal management needs.
        1) Fixture will provide three fan speed modes that are selectable via DMX.

2) Fixture will also provide a linear fan speed control channel.

b. Thermal management shall include temperature sensors within the housing to include:

1) LED array circuit board temperatures

c. Fixture shall permit monitoring of temperature sensors via a legible LCD multi-line backlit display

d. Fixtures that do not provide active thermal monitoring, fan speed controls, and current management of LED circuits shall not be acceptable.

3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 45° C (113°F) maximum ambient temperature. During times of storage, the fixture shall be stored in temperatures range of -20C (0°F) to 60C (140°F)

4. The fixture shall maintain .5 m (1.64 feet) distance from any flammable object

5. The fixture shall maintain a minimum of 2.0 m (6.56 feet) to any lighted object.

F. Electrical

1. The fixture shall be equipped with a 100V to 240V 50/60Hz auto-sensing internal power supply

a. Fixture shall draw a maximum of 6.2 amps at 100V and 2.5 amps at 240 V.

2. The fixture shall support power in and thru operation

a. Power in shall be via Neutrik® PowerCon™ True1 input connector

b. Power thru shall be via Neutrik ® PowerCon ™ True1 output connector

3. The fixture requires power from a non-dimmer source

4. Power supply outputs shall have self-resetting current-limiting protection

5. Power supply shall have power factor correction greater than 0.95 from 100 VAC to 240 VAC.

G. LED Emitters

1. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.

a. YLX is the sole manufacturer of approved emitter engines.

2. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.

3. All LED fixtures (100% of each lot) shall undergo a minimum 12-hour burn-in and stress test during manufacturing.

4. LED system shall comply with all relevant patents

5. Fixtures shall have PWM frequency up to 16,000hz to avoid flicker on camera

H. Calibration

1. Fixture shall be calibrated at factory to achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins

a. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency.

I. Color

1. The fixture shall be available in specialized LED arrays as outlined below:
   a. Ultra-Bright 8000k white light engine
      1) White LED Engine calibrated and binned to achieve 8000k (+/- 400k).
         a) Measured brightness of Ultra-Bright 8000k engine installed in luminaire shall be greater than 15,400 Lumens when tested in an integrating sphere.
2. Fixture must have a subtractive color mixing system utilizing six (6) dichroic color flags, controlled in pairs, to linearly subtract the following colors out of fixtures light output.
   a. Cyan
   b. Magenta
   c. Yellow
3. Fixture must have semi trapezoidal dichroic glass color segments on a single wheel that transmit the following colors. Dichroics are permanent and mounted in place via adhesive.
   a. Red
   b. Green
   c. Blue
   d. Yellow
   e. Purple
   f. TM-30
   g. Lavender
   h. Half CTO
   i. Full CTO
   j. Dark Blue
4. Fixture shall have an electronic CTO that utilizes the CMY mixing system of the fixture to reduce CCT color temperature from fixtures native color temperature down to 2200 K

J. Dimming

1. The LED system shall use 16-bit DMX control techniques for high-resolution dimming.
2. Dimming curves shall be optimized for smooth dimming over longer timed fades.
3. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
4. LED control shall be compatible with broadcast equipment in the following ways:
   a. PWM control of LED levels shall be imperceptible to video cameras and related equipment

K. Control and User interface

1. Ethernet compatible with support for ANSI1.31 Streaming ACN and ArtNet protocols
2. Fixture must provide an internal ethernet switch that supports both active and passive data pass-through.
3. Fixtures shall be support protocol conversion from Ethernet to DMX output and also conversion from DMX input to Ethernet output.
4. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
5. The fixture shall be compatible with the ANSI RDM E1.20 standard
    a. All fixture functions shall be accessible via RDM protocol for modification from suitably equipped control console
    b. Temperature sensors within the luminaire shall be viewable in real time via RDM.
    c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
6. The fixture shall be equipped with multi-line color LCD display for easy-to-read status reports and configuration changes.
    a. Display must have a feature to battery power the menu structure when the fixture is unplugged to allow fixture settings to be adjusted, including DMX.
7. The fixture shall be equipped with a six-button user-interface
8. The fixture may offer two DMX control profiles.
    a. Standard DMX Control Profile will have 48 channel control.
    b. Trifusion DMX Control Profile will have 48 channel control.

PART 3 QUANITIES

3.1 ARCHITECTURAL CONTROLS - PARADIGM

A. (1) – DIN14-P-ACP/SPS/NET PER DRAWING

B. (1) – DIN14-L PER DRAWING

1. (1) RESPONSE Mk2 four-port DMX/RDM DIN mounted gateway
2. (1) RESPONSE Opto-Splitter 8 port DIN mounted
3. (1) HDR-60-24 DIN Mounted power supply 60W

C. (1) SNB8 FP – 8 Port simple Network box with POE PER DRAWING

D. (4) - PI1004 Inspire 4-Button Control Station PER DRAWING

1. (4) w/ 1-gang faceplate

E. (1) – PI1008 Inspire 8-button Control Station PER DRAWING

1. (1) w/ 3-gang custom

F. (1) - P-TS7-PE 7 in Portable Touchscreen (NetConnect/Ethernet) PER DRAWING

1. 1) – 10’ Network Cable

G. (1) - EBDK EM. Bypass Detection Kit PER DRAWING

H. (1) – DEBC-6 DMX EM. Bypass Controller PER DRAWING

3.2 ETC POWER

A. 1) – SENSOR IQ48 120/240 V 48-circuit breaker panel PER DRAWING

1. (1) - IQ DOOR 120-24S
2. (48) - IQ SM B20 20A 1 Pole motorized breakers
3. (1) - IQ-TAP Sensor phase bar fuse tap kit

B. (2) – FOUNDRY UFD 600W Phase adaptive Dimmer PER DRAWING

3.3 OUTLET BOXES, FINAL QTY AND MOUNTING PER SITE WALK THROUGH:

A. (1) – ECPB NET/NET Network Faceplate PER DRAWING

1. (1) wall mounted back box
2. (1) 2-gang faceplate

B. (3) – ECPB Single DMX Out Faceplates PER DRAWINGS

1. (3) 1 – gang 2.5” back box
2. (3) Ubolt Kit for mounting solution

C. (TBD) – ADDITIONAL NETWORK LOCATIONS PER SITE WALK THROUGH TO SUPPORT NETWORK INTENT OF CONTROL

3.4 PORTABLE ENTERTAINMENT DATA CONTROL

A. (3) – Single Output Portable Gateway PER DRAWINGS

1. (3) C-Clamps
2. (3) Safety Cables

3.5 ENTERTAINMENT CONTROLS

A. (1) – Ion XE 2048 outputs
   1. (2) – 24" Widescreen LCD Touch Screen Monitor with adapters
   2. (1) – Locking regionalized IEC power cord
   3. (1) - LED console work light
   4. (1) – 25’ Network Cable

3.6 ENTERTAINMENT LUMINAIRES

A. (26) - ColorSource Spot V
   1. (26) – Color Frame
   2. (26) – TRUE 1 Power Cable to Stage Pin
   3. (26) – Safety Cables
   4. (26) – C Clamps
   5. (26) – 5’ DMX cables
   6. (6) Top Hats
   7. (20) – 14° Lens Tubs
   8. (6) – 26° Lens Tube
   9.

B. (7) – ColorSource Cyc
   1. (7) – C Clamps
   2. (7) – powerCON Power Cable to Stage Pin
   3. (7) – Safety Cable
   4. (7) – 10’ DMX Cables

C. (22) - ColorSource Par V Zoom
   1. (22) – D40 Diffuser
   2. (22) - Top Hats
   3. (22) - C Clamps
   4. (22) – TRUE 1 Power Cable to Stage Pin
   5. (22) – Safety Cable
   6. (22) - 10’ DMX Cables

3.7 TMB PROPLEX DMX 5-PIN CABLES, AS FOLLOWS:

A. (5) - 25'
B. (5) - 15’
C. (10) - 5'

3.8 TMB powerCON to PowerCON FIXTURE TO FIXTURE JUMPER, AS FOLLOWS:

A. (6) – 10’

3.9 TMB TRUE1 to TRUE1 FIXTURE TO FIXTURE JUMPER, AS FOLLOWS:

A. (21) - 5’

B. (15) - 10'

3.10 TMB 12/3 SO STAGE PIN CABLE, AS FOLLOWS

A. (5) – 5’

B. (5) – 10’

C. (5) – 15’

3.11 FEMALE EDISON TO MALE STAGE PIN CONNECTOR, AS FOLLOWS

A. (15) – 1’

3.12 HOUSE LIGHTING

A. (31) Meteor Atria II 8, 100W, 4000K(CRI85), TBD deg, DMX RJ45 Sockets, BLK

3.13 ENTERTAINMENT LUMINAIRES ADD ALTERNATES

A. (1) - Canto Astro 600 LED follow spotlight

1. (1) – HD Tripod Stand

B. (4) – HIGH END LONESTAR PRIME

1. (8) Mini-claw Clamps
2. (4) Safety Cables
3. (4) PowerCON True1 to Stage Pin

PART 4 EXECUTION

4.1 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

4.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

4.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

4.4 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

4.5 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturers recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Provide a coordination drawing of each electrical room or space contain electrical equipment using the actual dimensions of the equipment to be supplied indicating clearances and equipment dimensions.

C. Field Quality-Control Reports:

   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

E. Coordination Study Report: The findings of the Section 260573 Coordination Study Report (CSR) may affect the overcurrent protective devices and fault-current withstand requirements for switchboards, panelboards, and transfer switches. Also, the preparation of the CSR is dependent on the manufacturer's data for this equipment. Therefore until Submittal final Approval is granted for the CSR, these materials shall be considered at best "Approved, pending Approval of the CSR" and not released for order.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

   a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
   b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces.

Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Final Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: .

1. Rated for environmental conditions at installed location.
   a. Indoor Locations: NEMA 250, Type 1.
   b. Exterior Locations: NEMA 250, Type 3R
   c. Kitchen and areas subject to water and corrosion: NEMA 250, Type 4X

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finishes:

   a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Same finish as panels and trim.

4. Directory Card: Inside panelboard door, mounted in transparent card holder, with metal frame.

B. Incoming Mains Location: Top or bottom.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

G. All branch breakers over 60A and all main breakers in panelboards on the life safety, legally required and optional standby systems shall have LSI (long time, short time and instantaneous) settings.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric. (Basis of design)

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric. (Basis of Design)

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

C. Arc Energy Reduction. Where the highest continuous current trip setting of a circuit breaker is rated or can be adjusted to is 1200 A or higher.
1. Provide one of the following methods to reduce clearing time
    a. Zone-selective interlocking
    b. Differential relaying
    c. Energy-reducing maintenance switching with local status indicator
    d. Energy-reducing active arc flash mitigation system
2. Indicate the method of compliance in the submittals
3. Provide documentation how the breaker is authorized to be installed, operated, and/or inspected
4. Contractor shall adhere to the documentation and post the information at the location of the circuit breaker(s).

2.5 MINI UNIT SUBSTATIONS

A. UL Listed and tested assembly consisting of
1. Primary and Secondary Main Circuit Breaker

a. Circuit breaker ratings are selected to meet National Electrical Code (NEC) requirements and to coordinate with transformer magnetizing inrush current

2. Sealed Step-Down Transformer
   a. 185°C (365°F) insulation with 115°C (239°F) temperature rise
   b. Sealed, epoxy-resin encapsulated transformer
3. Distribution Panelboard
   a. Panel section has copper bus and uses standard circuit breakers. Tandem breakers are not allowed.
   b. Feeder circuit breakers are standard plug-on type

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Each panelboard section shall not exceed 42 single poles.

C. Panelboards 400A and less shall not exceed 20 in. (508 mm) wide by 5.75 in. (223 mm) deep

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. This includes thermo graphic survey. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a report that identifies panelboards included and that describes scanning results. Include IR color photos of each panel scanned. For panels with defects found, include “before” and “after” defect is repaired. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Communications outlets.
3. Snap switches and wall-box dimmers.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. In buildings used for instruction of students in grade K-6, all outlets install in the building shall be tamper resistant.

B. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper Wiring Devices, Inc.
b. Hubbell.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper Wiring Devices, Inc.
b. Hubbell.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2.4 TOGGLE SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Manufacturers:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper Wiring Devices, Inc.
b. Hubbell.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

C. Switches, 120/277 V, 20 A:

1. Description: Refer to drawings for pole configuation

D. Pilot Light Switches, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 2221PL for 120 V and 277 V.
b. Hubbell; HPL1221PL for 120 V and 277 V.
c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
d. Pass & Seymour; PS20AC1-PLR for 120 V.

2. Description: Single pole, with lighted handle, illuminated when switch is "ON."

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
3. Material for Unfinished Spaces: Galvanized steel.

4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , extra-duty rated, while-in-use, die-cast aluminum with lockable cover.

2.6 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use durable wire markers or tags inside outlet boxes.

3.3 WARRANTY

A. Warranty: Replace devices that fail in materials or workmanship within One year from date of Final Completion.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

    a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
5. Coordination charts and tables and related data.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software and in PDF format.
4. Coordination charts and tables and related data.

1.4 FIELD CONDITIONS

A. exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Bussmann; a division of Cooper Industries.
2. Edison; a brand of Cooper Bussmann; a division of Cooper Industries.
3. Littelfuse, Inc.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type CC: 600-V, zero- to 30-A rating, 200 kAIC , time delay.
3. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay.
2. Feeders: Class RK1, time delay.
3. Motor Branch Circuits: Class RK5, time delay.
4. Large Motor Branch (601-4000 A): Class L, time delay.
5. Power Electronics Circuits: Class J, high speed.
6. Other Branch Circuits: Class RK1, time delay.
7. Control Transformer Circuits: Class CC, time delay, control transformer duty.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests.

7. Confirmation of compliance with Design Lighting Consortium (DLC) or ENERGY STAR product requirements.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires. Use same designations indicated on Drawings.

D. For each fixture provide a color palette of the manufacturer's full color offering. Indicate which colors are standard (no additional cost) and which are custom (additional cost). Architect shall pick the color of all fixtures at the time of the submittal.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within Five years from date of Final Completion.

1.8 SUBSTITUTIONS

A. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
1. Basis of Design Product: The design of each luminaire and its support is based on the first product named. Subject to compliance with requirements, provide either the named product or a comparable product by another manufacturer.

2. The lighting fixture layout indicated in the Contract Documents is based upon photometric data, quality, construction and appearance of fixtures listed in the lighting fixture schedule. Substitutions of listed fixtures are allowed provided the following is provided:

2. Substitution package shall be submitted to Architect no later than fifteen (15) days prior to bid for review and approval.
3. Provide all data for the substitution package in a table similar in format to the lighting fixture schedule on the drawings.
4. Provide cut sheets of substitute fixtures with the various features highlighted.
5. Architect has final functional and aesthetic approval on all substituted fixtures.
6. Pre-bid approved will still be subject to the usual post bid submittal process and review.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. All interior LED lighting fixtures shall be compliant with current product requirements of Design Lighting Consortium (DLC) or ENERGY STAR program.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. CRI of minimum 80 CCT of 4100K.

F. Rated lamp life of 50,000.

G. Lamps dimmable from 100 percent to10 percent of maximum light output.

H. Internal driver:
1. Minimum efficiency: 85% at full load.
2. Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.).
3. Input Voltage: 120 - 277V (±10%) at 60 Hz.
4. Integral short circuit, open circuit, and overload protection.
5. Power Factor: ≥ 0.95.
6. Total Harmonic Distortion: ≤ 20%.
7. Comply with FCC 47 CFR Part 15.

I. LED Modules:
1. Comply with IES LM-79 and LM-80 requirements.
2. Minimum CRI 80 and color temperature 4200˚ K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
3. Minimum Rated Life: 50,000 hours per IES L70.
4. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

J. Nominal Operating Voltage: Provide Universal voltage (MVOLT) ballast where possible. Otherwise provide per the drawings.

K. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

L. Housings:

1. Extruded-aluminum or steel housing and heat sink.
2. Powder-coat painted finish.

2.2 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers:
1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.3 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch diameter aircraft cable supports attached to structure. Do not attached to ceiling with no additional support.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:
1. Secure luminaire to the luminaire opening using approved fasteners in a minimum of two locations, spaced near diagonal corners of luminaire.
2. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 265119

LIGHTING LEGEND

SYMBOL	DESCRIPTION
S	LIGHT SWITCH

SUBSCRIPT/SUPERSCRIPT LETTERS, NUMBERS, AND SYMBOLS INDICATES SWITCH TYPE AS FOLLOWS:

3	INDICATES 3-WAY LIGHT SWITCH
4	INDICATES 4-WAY LIGHT SWITCH
D	INDICATES DIMMER SWITCH
D3	INDICATES 3-WAY DIMMER LIGHT SWITCH
D4	INDICATES 4-WAY DIMMER LIGHT SWITCH
LV	INDICATES LOW VOLTAGE LIGHT SWITCH
OS	INDICATES SWITCH WITH INTEGRAL OCCUPANCY SENSOR
OD	INDICATES DIMMER SWITCH WITH INTEGRAL OCCUPANCY SENSOR

LOWER CASE LETTER INDICATES LIGHT FIXTURE CONTROL DESIGNATION

- LIGHT FIXTURE, CEILING MOUNT.
- LIGHT FIXTURE, WALL MOUNT, HEIGHT AS INDICATED.
- EMERGENCY EGRESS LIGHTING FIXTURE, WALL MOUNT, HEIGHT AS INDICATED.
- EXIT SIGN, CEILING MOUNT. DIRECTIONAL ARROWS AS INDICATED. SHADING INDICATES FACE(S) OF SIGN.
- EXIT SIGN, WALL MOUNT. DIRECTIONAL ARROWS AS INDICATED. SHADING INDICATES FACE(S) OF SIGN.

DEMOLITION GENERAL NOTES

A. PROVIDE ALL ELECTRICAL DEMOLITION WORK REQUIRED TO INSTALL THE WORK INDICATED. REMOVE, REROUTE, AND RECONNECT ALL BRANCH CIRCUITS THAT WILL REMAIN IN USE BUT INTERFERES WITH THE WORK.

B. REMOVE ALL EXISTING CONDUITS THAT WILL NOT BE REUSED AND WHERE THEY WILL BE EXPOSED AFTER COMPLETION. ABANDON ALL OTHERS IN THE WALLS ONLY. DISCONNECT ALL WIRING INDICATED AND/OR REQUIRED TO BE REMOVED FROM ALL POWER SOURCES. REMOVE ALL WIRING FROM ABANDONED CONDUITS AND PROVIDE BLANK COVER PLATES FOR BOXES NOT UTILIZED FOR THE WORK.

C. MAINTAIN CONTINUITY OF ALL EXISTING CIRCUITS TO REMAIN OR PORTIONS THEREOF AFFECTED BY THE WORK.

D. BEFORE DEMOLITION, VERIFY WITH THE OWNER ALL EQUIPMENT TO BE SALVAGED TO OWNER AND NOT REMOVED FROM THE SITE. FOR ALL REMAINING EQUIPMENT INDICATED FOR REMOVAL (AND NOT RELOCATED), REMOVE AND DISPOSE IN A LEGAL MANNER.

E. EXERCISE CARE IN REMOVING DEMOLITION ITEMS. REPAIR OR REPLACE ALL DAMAGE CAUSED TO EXISTING CONSTRUCTION AND EQUIPMENT TO REMAIN.

F. DRAWINGS ARE BASED UPON EXISTING PLANS AND FIELD INVESTIGATION WITHOUT DEMOLITION. VISIT THE EXISTING BUILDING AND BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND EXAMINE ALL DRAWINGS TO AVOID CONFLICTS.

G. WHERE DEMOLITION OF TELECOMMUNICATIONS DEVICES OCCUR, REMOVE CABLING NOT INDICATED TO REMAIN BACK TO POINT OF ORIGIN.

H. DEMOLITION FLOOR PLANS ARE PROVIDED FOR REFERENCE ONLY TO AID IN DEFINING THE SCOPE OF DEMOLITION WORK.

DEMOLITION LEGEND

SYMBOL DESCRIPTION

- REMOVE DEVICES, EQUIPMENT, IN ACCORDANCE WITH THE GENERAL DEMOLITION NOTES.
- DEVICES ARE EXISTING TO REMAIN.
- WITHIN HATCHED AREAS, DISCONNECT AND REMOVE ALL ELECTRICAL MATERIALS INCLUDING BUT NOT LIMITED TO LIGHTS, DEVICES, EQUIPMENT, SPEAKERS, FIRE ALARM, COMMUNICATIONS, AND CIRCUITRY.

GENERAL NOTES

A. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

B. FOLLOW MOUNTING HEIGHTS INDICATED IN THE ELECTRICAL LEGEND UNLESS OTHERWISE INDICATED. MEASURE ALL MOUNTING HEIGHTS FROM THE DEVICE CENTER LINE UNLESS OTHERWISE INDICATED.

C. FIELD VERIFY EXACT FEEDER LOCATIONS FOR MECHANICAL EQUIPMENT PRIOR TO ROUGH-IN.

D. EQUIPMENT CONNECTIONS ARE INDICATED IN THEIR APPROXIMATE LOCATIONS. VERIFY EXACT LOCATIONS OF ALL CONNECTIONS WITH OTHER TRADES SUPPLYING EQUIPMENT TO AVOID CONFLICTS AT INSTALLATION.

E. LOCATED ALL SWITCHES FOR LOCAL CONTROL OF LIGHTING ON STRIKE SIDE OF SINGLE DOORS UNLESS OTHERWISE INDICATED.

F. PROVIDE SPECIFIC BREAKER ARRANGEMENT FOR THE PANEL BOARDS WHEREVER PHYSICALLY POSSIBLE. PROVIDE AS-BUILT DRAWINGS INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. PROVIDE TYPE WRITTEN PANELBOARD DIRECTORIES INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT.

G. PROVIDE AS-BUILT DRAWINGS INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. PROVIDE TYPEWRITTEN PANELBOARD DIRECTORIES INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. HAND WRITTEN SCHEDULES ARE NOT ACCEPTABLE.

H. ALL CONDUIT RUNS INDICATED ARE DIAGRAMMATIC, COORDINATE ROUTING IN ALL SPACES WITH OTHER TRADES.

I. ALL PANELBOARDS INDICATED ARE HOUSED IN A SINGLE WIDTH ENCLOSURE, UNO. THE CONTRACTOR SHALL FIELD VERIFY ROOM LAYOUT AND ADJUST ACCORDINGLY, AT NO COST TO THE OWNER, IF PROVIDING ANY PANELBOARD ENCLOSURES.

J. WHERE POWER AND COMMUNICATION OUTLETS ARE INDICATED IN CLOSE PROXIMITY ON THE DRAWINGS, FIELD COORDINATE THE LOCATIONS TO PLACE THE OUTLETS ADJACENT TO EACH OTHER.

K. ALL EXTERIOR RECEPTACLES SHALL BE LABELED "WR" - WEATHER RESISTANT.

L. WHEN GROUPING MULTIPLE LINE TO NEUTRAL BRANCH CIRCUITS IN A CONDUIT, PROVIDE DEDICATED COLOR CODED NEUTRAL CONDUCTORS FOR EACH CIRCUIT. DO NOT USE BREAKER TIES AND SHARED NEUTRALS EVEN THOUGH PERMITTED BY NEC.

M. PROVIDE A 2" WIDE YELLOW LINE PAINTED ON THE FLOOR INDICATING THE ELECTRICAL WORKING SPACE. IN FRONT OF ALL ELECTRICAL PANELS IN ELECTRICAL ROOMS. REFER TO PLANS FOR ELECTRICAL WORKING SPACE DETAILS. STENCIL "NO STORAGE" IN 2" HIGH, YELLOW LETTERS CENTERED IN THE OUTLINED AREA.

N. REFER TO STRUCTURAL DRAWINGS FOR ALL CONDUIT REQUIREMENTS BEING PLACED IN CMU WALLS.

ABBREVIATIONS

1P	SINGLE PHASE
3P	THREE PHASE
3R	WEATHERPROOF (NEMA 3R)
A	AMPS
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ATS	AUTOMATIC TRANSFER SWITCH
BFC	BELOW FINISHED CEILING
BFG	BELOW FINISHED GRADE
BKR	BREAKER
C	CONDUIT
CATV	COMMUNITY ANTENNA TELEVISION (CABLE)
CB	CIRCUIT BREAKER
CBL	CABLE
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CLG	CEILING
CLR	CLEAR
CO.	COMPANY
COMB	COMBINATION
COMM	COMMUNICATIONS
CU	COPPER
DIA	DIAMETER
DISC	DISCONNECT
DIV	DIVISION
DWG	DRAWING
EBH	ELECTRIC BASEBOARD HEATER
EC	EMPTY CONDUIT
ECS	EMERGENCY COMMUNICATIONS STATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EPO	EMERGENCY POWER OFF
EQ	EQUIPMENT
ETR	EXISTING TO REMAIN
EWC	ELECTRIC WATER COOLER
EX	EXISTING
EXT	EXTERIOR
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FAGP	FIRE ALARM GRAPHIC PANEL
FAXP	FIRE ALARM EXTENDER PANEL
FFSCP	FIRE FIGHTER'S SMOKE CONTROL PANEL
FLA	FULL LOAD AMPS
FPMR	FUSE PER MANUFACTURERS REQUIREMENTS/RECOMMENDATIONS
FPND	FUSE PER NAMEPLATE DATA
G	GROUND
GE	GROUND FAULT PROTECTION FOR EQUIPMENT, 6-50mA PER NEC 427.22 (PROVIDE ACCESSORY FOR INDICATED BREAKER)
GFCI	GROUND FAULT CIRCUIT INTERRUPT
GFP	GROUND FAULT PROTECTION FOR PERSONNEL, 4-6mA (PROVIDE ACCESSORY FOR INDICATED BREAKER)
HKP	HOUSEKEEPING PAD
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
Hz	HERTZ
IAW	IN ACCORDANCE WITH
IG	ISOLATED GROUND
J-BOX	JUNCTION BOX
KHFSS	KITCHEN HOOD FIRE SUPPRESSION SYSTEM
KHz	KILOHERTZ
KVA	KILOVOLT AMPS
KW	KILOWATTS
KWH	KILOWATT HOURS
L	LOCKOUT TO PREVENT UNAUTHORIZED SWITCHING (PROVIDE ACCESSORY FOR INDICATED BREAKER)
LC	ROUTE CIRCUIT TO LOAD VIA LIGHTING CONTACTOR, REFER TO LC SCHEDULE
LED	LIGHT EMITTING DIODE
LTG	LIGHTING
LTS	LIGHTS
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MH	METAL HALIDE
MHz	MEGAHERTZ
MIN	MINIMUM
ML	MAINTENANCE LOCK (PROVIDE ACCESSORY FOR INDICATED BREAKER)
MLO	MAIN LUG ONLY
MNS	MASS NOTIFICATION SYSTEM
MOCP	MAXIMUM OVER CURRENT PROTECTION.
MTD	MOUNTED
N	NEUTRAL
N/C	NORMALLY CLOSED
N/O	NORMALLY OPEN
NO.	NUMBER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
P	PILOT LIGHT (AT THE SWITCH HANDLE)
PBD	PANELBOARD
PD	PROTECTIVE DEVICE
RCPT	RECEPTACLE
REC	RECEPTACLE
SEC	SECURITY
SPD	SURGE PROTECTIVE DEVICE
SPEC.	SPECIFICATION(S)
ST	SHUNT TRIP, 120V COIL (PROVIDE ACCESSORY FOR INDICATED BREAKER)
SW	SWITCH
SWBD	SWITCHBOARD
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TC	TELECOMMUNICATIONS CLOSET
TELECOM	TELECOMMUNICATIONS
TGB	TELECOMMUNICATIONS GROUNDING BUS BAR
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUS BAR
TYP	TYPICAL
UNO	UNLESS NOTED (INDICATED) OTHERWISE
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
W	WATTS
W/	WITH
WG	WIRE GUARD
WP	WEATHERPROOF
XFER	TRANSFER
XFMR	TRANSFORMER

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3/27/26

PORTER RIDGE HIGH SCHOOL AUDITORIUM LIGHTING DESIGN

UNION COUNTY PUBLIC SCHOOLS
2839 RIDGE RD, INDIAN TRAIL, NC 28079

PROJECT NO: 660274 DATE: MARCH 29, 2026

SUBMITTAL: PROGRESS SET

REVISIONS	
DATE	DESCRIPTION

LEGENDS, ABBREVIATIONS AND GENERAL NOTES

E0.1

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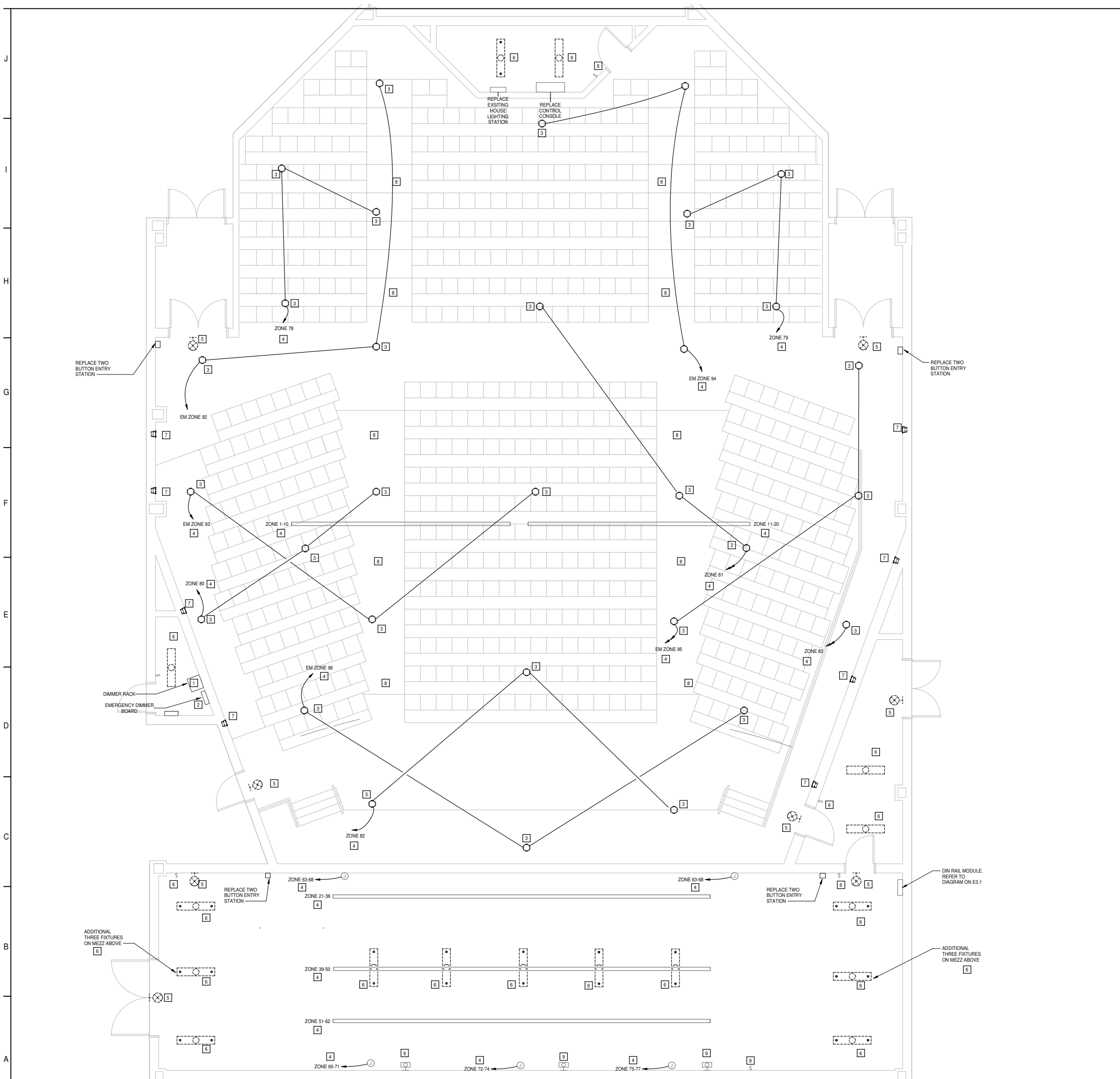

DEMOLITION FLOOR PLAN

1/4" = 1'-0"

KEYNOTES

APPLIES TO THIS DRAWINGS
REPRESENTED BY [n]

1. REPLACE EXISTING DIMMER CABINET AND THE INCANDESCENT DIMMING MODULES (96 TOTAL) . REFER TO RENOVATION PLANS
2. REWORK THE EXISTING EMERGENCY CABINET. REFER TO RENOVATION PLANS.
3. REPLACE THE DENOTED EXISTING PENDANT MOUNTED HOUSELIGHTS. REFER TO RENOVATION PLANS.
4. EXISTING DIMMING CIRCUITS SHALL BE AS COMBINED/REWORKED AS INDICATED ON THE RENOVATION PLANS.
5. REPLACE THE EXISTING EXIT SIGNAGE AS INDICATED ON THE RENOVATION PLANS
6. REPLACE EXISTING WORK LIGHTS AS INDICATED ON THE RENOVATION PLANS.
7. RETROFIT THE EXIST LOUVERED STYLE WALL FIXTURE WITH AND LED KIT. FIELD VERIFY EXISTING CONTROLS AND CONNECT TO REPLACEMENT DIMMER SYSTEM.
8. FIELD INVESTIGATE THE CONNECTIONS FOR THE EXISTING SEAT MOUNTED LIGHTING AND REPAIR AS NEEDED.
9. EXISTING WORK LIGHTS AND ON/OFF CONTROLS SHALL REMAIN

GENERAL NOTES

A. THE INFORMATION ON THESE DRAWINGS IS BASED ON RECORD DRAWINGS AND LIMITED FIELD INVESTIGATION. THE CONTRACTOR IS STRONGLY ENCOURAGED TO VISIT THE SITE BEFORE THE BID TO ACCESS THE NATURE OF THE WORK.

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ELECTRICAL PLANS AND DETAILS

E1.1

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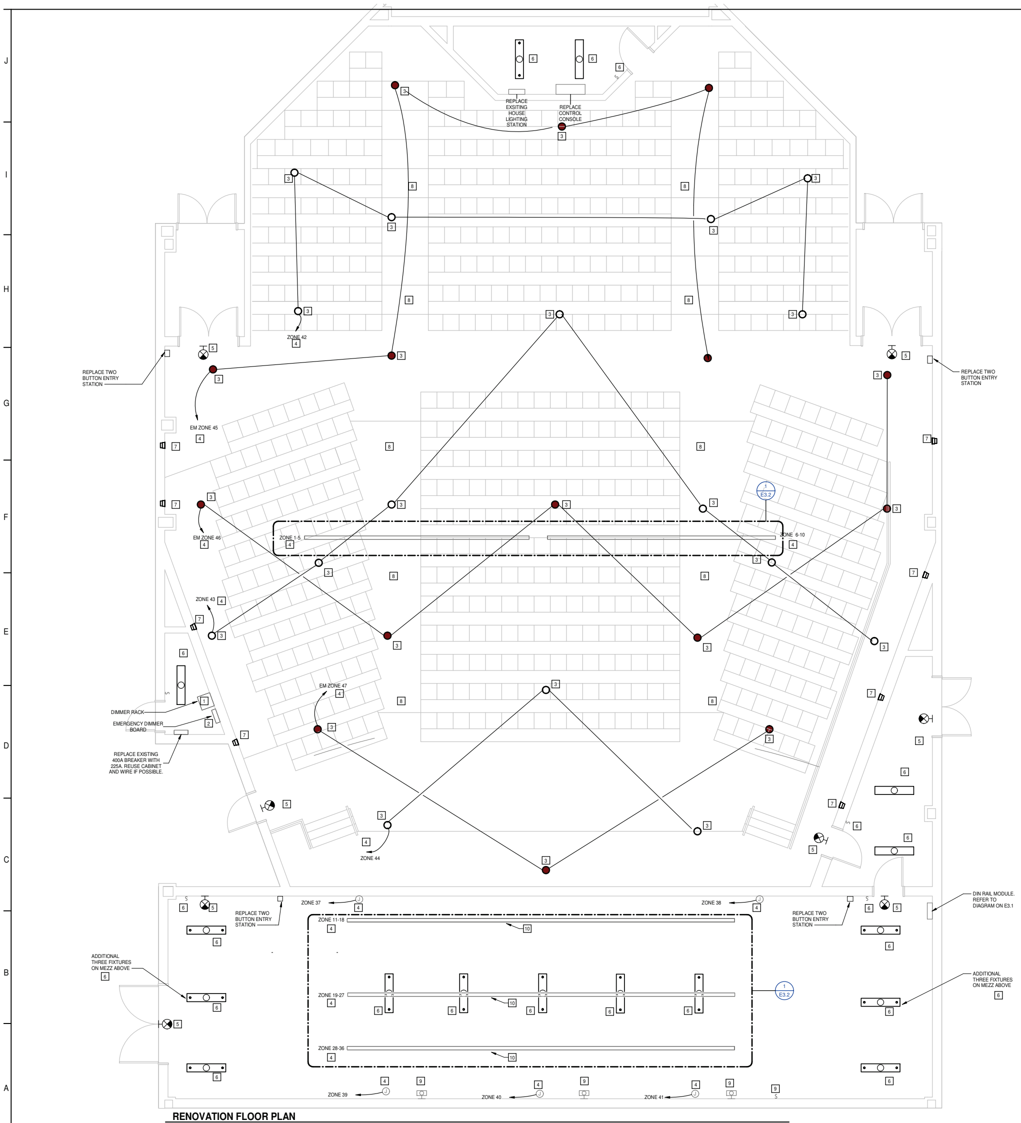


RENOVATION FLOOR PLAN

1/4" = 1'-0"

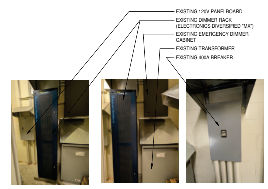
KEYNOTES

APPLIES TO THIS DRAWINGS
REPRESENTED BY [n]

1. PROVIDE A 48 MODULE MAIN FEED RELAY CABINET WITH DMX BREAKER AND PROVIDE DMX CABLING TO EXISTING CONNECTION POINTS. MODIFY CABINETS AS REQUIRED TO INTERFACE TO THE MODIFIED DIMMING CONTROLS.
2. REWORK THE EXISTING EMERGENCY CABINET TO INTERFACE TO THE REPLACEMENT RELAY CABINET. PROVIDE DMX CABLING TO EXISTING CONNECTION POINTS AS NEEDED.
3. REPLACE THE DENOTED EXISTING PENDANT MOUNTED HOUSELIGHTS WITH FIXTURE WITH 4K LED ARRAY, BLACK COLOR, DMX CONTROL, 120V, WITH 1% DIMMING (METEOR ATRIA II 8" OR EQUAL). FIXTURES OVER THE AISLE SHALL UTILIZE A NARROW REFLECTOR TO ILLUMINATE THE AISLE. EXISTING PENDANT HANGER MAY BE REUSED. CONNECT TO MODIFIED LIGHTING CIRCUIT AND DMX CONTROL. CIRCUIT MAY BE COMBINED TO INCLUDE UP TO TEN FIXTURES.
4. COMBINE/REWORK EXISTING DIMMING CIRCUITS AS INDICATED AND PROVIDE DMX CABLING/ INTERFACE TO THE RESPECTIVE CABINETS.
5. REPLACE THE EXISTING EXIT SIGNAGE WITH SIGN WITH TWO COMBO HEADS AND CAPACITY FOR 3W REMOTE HEAD. (LITHONIA LHQM LED R HO M6 OR EQUAL) AND CONNECT TO EXISTING CIRCUIT TO ILLUMINATE HEADS ON LOSS OF POWER . EXIT SIGN SHALL ILLUMINATE AT ALL TIMES.
6. REPLACE EXISTING WORK LIGHTS WITH SIMILAR LED FIXTURE (FIELD VERIFY TYPE) AND REUSE THE EXISTING CIRCUITS AND ON/OFF CONTROLS.
7. RETROFIT THE EXIST LOUVERED STYLE WALL FIXTURE WITH AND LED KIT. FIELD VERIFY EXISTING CONTROLS AND CONNECT TO REPLACEMENT DIMMER SYSTEM.
8. FIELD INVESTIGATE THE CONNECTIONS FOR THE EXISTING SEAT MOUNTED LIGHTING AND REPAIR AS NEEDED.
9. EXISTING WORK LIGHTS AND ON/OFF CONTROLS SHALL REMAIN
10. LOWER THE EXISTING STAGE ELECTRICS LIGHT BAR TO BE MIDWAY OF THE EXISTING "TEASER CURTAIN

GENERAL NOTES

A. THE INFORMATION ON THESE DRAWINGS IS BASED ON RECORD DRAWINGS AND LIMITED FIELD INVESTIGATION. THE CONTRACTOR IS STRONGLY ENCOURAGED TO VISIT THE SITE BEFORE THE BID TO ACCESS THE NATURE OF THE WORK.
B. REFER TO SPECIFICATION SECTION 265561 - THEATRICAL LIGHTING AND 012200- UNIT PRICING FOR LIGHTING FIXTURES, EQUIPMENT, ACCESSORIES AND UNIT PRICING TO BE PROVIDED AS PART OF THIS PROJECT



EXISTING EQUIPMENT

NO SCALE

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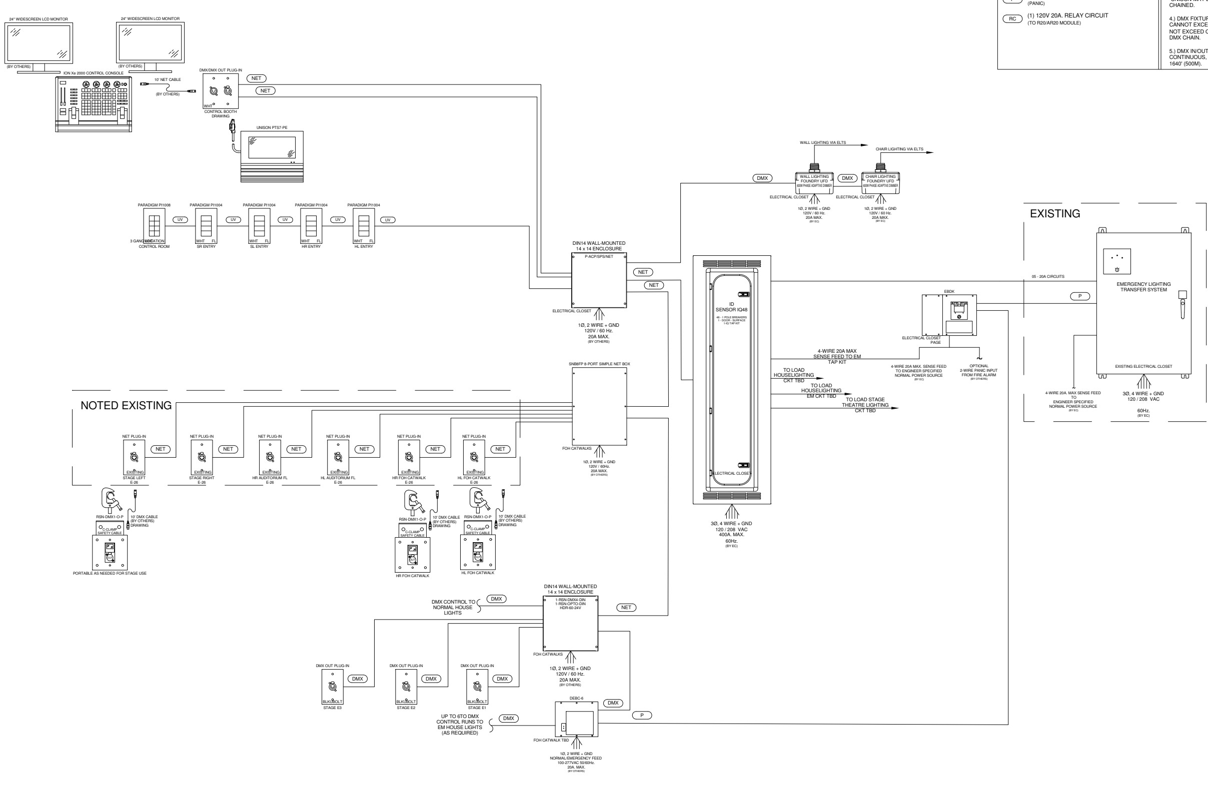
ELECTRICAL PLANS AND DETAILS

E2.1



LIGHTING SYSTEM RIGGER DIAGRAM

NO SCALE

CONTROL WIRING LEGEND	
UV	(1) TMB PCLP2PT (UNISON LON OR ECHO BUS WITH OPTIONAL AUX POWER)
DMX	(1) TMB PC244T (DMX)
NET	(1) BELDEN #1583A (ETCNet - Cat5e)
P	(2) #16 AWG. STRANDED WIRES (PANIC)
RC	(1) 120V 20A. RELAY CIRCUIT (TO R20/AR20 MODULE)

NOTES

1.) ALL CONTROL WIRING IS PROVIDED BY EC UNLESS NOTED OTHERWISE.

2.) ALL ETCNet RUNS SHALL BE CONTINUOUS, UNSPLICED RUNS LESS THAN 300' (90M). ALL NETWORK CONNECTIONS TO BE TIA/EIA 568B.

3.) TOTAL COMBINED LENGTH OF UNISON/ECHO WIRING RUNS CANNOT EXCEED 1640' (500M). UNISON MAY BE HOMERUN, STAR, 'T', OR DAISY CHAINED.

4.) DMX FIXTURE RUNS MUST DAISY CHAIN AND CANNOT EXCEED 1640' (500M) IN LENGTH. DO NOT EXCEED QUANTITY OF 32 DEVICES IN ONE DMX CHAIN.

5.) DMX IN/OUT PLUG LOCATIONS SHALL BE CONTINUOUS, UNSPLICED RUNS LESS THAN 1640' (500M).

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PORTER RIDGE HIGH SCHOOL AUDITORIUM LIGHTING DESIGN

UNION COUNTY PUBLIC SCHOOLS
2839 RIDGE RD, INDIAN TRAIL, NC 28079

PROJECT NO: 660274 DATE: MARCH 29, 2026
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REVISIONS	
DATE	DESCRIPTION

DETAILS

E3.1

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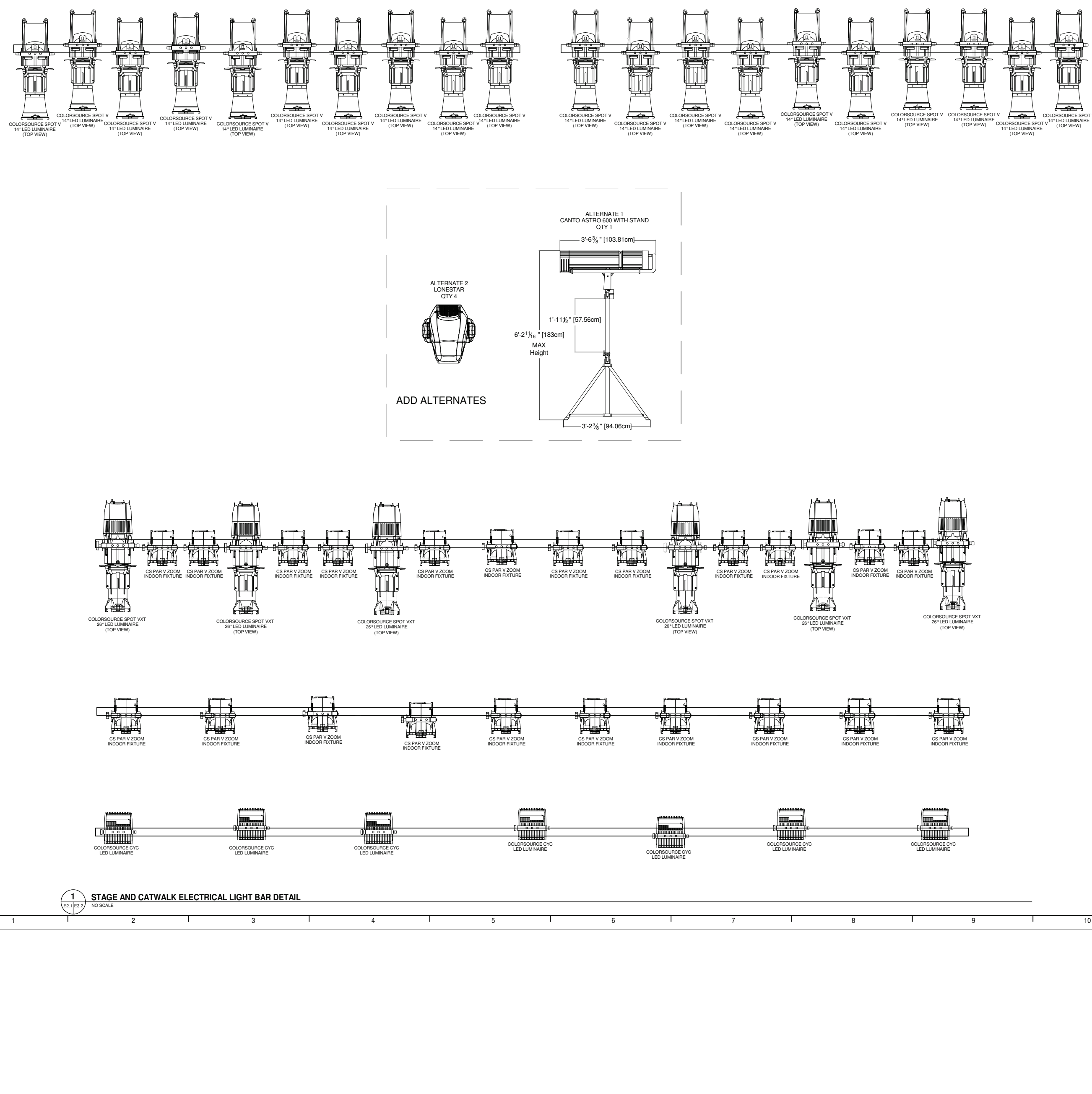

1 E2.1 E3.2 **STAGE AND CATWALK ELECTRICAL LIGHT BAR DETAIL**
NO SCALE

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PORTER RIDGE HIGH SCHOOL AUDITORIUM LIGHTING DESIGN

UNION COUNTY PUBLIC SCHOOLS
2839 RIDGE RD, INDIAN TRAIL, NC 28079

PROJECT NO: 660274 DATE: MARCH 29, 2026
SUBMITTAL: PROGRESS SET
REVISIONS
DATE DESCRIPTION

ENLARGED PLANS

E3.2

REQUIRED FORMS

Required with Bid

1. Executed Cost Proposal Form
2. HUB Affidavit A or B
3. Identification of Minority Participation Form

Recommendation of Award (Prior to Contract Execution)

1. Certificate of Insurance (meeting the requirements stated within Attachment A)
2. Good Faith Efforts (Affidavit C or D)
3. 100 % Performance and Payment Bond (within 10 days of award)
4. E-Verify Affidavit
5. Iran Divestment Certification

Bidders Checklist:

___ Bid Submittal form

___ Affidavit A or B

___ Identification of Minority Business Form

Cost Proposal/Execution of Proposal

Project title: Stage Lights Upgrades

Location: Porter Ridge High School Auditorium

BID NO: 6-97648062

By submitting this proposal, the potential contractor certifies the proposal is signed by an authorized representative of the firm.

- The cost and availability of all equipment, materials, and supplies associated with performing the services described herein have been determined and included in the proposed cost.
- All labor costs, direct and indirect, sales tax, etc. have been determined and included in the proposed cost.
- The offeror is aware of prevailing conditions associated with performing these services.
- The potential contractor has read and understands the conditions set forth in this bid and agrees to them with no exceptions.

Therefore, in compliance with this Request for Proposal, and subject to all conditions herein, the undersigned offers and agrees, if this proposal is accepted within 60 days from the date of the opening, to furnish the subject services for a cost not to exceed:

Base Bid:

Base Bid	$ _____
Insert Percentage (10%) allowance funds	$ _____
Base Bid plus Allowance funds Total	$ _____
Alternate 1:	$ _____ (Add or Deduct) Canto Astro 600 with stand Qty 1
Alternate 2:	$ _____ (Add or Deduct) Lonestar Qty 4
Acknowledge Addenda:	Addendum 1 ___ Addendum 2 ___ Addendum 3 ___ Addendum 4 ___ Not Applicable __
Project Schedule: Notice to Proceed: Approx June 15th Substantial Completion: TBD Final Completion: TBD	Consecutive **calendar** days required to achieve Final Completion from issuance of Notice to Proceed: _____ calendar days

Unit Costs:

Unit Costs may be used to add or delete from the project.

Unit prices

Colorsource Spot V 14° Led Luminaire $ _____

Colorsource Spot VXT 26° Led Luminaire $ _____

Colorsource Par V Zoom Indoor Fixture $ _____

Colorsource Cyc Led Luminair $ _____

Execution:

Offeror: _____ Federal Tax ID No. _____

License Description: _____ License No. _____

Address: _____ City, State, Zip _____

Telephone Number: _____Mobile: _____ Email: _____

By: _____ Date: _____ Title: _____

(Typed or printed name)

Identification of HUB Certified/ Minority Business Participation

I,_____,
(Name of Bidder)
do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be ($)_____.

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of_____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ❑ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ❑ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ❑ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ❑ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ❑ **5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- ❑ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ❑ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ❑ **8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ❑ **9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ❑ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20___

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____
Subscribed and sworn to before me this _____day of _____20____
Notary Public_____
My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project _____

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
Contractor: (Trade or Corporate Name)

_____
(Proprietorship or Partnership)

By: _____

Attest: (Corporation)

Title: _____
(Owner, Partner, or Corp.
Pres. or Vice Pres. only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec.. only)

(Corporate Seal)

_____
(Surety Company)

Witness:

By: _____

_____

Title: _____
(Attorney in Fact)

Countersigned:

_____

(Surety Corporate Seal)

_____
(N.C. Licensed Resident Agent)

_____

_____
Name and Address-Surety Agency

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project _____

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above-named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise, to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

Contractor: (Trade or Corporate Name)

(Proprietorship or Partnership)

By:

Attest: (Corporation)

Title:
(Owner, Partner, or Corp.
Pres. or Vice Pres. only)

By:

Title:
(Corp. Sec. or Asst. Sec... only)

(Corporate Seal)

(Surety Company)

Witness:

By:

Title:
(Attorney in Fact)

Countersigned:

(Surety Corporate Seal)

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

UCPS
UNION COUNTY PUBLIC SCHOOLS

E-VERIFY COMPLIANCE STATEMENT

The contractor shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes. Further, should Contractor utilize a subcontractor(s), Contractor shall require the subcontractor(s) to comply with the requirements of Article 2, Chapter 64 of the General Statutes. Pursuant to North Carolina General Statute § 143-133.3(c)(2), contracts solely for the purchase of apparatus, supplies, materials, and equipment are exempt from this E-Verify provision. If, at any time during the period this statement is considered valid, the Contractor should become non-compliant, it shall be the Contractor's responsibility to acknowledge the change in status to Union County Public Schools in writing.

{CONTRACTOR'S FULL LEGAL NAME} _____

_____ _____

SIGNATURE PRINTED NAME & TITLE

_____ _____

WITNESS PRINTED NAME & TITLE

IRAN DIVESTMENT ACT CERTIFICATION

REQUIRED BY N.C.G.S. 147-86.58

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 147-86.58.

The undersigned hereby certifies that he or she is authorized by the vendor or bidder listed above to make the foregoing statement.

Signature _____ Date _____

Printed Name _____ Title _____

Notes to persons signing this form:

N.C.G.S. 147-86.58 requires this certification for bids or contracts with the State of North Carolina, a North Carolina local government, or any other political subdivision of the State of North Carolina. The certification is required at the following times:

- When a proposal is submitted
- When a contract is entered into (if the certification was not already made when the vendor made its proposal)
- When a contract is renewed or assigned

N.C.G.S. 147-86.58 requires that contractors with the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any subcontractor found on the State Treasurer's Final Divestment List.

The State Treasurer's Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurer.com/Iran and will be updated every 180 days.

EXHIBIT A

Contract #:

CONTRACT FOR SERVICES
(CONTRACT FOR SERVICES AND/OR GOODS UNDER $500,000)

This **Contract for Services** ("Contract") is made and entered into **[Date]** between **The Union County Board of Education**, with a mailing address of 400 North Church Street, Monroe, North Carolina 28112 ("UCBOE") and **[Vendor Name]** ("Vendor" or "Contractor" or "Service Provider").

For and in consideration of the mutual promises set forth in this Contract, the parties do mutually agree as follows:

1. Obligations of Vendor. The Vendor agrees to provide the services, goods, materials, equipment, and/or software (the "Services" and/or "Goods," as appropriate) to fully, timely and properly complete **[Project Name]** as more particularly described in the Scope of Work document attached hereto and incorporated herein by reference as Exhibit 1.

   [If master work order contract, then insert: Individual tasks will be assigned in writing on a project by project basis by an authorized representative of UCBOE. Such writing shall be in the form of a standard UCBOE purchase order ("Purchase Order"), such Purchase Order to specify the specific Services and/or Goods desired by UCBOE; the dates, times and locations that the Vendor shall provide the requested Services and/or Goods; and the compensation that the Vendor will be paid for providing the requested Services and/or Goods. The Vendor will be deemed to have accepted a Purchase Order and be obligated to provide the Services and/or Goods outlined in the Purchase Order in accordance with the price and other terms of the Purchase Order, and the terms and conditions hereof, unless within 24 hours after the Vendor's receipt of a Purchase Order, the Vendor notifies the Project Coordinator (as hereinafter defined) in writing that it does not accept the Purchase Order and will not provide the requested Services and/or Goods.]

   [If construction contract and if applicable, insert: For construction Contracts, this Contract incorporates by reference the construction design drawings, plans and specifications, described as follows, which will govern the Services and/or Goods to be provided by the Vendor: [Reference Plans, if any.]]

   [If construction contract and if applicable, insert: The UCBOE and Vendor recognize that time is of the essence to this Agreement and that the UCBOE will suffer financial loss if the work is not completed within the times specified herein. Both parties also recognize the delays, difficulties and expense involved in proving, in a legal or arbitration proceeding, the actual loss suffered by the UCBOE if the Work is not completed on time. Accordingly, in lieu of requiring such proof, the UCBOE and Vendor agree that as liquidated damages for delay (but not as penalty) the Vendor shall pay to the UCBOE for each day in excess of the term allowed for completion of the Work, the sum of $100 as liquidated damages.

   The term of this Contract shall be **[Term of Contract]**.

   This Contract does not grant the Vendor the right or the exclusive right to provide specified Services and/or Goods to UCBOE. Similar Services and/or Goods may be obtained from sources other than the Vendor (or not at all) at the discretion of UCBOE.

   The Vendor shall begin work immediately upon issuance of a written notice to proceed. The Vendor agrees to perform the Services and supply the Goods or in a timely, complete, and professional manner and in accordance with the terms and conditions of this Contract. Furthermore, the Vendor represents and warrants that (i) it is duly qualified and, if required by law, licensed to provide the Services and/or Goods; (ii) it will provide the Services and/or Goods in a manner consistent with the level of care and skill ordinarily exercised by contractors providing similar Services and/or Goods under similar conditions; (iii) it possesses sufficient experience, personnel, and

resources to provide the Services and/or Goods; (iv) it shall provide the Services and/or Goods in compliance with applicable laws, statutes, ordinances, codes, orders, rules and regulations; and (v) its reports, if any, shall be complete, accurate, and unambiguous.

2. Obligations of UCBOE. UCBOE hereby agrees to pay to the Vendor for the faithful performance of this Contract, and the Vendor hereby agrees to provide all of the Services and/or Goods, for the sum not to exceed **[Contract Price]** ("Contract Price") subject to adjustments as provided for in the Contract Documents:

			Budget Account No.:
(i)	Vendor's Fee	$ _____	_____
(ii)	Taxes	$ _____	_____
(iii)	Travel/Lodging/Food Not to Exceed	$ _____	_____
(iv)	Other	$ _____	_____
(v)	Total Not to Exceed	_____	_____

[If multi-year: The parties acknowledge that UCBOE operates on a July 1-June 30 fiscal year and that operating funds are made available to UCBOE on a year to year basis. Accordingly, see Section 27 of Article I of the Standard Terms and Conditions for All Contracts. The mechanism by which UCBOE shall confirm that funding is available will be issuance of standard UCBOE purchase orders (each, a "Purchase Order") from time-to-time. The initial Purchase Order for services is expected to be issued on or about **[DATE]** and will reflect the amount of the authorization for the Services for **[Described initial scope]** in the amount of **[Dollar Amount]**. Thereafter, on an as-needed basis as determined by UCBOE, UCBOE may amend existing Purchase Orders from time to time or issue a new Purchase Order (e.g. at the start of each new fiscal year).]

[If master contract: A separate Purchase Order shall be issued for each assignment and the total amount due to the Vendor for a particular work assignment shall not exceed the amount shown in the Purchase Order for that assignment.]

3. Project Coordinator. **[Primary Contact for UCBOE]** is designated as the Project Coordinator for UCBOE. The Project Coordinator shall be UCBOE's representative in connection with the Vendor's performance under this Contract. UCBOE has complete discretion in replacing the Project Coordinator with another person of its choosing.

4. Vendor Supervisor. **[Primary Contact for Vendor]** is designated as the Vendor Supervisor for the Vendor. The Vendor Supervisor is fully authorized to act on behalf of the Vendor in connection with this Contract.

5. Terms and Methods of Payment. UCBOE will make payment after invoices are approved on a net 30-day basis. UCBOE will not pay for services or materials in advance without the prior approval of the Finance Officer. Vendor to submit invoices on the following schedule: **[Invoice Schedule]**.

6. Standard Terms and Conditions: Vendor agrees to the Standard Terms and Conditions set forth as Attachment A attached hereto and incorporated herein by reference.

7. Counterpart Execution. This Contract may be executed and recorded in two or more counterparts, each of which shall be deemed an original and all of which, when taken together, shall constitute one and the same instrument. Each party shall be entitled to rely upon executed copies of this Contract transmitted by facsimile or electronic "PDF" to the same and full extent as the originals.

[THE REST OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY]

[SIGNATURES ON NEXT PAGE]

IN WITNESS WHEREOF, UCBOE and the Vendor have executed this Contract on the day and year first written above.

[CONTRACTOR NAME]

Vendor Name

Signature of Authorized Representative Date

Vendor's Federal Identification #
[if Contract is with Organization or Social Security Number if individual]

THE UNION COUNTY BOARD OF EDUCATION

Authorized Representative Date

Procurement Director Date

This instrument has been preaudited
in the manner required by the School Budget
and Fiscal Control Act.

Finance Officer Date

Attachment A

Standard Terms and Conditions

I. Standard Terms and Conditions for All Contracts

1. Defined Terms, "Contract" means the agreement between UCBOE and Vendor which consists of the applicable Contract Documents. "Contract Documents" means: (i) any applicable purchase order between Vendor and UCBOE specifically including all terms and conditions set forth or referenced herein and on the face of a Purchase Order, (ii) any attachments hereto, (iii) any applicable solicitation documentation related to hereto (including without limitation any request for proposals or invitation for bids and Vendor's response thereto), and (iv) any other terms and conditions of a written agreement signed by Vendor and UCBOE that deals with the same subject matter. "Goods" means any supplies, materials, products or other tangible personal property provided by Vendor to UCBOE. "Purchase Order" mean any applicable purchase order issued by UCBOE. "Services" means services, specifically including without limitation construction services, design services, professional or consulting services and software as a service, "UCBOE" means the Union County Board of Education. "Vendor" means the party contracting with UCBOE and includes individual and entities that may be referred to in Contract Documents as "vendor", "seller", "service provider", or "contractor".
2. Written Agreement Signed by Both Parties; Acceptance of Purchase Order Terms and Conditions when there is not a Separate Written Agreement Signed by Both Parties. When a Contract is signed by both UCBOE and Vendor then the Purchase Order issued by UCBOE is for administrative convenience and is not part of the Contract Documents. When there is not a separate Contract signed by both UCBOE and Vendor, then Vendor's acknowledgment of the terms of any Purchase Order, without timely objection, or Vendor's shipment or performance of any part of a Purchase Order, constitutes an agreement to all terms and conditions set forth or referenced herein and on the face of the Purchase Order, together with the terms and conditions of any other applicable Contract Documents. The terms and provisions set forth in the Contract Documents shall constitute the entire agreement between Vendor and UCBOE with respect to the purchase by UCBOE of the Services and/or Goods work performed as described in the Contract Documents. In the event of any conflict between any terms and conditions of the Contract Documents, the terms and conditions most favorable to UCBOE shall control. A Purchase Order constitutes an offer by UCBOE and expressly limits acceptance to the terms and conditions stated therein. No additional or supplemental provision or provisions in variance herewith that may appear in Vendor's quotation, acknowledgment, invoice, or in any other communication from Vendor to UCBOE shall be deemed accepted by or binding on UCBOE. UCBOE hereby expressly rejects all such provisions which supplement, modify or otherwise vary from the terms of the Contract Documents, and such provisions are superseded by the terms and conditions stated in the Contract Documents, unless and until UCBOE's authorized representatives expressly assent, in writing, to such provisions. Stenographic and clerical errors and omissions by UCBOE are subject to correction.
3. Cancellation of Purchase Order. UCPS may cancel any Purchase Order or portion thereof without liability, if: (a) Vendor fails upon request to give reasonable assurance of timely performance or UCPS otherwise determines that it has reasonable grounds for insecurity regarding Vendor's performance; (b) conforming Goods or Services (including the quantities specified for delivery) are not delivered within the time specified or, if no time is specified, within a commercially reasonable time; (c) Vendor otherwise breaches the Contract and such breach is not corrected within thirty (30) days following written notice of breach; or (d) cancellation is otherwise required or allowed by law.
4. Quantities. Shipments must equal exact amounts ordered unless otherwise agreed in writing by UCBOE. The award of a term contract neither implies nor guarantees any minimum or maximum purchases. Materials received in excess of quantity specified on the purchase order , at UCBOE option's, may be returned at the Vendor's expense.
5. Prices. If Vendor's price or the regular market price of any of the Goods covered hereunder is lower than the price stated in the Contract Documents on the date of shipment of such Goods, Vendor agrees to give UCBOE the benefit of such lower price on any such Goods. In no event shall Vendor's price be higher than the price last quoted or last charged to UCBOE unless otherwise agreed in writing. No charges for transportation, boxing, crating, etc. are allowable unless such charges are included in the Contract Documents.
6. Invoices. It is understood and agreed that orders will be shipped at the established Contract prices in effect on dates orders are placed. Invoicing at variance with this provision may subject the Contract to cancellation.

Applicable North Carolina sales tax shall be invoiced as a separate item. Invoices shall be sent to UCBOE's accounts payable department with a copy to UCBOE Project Coordinator.

7. Freight on Board. All shipments of Goods are FOB destination unless otherwise stated in the Contract Documents. Any freight charges prepaid by Vendor are to be itemized on the invoice unless stated otherwise in writing by form of quote, bid, contract. In instances where Goods are shipped against this order by parties other than those specified on the Purchase Order, the third=party shipper must be instructed to list the UCBOE purchase order number on all packages, bills of lading, etc. to insure prompt identification of order.
8. Taxes. Taxes are included in the Contract Price. Applicable taxes shall be invoiced as a separate item for UCBOE's records.
9. Payment Terms. Payment terms are Net 30 days after receipt of correct invoice or acceptance of Goods, whichever is later.
10. Condition and Packaging. Unless otherwise provided by special terms and conditions or specifications, it is understood and agreed that any item offered or shipped has not been sold or used for any purpose and shall be in first class condition. All containers/packaging shall be suitable for handling, storage or shipment.
11. Safety Data Sheets. Safety Data Sheets must be provided with shipment of all chemicals."
12. Delays in Shipment. Time and date of delivery are of the essence, except when delay is due to causes beyond Vendor's reasonable control and without Vendor's fault or negligence.
13. Risk of Loss. Vendor shall have the risk of loss of and damage to the Goods subject to the Contract Documents until such Goods are delivered to the destination and accepted by UCBOE or its nominee.
14. Rejection. All Goods shall be received subject to UCBOE's inspection. Goods that are defective in workmanship or material or otherwise not in conformity with the requirements of the Contract Documents may be rejected and returned at Vendor's expense or may be accepted at a reduced price. UCBOE may require Vendor to promptly replace or correct any rejected Goods Services and, if Vendor fails to do so, UCBOE may contract with a third party to replace such Goods Services and charge Vendor the additional cost.
15. Warranties. Vendor warrants that all Goods delivered hereunder will be free from defects in materials and workmanship and will conform strictly to the specifications, drawings, or samples specified or furnished. This warranty shall survive any inspection, delivery, acceptance or payment by UCBOE of the Goods and shall run to UCBOE and any user of the Goods. This express warranty is in addition to Vendor's implied warranties of merchantability and fitness for a particular purpose which shall not be disclaimed. In addition to any other rights available at law or equity, UCBOE shall be entitled to all rights and remedies provided by the Uniform Commercial Code, Chapter 25 of the North Carolina General Statutes, for breach of express warranties and implied warranties of merchantability or fitness for a particular purpose, including but not limited to consequential and incidental damages.
16. Compliance with All Laws. Vendor warrants that all performance hereunder shall be in accordance with all applicable federal, state and local laws, regulations and orders. The right of Vendor to proceed may be terminated immediately by written notice if UCBOE determines that Vendor, its agent or another representative, has violated any provision of law.
17. Use of Federal Funds. If the source of funds for this Contract is federal funds, the following federal provisions apply pursuant to 2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II (as applicable):Equal Employment Opportunity (41 C.F.R. Part 60); Davis-Bacon Act (40 U.S.C. 3141-3148); Copeland "Anti-Kickback" Act (40 U.S.C. 3145); Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708); Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387); Debarment and Suspension (Executive Orders 12549 and 12689); Byrd Anti-Lobbying Amendment (31 U.S.C. 1352); Procurement of Recovered Materials (2 C.F.R. § 200.322); and Record Retention Requirements (2 CFR § 200.324).
18. Registered Sex Offenders; Jessica Lunsford Act. Under North Carolina law, certain sex offenders are prohibited from coming onto school campuses. Vendor agrees to conduct an annual check of the N.C. Sex Offender and Public Protection Registration Program, the N.C. Sexually Violent Predator Registration Program and the National Sex Offender Registry for all of its employees whose job involves direct interaction with students as part of the job. UCBOE prohibits any personnel listed on such registries from being on any property owned or operated by UCBOE and from having any direct interaction with students. As a term of the Agreement, said checks must be performed by the Vendor and reported to UCBOE's Superintendent or designee, if Vendor's employees will be working directly with students. Under provisions set forth in the Jessica Lunsford Act under North Carolina law, the signature below certifies that neither Vendor nor any employee or agent of Vendor is

listed as a sex offender on the N.C. Sex Offender and Public Protection Registration Program, the N.C. Sexually Violent Predator Registration Program, and/or the National Sex Offender Registry.

19. Nondiscrimination. During the performance of the Contract, Vendor shall not discriminate against or deny the Contract's benefits to any person on the basis of sexual orientation, national origin, race, ethnic background, color, religion, gender, age or disability.
20. FERPA Electronically Stored Data Compliance: Vendor is expressly prohibited from selling or trading any education records or personally identifiable information acquired under the Agreement. Furthermore, Vendor agrees not to attempt to re-identify students from aggregated data. Further, Vendor will not use any personally identifiable information or education records to advertise or market to students of UCBOE or their parents. Any personally identifiable information and education records held by Vendor pursuant to the Agreement will be made available to UCBOE upon request. Vendor will store and process all data using appropriate administrative, physical, and technical safeguards to secure personally identifiable information and education records from unauthorized access, disclosure, and use. Vendor will conduct periodic risk assessments and remediate any identified security vulnerabilities in a timely manner. Vendor will also have a written incident response plan, to include prompt notification to UCBOE in the event of a security or privacy incident, as well as procedures for responding to a breach of data. Vendor agrees to share its incident response plan upon request. Vendor shall, for all personally identifiable data and education records in its possession and in the possession of any subcontractors, or agents to which it has transferred data as permitted herein, destroy or de-identify such data when such data is no longer needed to perform the Agreement. Vendor hereby agrees to abide by all Board of Education policies and procedures governing the confidentiality of student records and the responsible use of technology and internet safety. If Vendor experiences a security breach concerning any information covered by the Agreement, and such breach is covered by N.C.G.S. §75.61(14), then Vendor will (a) fully comply with Vendor's obligations under the N.C. Identity Theft Protection Act, (b) immediately notify UCBOE with the information listed in N.C.G.S. §75-65(d)(1-4), and (c) fully cooperate with UCBOE in carrying out its obligations under said Identity Theft Protection Act. Vendor will indemnify UCBOE for any breach of confidentiality or failure of its responsibilities to protect confidential information, and for cost of notification of affected persons as a result of its accidental or negligent release of personally identifiable information or education records provided to Vendor pursuant to the Agreement.
21. North Carolina Public Records Law: Vendor acknowledges that UCBOE is subject to the requirements of North Carolina's Public Records Law ("NCPRL"), N.C.G.S. § 132-1, et. seq. The Agreement and any related documents, papers, letters, maps, books, photographs, films, sound recordings, magnetic or other tapes, electronic data-processing records, artifacts, or other documentary material, regardless of physical form or characteristics, made or received by UCBOE in connection with the transaction of the Agreement may be considered a "public record," subject to disclosure under the NCPRL. UCBOE is under no obligation to notify Vendor prior to its compliance of its duties under NCPRL.
22. Conflict of Interest. Vendor represents and warrants that no member of UCBOE or any of its employees or officers who may obtain a direct benefit, personal gain or advantage for themselves or a relative or associate as a result of the Contract, subcontract or other agreement related to the Contract is in a position to influence or has attempted to influence the making of the Contract, has been involved in making the Contract, or will be involved in administering the Contract. Vendor also represents and warrants that, if the Contract is funded by any amount of federal funds, no violation of 2 C.F.R. § 200.318(c) or any other applicable federal conflict of interest law has occurred or will occur. Vendor shall cause this paragraph to be included in all Contracts, subcontracts and other agreements related to the Contract.
23. Gratuities. Vendor represents and warrants that no member of UCBOE or any of its employees has been or will be offered or given a gratuity to an official or employee of UCBOE in violation of applicable law or policy.
24. Kickbacks to Vendor. Vendor shall not permit any kickbacks or gratuities to be provided, directly or indirectly, to itself, its employees, subcontractors or subcontractor employees for the purpose of improperly obtaining or rewarding favorable treatment in connection with a UCBOE Contract or in connection with a subcontract relating to a UCBOE Contract. When Vendor has grounds to believe that a violation of this clause may have occurred, Vendor shall promptly report to UCBOE in writing the possible violation.
25. Iran Divestment Act. Vendor certifies that, as of the date listed below, it is not on the Final Divestment List, as created by the State Treasurer pursuant to N.C.G.S. § 143-6A-4, in violation of the Iran Divestment Act. In compliance with the requirements of the Iran Divestment Act and N.C.G.S. § 143C-6A-5(b), Vendor shall not

utilize in the performance of the contract any subcontractor that is identified on the Final Divestment List. The Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurer.com/Iran and should be updated every 180 days.

26. Divestment from Companies that Boycott Israel. The Vendor certifies that it has not been designated by the North Carolina State Treasurer as a company engaged in the boycott of Israel pursuant to N.C.G.S. 147-86.81. It is the responsibility of each vendor or contractor to monitor compliance with this restriction. Contracts valued at less than $1,000.00 are exempt from this restriction.
27. E-Verification. Vendor shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes
28. Indemnification. To the fullest extent permitted by law, Vendor shall indemnify and hold harmless UCBOE, its officers, agents, employees and assigns from and against all claims, losses, costs, damages, expenses, attorneys' fees and liability that any of them may sustain (a) arising out of Vendor's failure to comply with any applicable law, ordinance, regulation, or industry standard or (b) arising directly or indirectly out of Vendor's performance or lack of performance of the terms and conditions of the Contract. In the event that any Services and/or Goods sold and delivered or sold and performed under the Contract Documents shall be defective in any respect whatsoever, Vendor shall indemnify and save harmless UCBOE, its officers, agents, employees and assigns from all loss or the payment of all sums of money by reason of all accidents, injuries or damages to persons or property that shall happen or occur in connection with the use or sale of such Services and/or Goods and are contributed to by said condition. In the event Vendor, its employees, agents, subcontractors and or lower-tier subcontractors enter premises occupied by or under the control of UCBOE in the performance of the Contract Documents, Vendor agrees that it will indemnify and hold harmless UCBOE, its officers, agents, employees and assigns, from any loss, costs, damage, expense or liability by reason of property damage or personal injury of whatsoever nature or kind arising out of, as a result of, or in connection with such entry.
29. Insurance. Unless such insurance requirements are waived or modified by UCBOE or risk management ("DIRM"), Vendor certifies that it currently has and agrees to purchase and maintain during its performance under the Contract the following insurance from one or more insurance companies acceptable to UCBOE and authorized to do business in the State of North Carolina: Automobile - Vendor shall maintain bodily injury and property damage liability insurance covering all owned, non-owned and hired automobiles. The policy limits of such insurance shall not be less than $1,000,000 combined single limit each person/each occurrence. Commercial General Liability - Vendor shall maintain commercial general liability insurance that shall protect Vendor from claims of bodily injury or property damage which arise from performance under the Contract. This insurance shall include coverage for contractual liability. The policy limits of such insurance shall not be less than $1,000,000 combined single limit each occurrence/annual aggregate. Worker's Compensation and Employers' Liability Insurance - If applicable to Vendor, Vendor shall meet the statutory requirements of the State of North Carolina for worker's compensation coverage and employers' liability insurance. Vendor shall also provide any other insurance or bonding specifically recommended in writing by the DIRM or required by applicable law. Certificates of such insurance shall be furnished by Vendor to UCBOE and shall contain the provision that UCBOE be given 30 days' written notice of any intent to amend or terminate by either Vendor or the insuring company. Failure to furnish insurance certificates or to maintain such insurance shall be a default under the Contract and shall be grounds for immediate termination of the Contract.
30. Termination for Convenience. In addition to all of the other rights which UCBOE may have to cancel this Contract or an applicable Purchase Order, UCBOE shall have the further right, without assigning any reason therefore, to terminate the Contract (or applicable Purchase Order), in whole or in part, at any time at its complete discretion by providing 10 days' notice in writing from UCBOE to Vendor. If the Contract is terminated by UCBOE in accordance with this paragraph, Vendor will be paid in an amount which bears the same ratio to the total compensation as does the Services and/or Goods actually delivered or performed to the total originally contemplated in the Contract. UCBOE will not be liable to Vendor for any costs for completed Goods, Goods in process or materials acquired or contracted for if such costs were incurred prior to the date of this Contract or an applicable Purchase Order.
31. Termination for Default. UCBOE may terminate the Contract, in whole or in part, immediately and without prior notice upon breach of the Contract by Vendor. In addition to any other remedies available to UCBOE law or equity, UCBOE may procure upon such terms as UCBOE shall deem appropriate, Services and/or Goods

substantially similar to those so terminated, in which case Vendor shall be liable to UCBOE for any excess costs for such similar goods, supplies, or services and any expenses incurred in connection therewith.

32. Contract Funding. It is understood and agreed between Vendor and UCBOE that UCBOE's obligation under the Contract is contingent upon the availability of appropriated funds from which payment for Contract purposes can be made. No legal liability on the part of UCBOE for any payment may arise until funds are made available to UCBOE's Finance Officer and until Vendor receives notice of such availability. Should such funds not be appropriated or allocated, the Contract shall immediately be terminated. UCBOE shall not be liable to Vendor for damages of any kind (general, special, consequential or exemplary) as a result of such termination.
33. Accounting Procedures. Vendor shall comply with any accounting and fiscal management procedures prescribed by UCBOE to apply to the Contract and shall assure such fiscal control and accounting procedures as may be necessary for proper disbursement of and accounting for all project funds.
34. Improper Payments. Vendor shall assume all risks attendant to any improper expenditure of funds under the Contract. Vendor shall refund to UCBOE any payment made pursuant to the Contract if it is subsequently determined by audit that such payment was improper under any applicable law, regulation or procedure. Vendor shall make such refunds within thirty (30) days after UCBOE notifies Vendor in writing that a payment has been determined to be improper.
35. Contract Transfer. Vendor shall not assign, subcontract or otherwise transfer any interest in the Contract without the prior written approval of UCBOE.
36. Contract Personnel. Vendor agrees that it has, or will secure at its own expense, all personnel required to provide the Services and/or Goods set forth in the Contract.
37. Key Personnel. Vendor shall not substitute for key personnel (defined as those individuals identified by name or title in the Contract Documents or in written communication from Vendor) assigned to the performance of the Contract without prior written approval from UCBOE Project Coordinator (the individual at UCBOE responsible for administering the Contract).
38. Contract Modifications. The Contract may be amended only by written amendment duly executed by both UCBOE and Vendor.
39. Relationship of Parties. Vendor is an independent contractor and not an employee of UCBOE. The conduct and control of the work will lie solely with Vendor. The Contract shall not be construed as establishing a joint venture, partnership or any principal-agent relationship for any purpose between Vendor and UCBOE. Employees of Vendor shall remain subject to the exclusive control and supervision of Vendor, which is solely responsible for their compensation.
40. Advertisement. The Contract will not be used in connection with any advertising by Vendor without prior written approval by UCBOE.
41. Monitoring and Evaluation. Vendor shall cooperate with UCBOE, or with any other person or agency as directed by UCBOE, in monitoring, inspecting, auditing or investigating activities related to the Contract. Vendor shall permit UCBOE to evaluate all activities conducted under the Contract. UCBOE has the right at its sole discretion to require that Vendor remove any employee of Vendor from UCBOE Property and from providing Services and/or Goods under the Contract following provision of notice to Vendor of the reasons for UCBOE's dissatisfaction with the Services and/or Goods of Vendor's employee.
42. Financial Responsibility. Vendor is financially solvent and able to perform under the Contract. If requested by UCBOE, Vendor agrees to provide a copy of its latest audited annual financial statements or other financial statements as deemed acceptable by UCBOE's Finance Officer. In the event of any proceedings, voluntary or involuntary, in bankruptcy or insolvency by or against Vendor, the inability of Vendor to meet its debts as they become due or in the event of the appointment, with or without Vendor's consent, of an assignee for the benefit of creditors or of a receiver, then UCBOE shall be entitled, at its sole option, to cancel any unfilled part of the Contract without any liability whatsoever.
43. Governmental Restrictions. In the event any governmental restrictions are imposed which necessitate alteration of the material, quality, workmanship or performance of the items offered prior to their delivery, it shall be the responsibility of the Vendor to notify, in writing, the issuing purchasing office at once, indicating the specific regulation which required such alterations. UCBOE reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or to cancel the Contract.
44. Inspection at Vendor's Site. UCBOE reserves the right to inspect, at a reasonable time, the equipment/item, plant or other facilities of a prospective contractor prior to Contract award, and during the Contract term as

necessary for UCBOE determination that such equipment/item, plant or other facilities conform with the specifications/requirements and are adequate and suitable for the proper and effective performance of the Contract.

45. Confidential Information. All information about UCBOE provided to the Vendor or its officers, employees, agents, representatives and advisors (the "Vendor Representatives"), and all copies or other full or partial reproductions thereof and notes, memoranda or other writings related thereto created by Vendor or any Vendor Representative, regardless of whether provided before or after the date of the Contract and regardless of the manner or medium in which it is furnished, is referred to as "Confidential Information". Confidential Information does not include any information that (a) is or becomes generally available to the public other than as a result of an impermissible disclosure by Vendor, (b) was known by or available on a nonconfidential basis to Vendor before it was disclosed by UCBOE or (c) becomes available to Vendor on a nonconfidential basis from a third party whom Vendor does not know to be bound by a confidentiality agreement with, or have an obligation of secrecy to, UCBOE. Except as and to the extent required by law or order or demand of any governmental or regulatory authority, Vendor and Vendor Representatives will (x) keep all Confidential Information confidential and (y) will only disclose or reveal any Confidential Information to Vendor Representatives who must have the information to fulfill Vendor's obligations under the Contract and who agree to observe the terms of this Section. Vendor and Vendor Representatives will not use the Confidential Information for any purpose other than fulfilling Vendor's obligations under the Contract. By way of example and not limitation, Vendor shall not sell, market, or commercialize Confidential Information, create derivative products or applications based on Confidential Information. If Vendor is requested or required, pursuant to applicable law or regulation or by legal process, to disclose any Confidential Information, Vendor will provide UCBOE with prompt and timely notice of the requests or requirements so that UCBOE can seek an appropriate protective order or other remedy and will not be prejudiced by delay. If UCBOE does not obtain a protective order or other remedy, Vendor will only disclose that portion of the Confidential Information which Vendor's legal counsel determines Vendor is required to disclose. Upon termination of the Contract or otherwise upon UCBOE's request, Vendor will promptly deliver to UCBOE all Confidential Information in the possession of Vendor or the Vendor Representatives.

    Student Information: If, during the course of Vendor's performance of the Contract, Vendor should obtain any information pertaining to students or students' official records, Vendor agrees to keep any such information confidential and to not disclose or permit it to be disclosed, directly or indirectly, to any person or entity. The Contract shall not be construed by either party to constitute a waiver of or to in any manner diminish the provisions for confidentiality of students' records. Additionally, pursuant to N.C.G.S. 115C-401.1, it is unlawful for a person who enters into a contract with a local board of education to sell personally identifiable information that is obtained from a student as a result of that person's performance under the Contract.

    Employee Personnel Information: If, during the course of Vendor's performance of the Contract, Vendor should obtain any information pertaining to employees of UCBOE's personnel records, Vendor agrees to keep any such information confidential and to not disclose or permit it to be disclosed, directly or indirectly, to any person or entity. This section will survive the termination of this Contract.

46. Intellectual Property. Vendor agrees, at its own expense, to indemnify, defend and save UCBOE harmless from all liability, loss or expense, including costs of settlement and attorney's fees, resulting from any claim that UCBOE's use, possession or sale of the Services and/or Goods infringes any copyright, patent or trademark or is a misappropriation of any trade secret.
47. No Pre-Judgment or Post-Judgment Interest. In the event of any action by Vendor for breach of contract in connection with the Contract, any amount awarded shall not bear interest either before or after any judgment, and Vendor specifically waives any claim for interest.
48. Background Checks. At the request of UCBOE's Project Coordinator, Vendor (if an individual) or any individual employees of Vendor shall submit to UCBOE criminal background check and drug testing procedures.
49. Mediation. If a dispute arises out of or relates to the Contract, or the breach of the Contract, and if the dispute cannot be settled through negotiation, the parties agree to try in good faith to settle the dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Rules before resorting to litigation.

50. No Third-Party Benefits. The Contract shall not be considered by Vendor to create any benefits on behalf of any third party. Vendor shall include in all contracts, subcontracts or other agreements relating to the Contract an acknowledgment by the contracting parties that the Contract creates no third-party benefits.
51. Force Majeure. Neither party shall be responsible to the other for any losses resulting from the failure to perform any terms or provisions of the Agreement if the party's failure to perform is attributable to war, riot or other disorder, strike or other work stoppage; fire; flood; storm; illness; pandemic, communicable disease, or any other act not within the control of the party whose performance is interfered with, and which, by reasonable diligence, such party is unable to prevent. However, UCBOE will be entitled to a refund for fees paid on account of services not rendered by Vendor including any and all deposits.
52. Ownership of Documents; Work Product. All documents created pursuant to the Contract shall, unless expressly provided otherwise in writing, be owned by UCBOE. Upon the termination or expiration of the Contract, any and all finished or unfinished documents and other materials produced by Vendor pursuant to the Contract shall, at the request of UCBOE, be turned over to UCBOE. Any technical knowledge or information of Vendor which Vendor shall have disclosed or may hereafter disclose to UCBOE shall not, unless otherwise specifically agreed upon in writing by UCBOE, be deemed to be confidential or proprietary information and shall be acquired by UCBOE free from any restrictions as part of the consideration of the Contract.
53. Strict Compliance. UCBOE may at any time insist upon strict compliance with these terms and conditions notwithstanding any previous course of dealing or course of performance between the parties to the contrary.
54. General Provisions. UCBOE's remedies as set forth herein are not exclusive. Any delay or omission in exercising any right hereunder, or any waiver of any single breach or default hereunder, shall not be deemed to be a waiver of such right or of any other right, breach, or default. If action be instituted by Vendor hereunder, UCBOE shall be entitled to recover costs and reasonable attorney's fees. Vendor may not assign, pledge, or in any manner encumber Vendor's rights under this Contract or applicable Purchase Order or delegate the performance of any of its obligations hereunder, without UCBOE's prior, express written consent.
55. Contract Situs. All matters, whether sounding in contract or tort relating to the validity, construction, interpretation and enforcement of the Contract, will be determined in Union County, North Carolina. North Carolina law will govern the interpretation and construction of the Contract.
56. Severability. Any provision of this Contract that is determined by any court of competent jurisdiction to be invalid or unenforceable will not affect the validity or enforceability of any other provision. Any provision of the Contract held invalid or unenforceable only in part or degree will remain in full force and effect to the extent not held invalid or unenforceable.

II. Additional Standard Terms and Conditions for Construction Contracts

1. Supervision and Provision for Labor and Supplies. The Vendor will supervise and direct the construction work (the "Work") and shall furnish, provide, and pay for all labor, materials, equipment, machinery, utilities, and services reasonably necessary for the execution and completion of the Work.
2. Coordination of Work and Notification of Progress. The Vendor agrees to coordinate its Work with the work of any other separate contractors or with the work of UCBOE's own forces to avoid delaying or interfering with their work. Vendor shall enforce good order and discipline among his employees and subcontractors on the Project. The Vendor further agrees to inform UCBOE on a regular basis or at UCBOE's request of the progress of the Work.
3. Provision for all Permits, Licenses, and Inspections. Unless otherwise provided, the Vendor shall secure and pay for all permits, licenses, and inspections necessary for the proper execution and completion of the Work.
4. Cleanliness. Vendor shall keep the Project reasonably free from waste materials or rubbish resulting from the Vendor's operations.
5. Additional Warranties. The Vendor warrants that the Vendor has visited the location of the Project and is familiar with all field conditions bearing upon the Vendor's performance of the Work; that the materials and equipment furnished under the Contract are of good quality and new (unless otherwise permitted); that the Work is non-negligent and meets or exceeds the standards ordinarily observed in the industry; and that the Work conforms to the requirements of the Contract and to all applicable codes, ordinances, laws, or regulations. The Vendor further warrants and promises that the Work shall be free from defects

and nonconformities in materials and workmanship for a period of one year from the later of the Date of Completion, which is the date UCBOE accepts the Work or such date as the Vendor actually completes all the Work (the "Date of Completion"). During such period, the Vendor will remedy at Vendor's expense nonconformities or defects in the Work within a reasonable time after receiving notice thereof from UCBOE.

6. Indemnity for Subcontractor Payment. In addition to the indemnification obligations contained in the attached terms and conditions to this Contract, the Vendor further agrees to defend and indemnify UCBOE from and against all claims, damages, losses, and expenses, including reasonable attorneys' fees, arising out of the Vendor's failure to pay subcontractors or materials suppliers.
7. Change Orders. The Vendor agrees that UCBOE may order changes in the general scope of the Work, including additions, deletions, and similar revisions. The parties agree to adjust the Contract Price and Date of Completion to reflect the effects of such changes, which adjustments shall be authorized only upon execution of a written change order (a "Change Order"). In case of emergency or extenuating circumstances or if a construction contingency is provided as stated below, approval of changes may be obtained verbally by telephone or field orders approved by UCBOE Project Coordinator and promptly thereafter substantiated in writing as outlined under normal procedures. The amount of any increase or decrease in the Contract Price shall be by mutual acceptance of a total amount supported by sufficient data and information to substantiate the change. Any decrease in Contract Price for a decrease in the Work will be the reasonable costs of the Work deleted, including a reasonable amount for the decrease in the Vendor's overhead.
8. Performance/Payment Bond. If required by law and/or the bidding documentation, the Vendor agrees to provide a Performance Bond and Labor and Material Payment Bond for its faithful performance in a form reasonably satisfying to UCBOE.
9. Payments Withheld. The UCBOE may withhold payment for the following reasons to the extent permitted under N.C. Gen. Stat. § 143-134.1(e): (1) defective Work not remedied; (2) third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to UCBOE is provided by the Vendor; (3) failure of the Vendor to make payments properly to subcontractors or for labor, materials or equipment; (4) reasonable evidence that the Work will not be completed with the time specified, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; (5) failure to carry out the Work in accordance with the Contract Documents; (6) failure to provide sales tax documentation in accordance with subparagraph 9.3.5; (7) failure or refusal of the Vendor to submit the required information on minority business enterprises; and (8) failure of the Vendor to comply with (a) the provisions of the Sedimentation and Pollution Control Act (N.C. Gen. Stat. § 113A-50 *et seq*.), and/or (b) any Notice of Violation issued by the North Carolina Department of Natural Resources.
10. Retainage. For public construction contracts costing an amount equal to or greater than $100,000, the UCBOE will retain five percent of the amount of each progress payment on the project for as long as is authorized by N.C. Gen. Stat. § 143-134.1. At all times during the Project, the UCBOE may retain the maximum funds allowed by N.C. Gen. Stat. § 143-134.1. The UCBOE specifically reserves the right to withhold additional funds as authorized by this Contract and N.C. Gen. Stat. § 143-134.1. The Vendor may pay each subcontractor no later than seven days after receipt of payment from the UCBOE and in accordance with N.C. Gen. Stat. § 143-134.1 the amount to which the subcontractor is entitled, reflecting percentages actually retained from payments to the Vendor on account of the subcontractor's portion of the Work. The Vendor shall, by appropriate agreement with each subcontractor, require each subcontractor to make payments to sub-subcontractors in a similar manner and in accordance with N.C. Gen. Stat. § 143-134.1.
11. The Vendor shall use and submit applications for payment using a form reasonably satisfactory to UCBOE ("Application for Payment"). The Contractor shall submit with each Application for Payment a completed "Statement of Sales Tax Paid" and "Minority Business Enterprise" documentation in a form acceptable to UCBOE.

III. Additional Standard Term and Condition for Designer Contracts (which include Architectural, Engineering, Surveying, and Technical Services)

Additional Insurance. In addition to the insurance required pursuant to Section 22 of the Standard Terms and Conditions for All Contracts, the Vendor certifies that it currently has and agrees to purchase and maintain during its performance under the Contract the following insurance from one or more insurance companies acceptable to UCBOE and authorized to do business in the State of North Carolina: Professional liability insurance in commercially reasonable amounts as reasonably determined by UCBOE.

IV. Additional Standard Terms and Conditions for Information Technology Contracts

1. Definitions.
   "Hardware" means the hardware the Vendor utilizes in the Hosted Environment for delivery and maintenance of the Hosted Software Services.
   "Hosted Environment" means the Hardware, system software, hosting support software, network connectivity, and facility used by Vendor to support the Hosted Software Services.
   "Hosted Software Services" means the application, including the Hosted Software and any applicable Third-Party Software, as run on the Hosted Environment.
   "Hosted Software" means the software owned and controlled by Vendor or Vendor's third-party contractor that supports the Hosted Software Services.
   "Support Services" means application and technical support required to maintain the performance, uptime and connectivity of the Hosted Software Services for UCBOE access and use, including without limitation, telephone support, error correction, maintenance, and installation of Updates and Upgrades to the Hosted Software.
   "Updates" means (i) modifications to or releases of the Hosted Software that (a) add new features, functionality, and/or improved performance, (b) operate on new or other databases, operating systems, or server platforms or (c) extend the Hosted Software functionality to take advantage of advances in coding language, hardware, network or wireless infrastructures; and (ii) deviation corrections, bug or error fixes, patches, workarounds, and maintenance releases.
   "Upgrades" means any new version or new release of the Hosted Software typically provided on an annual or bi-annual basis by the Vendor that includes new features, functions, support or service that were not in place with the immediately prior version.
2. Grant of License. Vendor grants to UCBOE for the term of this Contract a non-exclusive, non-transferable license to access and use over the internet the Hosted Software (the "License").
3. Updates and Upgrades. Vendor will make certain limited and applicable Hosted Software Updates and Upgrades available to UCBOE at no additional cost. All such Updates and Upgrades shall automatically become subject to the benefits and terms of this Contract and shall automatically be considered part of the License granted under this Contract.
4. Security. Vendor's Hosted Environment shall maintain security measures in place to help protect against the loss, misuse, and alteration of the Hosted Software Services, and specifically the Confidential Information provided to Vendor by UCBOE.
5. Warranties. Vendor warrants the following: (a) Vendor has the full authority to grant the License; (b) the Hosted Software is free from material defects or viruses; (c) the Hosted Software contains no disabling devices; and (d) the Hosted Software conforms to all material specifications set forth in the documentation and any other written material provided to UCBOE for any purpose. Without limiting any other remedies available to UCBOE under this Contract, at law or in equity, in the event that any Hosted Software does not conform to the warranties set forth for the Hosted Software herein, Vendor shall, at UCBOE's option, promptly correct or replace such Hosted Software and, in either case, Vendor shall perform any Support Services or other work required to restore the Hosted Software to the state that existed prior to any such breach, all at Vendor's expense. UCBOE reserves the right to reject the Hosted Software and to hold Vendor responsible for any loss, direct or indirect, caused by any such breach of warranty. In the event Vendor is or becomes aware of a problem with any item of Hosted Software, Vendor shall notify UCBOE upon such determination. Acceptance or use of the Hosted Software shall not constitute a waiver of any claim under any warranty.
6. Effect of Termination and Orderly Transition. Upon termination or expiration of this Contract for any reason, Vendor will cooperate in good faith with UCBOE to provide for an orderly transfer of the Goods and Services

and Confidential Information to UCBOE or UCBOE's successor vendor ("Orderly Transition") and according to the terms of this section.

a. Scope of Work for Orderly Transition. Within thirty (30) days of notification by UCBOE that it will transfer Goods and Services to itself or a successor vendor, the parties will create and execute a scope of work document detailing tasks, the responsible parties for individual tasks, and timeframes for completion of tasks necessary to complete an Orderly Transition. The final, executed Orderly Transition scope of work shall be incorporated into this Contract and become subject to its terms. Vendor's failure to (a) cooperate in developing the Orderly Transition scope of work, (b) execute an Orderly Transition scope of work, or (c) abide by the executed Orderly Transition scope of work shall be deemed a material breach of this Contract.

b. Time Frame. Unless otherwise mutually agreed in an executed Orderly Transition scope of work, Vendor shall continue to provide Goods and Services while UCBOE migrates its Confidential Information from Vendor's Hosted Software Services in the Orderly Transition process. Vendor agrees that, as part of the Orderly Transition process and within the specified time frame, it will transfer to UCBOE all of the Confidential Information provided to Vendor by UCBOE pursuant to this Contract. Vendor will provide the Confidential Information in commercially reasonable electronic format as agreed in the Orderly Transition scope of work at no additional cost.

c. Time and Material Costs Only. UCBOE will be obligated to pay for time and materials at a reasonable hourly rate of no more than $75/hour for the Orderly Transition. No other fees will be assessed for the Orderly Transition. Fees shall be agreed upon in advance as part of developing the scope of work referenced in subsection (a) above.

d. Destruction of Confidential Information after Orderly Transition. Unless otherwise mutually agreed in an executed Orderly Transition scope of work, Vendor agrees that after returning all Confidential Information to UCBOE pursuant to subsection (b) above it will destroy all remaining copies of Confidential Information and back-up Confidential Information in its possession, contained in or on any medium (such as a storage area network or "SAN") or as may be stored offsite, within thirty (30) days of completion of Orderly Transition. Vendor shall provide UCBOE with a detailed summary of the destruction process and standards to be utilized by Vendor with respect to the Confidential Information, and UCBOE shall approve such process and standards prior to Vendor commencing such destruction.

7. Intellectual Property Warranty. In addition to the warranties set forth elsewhere in this Contract with respect to the Goods and Services, Vendor expressly represents, warrants and covenants that neither the furnishing of Hosted Services to UCBOE hereunder, nor does the Hosted Software, violate, in whole or in part, any provision of any law, common law or regulation concerning copyrights, trade secrets, trademarks, tradenames, service marks, patents or other provisions regulating or concerning intellectual property rights.
8. Additional Indemnification. To the fullest extent permitted by law, Vendor shall indemnify, defend and hold harmless UCBOE, its and directors, officers, managers, employees and agents, from all suits, claims, costs, damages and other liabilities, including reasonable attorneys' fees as incurred by counsel of UCBOE's choice, relating to or arising from (a) Vendor's failure to maintain the security and integrity of Confidential Information, the Hosted Software Services and the Hosted Environment; (b) any claim for infringement of any copyright, trade secret, trademark, tradename, service mark, patent, or other law or regulation concerning intellectual and/or proprietary property rights; and (c) any claims by third party interests in the Hosted Software.
9. Data Use. Notwithstanding the foregoing, Vendor acknowledges and agrees that all Confidential Information is proprietary to and owned exclusively by UCBOE, whether provided in tangible or electronic form and whether entered into any software or Hosted Software Services owned or licensed by Vendor (including without limitation the Hosted Software and Hosted Software Services) or otherwise provided in connection with any products provided and services performed by Vendor (including without limitation the Goods and Services) and whether to, by or through a Vendor-affiliated ASP or other Hosted Software Services. Furthermore, Vendor shall not sell, market, or commercialize Confidential Information, create derivative products or applications based on Confidential Information or otherwise use Confidential Information in any manner unrelated to the performance of Vendor's obligations under the Contract. Vendor shall not share Confidential Information with any parent or subsidiary company of Vendor or any other Vendor-affiliated entity without the express prior written consent of UCBOE detailing the scope of allowable disclosure. Vendor agrees that if it breaches this

section, UCBOE may, at its option, pursue any or all of the following remedies: (a) immediately terminate this Contract without liability to Vendor; (b) seek an injunction without posting a bond; and (c) pursue whatever other remedies may be available to it at law, in equity or pursuant to this Contract.