SECTION 26 09 44

PERFORMANCE LIGHTING NETWORK, CONTROL, POWER AND FIXTURES

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\*\* NOTE TO SPECIFIER \*\* Wenger Corporation, JR Clancy and GearBoss product brands; Broadcast, theater and stage equipment, sound-control door assemblies, acoustic room components, lockers, storage assemblies, specialty casework, special purpose rooms, integrated lighting, integrated controls and audio video systems.   
  
This section is based on the products of Wenger Corporation, which is located at:   
 Wenger Corporation, JR Clancy and GearBoss, which is located at:  
555 Park Dr.  
Owatonna, MN 55060  
Toll Free Tel: 800-4WENGER (493-6437)  
Tel: 507-455-4100  
Fax: 507-455-4258  
Email: [request info (info@wengercorp.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Wenger+Corporation,+JR+Clancy+and+GearBoss&coid=36487&rep=&fax=507-455-4258&message=RE:%20Spec%20Question%20(16576wen):%20%20&mf=)  
Web: <https://www.wengercorp.com> | <http://www.jrclancy.com>   
  
Wenger Corporation - Syracuse, which is located at:  
7041 Interstate Island Road  
Syracuse, NY 13209  
Toll Free Tel: 800-836-1885  
Tel: (315) 451-3440  
Email: request info (info@wengercorp.com)   
  
[ [Click Here](https://www.arcat.com/arcatcos/cos36/arc36487.html) ] for additional information.  
  
Wenger Corporation and J.R. Clancy are Your Performance Partners. In 2011, Wenger and J.R. Clancy brought together almost 200 years of experience to provide complete solutions for Performing Arts Centers and Theatres. We design, manufacture and install leading theatrical equipment worldwide from Complete Rigging Solutions and Controls to Acoustical Shell Enclosures and Orchestra Pit Fillers as well as a full-line of quality furnishings.   
  
Wenger Corporation provides innovative, high-quality products and solutions for performing arts and music and theatre education. For more than 65 years Wenger has been listening to what our customers need and then designing and manufacturing innovative, durable and functional products to meet those needs.  
  
 Wenger pioneered sound isolation in practice rooms and now offers modular rooms with virtual acoustic technology (VAE) and built-in digital recording/playback. Products for music and theatre spaces include: pre-engineered acoustical doors, sound-isolating music practice rooms, acoustical shells, acoustical wall and ceiling treatment, instrument and equipment storage cabinets, portable audience seating, portable stage platforms and staging systems, music posture and portable audience chairs, orchestra pit fillers, makeup stations, tiered risers and music furniture.  
  
 Since 1885, J.R. Clancy has been a leading designer and supplier of theatrical rigging systems, accessories and services to the theatre and entertainment industries around the world. Our team of experienced mechanical and electrical engineers, project managers, and installers provides expert technical assistance and information to architects, general contractors, theatre consultants, end users, and dealers. With a combination of innovative designs, outstanding quality, and a century of experience, J.R. Clancy has become the leading manufacturer of theatrical stage equipment in the United States. We provide everything from the simplest hemp sets and rigging hardware to complete, highly sophisticated motorized rigging systems-for use just about anywhere.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Performance lighting network, control and power.
    2. Performance fixtures.
    3. Architectural fixtures.
    4. Life safety fixtures.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete sections below not relevant to this project; add others as required.

* + 1. Section 06 10 00 - Rough Carpentry.
    2. Division 16 - Electrical for power wiring.
    3. Division 11 - Specialty Equipment - Theatrical Equipment
    4. Division 16 - Audiovisual Systems
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American National Standards Institue (ANSI):
       1. ANSI E1.11 - Entertainment Technology -- USITT DMX512-A -- Asynchronous Serial Digital Data Transmission Standard For Controlling Lighting Equipment And Accessories.
       2. ANSI E1.20 - Entertainment Technology-RDM-Remote Device Management Over USITT DMX512 Networks.
       3. ANSI E1.31 - Entertainment Technology - Lightweight Streaming Protocol For Transport Of DMX512 Using ACN.
       4. ANSI E1.33 - Entertainment Technology - (RDMnet) - Message Transport And Device Management Of ANSI E1.20 (RDM) Compatible And Similar Devices Over IP Networks.
    2. IEEE SA Standards Association (IEEE):
       1. IEEE 802.3 - IEEE Standard for Ethernet.
    3. Telecommunication Industry Association (TIA):
       1. TIA-568A/B - Optical Fiber Cabling Components Standard.
    4. Underwriters Laboratories, Inc. (UL):
       1. UL 924 - Standard for Emergency Lighting and Power Equipment.
       2. UL 1573 - Standard for Stage and Studio Luminaires and Connector Strips.
       3. UL 1598 - Standard for Luminaires.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data: Submit applicable reference standards, current performance data, and application recommendations and product limitations.
     3. Shop Drawings: Submit assembly and installation layout drawings showing product components in assembly with adjacent materials and products (speakers, panels, microphones, electronics rack).
     4. A complete submission of 11 x 17 format drawings for approval is required. Integration riser diagram(s) shall be project specific and reflect all equipment systems described by this section. All termination points and interconnecting wiring, between products of one or more manufacturers, shall be identified and detailed.
     5. Operation and Maintenance Data.
     6. Warranty: Submit manufacturer's standard warranty statement.
  2. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Minimum 5 years experience in manufacture of similar products in use in similar environments, including project size, and complexity, and with the production capacity to meet the construction and installation schedule.
     2. Installer Qualifications: Installation, disassembly, re-assembly and calibration shall be done by the manufacturer and manufacturer employed approved subcontractors.
     3. Source Limitations: Obtain components and accessories through one source from a single approved manufacturer.

\*\* NOTE TO SPECIFIER \*\* All Wenger electrical components are supplied as listed and labeled by UL to meet typical local electrical inspection requirements.

* + 1. Electrical Components: UL listed and labeled.
  1. DELIVERY, STORAGE, AND HANDLING
     1. Pack and ship in accordance with manufacturer's recommendations:
     2. Do not accept damaged products at the site. Do not install damaged products.
     3. Store products in heated indoor storage near point of installation. Retain protective packaging until installing. Ship to jobsite only after roughing-in, painting work, and other related finish work has been completed and installation areas are ready to accept units and recommended temperature and humidity levels shall be maintained during the remainder of construction.
  2. PROJECT CONDITIONS
     1. Environmental Requirements: Do not install system until all mortar, wet and dust producing trades have completed their work and finished floor is in place.
     2. Where code permits, wiring may be run outside of conduit. Such wiring shall be coordinated either in a plenum space or by means of secondary enclosure that meets code requirements.
     3. Field Measurements: Obtain required field measurements and indicating performance setups, ceiling construction, wall construction, ventilation features, electrical systems, networks and potential obstacles on shop drawings.
  3. WARRANTY

Specifier: The warranty is provided by the manufacturer to the building owner. The warranty terms below are available from Wenger Corp. Verify that other manufacturers listed or seeking approval shall furnish warranty meeting requirements. Durability is a key aspect of Wenger's product value for Owners. The available warranty reflects Wenger's high confidence in the performance of their products.

* + 1. Repair/replacement warranties shall be provided by the equipment manufacturers.

Except as noted, each manufacturer's published warranty policy shall apply. A two-year coverage term (after acceptance) shall be provided.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Wenger Corporation, including all Wenger, J.R. Clancy and GearBoss product brands. Wenger Corporation, which is located at: 555 Park Dr.; Owatonna, MN 55060; Toll Free Tel: 800-4WENGER (493-6437); Tel: (507) 455-4100; Fax: (507) 455-4258; Email: request info (info@wengercorp.com); Wenger Corporation - Syracuse, which is located at 7041 Interstate Island Road, Syracuse, NY 13209; Toll Free Tel: 800-836-1885; Tel: (315) 451-3440; Email: request info (JRCinfo@wengercorp.com); Web: https://www.wengercorp.com

\*\* NOTE TO SPECIFIER \*\* Delete the following two paragraphs if required; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Pre-approved vendors are called out here and by schedule elsewhere. Named approval does not relieve a vendor from meeting specified performance requirements:
       1. Wenger
       2. ACT Lighting a/k/a Ayrton and MA Lighting - Hackensack NJ.
       3. Altman Lighting - Denver CO.
       4. CantoUSA - Atlanta, GA.
       5. Chauvet Professional a/k/a Chamsys - Sunrise, FL.
       6. Interactive Technologies - Cummings GA.
       7. Lex Products - Shelton, CT.
       8. Lumenesce - Denison, TX.
       9. Lyntec - Lenexa, KS.
       10. Pathway Connectivity - Calgary Alberta and Atlanta GA.
       11. Pathway Lighting - Old Saybrook CT.
       12. SSRC - Duncan, SC.
    2. Alternate submissions shall include a project Bill of Materials, datasheets with proposed options flagged and a complete description of all exceptions taken. A specifier review of alternate submissions shall require 10 days prior to bid opening. All approved alternates shall be listed and described by addenda.
  1. PERFORMANCE LIGHTING NETWORK, CONTROL AND POWER
     1. General Description:
        1. This section provides integrated power handling and control of performance, architectural, utility and life safety lighting loads located within the performance venue. All fixtures provided under this section are listed by schedule
        2. Ethernet, DMX512 and switch-controlled LED fixtures shall be furnished, hung-in-place and RDM programmed.
        3. Conduit, wire and electrical installation services shall be provided by a locally licensed electrical contractor.
        4. Use of ESTA E1.31 (sACN) networking protocols is a requirement of this specification. sACN ensures compatibility with third party DMX512 / RDM controlled equipment and greatly simplifies remote diagnostics and long-term hardware support. Compatibility (co-existence) with Pathway ssACN network security overlays is another closely related requirement.
        5. Equipment within this section shall be furnished to the Construction Manager/General Contractor by a qualified Systems Integrator (SI). Specified applications engineering, project management, L/V installation, turn-on, system programming, troubleshooting and owner instruction services shall also be provided.
        6. All line voltage wiring materials and installation work is outside of this DIV 11 scope and furnished by others. Refer to DIV 26 09 61 specifications, which calls out materials and services normally provided by a locally licensed electrical sub-contractor. The electrician, whose work does interact with the requirements of these DIV 11 sections, normally provides:
           1. Electrical conduit.
           2. Electric service and circuit breaker panels.
           3. Line voltage wire pulls and terminations.
           4. Low voltage wire pulls and architectural load terminations.
           5. Emergency generator/inverter and transfer switch (if required).
           6. Line voltage testing and troubleshooting.
           7. Required permits, licenses, inspections, and fees.
     2. LED and Centralized vs Distributed System Architecture:
        1. This specification does not use rack "dimming" system or default to incandescent loads. All fixtures provided are LED, digitally controlled and powered by motorized breakers or relays. Performance fixtures are self-contained, lightweight, and designed for portability. All fixtures provided under this section are DMX512/RDM controllable.
        2. Appropriate line voltage power distribution hardware and ssACN - DMX512/RDM digital control network nodes shall be located within (or very close by) each logical lighting position
        3. Power handling equipment (to include Stagelink panels and/or "distributed" columns) shall be installed as close by each logical lighting position as is practical. For cost and performance reasons, load wire runs are to be minimized and remote electrical equipment rooms eliminated wherever practical
     3. sACN and ssACN Ethernet Network Backbone:
        1. Ethernet network shall comply with the IEEE 802.3 10/100/1000BASE-T Ethernet specification
        2. All Ethernet cabling shall be Belden #1583A or pre-approved equal. Wiring shall conform to TIA-568A/B requirements and be color coded blue.
        3. Data transport shall utilize the TCP/IP suite of protocols for DMX data.
        4. Control devices shall support industry standard ANSI E1.31 Streaming ACN w/ support for priority setting and also: ANSI E1.20 - DMX512 over RS485, and ANSI E1.33 - RDM.NET .
        5. Control devices shall support (or seamlessly co-exist) with Pathway ssACN network security overlays.
        6. Compliance with recently introduced California Title 1.81.26 "Security of Connected Devices" network regulations is required. Full implementation shall require use of Pathway "ssACN" network overlays.
        7. Use of Pathway eLink gateway hardware/software shall allow non-compliant control devices (consoles) to interface with an otherwise secure ssACN network, without reconfiguration of the house system.
        8. Industry standard Pathway Pathscape V4.0 is the required Ethernet network configuration tool and ETC Concert is not considered an acceptable alternate. A local copy of Pathscape V4.0 w/ project specific config files shall be installed on a PC at the network rack
        9. Industry standard Pathway VIA family PoE managed Ethernet network switches shall be provided. Unmanaged consumer grade switches (eg: Cisco) are not normally considered equal
        10. In addition to sACN, support for ETC Net 3, Art-Net, and ShowNet protocols shall also be provided. Ethernet nodes shall accept data from equipment configured for these protocols seamlessly and simultaneously
        11. TCP/IP Ethernet connection to the Internet shall be provided at the network rack location Optional (but highly recommended) ISP Internet service and interconnecting wiring shall be provided and installed by others
        12. One (Internet connected) convection cooled Windows 10 PC, display and keyboard shall be installed in the network rack. This hardware permits remote troubleshooting, update, reconfiguration and operation of all network connected devices
        13. Basis of Design: Pathway Via Ethernet managed network switch(es), Pathway ssACN Pathport managed network gateways and Pathway eLink gateway.
     4. DMX512/RDM Network Backbone
        1. DMX512 network backbone shall support full bi-directional RDM communication and shall adhere to ANSII standard E1.20-2006 Entertainment Technology - RDM - Remote Device Management over DMX512 Networks.
        2. All DMX512 cabling shall be Belden #1583A or pre-approved equal. Wiring shall be color coded yellow.
        3. Supported RDM features shall include:
           1. Discovery and Identification of RDM capable devices
           2. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM
           3. Remote viewing of data as provided by connected devices
        4. Basis of Design: Pathway Quattro and Octo DMX512 gateways

\*\* NOTE TO SPECIFIER \*\* Optional. Delete if not required.

* + 1. BacNET and Contact Closure Backbone - Interface to BMS, Sensors and HVAC.
       1. BacNET network backbone shall comply with ASHRAE standard 135-2016.
       2. Architectural control system shall support an optional override and status interface to the building/campus BMS. The BMS system itself shall be furnished, wired, configured and maintained by others.
       3. BacNET / contact closure interface shall be located at the network rack position. BacNET wiring interface shall be furnished, installed, and programmed by others.
       4. Interface furnished under this section is not a BacNET gateway. Or a BacNET object. Lighting system programming or system reconfiguration from the BMS is not desirable.
       5. Basis of Design: Acuity/Pathway eDIN interface PCBs, configured, wired and programmed by Wenger
    2. Performance Lighting Control Backbone a/k/a Consoles:
       1. Theatrical consoles shall provide a familiar and easy-to-use graphic user interface (GUI). Controls shall restrict user access to the operating system but provide open access to user generated show files.
       2. Complete hardware, system software and show file back-up capability shall be provided. Any Windows 10 or better PC shall provide access.
       3. Theatrical controls shall be native IEEE 802.3af-2003 PoE device(s).
       4. Theatrical controls shall provide native support for ANSI E1.11-2008 (DMX512A) networking and ANSI E1.20 RDM return data
       5. Theatrical controls shall provide native support for ANSI E1.31 (Streaming DMX over ACN) networking
       6. GUI control of intelligent lighting fixtures shall be provided. A complete library of intelligent fixture profiles shall be included and periodically updated. The ability to edit existing profiles and create additional profiles shall also be provided.
       7. Intelligent fixture attributes shall be graphically defined, not by channel numbers or DMX512 values. Each intelligent fixture shall be represented by a single control channel, not a number series of values.
       8. Basis of Design: Approved console brands include MA, Chamsys, Vari-lite / Strand and ETC. Specified console models and configurations are called out in the Bill of Materials
    3. Architectural Control and Streaming ssACN (a/k/a Snapshot) Backbone:
       1. Most architectural control stations shall be color PoE touchscreens, in sizes and quantities specified. One touchscreen (typically located in the control booth) shall be greater than 20 inches diagonal and designated as a "master"
       2. Most remote stations shall be wall mount, programmable and include appropriate numbers of illuminated pushbuttons
       3. Architectural control network shall be able to seamlessly integrate into (and interact with) the entire performance systems network. System firmware configuration shall allow specific devices and groups to be walled off
       4. "Snapshot" functionality over Ethernet shall be capable of capturing any "look" OR "timed event" (a/k/a ssACN stream) generated by the performance control system. Recorded snapshots may then be recalled from any touchscreen or button on the architectural control system
       5. Architectural processor shall support seamless trigger integration with 3rd party BMS and security systems over BacNET
       6. Architectural processor shall support seamless trigger integration with 3rd party analog vacancy and photocell sensing devices
       7. Basis of Design: Interactive CS-900 CueServer 2, Interactive CT-400 7" Touchscreen, Interactive Cue Station and ELO PoE Touchscreens.

\*\* NOTE TO SPECIFIER \*\* Optional. Delete if not required.

* + 1. Vacancy and Photocell Sensing Network:
       1. Sensors shall be digital, programmable, and powered by their control network (24V).
       2. Sensors shall be "dual-tech". Both PIR and ultrasonic technologies used w/ error checking.
       3. Sensors shall trigger architectural presets and provide automatic turn-off functionality.
       4. Sensors shall tie to the nearest architectural control station or homerun to the network rack.
       5. Sensors shall be designed for high ceiling applications.
       6. Sensors and the architectural control system shall support "time of day" scheduling.
       7. Basis of Design: Acuity SensorSwitch Dual Tech Sensors.
    2. Motorized Breaker Switching and MOSFET Dimming Panels (Default Power Control Option)
    3. Stagelink motorized breaker panels shall be available in five physical sizes. Panels shall allow for as many 84 individual "bolt-in" breakers
    4. Motorized breaker technology shall be commercial grade and based on Schneider Powerlink technology. Base line fault current and MTBF requirements shall meet or exceed the Powerlink performance spec
    5. MOSFET (phase control) dimming is an available Stagelink option. Each MOSFET module shall house two 20A dimmers. Total dimming capacity shall be twenty-four dimmers per Stagelink panel
    6. Motorized breaker panels shall be convection cooled. Use of fans or filters is unacceptable
       1. Panels shall natively support ANSI E1.11-2008 (DMX512A) networking.
       2. Panels shall natively support ANSI E1.31 (Streaming DMX over ACN) networking.
       3. Panels shall natively support UL924 Emergency functions.
       4. Panels shall optionally support UL924 Emergency phase loss sensing.
       5. Panels shall be provided with local flag status displays.
       6. Panels shall allow for local manual override, with or without control signal present.
       7. Panels shall allow sequenced switching of loads controlled.
       8. Panels shall support line side and load side metering, as a cost added option.
       9. Panels shall support remote status reporting, thru a network connected browser application.
       10. Basis of Design: Lyntec Stagelink Panel
    7. Motorized Breaker Switching Columns (Default Power Control Option)
       1. Motorized breaker "columns" shall be available in two physical sizes. Stagelink columns allow for as many 42 individual "bolt-in" breakers
       2. Slim product dimensions shall not exceed: 8.625 inches wide x 85 inches high x 5 inches deep.
       3. Stagelink Slims do not house MOSFET dimming modules.
       4. Except for items "a" and "c" above, all product components and performance specifications shall exactly match the Stagelink Panel.
       5. Basis of Design: Lyntec Stagelink Slim.
    8. Relay Switching Panels (VE Power Control Option)
       1. Relay panel size shall allow 8,16, 24, 32, 48 or 64 individual "snap-in" Panasonic relays.
       2. Relay panels shall be convection cooled. Fans and filters are unacceptable.
       3. Relays mounted in groups or installed on PCBs are unacceptable.
       4. Panels shall provide native support for ANSI E1.11-2008 (DMX512A) networking.
       5. Panels shall provide native support for ANSI E1.31 (Streaming DMX over ACN) networking.
       6. Panels shall provide support for UL924 Emergency functions.
       7. Panels shall be provided with flag status displays and permit local manual override.
       8. Panels and relays shall both be UL or ETL listed and labeled.
       9. Basis of Design: Lyntec RPCR Panel.
    9. Fixture Yoke Mount IGBT Dimming Modules (Legacy Incandescent Fixture Option):
       1. Portable, yoke mount modules allow legacy incandescent and quartz-halogen loads to be dimmed by this DMX512/RDM plus switched power system.
       2. Yoke mount dimmers must be based on IGBT (Insulated Gate Bi-polar Transistor) technology and support both FPC and RPC (Reverse Phase) output waveforms. SCR and triac based dimming solutions shall NOT be acceptable.
       3. Voltage transition time shall be a minimum of 800 uS. Buzzing filter chokes shall NOT be used to slow rate of voltage transition.
       4. Yoke mount module shall provide local address setting, On/Off/Dim and LED status buttons and displays.
       5. Basis of Design: Strand IGBT LightPack.
    10. Internet / Cloud Diagnostic, Update and Owner Training Functionality
        1. All power handling, Ethernet network and control hardware specified herein shall support and be manipulated thru a single Internet support platform
        2. Remote support shall utilize the TeamViewer cloud/software platform with the SixEye utility platform as an optional add. No acceptable alternate has been reviewed
        3. Within the system warranty period, remote support shall not require a paid subscription
        4. PC and software required for remote support functionality shall be quoted as an add alternate, if not called out as a base requirement of this specification
        5. Remote support functionality does require access to a client furnished (wired or wireless) Internet connection. Internet solutions outside client firewalls are preferred
        6. Basis of Design: Wenger Internet Support technology
    11. Power Distribution:
        1. Power distribution shall consist of scheduled outlet box, pigtail box and connector strip systems.
        2. TSI shall furnish power distribution for physical and electrical installation by the Division 26 contractor.
        3. All power distribution shall be supplied with required mounting hardware, multi-conductor cable, kellum strain reliefs, cable cradles and junction boxes.
        4. All power distribution shall be supplied with Brady style circuit number labeling.
        5. Cable reels or pantograph cable pickup devices (if required) do fall under this contact.
        6. All power distribution shall be UL or ETL listed and labeled.
        7. Basis of Design: SSRC.
    12. SI Furnished Integration Services:
        1. A complete submission of project specific 11 x 17 format "coordination drawings" is required. The drawing package shall include integrated riser diagram(s), circuit layouts, panels schedules and related details for all equipment systems described by this section. All termination points and interconnecting wiring, between products (from one or more manufacturers), shall be identified and detailed.
        2. On-site project management services shall be provided by direct ETCP certified SI employees. Services provided by sales reps and freelancers shall not be deemed equal, as they lack accountability, training and certification necessary for performance venue project management tasks.
        3. On-site turn-on, programming, troubleshooting and owner instruction services shall be provided by SI employed (or contracted) technician(s) trained and certified by each equipment manufacturer.
        4. Before any billing or notice to proceed, SI shall supply the Construction Manager with a complete and acceptable DIV 11 vs DIV 26 contractor responsibility matrix. Construction Manager shall be the sole authority who determines if this requirement has been satisfied.
    13. SI and Manufacturer's Warranties
        1. SI shall maintain a 24/7 service contact telephone line.
        2. SI shall be the first point of contact for all service and support concerns.
        3. Repair/replacement warranties shall be backed by the respective equipment manufacturers.
        4. Except where noted, manufacturer's published warranty policy statement shall be applicable.
        5. SI shall provide a two-year umbrella warranty coverage term (after acceptance) .
        6. While under warranty, if permanently installed equipment cannot be repaired or replaced via parts swap, applicable manufacturer shall reimburse TSI for material and labor costs.
  1. PERFORMANCE FIXTURES
     1. Performance Fixtures: 100% LED conventional, automated and followspot models
        1. Performance fixtures shall fall into three groups:
           1. White light and RGBA+L (5+ color) LED source, fixed position, DMX512 controlled and dimmed.
           2. White light and RGBA+L (5+ color) LED source, intelligent focus and positioning, DMX512 control and dimming.
           3. White light LED source manually operated follow spot, with DMX512 and local controls both provided.
           4. Four color LED performance fixture designs shall be considered obsolete and are not acceptable.
        2. All fixture types shall provide native support for ANSI E1.11-2008 (DMX512A) networking and RDM return data.
        3. All fixtures shall be ETL, cETL and CE LISTED and labeled. ETL listing shall be under Portable Luminaires (UL Standard 1573) and Surface Mount Luminaires (UL Standard 1598).
        4. All fixtures shall be designed for an ambient operating temperature of -14 degrees F to 104 degrees F (- 10 degrees C to 40 degrees C).
        5. All fixtures shall include multiple internal temperature sensors and automatic overtemp shutdown.
        6. All fixtures shall be IP20 rated for (clean and dry) indoor use.
        7. All fixtures equipped with internal cooling fans shall provide "low noise" and "no noise" (fan OFF) operating modes. This option setting shall be user accessible over RDM. The fixture heatsink design shall be sized to support fan OFF operation for indefinite periods of time.
        8. Open and exposed (PC style) cooling fans shall not be acceptable, due to irresolvable noise and maintenance limitations.
        9. All fixtures shall be constructed of die cast aluminum and steel. Use of flammable polycarbonate (plastic) fixture housings shall not be acceptable.
        10. All fixtures shall be furnished with a mounting clamp, color frame and safety cable. PowerCON input and output connectors shall be provided. XLR5 DMX512 input and output connectors shall also be provided.
        11. All fixtures shall be assembled, addressed and hung in place by SI.
        12. Basis of Design: Brands include Chauvet Ovation and Ovation Reve, Ayrton and Robe. Required product models called out in the Bill of Materials.
  2. ARCHITECTURAL FIXTURES
     1. Architectural Fixtures: 100% LED recess, pendant and surface mount models.
        1. Architectural fixtures shall fall into three groups. Acceptable fixture vendors must offer all three variants:
           1. White light LED source, fixed position, DMX512 controlled and dimmed.
           2. Tunable color temperature white light LED source, fixed position, DMX512 controlled and dimmed.
           3. RGBA or RGBW (4 color) LED source, fixed position, DMX512 controlled and dimmed.
        2. All architectural fixtures shall utilize convection cooled light engines exclusively. No cooling fans or liquid (radiator) systems shall be acceptable.
        3. No architectural fixture using the eldoLED DMX512 LED driver shall be acceptable.
        4. Architectural fixtures shall not be a significant source of RFI emission.
        5. Except where excluded by schedule, architectural fixtures shall be compatible with the DMX512 control protocol and provide full RDM support.
        6. Design team will state minimum delivered performance in footcandles or lumens. Design team may call for a vendor supplied AGi photometric performance layout to demonstrate compliance.
        7. Architectural fixtures shall dim down to 1 percent, with no discernable stepping, pulse or drift.
        8. Architectural fixtures shall dim up from zero with no discernable flash or "pop".
        9. On-site performance testing shall demonstrate compliance with "c", "d", "e" and "f" above, as part of the system turn-on process. Non-compliance may provoke a design team demand for fixture replacement.
        10. Architectural fixtures shall be UL or ETL listed and labeled.
        11. Basis of Design: Brands include Aquarii Axceleron, Aquarii Zino and Chauvet. Required product models called out in the Bill of Materials.

\*\* NOTE TO SPECIFIER \*\* Life safety fixtures are optional. Delete if not required.

* 1. LIFE SAFETY FIXTURES
     1. Life Safety Fixtures:
        1. Life Safety fixtures shall fall into four groups:
           1. LED seat and aisle lights.
           2. LED worklight and running lights a/k/a "blues".
           3. LED stage edge lighting.
           4. LED lock rail lighting.
        2. All four types shall provide support for ANSI E1.11-2008 (DMX512A) dimming.
        3. All four types shall provide support for UL924 emergency transfer.
        4. Work, running and lock rail options shall be four color controllable.
        5. Basis of Design: Brands include Lumenesce and Tempo. Required product models called out in the Bill of Materials

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until substrates have been properly prepared.
      2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation.
      2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. INSTALLATION
      1. Install in accordance with manufacturer's instructions and approved submittals.
      2. On-site project management services shall be provided by a direct ETCP certified employee of the TSI. Services provided by sales reps and freelancers shall not be deemed equal, as they lack accountability, training, and certification necessary for performance venue project management tasks.
      3. On-site turn-on, programming, troubleshooting, and owner instruction services shall be provided by technician(s) trained and certified by each equipment manufacturer.
      4. Equipment shall be installed per plans and specifications. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety, and for the best visual appearance.
   4. FIELD QUALITY CONTROL
      1. Inspect installed work to verify compliance with requirements.
         1. Verify that electrical work complies with manufacturer's submittals and written installation requirements.
         2. Perform installation and startup checks as recommended by manufacturer.
         3. Prepare inspection reports and submit to Architect.
   5. PROTECTION
      1. Repair or replace defective work as directed by Architect upon inspection.
      2. Clean surfaces. Touch up marred finishes or replace damaged components that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by manufacturer.
      3. Protect installed products from damage, abuse, dust, dirt, stain, or paint until completion of project. Do not permit use during construction.

END OF SECTION