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PART 1 GENERAL

1.1 DESCRIPTION

A. This section is the Interior Lighting Systems Specification for Luminaires, Lamps, Ballasts, Drivers, and Low Voltage or other Lighting Devices for Wayne State University Community Arts Gallery, Detroit, MI.
B. This specification is generated to assure lighting design compliance with lighting criteria. This is not intended nor does it presume to cover Mechanical, Electrical, Civil or Structural Engineering nor any Architectural or Landscape Architectural issues. These areas shall be addressed by the respective disciplines and coordinated by Contractor to assure safe, aesthetic, and operationally complete lighting installations.
C. **Revisions to this specification are indicated by bold purple text in the area(s) which have been revised, as shown here.**
D. ~~Deletions to this specification are indicated by strikeout of the area(s) which have been deleted, as shown here.~~
E. All equipment and parts specified herein shall bear the "UL Approved" label (or other NRTL label) indicating compliance with UL requirements or as otherwise allowed in Section 1.6.L. All luminaires shall be UL/NRTL listed and labeled for installation in fireproof or non-fireproof construction, dry, damp, or wet locations as required.
F. Products identified herein and cutsheets which may be attached or referenced represent copyrighted and/or patented and/or trademarked material and may not be freely copied nor distributed for any purposes other than the purchase of the specified products.

1.2 RELATED WORK

A. All work of this Section shall comply with the requirements of the terms and conditions of the contract, with the Drawings, and with all other Contract Documents.
B. If cited in the Electrical Engineering Documents, Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General requirements that are common to more than one section of Division 26.
C. If cited in the Electrical Engineering Documents, Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.
D. If cited in the Electrical Engineering Documents, Section 26 27 26, WIRING DEVICES: Wiring devices used as part of the lighting systems.
E. If cited in the Electrical Engineering Documents, Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.
F. If cited in the Electrical Engineering Documents, Section 26 09 23, LIGHTING CONTROLS.
G. If cited in the Electrical Engineering Documents, Section 26 08 00, COMMISSIONING OF ELECTRICAL SYSTEMS.

1.3 WORK INCLUDED

A. This work consists of furnishing all labor, materials, mounting hardware, and equipment required for an operationally and aesthetically complete installation of luminaires, including power and control wiring, and including accessories, in accordance with the contract documents. Contractor shall coordinate any infrastructure requirements with all approved lighting equipment prior to infrastructure installation, including, but not limited to appropriately sized, positioned, and located junction boxes, structural supports, feeds, power and control conduits, and remote code-compliant power-supply enclosures all in appropriate quantities.
B. Any and all exceptions related to coordination by the Contractor with other trades necessary to complete the work herein shall be identified by the Contractor at time of bid or otherwise shall be considered included in the bid.
C. For luminaires being replaced, this work by the Contractor consists of recording all existing ceiling luminaire apertures, carefully removing and packing all existing luminaires from ceiling luminaire apertures in manageable and well-made, strong boxes suitable for stacking and convenient

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maneuverability, labeling boxes with "WSU Community Arts Gallery 1950-era Lights" in neat, legible hand in permanent marker or laser-print on four sides. Boxes shall be marked fragile and labeled with "Top Side Up" indications or as otherwise directed by Owner. Confirm total count to Owner and seal boxes and turn over to Owner.

D. Additionally as/if relevant, where limited testing for asbestos has been conducted on building and luminaire wiring, results of this testing are provided in Specification Section 13280, if cited in the Electrical Engineering Documents and noted in respective luminaire types herein.
E. Additionally as/if relevant, where wiring in luminaires that are scheduled for replacement has tested positive for asbestos, proper handling and disposal of this material is the responsibility of the Contractor and shall be carried out according to all applicable laws and regulations.
F. Additionally as/if relevant, where wiring in luminaires that are scheduled for replacement has not been tested and so noted in respective type descriptions herein, the Contractor shall treat the luminaires as containing wiring with asbestos. Proper handling and disposal of this material is the responsibility of the Contractor and shall be carried out according to all applicable laws and regulations.
G. Additionally as/if relevant, where wiring in luminaires that are scheduled for replacement and that are to be turned over to the Owner has not been tested and so noted in respective type descriptions herein, the Contractor shall treat the luminaires as containing wiring with asbestos and shall tag such as "The wiring in the historic luminaires contained herein has not been tested for asbestos as of [indicate date of removal]."
H. Additionally as/if relevant, where wiring in luminaires that are scheduled for replacement and that are to be turned over to the Owner has tested negative and so noted in respective type descriptions herein, the Contractor shall tag such as "The wiring in the historic luminaires contained herein has tested negative for asbestos as of [indicate date of removal]."
I. Additionally as/if relevant, where wiring in luminaires scheduled for demolition has not been tested and so noted in respective type descriptions herein, the Contractor shall treat the luminaires as containing wiring with asbestos and shall handle and dispose luminaires according to all applicable laws and regulations.
J. For all off-the-shelf, modified, and/or custom luminaires to be procured by Contractor, Contractor shall include with bid quotation all notes, qualifications, exceptions, and pricing variants offered by Vendors to avoid any post-bid misunderstandings and/or expectation shortfalls.
K. Contractor shall establish all material quantities independently. Counts and quantities referenced by others or in schedules or this specifications or bill of materials shall not be considered complete or final in accordance with the released bid documents. Any area, count, or space references within this specification are subject to confirmation by the Contractor.
L. Contractor shall supply all materials in quantities and as specified according to the latest approved bid document plans and specifications.
M. For luminaires to be procured by Contractor, Contractor shall supply listed manufacturers with a copy of this entire document.
N. Conformance: All luminaires shall be manufactured in strict accordance with the contract documents.
O. Specifications and scale drawings are intended to convey salient features, functions and characters of the luminaires and do not undertake to illustrate or set forth every item or detail necessary for the work. Contractor shall coordinate with Vendors and other Trades in advance of and to define all infrastructure and installation work.
P. Minor details, not usually indicated on the drawings nor specified, but that are necessary for the proper execution and completion of the design intent, shall be included, the same as if they were herein specified or indicated on the drawings, and expected to be commensurate with a project of this significance.
Q. In accordance with the above and the criteria established herein, the Contractor is responsible for assuring the final design, fabrication and installation which fulfills the requirements of the Contract Documents.

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1.4 QUALITY ASSURANCE

A. If cited in the Electrical Engineering Documents, Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
B. If cited in the Electrical Engineering Documents, Refer to Paragraph, GUARANTY, in Section 00 72 00, GENERAL CONDITIONS.
C. Additionally, materials, equipment, and appurtenances as well as workmanship provided under this Section shall conform to the highest commercial standard as specified and as indicated on drawings.
D. Additionally, for luminaires to be procured by Contractor, the Contractor shall submit a notarized affidavit with supporting spreadsheet(s) confirming listed manufacturers were copied with this entire document and confirming quotations were sought and received for all specified products. Include citations of quoted cost values.
E. Additionally, the Contractor shall submit with the bid, a spreadsheet with the names of the lighting manufacturers, respective luminaire series name and respective local representation in accordance with Section 2.3 to be used for each luminaire type contained within the bid, along with line-item unit equipment prices for each luminaire type. Fixed lot or packaged pricing and/or unidentified Vendors and representatives are not acceptable. Any deviation(s) from specification shall be clearly noted by Contractor.
F. Additionally, where groups of luminaire types exhibit the same list of acceptable Vendors, such as downlights, accents, and wallwashers, the intent is to have a final installation with the same Vendor's equipment across the groupings as specified for consistency of optics, aesthetics, and similarity of maintenance procedures. Mixing/matching across groups is unacceptable except where specified or in the event of extenuating circumstances identified in writing by the Contractor at time of bid and accepted by Owner in writing. This also applies to multi-phased projects with single or mutliple, but related luminaire types exhibiting the same list of acceptable Vendors, except where products have subsequently been discontinued or significantly redesigned in size, appearance, lamping, or gear.
G. Unless exceptions are clearly indicated by the Contractor at time of bid submittal and meet the requirements of Submittals Section 1.5.H and are accepted by the Owner in writing at time of award, the Contractor commits to meeting the specification and plan requirements in a timely manner as scheduled with the Owner. Substitutions after award, late submittals, lack of communication and coordination with Vendors on leadtimes and deposits, component or raw material shortages, and other techniques are not acceptable methods to attempt delay of the project or forced acceptance of non-specified material unless arranged with Owner in writing at time of award or, in the situation of raw material shortages or discontinued material, arranged with Owner within 24 hours of said shortage or discontinuation made known to the Contractor.

1.5 SUBMITTALS

A. In accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, if cited in the Electrical Engineering Documents, and for luminaires to be procured by Contractor, submit the following:
B. Shop Drawings:
   1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications. Equipment product data lacking sufficient detail to indicate compliance with contract documents will not be acceptable.
   2. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, lenses, louvers, lamps, and controls.
   3. When catalog data and/or shop drawings for luminaires are submitted for approval, photometric data from an independent testing laboratory or one participating in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) shall be included with the submittal, indicating average brightness and efficiency of the luminaire specified in specification or as shown on the drawings. This information is unnecessary if it is for specified

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luminaire(s) and is identical to that which had been available online or on cutsheets for the specified luminaires on the date of specification. Coefficient of utilization data is unacceptable.

C. Additionally, the Contractor shall be responsible for supplying complete equipment product data, and as indicated in the Luminaire Specification Section 4.1, casting/stamping master patterns and component, partial, or complete working samples of the specified equipment in a timely fashion for design team approval, prior to releasing orders on equipment. Specifically for sample submittals:
   1. The Contractor shall furnish components, partial mockups, operational samples, and/or one complete luminaire, including specified lamp, for each type so designated as requiring such for submittal(s).
   2. For specified Vendors, this shall occur after the equipment product data review process is complete and approved for such designated luminaires and prior to their fabrication.
   3. Operational components, partial mockups, operational samples, and/or complete review sample luminaires shall be delivered to the project's designated Resident Engineer, Owner's Representative, or other such advocate ("Resident Engineer") and, as directed by the Resident Engineer, shall be installed by Contractor in the location so directed.
   4. Within two weeks of sample installation, the Resident Engineer shall notify the Contractor in writing of approval/rejection/comments necessary for manufacturing or resubmittal.
   5. Contractor shall remove, repackage, and turn over to the Resident Engineer all samples after final inspection and disposition. All review samples shall become the property of the Owner, but may be used as a prototype by the Manufacturer during the fabrication process or by the Contractor during installation. UL/NRTL listed and labeld approved review samples may be counted as project quantities providing these remain in as-new condition during the process and are not visibly, optically, or electrically different from the final manufactured lot.
   6. Review samples must be made from parts to be used on project luminaires and according to equipment product data and specifications. For example, extruded components are unacceptable if final parts are to be stamped metal components.
   7. Restoration and custom luminaire Vendor(s) shall provide access to the factory for the Owner, Architect, and/or Lighting Designer and Construction Manager to review work in progress and to review partial and complete luminaire mockups as identified in the Luminaire Specification Section 4.1.

D. Additionally, Contractor shall be responsible for coordinating all aspects of order placement, deposits, shop drawing and sample procurement, order release, order follow-up, delivery tracking, etc. with Distributor in a timely fashion to maintain project schedule commitments. Some luminaires may require at least 12 to 16 weeks of lead time or more - the Contractor is responsible for allowing sufficient time for the order/depost process, shop drawing procurement, submittal, and review process. Substitutions in whole or part will not be accepted on the basis of the contractor’s obligation to make any deadlines, contractual or otherwise, agreed by the Contractor toward the completion of this project. Lamp submittals are as important and necessary as luminaire submittals and must be supplied by the Contractor to assure correct lamp wattage, color and efficacy. Where lamps are integral as part of the OEM luminaire, this shall be so stated and evident on submittals.

E. Additionally, all submittals shall be generated by respective factories and each submittal sheet shall be clearly labeled with UL/NRTL listing and labeling, input wattage, weight, catalogic relevant to submitted luminaire for this specific project, date of submittal generation and name/phone number/email address of submittal author certifying provenance of information. The Architect (including, but not limited to the Lighting Designer) or Owner may contact respective factory submittal source or contact directly at his/her discretion. Any submittals made by a factory's agency representative rather than directly by the factory, shall be considered the same as if made by the factory and does not obviate specification requirements or Architect's or Owner's submittal comments from factory's responsibilities in meeting the specification.

F. Additionally, submittals shall be made in electronic PDF format on factory-authorized submittal drawings or datasheets. Equipment product data shall clearly indicate a drawing number as established by the Vendor for convenient reference and shall include luminaire type designation,

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name of Project, Owner, Architect, Electrical Engineer, Lighting Designer, Contractor, and Factory-direct Contact (at place of manufacture), and the Factory's Local-to-project Representative Contact capable of addressing delivery, installation, and warranty aspects. Equipment product data shall be complete.

G. Additionally, the lighting equipment specified herein has been carefully chosen for its ability to meet the luminous environment requirements of this project. Calculations (with AGi32 or other such software) are generally performed to determine luminances, luminance ratios, and horizontal and vertical illuminances and respective ratios and to assess glare and reflected glare. In some instances, virtual reality "images" have been generated (with AGi32 or other such software) to assist the Lighting Designer, the Architect and/or the Owner in assessing the lighting quality of the space(s). Equipment and/or manufacturers which have been shown to comply with established criteria, including ASHRAE/IES 90.1 and IES guidelines and normal-power lighting requirements as applicable by ordinance, code, Federal law, mandate, or directive, and/or intended LEED certification or other building-rating system, and other lighting standards as deemed appropriate for this specific project is specified herein. Substitutions of specific product attributes, products, and/or Vendors in all likelihood will be unable to meet all or some of the salient criteria as the specified equipment.

H. Additionally, where permitted, substitution submittals shall consist of:
   1. Date of submittal (made in accordance with Section 01 25 15 if cited in the Electrical Engineering Documents).
   2. Submitting firm's name, address, representative's name and contact information.
   3. Vendor's name, address, representative's name and contact information.
   4. A physical description, detailed dimensioned drawing and complete photometric and electric data of the proposed lamp, ballast, driver, or transformer as required, and luminaire.
   5. Heat test data with specified lamp/ballast/driver/transformer at 23°C ambient for 8 hours or as otherwise codified in recognized industry standards intended to address heat effects on light output, degradation and failure of electrical and electronic components, and safety.
   6. Heat test on in-grade/in-floor uplight lenses at 23°C ambient for 8 hours.
   7. Total quantity of originally-specified units involved
   8. Total quantity of proposed substitution eqiupment necessary to meet all of the same criteria as originally-specified equipment.
   9. Unit equipment cost of lowest-cost originally-specified equipment.
   10. Unit installation labor cost of lowest-cost originally-specified equipment.
   11. Connected load of originally-specified equipment.
   12. Unit cost of proposed substitution equipment.
   13. Unit installation labor cost of proposed substitution equipment.
   14. Connected load of proposed substitution equipment.
   15. Affect on controls of proposed substitution equipment.
   16. Total initial cost savings of proposed substitution equipment.
   17. Total connected load difference between originally-specified equipment and proposed substitution equipment.
   18. UL/NRTL certification paperwork.
   19. Warranty.
   20. Number of years substitution Vendor has been in business and has manufactured proposed substitution equipment and manufactured similar equipment.
   21. Place of manufacture and primary country(ies) of manufacturer of at least 51% of components.
   22. Identify specifics of purchasing chain and warranty support, including local distributor, factory-direct, and local representative.
   23. Signed affidavit from submitter warranting that proposed substitution will perform as well as or better than originally-specified equipment and that submitter will replace substitutions with originally-specified equipment at no cost should any deficiencies arise within the first year of their installation.
   24. Additionally, working samples of lamp and luminaire substitutions must also be supplied at time of substitution submittal for visual check of finish, operating and photometric

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characteristics, and functional and aesthetic design. Photometric reports must list the actual candela values of the luminaire's distribution with specified or similar lamp in at least five horizontal planes with elevation angles in increments not greater than 5° from nadir to zenith and shall be formatted in accordance with IES standards for said lamp/luminaire type. Candela curves, footcandle and lumen tables and iso-footcandle contours are not acceptable. The Contractor shall be responsible for negotiation with the Client, Lighting Designer, Architect, and Electrical Engineer prior to substitution submittal to assure fees are available to redesign entire project, including other phases if those are so impacted, based on proposed substitutions; or to review by Lighting Designer, Architect or Owner, and Electrical Engineer all photometric, sample, design and calculation documentation and virtual reality renderings (provided by Contractor) for proposed substitutions. Such reviews do not assure approval and rejection does not relieve Contractor from providing specified equipment on project schedule. All substitutions must be identified and approved prior to bid date; and all contractor negotiations re: additional fees for redesign/review work due to substitutions must occur prior to bid date. Otherwise such negotations during submittals may delay the review and disposition of such submittals for which Design Team shall not be responsible. In addition to the requirements outlined here, substitution requests shall be in accordance with Section 01 25 15 Product Approval Procedures, if cited in the Electrical Engineering Documents,.

No substitutions will be considered without compliance with the above paragraph H. Contractor's bid value and/or project schedule commitments shall not be based on an expectation of design team approval, nor on Contractor estimated value of specified equipment, nor on protracted submittals and resubmittals of rejected products in an effort to deplete the schedule for timely procurement of specified equipment. If submitted substitution fails to comply with any specification requirements or is rejected for any or no reason whatsoever, Contractor will furnish specified equipment at no additional cost or delay to the Owner.

I. Additionally, the Contractor shall coordinate all luminaire drawings with the drawings and details of the architectural, structural, electrical, mechanical, and other related trades to assure a perfect and efficient installation.
J. Additionally, review of equipment product data or samples does not waive contract requirements.
K. Manuals:
   1. Simultaneously with the shop drawings, submit companion copies of complete maintenance and operating manuals including technical data sheets, and information for ordering replacement parts.
   2. Two weeks prior to the final inspection or in accordance with Section 26 08 00 Commissioning of Electric Systems, if cited in the Electrical Engineering Documents, submit four copies of the final updated maintenance and operating manuals, including any changes, to the Resident Engineer. Provide at least three (3) CDs/DVDs with high resolution PDF files of all equipment product data for Owner's use in equipment identification and maintenance with recommended maintenance manuals including, at a minimum:
      a. Vendor and local representative's contact information
      b. Tools required
      c. Types of cleaners to be used
      d. Replacement parts identification lists
      e. Equipment product data (high-quality reproducible copies)
      f. Warranty documentation
L. Certifications:
   1. Two weeks prior to final inspection or in accordance with Section 26 08 00 Commissioning of Electric Systems, if cited in the Electrical Engineering Documents, submit four copies of the following certifications to the Resident Engineer:
      a. Certification by the Contractor that the equipment has been properly installed, adjusted, and tested.
      b. Include with shop drawings, certification from the manufacturers that all electronic high-frequency ballasts meet the transient protection required by IEEE C62.41, Cat. A. Include with initial shop drawing submittal.

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1.6 APPLICABLE PUBLICATIONS AND REFERENCES

A. Any references in this specification to lighting mounted in, on, or to the exterior of the building or site are additionally governed by Specification Section 26 56 00 EXTERIOR LIGHTING, if cited in the Electrical Engineering Documents,.
B. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification and may be referenced in the text by designation only.
C. American National Standards Institute (ANSI):
   1. ANSI C62.41 - Recommended Practice in Low Power Circuits
   2. ANSI C78 Series - Physical and Electrical Characteristics of High-Intensity Discharge Lamps
   3. ANSI C78.1 - Dimensional and Electrical Characteristics of Fluorescent Lamps - Rapid Start Types
   4. ANSI C78.1-91 - Fluorescent Lamps - Rapid-Start Types - Dimensional and Electrical Characteristics
   5. ANSI C78.2-91 - Fluorescent Lamps - Preheat-Start Types - Dimensional and Electrical Characteristics
   6. ANSI C78.3-91 - Fluorescent Lamps - Instart Start and Cold-Cathode Types - Dimensional and Electrical Characteristics
   7. ANSI C78.376-91 - Chromaticity of Fluorescent Lamps (ANSI/NEMA C78/376-96)
   8. ANSI C78.377 - Specifications for the Chromaticity of Solid State Lighting Products
   9. ANSI C81 Series - Electric Lamp Bases and Holders
   10. ANSI C82.1 - Specifications for Fluorescent Lamp Ballasts
   11. ANSI C82.4 - Specifications for High Intensity Discharge Lamp Ballasts (Multiple Supply Type)
   12. ANSI C82.11 - Performance Requirements for High Frequency Ballasts
   13. ANSI C82.77 - Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment
   14. ANSI E1.20 - Remote Device Management Over DMX512 Networks
   15. ANSI/IES RP-16-10 - Nomenclature and Definitions for Illuminating Engineering
D. Certified Ballast Manufacturers Association (CBM):
   1. Requirements for Ballast Certification.
E. Federal Communications Commission (FCC):
   1. Code of Federal Regulations (CFR), Title 47, Part 18
   2. Part 15 Class B: Radio Frequency Devices, Commercial Rated
F. Entertainment Services and Technology Association:
   1. ESTA E1.3 - Entertainment Technology - Lighting Control System - 0 to 10V Analog Control Protocol
G. International Electrotechnical Commission (IEC)
   1. IEC 61000-3-2 - Harmonic Current Emissions
   2. IEC 61347-1 - General and Safety Requirements for Lamp Control Gear
   3. IEC 61347-2-13 - Particular Requirements for Electronic Control Gear for LED Modules
   4. IEC 61547 - EMC Immunity Requirements
   5. IEC 62384 - DC and AC Supplied Electronic Control Gear for LED Modules - Performance Requirements
   6. IEC 62386-101 - Digital Addressable Lighting Interface - Part 101: General Requirements - System
   7. IEC 62386-102 - Digital Addressable Lighting Interface - Part 102: General Requirements - Control Gear
   8. IEC 62386-207 - Digital Addressable Lighting Interface - Part 207: Particular Requirements for Control Gear - LED Modules (device type 6)
H. Illuminating Engineering Society of North America (IESNA):
   1. IES Approved Method for Life Performance Testing of General Lighting Incandescent Filament Lamps, LM-49.
   2. IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps, LM-45.

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3. IES Approved Method for Life Performance Testing of Fluorescent Lamps, LM-40.
4. IES Approved Method for the Electrical and Photometric Measurements of Fluorescent Lamps, LM-9.
5. IES Approved Method for Life Testing of High Intensity Discharge Lamps, LM-47.
6. IES Approved Method for Photometric Measurements of High Intensity Discharge Lamps, LM-51.
7. IES Approved Method for Photometric Testing of Indoor Fluorescent Luminaires, LM-41.
8. IES Approved Method for Photometric Testing of Indoor Luminaires Using High Intensity Discharge Lamps, LM-46.
9. IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products, LM-79.
10. IES Approved Method for Measuring Lumen Maintenance of LED Light Sources, LM-80.
11. IES Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature, LM-82.
12. IES Projecting Long Term Lumen Maintenance of LED Light Sources, TM-21.

I. Institute of Electrical and Electronic Engineers (IEEE):
   1. C62.41-91 - Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits

J. National Fire Protection Association (NFPA):
   1. 70-02 - National Electrical Code (NEC)
   2. 101-00 - Life Safety Code

K. National Electrical Manufacturer's Association (NEMA)
   1. C82.1-97 - Ballasts for Fluorescent Lamps - Specifications
   2. C82.2-02 - Method of Measurement of Fluorescent Lamp Ballasts
   3. C82.4-02 - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps
   4. C82.11-02 - High Frequency Fluorescent Lamp Ballasts
   5. NEMA LE1, - Fluorescent Luminaires
   6. NEMA LE2, - HID Lighting System Noise Criterion (LS-NC) Ratings
   7. NEMA FA1, - Outdoor Flood Lighting Equipment
   8. NEMA SH5, - Tubular Steel, Aluminum and Prestressed Concrete Roadway Lighting Poles
   9. NEMA LSD 23-2002, - Lamp Seasoning for Fluorescent Dimming Systems
   10. NEMA LL9-2009, - Dimming of T8 Fluorescent Lighting Systems
   11. NEMA SSL1, - Electronic Drivers for LED Devices, Arrays, or Systems
   12. NEMA SSL3, - High-Power White LED Binning for General Illumination
   13. NEMA SSL7A, - Phase Cut Dimming for Solid State Lighitng: Basic Compatibility
   14. NEMA 410, - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts

L. Underwriters Laboratories, Inc. (UL):
   1. Underwriters Laboratories (UL) Standards
   2. Underwriters Laboratories (UL) Standard for Class 2 Power Units
   3. Underwriters Laboratories Safety Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products, UL 8750

M. Codes: Materials and installations shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State and local codes and regulations.

N. Listing: All luminaires shall be manufactured in strict accordance with the appropriate and current requirements of the National Electrical Code as verified by Underwriters Laboratories, Inc. (UL), or tested to UL standards by other nationally recognized testing laboratory (NRTL) as acceptable to Building Officials and Code Administrators International (BOCAI); the International Conference of Building Officials (ICBO); or other relevant code authority recognized by the jurisdiction within which the project is being constructed. Such a listing shall be provided for each luminaire type, and the appropriate label or labels shall be affixed to each luminaire in a location as required by code or law.

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1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall provide, receive, unload, uncrate, store, protect and install lamps, luminaires and auxiliary equipment as specified herein in accordance with respective manufacturers' project conditions of temperature and humidity and with appropriate protection against dust and dirt. Lamps for miscellaneous equipment shall be provided and installed by the Contractor according to equipment manufacturers' guidelines.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Shall be in accordance with NFPA 70, UL 1598 and shall be as shown on drawings and as specified.
B. Sheet Metal:
   1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
   2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
   3. Where luminaires are detailed with minimum 20 gauge housing, minimum 22 gauge housings will be acceptable provided they have strengthening embossed rib and break formations, which give the equivalent rigidity of a 20 gauge housing.
   4. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.
   5. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools, unless otherwise specified.
C. Ballasts, drivers, or transformers, unless otherwise specificied, shall be field replaceable and shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.
D. Lamp Sockets:
   1. Light Emitting Diode (LED): Unless otherwise specified, a dedicated means of connecting light source to power shall be used in all luminaires unless otherwise specified and shall meet all UL requirements. LED modules shall be field replaceable.
E. Luminaire Vendor shall be responsible for operating lamps, ballast, drivers, and other components at or below the respective required component warranty- and recommended-operating temperatures in an interior ambient of 77°F.
F. Recessed luminaires mounted in an insulated ceiling shall be listed for use in insulated ceilings or provisions made to maintain code-compliant air-space around luminaires in accordance with Vendors' instructions.
G. Unless otherwise specified, luminaires with louvers or light transmitting panels shall have hinges, latches and safety catches to facilitate safe, convenient cleaning and relamping. Vapor tight luminaires shall have pressure clamping devices in lieu of the latches.
H. Mechanical Safety: Unless otherwise specified, luminaire closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
I. Metal Finishes:
   1. The manufacturer shall apply factory-standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking and shall be free from defects such as scratches, discolorations, sand and dust spots, cracks, chips and paint runs.

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2. Interior-to-body light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise specified or shown on the drawing.
3. Exterior-to-body finishes shall be as specified or shown on the drawings.

J. Provide all luminaires with a specific means for grounding their metallic wireways and housings to an equipment grounding conductor and ground accordingly upon installation.

K. Light Transmitting Components for Luminaires:
1. Shall be 100 percent virgin acrylic plastic or water white, annealed, crystal glass, unless otherwise specified. The quality of the raw material shall meet ASTM standards as tested by an independant test laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded or extruded as necessary to meet the intent of the specified optics, and shall remain free of any dimensional instability, discoloration, embrittlement, or loss of light transmittance for the period of the Manufacturer's warranty. Where optical lenses are used, they shall be free from spherical and chromatic aberrations and other imperfections which may hinder the optic performance.
2. Large-area flat lens panels shall have not less than 3.2 mm (1/8 inch) of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
3. All lenses or other light diffusing elements shall be removable for access to lamp and electrical and electronic components and luminaire cleaning, however, they must otherwise be positively and securely held in-place, unless otherwise specified.
4. There shall be no light leaks between the lens and the lens frame.
5. There shall be no light leaks around the interface between lens door or holder trim flanges and the ceiling or wall.
6. All lens door or holder trim flanges shall fit plumb and flush with the ceiling or wall surface.
7. All lenses for all luminaires shall be installed and turned over to the Owner clean and free of dust, bugs, scratches, smudges and fingerprints. All cleaning shall be in accordance with respective manufacturers' instructions (securing of which is the responsibility of the Contractor).

L. Luminaires in Hazardous Areas: Luminaires shall be suitable for installation in flammable atmospheres (Class and Group) as defined in NFPA 70 and shall comply with UL 844.

M. LED luminaires shall be manufactured specifically for their respective light source with dedicated electrical connections and with ballasts/drivers/transformers integral to the fixture, except where remote devices are specified. Assemblies designed to retrofit incandescent luminaires are prohibited except when specifically indicated for renovation of existing luminaires. Luminaires shall be designed for lamps as specified.

N. Luminaires shall be entirely factory wired by the luminaire manufacturer in accordance with code and UL requirements and shall be furnished fully compatible with the project electrical wiring and controls system for smooth, continuous, dimming or on/off flicker-free operation.

O. Castings shall exactly replicate the approved pattern(s) and shall be free of sand pits, blemishes, scales and rust, and shall be smoothly finished, except as necessary for an authentic historic appearance and as agreed by Architect or Owner. Tolerance shall be provided for any shrinkage in order that the finished castings accurately fit their locations resulting in plumb and level fittings and consistently tight-seamed fittings.

P. The Contractor shall assure that all trims and canopies and escutcheons fit snugly and securely to the ceiling and/or wall so that no light leaks occur and so that no gaps or uneven waves are evident.

Q. Yokes, brackets and supplementary supporting members necessary for mounting lighting equipment shall be furnished and installed by the Contractor and approved by the Architect or Owner. All materials, accessories, and any other equipment necessary for the complete and proper installation of luminaires, lamps, ballasts/neon transformers included in the contract shall be furnished and installed by the Contractor. All yokes, brackets and supplementary supports shall provide a neat, square, plumb and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, lenses, lens frames or doors etc. in place.

R. All components of luminaires shall be compatible visually with each other and shall be compatible structurally.

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S. All tubing shall be brass of diameter and wall thickness necessary to provide a structurally integral, plumb and level, flush finished product. Tubing shall provide a neat, square, plumb appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, lenses, lens frames or doors, etc. in place.

T. Castings for historic luminaires shall be bronze or brass with at least 80% copper component. Aluminum shall be unacceptable unless otherwise specified or unless explicitly approved during submittal reviews for reasons of weight and with cost savings identified accordingly. All castings shall provide a neat, square, plumb and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, lenses, lens frames or doors etc. in place.

U. Stampings for custom historic replicas shall be brass with at least 80% copper component. All stampings shall provide a neat, square, plumb and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, etc. in place.

V. All connections shall be fixed rigid by screws, rivets and/or soldering. Screws and rivets shall not be visible except as necessary for maintenance and/or aesthetic appearance. Soldering shall be ground smooth to a clean, contiguous surface. All connections shall provide a neat, square, plumb and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place. No double-sided tape or Velcro shall be an acceptable means of connection of any luminaire component.

W. All materials, accessories, and other related luminaire parts shall be new and free from any defects, except where recycled, restored, or natural materials are specified, and shall be effectively protected from any damage from time of fabrication until final acceptance of the work by the Architect or Owner.

X. Sheet Metal Work: All sheet metal work shall be free from tool marks and dents, and shall have accurate angles bent as sharp as compatible with the gauges of the required metal and the luminaire styling. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly.

Y. All lamp sockets in luminaires shall be suitable for the indicated lamps and shall be set so that lamps are positioned in optically correct relation to all luminaire components. If adjustable sockets are provided, socket shall be preset in factory for lamp specified. If different socket positions are specified for the same luminaire, sockets shall be preset for each type, and cartons marked accordingly.

Z. Mounting Frames and Rings: If ceiling system and luminaire type requires, each recessed and semi-recessed luminaire shall be furnished with a mounting frame or ring compatible with the ceiling in which they are to be installed as coordinated by Contractor. The frames and rings shall be one piece or constructed with electrically-welded butt joints, and of sufficient size and strength to sustain the weight of the luminaire and maintain plumb.

AA. Pendant Supports: Contractor shall be responsible for coordination with Manufacturer, Architect, Structural Engineer and related trades to ensure that proper and adequate structural reinforcement is provided within ceilings to support pendant mounted lighting equipment for a secure, neat, square, plumb appearance. Pendants shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

AB. Wall Bracket (Sconce) Supports: Contractor shall be responsible for coordination with Manufacturer, Architect, Structural Engineer and related trades to ensure that proper and adequate structural reinforcement is provided within walls to support wall mounted lighting equipment for a secure, neat, square, plumb appearance. Wall brackets shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

AC. Outdoor Luminaires: Luminaires shall be suitably gasketed and vented according to manufacturers instructions. All dissimilar metal materials shall be separated by non-conductive materials to prevent galvanic action.

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AD. For steel and aluminum luminaires, all screws, bolts, nuts and other fastening and latching hardware shall be a cadmium or equivalent plated. For stainless steel luminaires, all hardware shall be stainless steel. For all bronze luminaires, all hardware shall be bronze.

AE. All materials, accessories, and any other equipment necessary for the complete and proper installation, wiring and controls of all luminaires included in this Contract shall be furnished by the Contractor.

AF. Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surface will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion and discoloration. Remove weld splatter and welding oxides from all welded surfaces.

AG. Extruded aluminum frames and trims shall be rigid and manufactured from quality aluminum without blemishes in the installed product. Miter cuts shall be accurate, joints shall be flush and without burrs and cut alignment maintained with the luminaire located in its final position.

AH. Warranty: The Contractor shall warrant the luminaire, its finishes, and all of its component parts, except ballasts/drivers/transformers, to be free from defects for a period of at least one year from date of acceptance as installed if operated within rated voltage range. Replacement of faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.

AI. Junction Boxes: All luminaires supplied for recessing in suspended ceilings shall be supplied with pre-wired junction boxes, unless otherwise specified.

AJ. All luminaires, new and restored/refurbished, shall be furnished with a ground wire and grounded accordingly upon installation.

AK. All suspended luminaires with a weight in excess of 174 pounds shall be fitted with safety cable of sufficient strength and length to meet all UL safety cable load-bearing requirements. Cable shall exhibit a finish (but not painted) compatible with that of the metal finish of the stem/chain/suspension-cable assembly or alternatively finished in black as approved by Architect or Owner. Shop drawings shall indicate luminaire weight. Contractor shall coordinate structural support/attachment requirements including independant structure for safety cable attachment with Vendor, Architect, and Structural Engineer and all respective trades. Safety cable shall exhibit sufficient length to wrap tightly and entirely around structural member at least twice before attachment subject to Vendor confirmation of UL requirements and pending Structural Engineer review. Contractor shall provide labor necessary for the stem/chain-assembly-wiring-threading and safety-cable-attachment as instructed by Vendor.

AL. Additionally, for all restoration and replication work, unless otherwise specified in the Luminaire Specification Section 4.1:
   1. Use materials to match the original or with matching equivalent physical characteristics of strength, finish, resistance to corrosion, and the like.
   2. Use gauges and thicknesses and contours required to provide the structural integrity and performance, durability, and appearance appropriate to the restoration era.
   3. Restoration of existing luminaires shall consist of the following:
      a. Physical restoration consisting of repair or replacement of any parts that are missing, broken, or damaged. Replacement shall match original parts in strength and appearance, including all detail.
      b. Electrical restoration shall be a complete electrical update to support the specified lamp(s)/driver(s)/ballast(s). Components and the entire assembly shall be UL/NRTL listed and labeled.
   4. Applied ornamentation components shall be cast, spun, stamped, or hand-wrought as necessary to achieve an authentic appearance and shall be of a material similar to or sympathetic with that to which they are attached, unless otherwise determined during research and approved by Lighting Designer. In any event, components shall be finished in contrasting

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or matching finish to fixture body components to which they attach as research indicates and approved by Lighting Designer. Applied rnamentation shall be attached with mechanical fasteners in discreet locations and finished to match the material into which they are set. Fasteners shall be sufficiently affixed to prevent casual loss/theft of ornamentation.

5. Finishes, whether re-finished or new for restorations or replications, shall be authentic metal or bronzing powder with hand-relieved and/or patinated detailing based on Vendor(s) research and proposed pallette approved by Lighting Designer through submittals, samples, and mockups prior to any finish production work at factory. BIDS SHALL BE BASED ON A PRELIMINARY PRESUMPTION OF AUTHENTIC METAL FINISHES. Pending Vendor(s) research, findings, recommendations, and mockups, finishes shall be appropriately sealed with a UV-resistant clear-coat lacquer in matte, semi-gloss, or gloss if/as approved by Lighting Designer. Final finishes on installation shall be consistent, free of runs, specks, smudges, checking, rainbowing, milkiness, or other flaw.
6. Diffusers (globes) shall match the original diffuser glass as shown in extant luminaires, historic photos, and historic cutsheets subject to approval by Lighting Designer. Size, thickness, material, color, texture, shape/configuration (as much as practical and environmentally-compliant) shall be used as matching metrics. Proposed piece/portion samples shall be submitted for Lighting Designer's recommended disposition prior to development of molds. After patterns, glass, and molds are fully reviewed and approved by Lighting Designer, full diffuser samples shall be submitted for Lighting Designer's recommended disposition. Where extant diffusers remain in good condition and providing new matches are exact in appearance when illuminated, re-use shall be acceptable. Attic stock of spare diffusers shall consist of 10% of each diffuser type/style/size, but not to be fewer than 4 diffusers nor more than 10 diffusers of each type/style/size.
7. Luminaires shall be free of light leaks except as necessary to meet heat-temperature-requirements and/or where originally-intended on historic equipment. Fitters shall consistently mate with diffusers and fitter thumbscrews shall be sized and arranged to allow for a uniform engagement and plumb/true diffuser arrangement. Thumbscrews shall be finished to match fitter and shall be self-retaining type.

2.2 LUMINAIRE REFLECTORS AND TRIMS:

A. Alzak cones, reflectors, baffles and louvers shall be warranted against discoloration.
B. Aluminum cones, reflectors, baffles and louvers shall be finished specular, semi-specular or diffuse as specified and shall meet or exceed Alzak specifications. All material shall be low-iridescent type.
C. All cones, reflectors, baffles and louvers shall be removable for lamp access and luminaire cleaning, however, they must otherwise be positively and securely held in-place.
D. There shall be no light leaks around the interface between cone/reflector/shade trim flanges and the ceiling or wall.
E. All cone/reflector trim flanges shall fit plumb and flush with the ceiling surface—there shall be no gaps.
F. All cones, reflectors, baffles and louvers and visible trim of all luminaires shall be turned over to the Owner clean and free of scratches, dirt, smudges and fingerprints. All cleaning shall be in accordance with respective manufacturers' instructions (securing of which is the responsibility of the Contractor.
G. For trimless or flangeless luminaires, Contractor shall coordinate with other Trades to achieve a trimless/flangeless installation acceptable to the Architect or Owner. Where ceilings are drywall or plaster, this involves Level 5 finishes or as otherwise directed by

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the Architect or Owner. In drywall, plaster, wood, or stone ceilings, special luminaire collars and exacting coordination are required of Contractor.

2.3 LUMINAIRE AND LAMP VENDOR(S) WARRANTY, PROFICIENCY, AND SUPPORT:

A. Contractor shall coordinate all warranty aspects with respective Vendors. Where components are an integral part of the luminaires as shipped from factory, the Contractor shall coordinate warranty aspects with the Luminaire Vendor(s) who shall be responsible for addressing such warranty aspects.
B. Historical restoration and re-creation luminaires shall be warranted for a minimum period of two years from date of shipment from factory unless otherwise noted in the luminaire description in Section 4.1 Luminaire Specification.
C. Modern luminaires shall be warranted for a minimum period of one year from date of shipment from factory unless otherwise noted in the luminaire description in Section 4.1 Luminaire Specification.
D. Luminaire Vendors shall provide a level of support consistent with industry practice and expectations on a project of this scale and prominence regardless of point of actual sale and/or chain of sale.
E. Luminaire Vendors shall provide factory representation support at the specification locale, the procurement locale, and the installation locale.
F. Vendors shall identify factory and local representation to provide immediate qualified assistance as necessary during the project. One local representative shall be based within 100 miles of project and, if project is located outside the Ann Arbor area, one local representative shall be based within 100 miles of Ann Arbor, Michigan. Both local representatives shall have working knowledge of respective Vendor's product line and capabilities and shall respond to project needs within one business day. Both local representatives shall coordinate respective efforts and respective Vendor's work to satisfy Contractor and Owner. Additionally, a factory account executive shall be based at respective Vendor's United States factory and shall have authority to make design and engineering decisions related to the luminaire(s), shall report factory costs (aka distributor net or DN pricing) if and when requested by Lighting Designer, and shall be capable of responding to project needs within two business days. Provide contact information as outlined in Section 1.5.H.3.
G. Restoration and custom luminaire Vendor(s) shall coordinate scheduling of all efforts with Contractor and shall meet the project schedule requirements agreed to between Vendor and Contractor, indicating same on bid. Contractor shall coordinate with Vendor, Owner, and/or Architect as necessary to meet the project requirements.
H. Restoration and custom luminaire Vendor(s) shall provide written warranty of parts and labor on entire luminaire assembly in accordance with 2.3.B and, as applicable, in accordance with 2.4.J, 2.5.B, 2.6.A.6, and 2.6.B.5.
I. Restoration and custom luminaire Vendor(s) shall provide documentation indicating firm's continual operation under the same DBA name as a custom luminaire manufacturer for a period of at least thirty five [35] years and citing fifteen [15] historic landmark projects, including state capitols and federal courthouses. Additionally, Vendor(s) shall submit qualification data of five [5] of these historic restoration projects within the last ten [10] years of similar scope and magnitude, at least three [3] of which shall be lamped with dedicated-socket, other-than incandescent/ halogen lamping, including photographic documentation of the completed work along with project references (an individual's name and contact information for each of the five project).

2.4 FLUORESCENT LAMP BALLASTS

A. Ballasts shall comply with NEMA 82.1, 82.2 and 82.11, NFPA 70, and UL 935 unless otherwise specified.
B. Unless otherwise specified, all lamps shall be operated by electronic, high frequency ballasts.
C. Electronic high-frequency ballasts:
   1. Ballasts shall operate the lamps at a frequency between 20 and 60 KHz from an input frequency of 60Hz.

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2. Ballast package:
   a. Size: The ballast case shall be sized to fit the intended luminaire housing.
   b. Case marking: Mark the ballast to indicate the required supply voltage, frequency, RMS current, current surge during starting, input watts, and power factor at the design center voltage, open circuit voltage, crest factor and efficacy.
3. Performance:
   a. Starting: The ballast shall be capable of starting and maintaining operation of lamps at an ambient temperature of 10 degrees C (50 degree F) or more for an input voltage of plus or minus 10 percent about the center design voltage unless otherwise indicated. The ballast shall never be started in the instant start mode at any temperature.
   b. Operation:
      1) Unless otherwise specified, the ballast shall safely and reliably operate in a room ambient temperature from 10 degrees C (50 degree F) to 40 degrees C (105 degrees F).
      2) The light output shall not vary by more than plus or minus 5 percent for a plus or minus 10 percent variation of the input voltage about the center design voltage. Light output shall remain constant for a plus or minus 5 percent variation of the input voltage.
      3) The ballast shall operate the lamps in a manner that will not adversely curtail the normal life of the lamp.
   c. Transient protection: The ballast shall comply with ANSI/IEEE C62.41, Cat. A.
   d. Flicker: The flicker shall be less than 5 percent at all frequencies below 1000 Hz and without visible flicker.
   e. Noise: The audible noise levels should be equivalent to or better than the Class A rating of CBM certified ballasts.
   f. Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI): The EMI and RFI limits shall meet the requirements of the Federal Communications Commission Rules and Regulations (CFR 47 Part 18).
   g. Rated life: The ballast shall have a rated life of at least 10 years or 30,000 hours (based on a 10 hour day).
   h. The two-lamp T8 ballast shall safely operate two F32T8 RS, 32- watt lamps or two F32T8/U lamps. The single lamp T8 ballast shall safely operate one F32T8 RS, 32-watt lamp or one F32T8/U lamp.
   i. Power factor: Not less than 95 percent, for primary ballast/lamp application.
   j. Reliability:
      1) Labels: Ballasts must be labeled or listed by UL and CBM/ETL.
      2) Submit, simultaneously with shop drawings, a certified test report by an independent testing laboratory or one participating in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) showing that the electronic ballasts meet or exceed all the performance requirements in this specification.
   k. Total harmonic distortion (THD) shall be less than 10 percent for primary ballast/lamp application.

D. Core-and-coil ballasts (for lamps other than F32T8 and F32T8/U or where shown on drawings as "core-and-coil"):
   1. Shall be rapid starting type.
   2. Shall comply with NEMA 82.1 and UL 935.
   3. Shall be UL Class P with automatic resetting, internal, thermal protection.
   4. Shall be CBM/ETL certified.
   5. Power factor shall be not less than 95 percent. Capacitors in ballasts shall not contain PCB (Polychlorinated Biphenyl) fluids or other fluids recognized as hazardous when discharged into the environment.
   6. Sound ratings shall be Class A or better, except for ballast sizes which are not available with Class A ratings, as standard products from any manufacturer. Ballasts which are not available with Class A ratings shall have the quietest ratings available.

7. Where core-and-coil ballasts are specified or detailed in lieu of the normally required electronic high frequency types, two lamp ballasts shall be energy saving type, UL/NRTL listed to operate F40T12 rapid start lamps for both standard 40 watt lamps and the reduced wattage 35/34 watts energy-saving lamps. Lamp output shall be within 5 percent of nominal rating. When operating energy saving lamps, the input watts to the ballast shall not exceed 78 watts at 120 V.A.C. or 79 watts at 277 V.A.C. Energy saving type ballasts should not be used in ambient temperatures below manufacturer's recommendations.

E. Ballasts for luminaires controlled by dimming devices shall be the electronic, high frequency type as specified herein, equipped for dimming and conform to the recommendations of the manufacturer of the associated dimming devices to assure satisfactory operation of the lighting system. Contractor shall coordinate all wiring infrastructure to accommodate final-selected ballasts and controls systems for smooth, continuous, and flicker-free operation.

F. All ballasts serving straight or "U" type lamps shall be mounted by four non turning studs (or captive bolts) equipped with lock washers and nuts or locking type nuts, or by four thread cutting (TC) sheet metal screws which are firmly secured against the fixture body (or wireway) to maximize dissipation of heat and minimize noise. Exception: electronic high-frequency ballasts may be mounted at a minimum of two points, one at each end of unit.

G. Ballasts shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.

H. Unless otherwise specified, to facilitate multi level lamp switching, lamps within fixture shall be wired with the outermost lamp at both sides of the fixture on the same ballast, the next inward pair on another ballast and so on to the innermost lamp (or pair of lamps). Within a given room, each switch shall uniformly control the same corresponding lamp (or lamp pairs) in all fixture units that are being controlled.

I. Where three lamp luminaires are indicated, unless switching arrangements or ballast tandem-wiring limitations dictate otherwise, utilize a common two lamp ballast to operate the center lamp in pairs of adjacent units that are mounted in a continuous row. The ballast fixture and slave lamp fixture shall be factory wired with leads or plug devices to facilitate this circuiting. Individually mounted luminaires and the odd fixture in a row shall utilize a single lamp ballast for operation of the center lamp.

J. Fluorescent ballasts shall be warranted for a minimum of three years unless otherwise noted in the Luminaire Schedule or on submittals.

K. All fluorescent luminaires shall be fused on the primary side of the ballast as recommended by the respective luminaire manufacturers unless otherwise directed by the Electrical Engineer or such fusing is an integral part of the ballast.

L. Unless otherwise noted in the Luminaire Specification Section 4.1, for all fluorescent ballasts, Contractor shall supply a quantity of 5% of each ballast type required for each luminaire, but no fewer than 2 and no more than 24 replaceable ballast. These ballasts shall constitute the Owner's initial replacement stock and are not to be used as warranty replacements in compliance with section 2.6.F.

2.5 DRIVERS FOR LED LUMINAIRES:

A. At a minimum, LED drivers shall comply with NEMA SSL 1, NFPA 70, and UL 8750 unless otherwise specified.

B. LED drivers shall be warranted for a minimum of three years unless otherwise noted in the Luminaire Schedule or on submittals.

C. All LED luminaires shall use drivers integral to luminaires or as otherwise required by the luminaire manufacturer.

D. Drivers remote from luminaires shall be housed in NEMA enclosures so rated for the driver and located in code-compliant, sound-isolated, well-ventilated, easily-accessible areas. Wire shall be sized according to run length and LED Vendor's size and distance-of-run requirements and all in accordance with all code requirements.

E. All LED drivers shall be suitably sized to accommodate the LED array consistent with industry standards, including IEC standard 60929 Annex E.

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F. All LED luminaires shall be fused on the primary side of the driver as recommended by the respective luminaire manufacturers unless otherwise directed by the Electrical Engineer or such fusing is an integral part of the driver.
G. All LED installations shall be suitably protected from electrical surges unless otherwise directed by the Electrical Engineer.
H. LED driver shall withstand up to a 1,000-volt surge without impairment of performance as defined by ANSI C62.41 Category A.
I. LED driver total harmonic distortion (THD) shall be less than 20 percent for drivers unless otherwise specified. For dimming drivers, THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.
J. LED driver power factor shall be 0.9 or greater unless otherwise specified.
K. LED driver rated life shall be at least 30,000 hours or as otherwise noted in the luminaire description in Section 4.1 Luminaire Specification.
L. LED driver shall tolerate ±10 percent supply voltage fluctuation with no adverse effects to driver or LEDs.
M. LED driver shall exhibit no visible change in light output with a variation of ±10 percent line voltage input.
N. LED driver forward voltage (Vf) shall be matched to LED board.
O. Drivers for luminaires controlled by dimming devices shall be as specified herein and equipped for dimming and conform to the recommendations of the manufacturer of the associated dimming devices to assure satisfactory operation of the lighting system. Contractor shall coordinate all wiring infrastructure to accommodate final-selected drivers and controls systems for smooth, continuous, and flicker-free operation.
    1. Drivers for DALI protocol control systems shall be consistent with digital addressable lighting interface standards including, but not limited to IEC 62386-101/102/207.
    2. Unless otherwise specified, drivers shall use the constant current reduction (CCR) method of dimming regardless of dimming protocol and Contractor shall coordinate control system architecture accordingly.
P. Flicker: The flicker shall be less than 5 percent at all frequencies below 1000 Hz and without visible flicker.
    1. Drivers shall meet or exceed NEMA 410 driver inrush standard.
Q. Unless otherwise noted in the Luminaire Specification Section 4.1, for all LED drivers, Contractor shall supply a quantity of 5% of each driver type required for each luminaire, but no fewer than 2 and no more than 24 replaceable drivers unless drivers are an inherent/integral non-replaceable part of the entire luminaire in which case no spares are required. These drivers shall constitute the Owner's initial replacement stock and are not to be used as warranty replacements in compliance with section 2.6.F.

2.6 LAMPS

A. Fluorescent Lamps:
    1. Rapid start fluorescent lamps shall comply with ANSI C78.1; preheat-start type shall comply with ANSI C78.2; and instant-start and cold-cathode lamps shall comply with ANSI C78.3.
    2. Chromacity of fluorescent lamps shall comply with ANSI C78.376.
    3. The lamps shall include the F32T8, F32T8/U 32 watt energy saving type and EPACT approved F40T12 type if specifically required by contract drawings for special applications.
    4. Lamp color temperature shall be as defined in the schedule and specification.
    5. Lamp color rendering shall be as defined in the schedule and specification.
    6. Fluorescent lamps shall be warranted for a minimum of 1 year unless otherwise noted in the Luminaire Specification Section 4.1.
B. LED Lamps:
    1. LED lamps shall comply with ANSI C78.1.
    2. Chromacity of LED lamps shall comply with ANSI C78.377A and NEMA SSL-3.
    3. Lamp color temperature shall be as defined in the schedule and specification.

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4. Lamp color rendering shall be as defined in the schedule and specification.
5. LED lamps shall be warranted for a minimum of 5 years unless otherwise noted in the Luminaire Specification Section 4.1.

C. Incandescent lamps shall not be used except in special circumstances as defined in the schedule and specification.
D. Halogen lamps shall not be used except in special circumstances as defined in the schedule and specification.
E. For color consistency, lamp maintenance consistency and for light output consistency, mixed lamps of the same lamp type from different manufacturers are unacceptable. Use the same brand and date code for all lamps except as otherwise specified. Contractor shall be responsible for coordinating all lamps and brand among all luminaire Vendor(s) and Contractor's respective distributor(s).
F. Lamps which fail within 90 days after acceptance by the Owner shall be replaced by Contractor at no cost to the Owner.
G. Unless otherwise noted in the Luminaire Specification Section 4.1, for all but LED lamps, Contractor shall supply a quantity of lamps equal to 5% of each lamp type required for each luminaire, but no fewer than 12 of each lamp type and no more than 72 lamps of each type unless otherwise indicated in the Luminaire Specification Section 4.1. For LED lamps, Contractor shall supply a quantity of 5% of each lamp type required for each luminaire, but no fewer than 2 and no more than 24 replaceable lamp- or lamp-array-modules of each lamp type unless modules are an inherent/integral part of the entire luminaire in which case no spares are required, unless otherwise indicated in the Luminaire Specification Section 4.1 These lamps shall constitute the Owner's initial replacement stock and are not to be used as warranty replacements in compliance with section 2.6.F.
H. Lamps shall conform to ANSI C78 Series Dimensional and Electrical Characteristics of Lamps.
I. Lamp performance (initial lumen output, life, color and lumen maintenance) shall be as specified in the Luminaire Specification Section 4.1.
J. Initial lumen output shall be as measured after 100 hours of operation.
K. Lamp color for light sources shall be as specified in either color temperature (Kelvin) or CIE chromaticity coordinates measured by means of spectroradiometry.
L. Lamp performance shall be in accordance with the manufacturer's latest published data for the lamp types and respective manufacturers specified.
M. Manufacturer for respective lamps and modules shall be as indicated below and may not be cross-substituted (e.g., where GE is specified for one luminaire type and Osram is specified for another luminaire type, the GE lamp may not be substituted with Osram and the Osram lamp may not be substituted with GE). All lamps shall be dedicated-socket unless specified otherwise. Where more than one lamp manufacturer is cited across luminaire types, final lamping for all such luminaire types shall be assigned to a single lamp manufacturer in order to assure color and output consistency. All lamps of a given type shall be supplied by the same manufacturer with same lot/date codes for color consistency.
    1. LED modules shall be manufactured by Bridgelux, Cree, GE, Philips, Osram, or Xicato as specified in and meeting the requirements of the Luminaire Schedule unless specified otherwise.
N. If a specific manufacturer(s) is/are noted in the Luminaire Schedule, only that manufacturer shall be acceptable.
O. Work shall include the provision and installation of lamps and, for all adjustable luminaires, aiming/adjustment of lamps for all luminaires.
P. Replace defective and burned out lamps at the date of substantial completion as determined by the Architect or Owner.

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PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, manufacturer's instructions and as shown on the drawings and specifications.
B. Installed luminaires shall be provided with protective covering by Contractor until such time as the space(s) is cleaned and ready for occupancy.
C. Align, mount and level the luminaires uniformly. All luminaires shall be installed plumb/true and level as viewed from all directions unless specifically identified otherwise in the Luminaire Specification Section 4.1. Luminaires shall remain plumb and true without continual adjustment or visibly obvious means beyond what is shown on luminaire submittal drawings.
D. The Contractor shall coordinate the lighting system installation with the relevant trades so as to eliminate interferences with hangers, mechanical ducts, sprinklers, pipes, steel, etc. Avoid interference with and provide clearance for equipment. Where the indicated locations for the luminaires conflict with the locations for equipment, coordinate relocations with the Architect or Owner.
E. For suspended luminaires, the mounting heights and configuration of the luminaires shall be as specified in the Luminaire Specification Section 4.1 and/or indicated on the drawings, and where conflicts exist, as approved by the Architect or Owner.
F. Suspended luminaires shall be installed plumb/true and level unless specifically identified otherwise in the Luminaire Schedule and at a height from finished floor as specified on the drawings, details and Luminaire Schedule. In cases where this is impractical, refer to the Architect or Owner for a decision. All appurtenances shall be consistently organized for a neat, uniform appearance.
G. Lighting Fixture Supports:
    1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
    2. Shall maintain the fixture positions after cleaning and relamping.
    3. Shall support the luminaires without causing the ceiling or partition to deflect
    4. For installation in suspended ceilings, ensure that the luminaires are supported such that there is no resultant bowing or deflection of the ceiling system greater than 1/360 of the length of the total span of the ceiling member.
H. Luminaires shall be integrated with controls in accordance with respective luminaire manufacturers' and controls manufacturers' recommendations and instructions and Controls Specification Section and to provide a complete, trouble-free/flicker-free/smooth-and-continuous-dimming operation without compromising safety, code and/or UL requirements.
I. Contractor shall be responsible for sealing all luminaires for wet locations (i.e. all knock-outs, all pipe and wire entrances, etc.) to prevent water wicking.
J. Unless otherwise installed at the Luminaire Vendor's factory, furnish and install the specified lamps for all luminaires installed and all existing luminaires reinstalled under this project.
K. Coordinate between the electrical and ceiling trades to ascertain that approved luminaires are furnished in the proper sizes, with the proper flange details, and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.
L. Bond luminaires and metal accessories to the grounding system as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS if cited in the Electrical Engineering Documents.
M. Luminaire finishes which are disturbed in any way during construction shall be touched up or refinished in a manner satisfactory to the Architect or Owner and which do not void warranty.
N. Reflector cones, louvers, baffles, lenses, trims and other decorative elements shall be installed after completion of ceiling tile installation, plastering, painting and general cleanup.
O. Whenever a luminaire or its hanger canopy is installed directly to a surface mounted junction box, a finishing ring painted to match the ceiling, shall be used to conceal the junction box.
P. All lamps shall be seasoned for a minimum of 12 hours and a maximum of 100 hours in full-on

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mode without dimming prior any dimming and prior to turn-over to Owner. All lamps used for convenience lighting during construction for periods collective operation longer than 100 hours and any lamps which have failed/burned-out shall be replaced with identical new lamps, which shall then be seasoned as described above, immediately prior to the date of substantial completion as determined by the Architect or Owner.

3.2 TESTING AND ADJUSTMENT:

A. Contractor shall coordinate lighting operations with commissioning (Section 26 08 00, COMMISSIONING OF ELECTRICAL SYSTEMS, if cited in the Electrical Engineering Documents) and controls (SECTION 26 09 23 LIGHTING CONTROLS, if cited in the Electrical Engineering Documents). The lighting and lighting controls systems shall be synchronized and fully operable to address the lighting operation in a complete and code-compliant manner.
B. All adjustable luminaires shall be aimed, focused, locked, etc., by the Contractor under the observation of the Architect or Owner. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely by the Contractor.
C. Contractor shall coordinate with Architect or Owner to establish the number of two-member crews required for aiming and adjusting. All aiming and adjusting shall be performed after the entire installation is complete for each phase or area. The Contractor shall be responsible for notifying the Architect or Owner of appropriate time for final luminaire adjustment.
D. All ladders, scaffolds, lifts, gloves, cleaning cloths, access/adjustment tools, etc. required for aiming and adjusting luminaires shall be furnished by the Contractor.
E. Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing lighting effects, aiming shall be accomplished at night.

3.3 CLEANING:

A. At completion of each phase or area all luminaires and accessories shall be thoroughly cleaned. All fingerprints, dirt, tar, smudges, drywall mud and dust, etc. shall be removed by the Contractor from the luminaire bodies, reflectors, trims, and lens/louvers prior to final acceptance. All reflectors shall be free of paint other than factory-applied, if any. All reflectors, cones and lenses shall be cleaned only according to manufacturers' instructions.

PART 4 LUMINAIRES

4.1 LUMINAIRE SPECIFICATION (DESCRIPTIONS AND CUTSHEETS)

A. Salient luminaire features and details are described and illustrated on the following pages.
B. Products identified herein and cutsheets which may be attached or referenced represent copyrighted and/or patented and/or trademarked material and may not be freely copied nor distributed for any purposes other than the purchase of the specified products.
C. Cutsheets, where included, represent the luminaire concept. Refer to listed Vendors' latest datasheets for exact relevant information.

(DESCRIPTIONS AND CUTSHEETS ON FOLLOWING PAGES)

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DDA1a

Ambient Lighting - Plaster Ceiling Condition

allow 50W-dimmable-120V on one control channel

DDA1a

New, regressed canopy (to existing ceiling aperture in plaster ceiling condition) mounted LED trackhead luminaire shall consist of a canopy pan, a flange ring, and a cylindrical trackhead. Canopy pan shall exhibit an overall diameter of about 0 feet/10 inches subject to factory confirmation of two extant recessed luminaire housings with retaining screws and whip/nipple/Steel City box cover shipped by Owner to factory (make suitable provisions to make temporary condition safe and code compliant). **These two extant samples shall constitute "plaster ceiling" trims.**

Owner shall remove and provide to Vendor two extant housings from plaster ceiling areas clearly marked "DDA1a extant housing" and two extant housings from concealed-spline-tile-ceiling areas clearly marked "DDA1b extant housing". Extant housings shall include the whip attached to luminaire body and to the junction box cover (include junction box cover and fasteners). Vendor shall use these as guides/templates in finalizing submittal drawings for the new luminaires, with an intention that all are identical, but to be determined based on Vendor's review of these extant housings. Vendors are invited to an on-site viewing prior to quotation, date to be coordinated between Vendor and Owner. This will be the only on-site viewing prior to quotation.

New canopy pan shall be heavy-gauge spun or machined metal in a consistent and precise form suitable for mounting to existing in-ceiling retaining ring via mounting screws and without causing galvanic reaction or disparate expansion/contraction. Canopy pan shall exhibit horizontal screw slots of a sufficient length and/or number on close spacings without compromising structural integrity to permit Contractor installation with consistent orientation/layout of track adapter and controls. Mounting screws shall be screw-slot flathead painted to match luminaire and of sufficient length to accommodate the canopy pan and the flange ring assemblies. Provide touch-up paint for field application or decorative finish caps to match luminaire. Canopy pan shall exhibit a regress depth of 0 feet/1¼ inches with regress return edge sitting above existing ceiling plane by no more than ¼ inch.

Canopy pan shall be fitted with code-compliant, prewired power connection whip with nipple to fit existing Steel City junction box. If Vendor determines necessary for UL and/or code compliance, canopy pan shall be fitted with safety cable of sufficient length to allow complete removal of canopy from ceiling aperture. Contractor shall attach safety cable to structure above ceiling after making appropriate provisions. Canopy pan, trackhead, track adapter, and switch and dimming devices shall exhibit sufficient strength and durability to permit periodic insertion/removal of trackhead, periodic changing of LED optic, and periodic switch/dimmer setting adjustment as expected in a collegiate community art gallery.

Flange ring shall exhibit a ¾ inch wide flange subject to Vendor's field confirmation and review of dimensions of extant recessed luminaire samples. Flange ring shall exhibit three vertical screw slots at positions to match those on extant recessed luminaire samples.

Canopy pan shall be fitted with a track segment which shall accommodate a removable cylindrical trackhead. Trackhead which shall exhibit a diameter of no more than 0 feet/5¾ inches and an overall length of no more than 0 feet/10 inches from the face of the plane of the regressed canopy. Each removable cylindrical trackhead shall be fitted with a Xicato Artist Series XSM **2000-lumen (at 1050 MA)** light engine exhibiting **1800** lumens (at full-power ~~of 1050 MA~~), 3000 K color temperature, and 95 CRI, with 50,000-hour-rated-life to 70% lumen output, and a 5-year warranty. Trackhead shall also be fitted with an electrically fused integral eldoLED dimmable electronic driver meeting requirements identified in Section 2.5 DRIVERS FOR LED LUMINAIRES and which shall also exhibit a design-life of at least 50,000 hours at rated maximum operating temperature and shall be warranted for 5

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years. Trackhead shall exhibit a 360°-plus rotation and 90°-**maximum**-above-nadir tilt.

Light engine shall accomodate the number of accessory optics necessary to achieve a 20°, 40°, and 60° beam. The 20° optic shall produce at least 806 initial beam lumens with initial center beam candlepower of 4800 candelas. Optics shall be lensing and/or reflector media that positively attaches to/detaches from the trackhead cylinder or light engine. Provide one complete set of optics for each trackhead.

All exposed metal components. **excluding** heat sink, shall be finished in factory-standard silver. **Heat sink shall be anodized matte aluminum.** Cord from heat sink to track adapter shall be factory-standard white.

Trackhead shall be fitted with an integral track adapter to mate with canopy pan track segment and shall also be fitted with an integral on/off switch and dimmer capable of roughly 10% to 100% range with no visible flicker. Switch and dimmer may be one-in-the-same, providing that a labeled or universally-visual-cued positive-action OFF (no electricity flowing to trackhead) and ON function is available. Switch and dimmer devices shall be as small as practical, shall exhibit a sympathetic design character to the round canopy and trackhead, and shall be finished to match canopy/trackhead or in black.

Position/location/orientation of switch and dimming devices and the track adapter location/orientation shall be identical on all trackheads/canopy pans and Contractor shall install all canopy pans in matching orientation. Contractor shall install trackheads in the canopy pan locations shown on plan subject to confirmation by Contractor with Owner prior to final trackhead installation. ~~Contractor shall fit~~ **E**ach trackhead **shall be factory-fitted** with the 20° optic. All trackhead and optic installations shall be made with clean white gloves to prevent any fingerprinting. At the end of the project and immediately prior to turn-over to Owner, all trackheads and optics shall be cleaned of any dirt, dust, and/or fingerprinting in accordance with manufacturers instructions.

Any grommets, mechanical fasteners, and other necessary appurtenances shall be arranged in a symmetric and consistent pattern, shall be of as small a size as practical, and shall be finished to match canopy/trackhead color or in black or stainless as is consistent industry practice and subject to shop drawing review and disposition.

Entire assembly shall be UL/NRTL listed and labeled for application and shall be warranted for a period of 5 years from date of shipment. Contractor shall receive, open, prepare, assemble, and install all canopies, trackheads, and the specific optic identified above.

Manufacturer shall provide five spare canopies, five spare trackheads, five spare sets of optics, thirteen Xicato Artist Series XSM LED light engines, and thirteen LED drivers. These shall be separately boxed and labeled and shall remain packed and turned over to the Owner's Representative. These shall constitute attic stock. Any inoperable or damaged goods from the main installation shall be immediately returned to manufacturer for replacement.

All lamps shall be group energized for a consistent contiguous amount of time prior to turn-over to Owner, but no less than 12 hours and no more than 100 hours. Lamps shall not be used for construction lighting except as Contractor secures approval from Owner's Representative in advance.

▶ Edison Price [130] Wayne CPY ASSY UPC(1C)RR-0-10V SLIDE DIMMER/ SWITCH(BLK) PLUS [130] A3-XSM2-O-XB-L18A-30K-XXD-SINK(SLV)-BSLV-SIL/ XSM-REF20/XSM PLUS [130] XSM-REF40 PLUS [130] XSM-REF60 PLUS [13] XSM modules PLUS [13] Drivers

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DDA1 series

Date	By	Subject	Project Number
©02/19/2014	GJW	WSU Community Arts Gallery	11813

Luminare Type DDA1 Canopy

Existing mounting ring with tabs for screws equally spaced around circumference.

Existing junction box cast into concrete deck above.

Existing mounting ring with tabs for screws equally spaced around circumference.

Opening that remains after existing pull-down luminaires are removed from plaster and concealed spline acoustic tile ceiling.

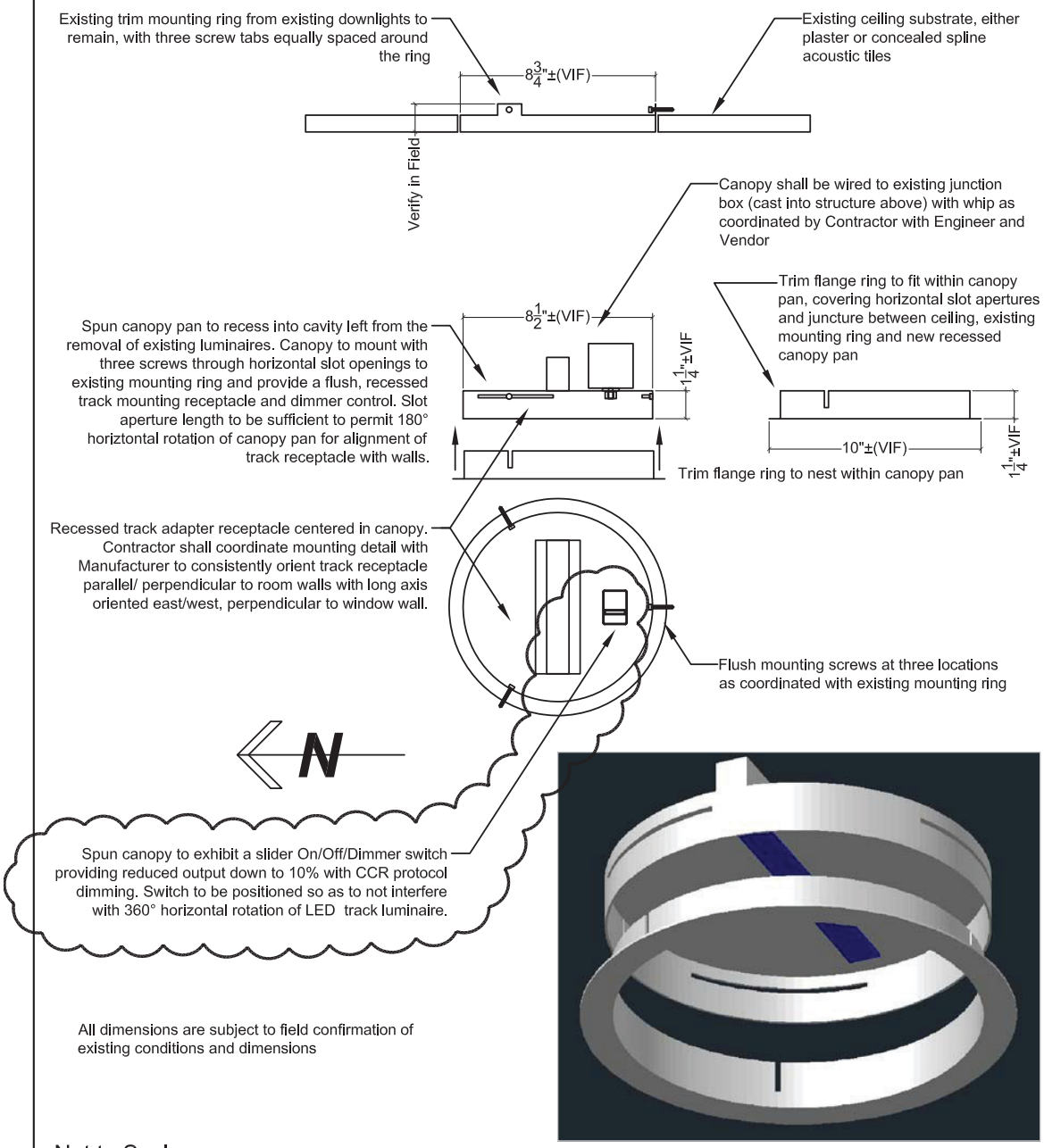
GarySteffyLightingDesign Inc.

DDA1 series

©rev.04/07/2014 GJW WSU Community Arts Gallery 11813

Date By Subject Project Number

Luminare Type DDA1 Canopy



All dimensions are subject to field confirmation of existing conditions and dimensions

Not to Scale

GarySteffyLightingDesign Inc.

DDA1 series

ARTIMA® LED/3 O-OBM

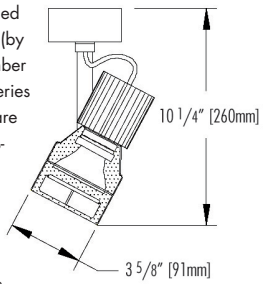
surface mounted LED accent light

Spec Sheet

TRACK FIXTURES
0-240

FEATURES

Artima LED/3 O-OBM is an accent light designed for mounting on a 4" octagonal outlet box (by others). Luminaire is powered by one of a number of Xicato LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficacies.



Standard driver is suitable for either 120 or 277 volt operation and is dimmable to 10% with a 0-10 volt (0-10V) dimmer. Standard driver case measures 4" x 5 3/16" x 1 7/8" deep.

A matte black cross-baffle assembly controls surface brightness and reduces spill light. Lens orientation may be adjusted from below by rotating cross-baffles. The cross-baffle assembly is spring mounted but keyed relative to the fixture housing, to retain lens orientation once set.

Beam spread is changed by removing the cross-baffle assembly, replacing one 'twist and lock' reflector with another, and re-inserting the cross-baffle assembly. Luminaire is ordered with a single reflector; one or both of the other reflectors may be ordered as accessories.

Luminaire provides 385° horizontal rotation and vertical adjustment from 0° to 90°. Lamp focus can be locked by tightening two collar clamps using a 3/32" hex key.

Artima LED/3 O-OBM luminaires accept one or two of a number of Optical Accessories, including spread lenses, color filters and light reduction screens. A complimentary Beam Smoother is included.

Standard finish is white with white lead cord, matte aluminum heat sink and white switch, if any. Black and Industrial Silver finish options include black lead cord, black heat sink and black switch, if any. For a custom color paint finish specify color and specify white or black lead cord, heat sink and switch, if any.

APPLICATIONS

Luminaire is suitable for highlighting vertical or horizontal surfaces, as well as objects in museums, galleries, showrooms, residences, offices and stores.

Luminaire is suitable for 120-volt or 277-volt electrical service and cULus listed for mounting on a standard 4" octagonal outlet box (by others).

PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit A3-XSM2-OBM-O-XB

Light Output
- 700 lumens / CRI 97 Artist ..... - L07A
- 1000 lumens / CRI 97 Artist ..... - L10A
- 1000 lumens / CRI 80+ ..... - L10S
- 1300 lumens / CRI 97 Artist ..... - L13A
- 1500 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L15V
- 1500 lumens / CRI 80+ ..... - L15S
- 1800 lumens / CRI 97 Artist ..... - L18A
- 2200 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L22V
- 2200 lumens / CRI 80+ ..... - L22S
- 2700 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L27V
- 2700 lumens / CRI 80+ ..... - L27S

Light Color
- 2700 K ..... - 27K
- 3000 K ..... - 30K
- 3500 K ..... - 35K
- 4000 K ..... - 40K

Beam Spread Reflector *(specify one to ship with fixture)*
- 20° spot ..... - 20D
- 40° flood ..... - 40D
- 60° wide flood ..... - 60D

OPTIONS *Specify by adding to the product code.*

Dimmable ..... **1800A, 2700V** & **2700 models**: standard driver dims to 10% with 0-10V dimmer on 120 or 277 volt service; **all other models**: standard driver dims to 1% with 0-10V dimmer on 120 or 277 volt service

Dimmable to 1% with Lutron driver, compatible with Lutron 3 -wire fluorescent dimmer or EcoSystem Bus Control; suitable for 120-volt or 277-volt service ..... – D3D-LU

rocker type **on/off switch** in driver case, for use on 120-volt track only ..... – SW

matte black finish
heat sink & lead cord black; optional switch black ..... – BL

Industrial Silver finish
heat sink & lead cord black; optional switch black ..... – SI

custom color paint finish
either, specify heat sink, lead cord & switch (if any) white ..... – CCW
or, specify heat sink, lead cord & switch (if any) black ..... – CCB
and, identify paint color in specification

EXTRA REFLECTORS *Specify as separate line items.*

- **20° spot reflector** XSM-REF20
- **40° flood reflector** XSM-REF40
- **60° wide flood reflector** XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

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1:14

DDA1 series

ARTIMA LED/3 O-OBM

EDISON PRICE LIGHTING

OPTICAL ACCESSORIES

Specify as separate line items; only for use with one of the above.
All are 2 ¾" (70 mm) diameter. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
55° spread lens LENS/2.75
prismatic lens *(Solite)* PLS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother *included with fixture* CLR/2.75

color filters
Daylight Blue DAY/2.75
Surprise Pink PNK/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

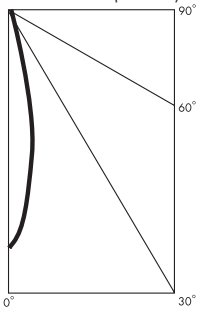
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Verification Services Report No.182709. Original test report furnished upon request.

Luminaire ..... surface-mounted LED accent light with a 20° reflector and black cross-baffle (NO LENS)
Lamp ..... Xicato LED Module, 1500 lumens, 3000K
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Luminaire Light Output ..... 753 lumens

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	4506
5	3689
15	1046
25	188
35	14
45	6
55	3
65	1
75	0
85	0
90	0



LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lumens/watt)*	*System Wattage*
700 Lumens Artist	339*	21	16*
1000 Lumens Artist	429*	20	21*
1300 Lumens Artist	572*	18	32*
1800 Lumens Artist	806*	18	44*
1000 Lumens standard	474*	32	15
1500 Lumens standard & Vibrant	753	33	23
2200 Lumens standard & Vibrant	979*	29	34*
2700 Lumens standard & Vibrant	1197*	27	45*

**estimated values*

LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	3076
55	1759
65	1014
75	0
85	0

LIGHT OUTPUT MULTIPLIER

LED Module	*Light Output Multiplier*
700 Lumens Artist	.45*
1000 Lumens Artist	.57*
1300 Lumens Artist	.76*
1800 Lumens Artist	1.07*
1000 Lumens standard	.63*
1500 Lumens standard & Vibrant	1
2200 Lumens standard & Vibrant	1.30*
2700 Lumens standard & Vibrant	1.59*

**estimated values*

STANDARD (ELV DIMMING) DRIVER INFORMATION *(UL Class 2, dry and damp location)*

Voltage	*120*	*277*
Input Watts (700A/1000A/1300A/1800A/1000/1500/2200/2700 lumens)	16/21/32/44/15/23/34/45	16/21/32/44/15/23/34/45
Input Current (A) (700A/1000A/1300A/1800A/1000/1500/2200/2700 lumens)	.13/.18/.27/.37/.13/.19/.28/.38	.06/.08/.12/.16/.05/.08/.12/.16
Output Current (mA)	500-1050	500-1050
Min. Power Factor	0.99	0.99
Operating Temperature Range (F)	–13 to 122	–13 to 122

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DDA1b

Ambient Lighting - Concealed-spline Ceiling Condition

allow 50W-dimmable-120V on one control channel

DDA1b

New, regressed canopy (to existing ceiling aperture in concealed-spline ceiling condition) mounted LED trackhead luminaire shall be similar to Type DDA1a, except for possible minor physical and dimensional aspects to accommodate the ceiling condition. **These two extant samples to be provided by Owner shall constitute "concealed-spline ceiling" trims.**

- Edison Price [50] Wayne CPY ASSY UPC(1C)RR-0-10V SLIDE DIMMER/ SWITCH(BLK)

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DDD1

Ambient Lighting - Plaster Ceiling Condition

allow 22W-dimmable-120V on one control channel

DDD1

New, regressed canopy (to existing ceiling aperture in plaster ceiling condition) mounted LED downlight shall consist of a recessed canopy pan, flange ring, and a retro-fit style recessed downlight. Recessed downlight shall exhibit a nominal aperture of 0 feet/4 inches and canopy pan/flange ring shall exhibit an overall diameter of about 10" subject to factory confirmation of two extant recessed luminaire housings with retaining screws and whip/nipple/Steel City box cover shipped by the Owner to the factory for types DDA1a/b. Complete assembly of regressed canopy and recessed downlight shall exhibit an overall height of no more than 0 feet/10½ inches subject to field confirmation by the Vendor of the existing recessed depth available at each location.

New canopy pan shall be heavy-gauge spun or machined metal in a consistent and precise form suitable for mounting to existing in-ceiling retaining ring via mounting screws and without causing galvanic reaction or disparate material expansion/contraction. Mounting screws shall be screw-slot flathead painted to match canopy and of sufficient length to accommodate the canopy pan and the flange ring assemblies. Provide touch-up paint for field application or decorative caps to match canopy. Canopy pan shall exhibit a regress depth of 0 feet/1¼ inches with regress return edge sitting above existing ceiling plane by no more than ¼ inch.

Canopy pan shall be fitted with code-compliant, prewired power connection whip with nipple to fit existing Steel City junction box. If Vendor determines necessary for UL and/or code compliance, canopy pan shall be fitted with safety cable of sufficient length to allow complete removal of canopy and downlight from the ceiling aperture. Contractor shall attach safety cable to structure above ceiling after making appropriate provisions.

Flange ring shall exhibit a ¾ inch wide flange subject to Vendor's field confirmation and review of dimensions of extant recessed luminaire samples. Flange ring shall exhibit three vertical screw slots at positions to match those on extant recessed luminaire samples.

Canopy pan shall be fitted with a recessed downlight exhibiting a clear aluminum reflector cone with a slightly diffuse clear finish. Downlight reflector cone shall be nominally 0 feet/4 inches in diameter shall exhibit an overlapping flange, nominally **5/8** inches wide, painted to match canopy. Downlight shall exhibit an overall height above the top of the recessed canopy of no more than 0 feet/9¼ inches. Downlight shall be fitted with a Xicato Artist Series XSM light engine exhibiting 1000 lumens (at full-power 1050ma), 3000K color temperature, and 95 CRI, with 50,000-hour-rated-life to 70% lumen output, and a 5-year warranty. Downlight luminaire shall be fitted with an electrically fused integral eldoLED dimmable electronic driver meeting requirements identified in Section 2.5 DRIVERS FOR LED LUMINAIRES and which shall also exhibit a design-life of at least 50,000 hours at rated maximum operating temperature and shall be warranted for 5 years. Driver shall also exhibit a design-life of at least 50,000 hours at rated maximum temperature and shall be warranted for 5 years. Light engine shall be furnished with a 40^0 narrow flood reflector producing at least 710 initial luminaire lumens with an initial center beam candlepower of 2450 candelas.

Contractor shall install canopy pan and downlight flat, flush, level and plumb.

Entire assembly shall be UL/NRTL listed and labelled for application and shall be warranted for a period of 5 years from date of shipment. Contractor shall receive, open, prepare, assemble, and install all canopies and downlights identified in this description.

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Manufacturer shall provide one complete spare canopy and downlight assembly. This assembly shall be separately boxed and labeled and shall remain packed and turned over to Owner's Representative. This assembly shall constitute attic stock. Any inoperable or damaged goods from the main installation shall be immediately returned to manufacturer for replacement.

All lamps shall be group energized for a consistent contiguous amount of time prior to turn-over to Owner, but no less than 12 hours and no more than 100 hours. Lamps shall not be used for construction except as Contractor secures approval from Owner in advance.

▶ Edison Price [8] Presto-WSU PST-XSM2-4DL-L10A-30K-**40D**-120V-VTF/ SLVOFL-DME-Fuse with Wayne-CPY ASSY SLV

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DDD1 series

PRESTO™ DL LED XSM/4

recessed LED downlight remodeler

Spec Sheet

REMODEL
7-030

FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE

FEATURES

Presto DL LED XSM/4 is an efficient , 4" aperture, LED remodeler downlight powered by one of a number of Xicato® LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficiencies.

Luminaire includes an internal reflector to produce a 20° spot, 40° flood or 60° wide flood beam spread. To allow beam spread to be changed after installation, internal reflectors are also available as accessories.

Precise external reflector design minimizes aperture brightness and provides a shielding angle of 40°. Recess depth is 9 1/4".

Standard driver allows luminaire to be dimmed to 10% by a 0-10V dimmer on either 120-volt or 277-volt service. An optional driver allows luminaire to be dimmed to 10% by an ELV dimmer on 120-volt service only.

Luminaire accepts one or two of a number of available Optical Accessories including lenses and color filters. A complimentary Solite prismatic lens is included.

Reflectors are available in three clear natural aluminum finishes — semi-specular (C), slightly diffuse (V) or fully diffuse (EC) — as well as champagne gold or black Alzak®. Other finishes available on special order. A LightPlate™ decorative trim may be ordered instead of a standard reflector.

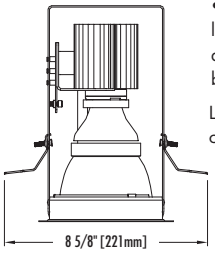
Trim flange conceals edges of ceiling installation hole. Standard finish is white; custom paint finish available on special order.

APPLICATIONS

Luminaire is recommended for downlighting in stores, offices, restaurants, showrooms, hotels and residences where fixtures are to be installed from below into an existing ceiling.

Installation locations should offer the following conditions:

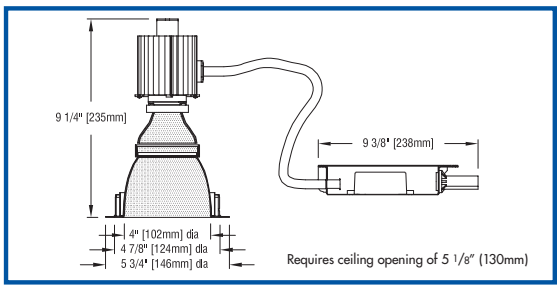
- ceiling material 2" or less thick capable of supporting 16 pounds
- recess depth of at least 9 1/4"
- plenum free of joists or obstructions for at least 8" from center along one side (to accommodate junction box).



Luminaire is listed for Damp Location, RoHA compliant, prewired with a thermal protector and suitable for use in a fire rated ceiling. Removal of the reflector allows access to the driver and junction box.

FULLY SUSTAINABLE
Presto DL LED XSM/4 is fully sustainable. All critical components are replaceable and are available from Edison Price Lighting.

MODIFICATIONS AVAILABLE ▼ *See next page*



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit PST-XSM2-4DL
Custom painted trim flange available on special order. Add –CC

Light Output
- 700 lumens / CRI 97 Artist ..... - L07A
- 1000 lumens / CRI 97 Artist ..... - L10A
- 1000 lumens / CRI 80+ ..... - L10S
- 1300 lumens / CRI 97 Artist ..... - L13A
- 1500 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L15V
- 1500 lumens / CRI 80+ ..... - L15S
- 2200 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L22V
- 2200 lumens / CRI 80+ ..... - L22S

Light Color
- 2700 K ..... - 27K
- 3000 K ..... - 30K
- 3500 K ..... - 35K
- 4000 K ..... - 40K

Beam Spread Reflector *(specify one to ship with fixture)*
- 20° spot ..... - 20D
- 40° flood ..... - 40D
- 60° wide flood ..... - 60D

Voltage
- 120 volt ..... – 120
- 277 volt ..... – 277

Reflector Color
- Semi-specular Clear ..... CTF
- Slightly diffuse Clear ..... VTF
- Fully diffuse Clear ..... ECTF
- Champagne Gold ..... GTF
- Black ..... BTF

Other reflector finishes available on special order.
A LightPlate decorative trim (see over) may be ordered instead of the standard reflectors above.
LightPlate **Downlight Spot**, white ..... DP-TF
Custom painted LightPlate are available on special order. Add –CC

OPTIONS *Specify by adding to the basic unit.*

Dimmable ..... standard driver is dimmable to 10% with a 0-10 volt dimmer and is suitable for either 120 or 277 volt operation.

Dimmable to 10% with an electronic low voltage at 120 volts only *(dimming not possible at 277 volts because dimmer controls are not available)* ..... –DME

EXTRA REFLECTORS *Specify as separate line items.*

- **20° spot reflector** XSM-REF20
- **40° flood reflector** XSM-REF40
- **60° wide flood reflector** XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING
41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com
U.S. Patent No. US 7,744,256 B2 (June 29, 2010)

DDD1 series

PRESTO DL LED XSM/4

EDISON PRICE LIGHTING

MODIFICATIONS AVAILABLE

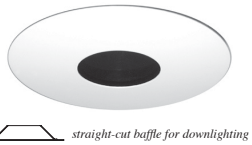
Contact factory with quantity for pricing; orders may require shop drawing approval.

+DOD: luminaire suitable for **high humidity** environments; add +DOD to Product Code.

+MAR: reflector suitable for **marine** environments; add +MAR to Product Code.

LIGHTPLATE *LightPlate may be used instead of standard reflectors.*

DOWNLIGHT SPOT



straight-cut baffle for downlighting

OPTICAL ACCESSORIES *Specify as separate line*

All are 2 ¾" (70mm) diameter. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
prismatic lens (Solite) PLS/2.75
55° spread lens LENS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother CLR/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

color filters

surprise pink PNK/2.75
daylight blue DAY/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75

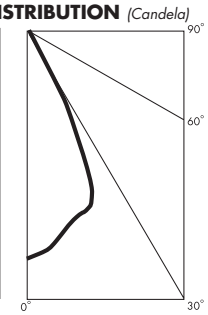
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Prorated from LTL Report No. 28251. Original Luminaire Testing Laboratories, Inc. (LTL) test reports furnished upon request.

Luminaire ..... recessed LED round downlight with semi-specular clear aluminum reflector and prismatic lens
Lamp ..... one Xicato XSM LED module with 60° beam spread integral reflector, 3000 CCT, 80 CRI, 1500 lumens
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Spacing Criteria 0.9

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	1370
5	1324
15	1158
25	739
35	93
45	1
55	0
65	0
75	0
85	0
90	0



STANDARD DRIVER INFORMATION *UL Class 2, dry and damp location*

Voltage	*120*	*277*
Input Watts (700A/1000A/1300A/1000/1500 • 1500V/2200 • 2200V lumens)	15/22/33/14/22/34	15/22/33/14/22/34
Input Current (A) (700A/1000A/1300A/1000/1500 • 1500V/2200 • 2200V lumens)	.13/.18/.28/.12/.18/.28	.05/.08/.12/.05/.08/.12
Output Current (mA)	500/1050	500/1050
Min. Power Factor	>0.99	>0.99
Operating Temperature Range (F)	-13 to 122	-13 to 122

LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lumens/watt)*	*System Wattage*
700 Lumens Artist	397*	26	15*
1000 Lumens Artist	510*	23	22*
1300 Lumens Artist	674*	20	33*
1000 Lumens standard	588*	49	14*
1500 Lumens standard & Vibrant	864*	39	22
2200 Lumens standard & Vibrant	1158*	34	34*

**estimated values*

LIGHT OUTPUT MULTIPLIER

LED Module Type	*Luminaire Output Multiplier*
700 Lumens Artist	46*
1000 Lumens Artist	59*
1300 Lumens Artist	78*
1000 Lumens standard	68*
1500 Lumens standard & Vibrant	1
2200 Lumens standard & Vibrant	1.34*

**estimated values*

ZONAL LUMEN SUMMARY

Zone	*Lumens*	*% Fixture*
0 - 30°	784	90.7
0 - 40°	855	99.5
0 - 60°	864	100.0
0 - 90°	864	100.0
90 -180°	0	0.0
0 -180°	864	100.0

LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	243
55	0
65	0
75	0
85	0

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END OF SECTION 26 51 00

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