SECTION 265116 - FLUORESCENT INTERIOR LIGHTING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Luminaires are usually scheduled on Drawings. To coordinate this Section with a Drawing schedule, see the "Luminaire Schedule" Article in the Evaluations.

See "Sustainable Design Considerations" Article in the Evaluations for a discussion of sustainable design requirements that may impact the editing of this Section.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section Includes:

Ballasts for linear fluorescent lamps.

Ballasts for compact fluorescent lamps.

Emergency fluorescent power units.

Fluorescent lamps.

Cylinder.

Downlight.

Highbay, linear.

Linear industrial.

Lowbay.

Parking garage.

Recessed linear.

Strip light.

Surface mount, linear.

Surface mount, nonlinear.

Suspended, linear.

Suspended, nonlinear.

Materials.

Luminaire support components.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. BIM: Building information model.
        2. CAD: Computer-aided design.
        3. CCT: Correlated color temperature.
        4. CRI: Color Rendering Index.
        5. Fixture: See "Luminaire."
        6. IP: International Protection or Ingress Protection Rating
        7. Lumen: Measured output of lamp and luminaire, or both.
        8. Luminaire: Complete lighting unit, including lamp, reflector, and housing.
      1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product.

Arrange in order of luminaire designation.

Include data on features, accessories, and finishes.

Include physical description and dimensions of luminaires.

Ballast, including BF.

Include life, output (lumens, CCT, and CRI), and energy efficiency data.

Include photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the luminaire as applied in this Project.

Retain or "Manufacturers' Certified Data" or "Testing Agency Certified Data" subparagraph below. Retain first subparagraph if photometric data, based on testing by accredited manufacturers' laboratories, is considered adequate for luminaires in this Project. Retain second subparagraph if photometric data for one or more luminaires are based on independent laboratory tests; coordinate with the Interior Lighting Fixture Schedule on Drawings to indicate which units shall meet this requirement. See the Evaluations.

Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

Retain "Air and Thermal Performance Data" and "Sound Performance Data" subparagraphs below for projects with air-handling luminaires.

* + - * 1. Shop Drawings: For nonstandard or custom luminaires.

Include plans, elevations, sections, and mounting and attachment details.

Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

Retain "Samples" paragraph for custom luminaires and for single-stage Samples. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each luminaire and for each color and texture indicated with standard factory-applied finish.
        2. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

Include Samples of luminaires and accessories involving color and finish selection.

* + - * 1. Samples for Verification: For each type of luminaire.

Include Samples of luminaires and accessories to verify finish selection.

Lamps and ballasts, installed.

Cords and plugs.

Pendant support system.

* + - * 1. Product Schedule: For luminaires and lamps.[**Use same designations indicated on Drawings.**]
        2. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

Luminaires.

Suspended ceiling components.

Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.

Structural members to which [**equipment**] [**and**] [**or**] luminaires will be attached.

Initial access modules for acoustical tile.

Items penetrating finished ceiling, including the following:

Other luminaires.

Air outlets and inlets.

Speakers.

Sprinklers.

Access panels.

Ceiling mounted projectors.

<**Insert item**>.

Moldings.

<**Insert feature**>.

Coordinate "Qualification Data" paragraph below and as may be supplemented in "Quality Assurance" Article.

* + - * 1. Qualification Data: For testing laboratory providing photometric data for luminaires.

Retain "Product Certificates" paragraph below to require submittal of product certificates from manufacturers.

* + - * 1. Product Certificates: For each type of ballast for bi-level and dimmer-controlled luminaires, from manufacturer.
        2. Product Test Reports: For each luminaire, for tests performed by [**manufacturer and witnessed by a qualified testing agency**] [**a qualified testing agency**].
        3. Sample warranty.

Retain "Seismic Qualification Certificates" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 260548.16 "Seismic Controls for Electrical Systems." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

* + - 1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For luminaires and lighting systems to include in maintenance manuals.

Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

* + - 1. MAINTENANCE MATERIAL SUBMITTALS
         1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Lamps: [**Ten for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.

Diffusers and Lenses: [**One for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.

Fluorescent-luminaire-mounted emergency battery pack: One for every [**20**] [**50**] <**Insert number**> emergency lighting unit.

Globes and Guards: [**One for every 20**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.

* + - 1. QUALITY ASSURANCE
         1. Luminaire Photometric Data Testing Laboratory Qualifications:

Retain one of two subparagraphs below, or both, to specify qualifications for laboratories providing photometric data. Retain first subparagraph for testing laboratories that are associated with a luminaire manufacturer's production facility. Retain second subparagraph for testing laboratories that are independent of a luminaire manufacturer's production facility.

Luminaire manufacturer's laboratory is accredited under the NVLAP for Energy Efficient Lighting Products.

Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

* + - * 1. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

Obtain Architect's approval of luminaires in mockups before starting installations.

Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.
      2. WARRANTY

When warranties longer than one year are required and would exceed the "one-year period for correction of Work," verify with Director’s Representative that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods.

Warranty Period: [**Two**] <**Insert number**> year(s) from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

Terminology used to describe products complies with NEMA LE 6 product classifications. These classifications were current at the time this Specification was written, but may not be inclusive of products required for the Project. For additional products, add new articles, describe characteristics not already included in the specification, and choose the appropriate manufacturer listing.

* + - 1. PERFORMANCE REQUIREMENTS
         1. Seismic Performance:

Retain one of two subparagraphs below with "Seismic Qualification Certificates" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete both subparagraphs if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with Structural Engineer.

Luminaires shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Luminaires and lamps shall be labeled vibration and shock resistant.

Retain subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified[**and the luminaire will be fully operational during and after the seismic event**]."

* + - 1. LUMINAIRE REQUIREMENTS
         1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
         2. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

Coordinate "FM Global Compliance" paragraph below with Drawings.

* + - * 1. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
        2. UL Compliance: Comply with UL 1598.
        3. Lamp base complying with [**ANSI C81.61**] [**or**] [**IEC 60061-1**].
        4. Nominal Operating Voltage: [**120 V ac**] [**240 V ac**] [**277 V ac**].
        5. Recessed Luminaires: Comply with NEMA LE 4.

Retain "EMI Filters" paragraph below for special applications where freedom from conducted EMI is critical. Coordinate with the Interior Lighting Fixture Schedule on Drawings.

* + - * 1. EMI Filters: Factory installed to suppress conducted EMI according to MIL-STD-461E. Fabricate luminaires with one filter on each ballast indicated to require a filter.
        2. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
        3. Heat-Removal Units: Air path leads through lamp cavity.
        4. Combination Heat-Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the luminaire door with air supply same as for air-supply units.
        5. Dampers: Operable from outside luminaire for control of return-air volume.
        6. Static Luminaire: Air-supply slots are blanked off, and luminaire appearance matches active units.
      1. BALLASTS FOR LINEAR FLUORESCENT LAMPS

For luminaires requiring other than instant-start ballasts, indicate ballast type in the Interior Lighting Fixture Schedule on Drawings. See the Evaluations for discussion on instant-, rapid-, and programmed-start ballasts.

* + - * 1. General Requirements for Electronic Ballasts:

Comply with UL 935 and with ANSI C82.11.

Designed for type and quantity of lamps served.

Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.

ANSI C82.11 states that lamp and ballast combinations are for operation at temperatures of 50 to 105.8 deg F. Applications outside this range should be noted in the Interior Lighting Fixture Schedule on Drawings.

Sound Rating: [**Class A**] [**Class A, except Class B for T12/HO and T12/Slimline lamp ballasts**].

See the Evaluations for discussion on harmonic considerations.

THD Rating: Less than [**10**] [**20**] <**Insert number**> percent.

Surge Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

Lower operating frequencies are available but may interfere with default ballasts when used in proximity of infrared sensors.

Operating Frequency: [**42**] <**Insert number**> kHz or higher.

See the Evaluations for discussion on lamp current crest factor.

Lamp Current Crest Factor: [**1.7**] <**Insert number**> or less.

BF: [**0.88**] <**Insert number**> or higher.

Power Factor: [**0.95**] [**0.98**] <**Insert number**> or higher.

Retain "Parallel Lamp Circuits" subparagraph below if default ballast is programmed-start type and it is important for surviving lamps to operate when one lamp served by that ballast has failed. There may be a cost premium for this little-used option for programmed-start ballasts.

Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

* + - * 1. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.
        2. Electronic Programmed-Start Ballasts for [**T5**] [**T8**] [**T5HO**] [**T5 and T5HO**] Lamps: Comply with ANSI C82.11 and the following:

Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.

Automatic lamp starting after lamp replacement.

Electromagnetic Ballasts: Comply with ANSI C82.11; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

ANSI C82.11 states that lamp and ballast combinations are for operation at temperatures of 50 to 105 deg F. Applications outside this range should be noted in the Interior Lighting Fixture Schedule on Drawings.

Ballast Manufacturer Certification: Indicated by label.

Retain "Single Ballasts for Multiple Luminaires" paragraph below to require ballasts in some luminaires to serve lamps in other luminaires. Indicate luminaire types to which this requirement applies in the Interior Lighting Fixture Schedule on Drawings, and indicate connections on lighting plans.

* + - * 1. Single Ballasts for Multiple Luminaires: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.
        2. Ballasts for Low-Temperature Environments:

Retain "electromagnetic" option in "Temperatures 0 Deg F and Higher" subparagraph below if lamp-starting and -operating temperature near 0 deg F is a critical requirement. Verify, with manufacturers, the compatibility of ballasts with indicated lamps for low-temperature operation.

Temperatures 0 Deg F and Higher: [**Electronic**] [**or**] [**electromagnetic**] type rated for 0 deg F starting and operating temperature with indicated lamp types.

Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.

Retain "Ballasts for Residential Applications" paragraph below for residential luminaires.

* + - * 1. Ballasts for Residential Applications: Luminaires designated as "residential" may use low-power-factor electronic ballasts having a Class B sound rating and THD of approximately 30 percent.

Retain "Ballasts for Low-EMI Environments" paragraph below for projects or locations that have higher-than-normal sensitivity to EMI. Coordinate with Drawings. Products for consumer use (usually household) must suit more stringent EMI limitations than those for nonconsumer environments. See "Ballasts" Article in the Evaluations for more information.

* + - * 1. Ballasts for Low-EMI Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on EMI and RFI for consumer equipment.
        2. Ballasts for Dimmer-Controlled Luminaires: Electronic type.

Dimming Range: 100 to [**5**] <**Insert number**> percent of rated lamp lumens.

Ballast Input Watts: Can be reduced to [**20**] <**Insert number**> percent of normal.

Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

Coordinate "Control" subparagraph below if lighting control Sections, such as Section 260943.16 "Addressable-Fixture Lighting Controls," Section 260943.23 "Relay-Based Lighting Controls," and Section 260923 "Lighting Control Devices," are used for Project.

Control: Coordinate wiring from ballast to control device to ensure that ballast, controller, and connecting wiring are compatible.

Use of bi-level and tri-level ballasts may comply with state and local energy-conservation code requirements, including Title 24, Part 6, of the California Code of Regulations.

* + - * 1. Ballasts for Bi-Level Controlled Luminaires: Electronic type.

Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level operation and off.

High-Level Operation: 100 percent of rated lamp lumens.

Low-Level Operation: 30 percent of rated lamp lumens.

Ballast shall provide equal current to each lamp in each operating mode.

Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

* + - * 1. Ballasts for Tri-Level Controlled Luminaires: Electronic type.

Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level operation and off.

High-Level Operation: 100 percent of rated lamp lumens.

In "Low-Level Operation" subparagraph below, retain either option for tri-level ballasts, depending on manufacturer.

Low-Level Operation: [**30 and 50**] [**30 and 60**] percent of rated lamp lumens.

Ballast shall provide equal current to each lamp in each operating mode.

Compatibility: Certified by manufacturer for use with specific tri-level control system and lamp type indicated.

* + - 1. BALLASTS FOR COMPACT FLUORESCENT LAMPS

ANSI C82.11 states that lamp and ballast combinations are for operation at temperatures of 50 to 105.8 deg F. Applications outside this range should be noted in the Interior Lighting Fixture Schedule on Drawings.

* + - * 1. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

Lamp end-of-life detection and shutdown circuit.

Automatic lamp starting after lamp replacement.

Sound Rating: Class A.

THD Rating: Less than 20 percent.

Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

Operating Frequency: 20 kHz or higher.

Lamp Current Crest Factor: 1.7 or less.

BF: 0.95 or higher unless otherwise indicated.

Retain last option in "Power Factor" subparagraph below for residential luminaires.

Power Factor: [**0.95**] [**0.98**] [**, except luminaires designated as "residential" may use low-power-factor electronic ballasts**] or higher.

See "Ballasts" Article in the Evaluations for discussion on CFR compliance required in "Power Factor" subparagraph below.

Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on EMI and RFI for nonconsumer equipment.

* + - 1. EMERGENCY FLUORESCENT POWER UNIT

Retain "Internal Type" or "External Type" paragraph below, or both, to specify emergency battery operation of either linear or compact fluorescent luminaires for code-required egress lighting. Indicate luminaire types to be equipped with these devices in the Interior Lighting Fixture Schedule on Drawings, and indicate connections on lighting plans.

* + - * 1. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast. Comply with UL 924.

Emergency Connection: Operate [**one**] <**Insert number**> fluorescent lamp(s) continuously at an output of [**1100**] <**Insert value**> lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.

Retain "Nightlight Connection" subparagraph below to require nightlight connections. If used, differentiate two connection modes on Drawings or in the Interior Lighting Fixture Schedule on Drawings.

Nightlight Connection: Operate one fluorescent lamp continuously.

Test Push Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

Battery: Sealed, maintenance-free, nickel-cadmium type.

Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

Retain "Remote Test" subparagraph below to allow periodic test, as required by codes for emergency equipment, to be performed using a hand-held remote device to trigger simulation of loss of normal power in the tested unit.

Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

Retain "Integral Self-Test" subparagraph below to eliminate necessity to manually perform periodic test required by codes for emergency equipment. Verify requirements of authorities having jurisdiction.

Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

* + - * 1. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from luminaire. Comply with UL 924.

Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.

Retain "Nightlight Connection" subparagraph below if nightlight connections are used. If used, differentiate two connection modes on Drawings or in the Interior Lighting Fixture Schedule on Drawings.

Nightlight Connection: Operate one fluorescent lamp in a remote luminaire continuously.

Battery: Sealed, maintenance-free, nickel-cadmium type.

Charger: Fully automatic, solid-state, constant-current type.

Housing: NEMA 250, Type 1 enclosure.

Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

Retain "Remote Test" subparagraph below to allow periodic test, as required by codes for emergency equipment, to be performed using a hand-held remote device to trigger simulation of loss of normal power in the tested unit.

Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

Retain "Integral Self-Test" subparagraph below to eliminate necessity to manually perform periodic test required by codes for emergency equipment. Verify requirements of authorities having jurisdiction.

Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

* + - 1. FLUORESCENT LAMPS

Coordinate this article with Drawings. Where color rendition or color uniformity is important and several types of fluorescent lamps are used, provide consistent manufacturer designations or ANSI lamp designations to define requirements.

Paragraphs below are sample specifications for typical lamps, which are a few of the thousands of types and ratings available for building illumination. Indicate here or in the Interior Lighting Fixture Schedule the standard designations of the lamps that comply with lumen output, energy rating, CRI, color temperature, lamp life, and other requirements for specific Project applications.

* + - * 1. T8 rapid-start lamps, rated 32-W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI of 75 (minimum), color temperature of [**3500**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.
        2. T8 rapid-start lamps, rated 17-W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI of 75 (minimum), color temperature of [**3500**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.
        3. T5 rapid-start lamps, rated 28-W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI of 85 (minimum), color temperature of [**3000**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.
        4. T5HO rapid-start, high-output lamps, rated 54-W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI of 85 (minimum), color temperature of [**4100**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.
        5. Compact Fluorescent Lamps: Four-pin, CRI of 80 (minimum), color temperature of [**3500**] <**Insert value**> K, average rated life of 10,000 hours at three hours of operation per start[**, and suitable for use with dimming ballasts**] unless otherwise indicated.

Add compact fluorescent lamp type(s) to list below if needed.

13 W: T4, double or triple tube, rated 900 initial lumens (minimum).

18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).

26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).

32 W: T4, triple tube, rated 2400 initial lumens (minimum).

42 W: T4, triple tube, rated 3200 initial lumens (minimum).

57 W: T4, triple tube, rated 4300 initial lumens (minimum).

70 W: T4, triple tube, rated 5200 initial lumens (minimum).

<**Insert type**>.

* + - 1. COMMERCIAL FLUORESCENT FIXTURES
         1. Type CNL: 2 lamp recessed night-light; McPhilben Lighting’s 93-25AFE, or Perfeclite Co.’s NL Series:

If these fixtures are used in fire rated gypsum walls check with architect to insure that these fixtures will be installed in such a manner that the ul fire rating of walls will be maintained.

Specific purpose ballast.

Cast aluminum louver backed with glass enclosure.

Bronze finish available.

Satin aluminum finish.

Vandal resistant fasteners, spanner style.

Lamps (F8T5/CW or F7TT/27K).

Use type cr-1 thru cr-7a for standard commercial type recessed fixtures.

* + - * 1. Type CR-1 thru CR-8: Commercial type recessed troffers:

Company and Series: Columbia Lighting Inc.’s 5000 Series, Day-Brite Lighting’s Designer Series, Guth Lighting’s Recessed Fluorescent Modules FSI, Holophane’s Highland Series Recessed Fluorescent Static Luminaires, Hubbell Lighting’s Versaline, Keene Corp.’s Moduline/ST, or Lightron of Cornwall’s Tarton III.

Electronic ballast.

Door Frame: Flush, hinged and latched, mitered corners, baked white enamel finish, minimum 20 gage steel or .060 inch extruded aluminum.

Lens:

IMA: Injection molded acrylic unpenetrated minimum .175 inches thick; American Louver Co.’s 48-2448 or 48-2448-01, Holophane’s 6251, or Keene Corp.’s 7769 (.175).

PL: American Louver Co.’s Paracube 1 99-2448 parabolic louver.

GL: ASG Crystal 70 glass.

| **TYPE** | **LAMPS** | **TROFFER SIZE** | **LENS** |
| --- | --- | --- | --- |
| CR-1 | 2 (F032/41K) | 1 x 4 | IMA |
| CR-1A | 2 (F032/41K) | 1 x 4 | PL |
| CR-2 | 3 (F032/41K) | 1 x 4 | IMA |
| CR-2A | 3 (F032/41K) | 1 x 4 | PL |
| CR-3 | 2 (F032/41K) | 2 x 4 | IMA |
| CR-3A | 2 (F032/41K) | 2 x 4 | PL |
| CR-4 | 3 (F032/41K) | 2 x 4 | IMA |
| CR-4A | 3 (F032/41K) | 2 x 4 | PL |
| CR-5 | 4 (F032/41K) | 2 x 4 | IMA |
| CR-5A | 4 (F032/41K) | 2 x 4 | PL |
| CR-6 | 2U (FB031/41K) | 2 x 2 | IMA |
| CR-6A | 2U (FB031/41K) | 2 x 2 | PL |
| CR-7 | 3U (FB031/41K) | 2 x 2 | IMA |
| CR-7A | 3U (FB031/41K) | 2 x 2 | PL |
| CR-8 | 2 (F032/41K) | 1 x 4 | GL |

* + - * 1. Type CRL-3: 3 lamp 2 x 4 foot commercial type recessed parabolic troffer; Columbia Lighting Inc.’s P4 Parabolume, or Lightron of Cornwall’s Series PB:

18 cell louver, 3 inches deep, hinged louver door assembly.

Use one of next 2 subparagraphs to suit application.

Electronic ballasts. Connect for multi-level illumination. For each pair of fixtures equip one fixture with one 2 lamp ballast, to operate the center lamp of each pair of fixtures. Also equip each fixture with a 2 lamp ballast to operate the outboard lamps:

Level 1: One lamp illuminated (center lamp).

Level 2: Two lamps illuminated (outboard lamps).

Level 3: Three lamps illuminated.

Electronic ballasts. For three-lamp operation equip fixtures with a single and two-lamp ballast or a 3 lamp ballast.

Lamps (F032/41K).

* + - * 1. Type CRL-4: 3 lamp 2 x 4 foot commercial type recessed parabolic troffer; Columbia Lighting Inc.’s Parabolume 4500 Series, or Lightron Of Cornwall’s Series PB:

18 cell louver, 4 inches deep, hinged louver door assembly.

Use one of next 2 subparagraphs to suit application.

Electronic ballasts. Connect for multi-level illumination. For each pair of fixtures equip one fixture with one, two-lamp ballast, to operate the center lamp of each pair of fixtures. Also equip each fixture with a two-lamp ballast to operate the outboard lamps:

Level 1: One lamp illuminated (center lamp).

Level 2: Two lamps illuminated (outboard lamps).

Level 3: Three lamps illuminated.

Electronic ballasts. For three-lamp operation equip fixtures with a single and two-lamp ballast or a 3 lamp ballast.

Lamps (F032/41K).

Use type cs-1 and cs-1a for standard surface or pendent mounted commercial type fixtures. Note: when using type cs-1 and cs-1a with metal surface raceway or exposed conduit, do not show more than one raceway entering each end of fixture (knockouts only on ends).

* + - * 1. Type CS-1 and CS-1A: Commercial type surface mounted fixture with injection molded acrylic wraparound diffuser:

Company and Series: Holophane’s Prismwrap K7100-4, Keene Corp.’s Celebrity/SU CBS-240, Lightron of Cornwall’s Series 71, or Prudential Lighting Corp.’s P1602/4-HL.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| CS-1 | 2 (F032/41K) | 1 x 4 |
| CS-1A | 4 (F032/41K) | 2 x 4 |

When using surface mounted fixtures in stairwells, entrances or lobbies use type cs-2, cs-2a or other suitable fixture with glass lens.

* + - * 1. Type CS-2 and CS-2A: Commercial type surface mounted fixture with C-70 pattern tempered glass lens .125 inches thick:

Company and Series: Lightron of Cornwall’s Series S.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| CS-2 | 2 (F032/41K) | 1 x 4 |
| CS-2A | 2 (F20T12D35) | 1 x 2 |

* + - * 1. Type CS-3: 2 lamp round drum style surface mounted ceiling fixture with white acrylic diffuser; Brownlee Lighting’s Summit 215, or Progress Lighting’s P7376:

Specific purpose ballast.

Lamps (F13TT/27K).

Type cw-1 also available with pull switch, convenience outlet, uplight, other finishes.

* + - * 1. Type CW-1: 2 lamp 4 foot wall mounted fixture with acrylic diffuser (no uplight) and painted white finish; Keene Corp.’s Decorline/WA, or Miller Co.’s PV 2110-04:

Electronic ballast.

Lamps (F032/41K).

* + - * 1. Type CW-2: 1 lamp 4 foot wall mounted fixture with 100 percent uplight, 0 percent downlight, and fawn brown finish; Litecontrol Corp.’s MOD-66-II Wall Asymmetric Indirect:

Electronic ballast.

Lamps (F032/41K).

* + - * 1. Type CW-3: 2 lamp 4 foot wall mounted fixture with down light acrylic diffuser, 50 percent uplight, and fawn brown finish; Litecontrol Corp.’s MOD-66-II Wall Indirect/Direct:

Electronic ballast.

Lamps (F032/41K).

When using wall mounted fixtures in stairwells, use type cw-4, cw-4a or other suitable fixture with tempered glass lens.

* + - * 1. Type CW-4 and CW-4A: Wall mounted triangular (cross section) fixture with C-70 pattern tempered glass lens .125 inches thick:

Company and Series: Lightron of Cornwall’s Series 94.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| CW-4 | 2 (F032/41K) | 4 foot |
| CW-4A | 2 (F017/41K) | 2 foot |

* + - 1. INDUSTRIAL FLUORESCENT FIXTURES

Use type if-1 for standard 2 lamp industrial type fixture.

* + - * 1. Type IF-1 and IF-1A: Industrial type fixture with porcelain enamel reflector (10 percent uplight):

Company and Series: Day-Brite Lighting’s FL Series, Hubbell Lighting’s Crown IC, or Lightron of Cornwall’s 92T-POR.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** | **OTHER** |
| --- | --- | --- | --- |
| IF-1 | 2 (F032/41K) | 1 x 4 | - |
| IF-1A | 2 (F032/41K) | 1 x 4 | WireGuard |

* + - * 1. Type IX-1 and IX-1A: Enclosed and gasketed vaportight industrial type fixture suitable for use in Class I, Division 2 hazardous locations, clear tempered glass lens, end connections for through feed wiring:

Company and Series: Crouse-Hinds Co.’s FVN Series, or Rig-A-Lite Co.’s HEF Series.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** | **OTHER** |
| --- | --- | --- | --- |
| IX-1 | 2 (F032/41K) | 4 foot | - |
| IX-1A | 2 (F032/41K) | 4 foot | 45 degree angle mounting brackets |

* + - * 1. Type IX-2: 2 lamp pendent mounted cast aluminum explosion proof industrial type fixture suitable for use in Class I - Division 1 hazardous locations, with reflector (interior finished with baked white enamel, remainder of fixture finished with grey epoxy); Appleton Electric Co.’s ARS 240 Series, Crouse-Hinds Co.’s EVF Series, or Rig-A-Lite Co.’s XP Series.

Electronic ballast.

Lamps (F032/41K).

* + - * 1. Type IW: Single lamp, vapor tight, industrial type fixture with glass globe and cast guard; Crouse-Hinds Co.’s Type VF, or Day-Brite/Benjamin’s Protected Fluorescent Vapolets:

Specific purpose ballast.

Lamp (F9TT/27K).

Mounting designed for:

IW-1 Wall bracket.

IW-2 - Ceiling, surface.

IW-3 - Pendant.

* + - 1. MISCELLANEOUS FLUORESCENT FIXTURES

Type ig is suitable for use in heated wet location, and has been used in correction facility greenhouses.

* + - * 1. Type IG: 4 lamp 8 foot fixture with gasketed vandal resistant clear lens, UL listed suitable for wet locations; LPI’s EG Series 111801:

Electronic ballast.

Lamps (F032/41K).

Type rc-1 is suitable for areas where the temperature will not go below 40 degrees f., such as in a cooler.

* + - * 1. RC-1: Two lamp, 4 foot ceiling mounted fixture (UL listed suitable for Wet Locations); Columbia Lighting Inc.’s 4700 Series, or Keene Lighting Products’ Cleanlite:

0 degree F ballast.

Lamps (F4OCW).

Type rf-1 is suitable for use in refrigerators or other applications where the temperature is not expected to go below 0 degrees f. If not used in refrigerator, fixture must be mounted 1-1/2 inches off surface.

* + - * 1. Type RF-1: Two lamp, 4 foot ceiling mounted fixture (UL listed suitable for Wet Locations); Columbia Lighting Inc.’s 4700 Series, or Keene Lighting Products’ Cleanlite:

-20 degrees F ballast.

These lamps are rated 60 watts each, 800 ma., recessed double contact. For design guide use 150 watts total load per fixture. Use 4300 lumens per lamp as design guide.

Lamps (F48T12/CW/HO).

Type fz-1 and fz-2 are suitable for use in freezers or other applicable down to -20 degrees f. If not used in freezer, fixture must be mounted 6 inches off surface.

* + - * 1. Type FZ-1: One lamp, 4 foot ceiling mounted fixture (UL listed suitable for Wet Locations); Metalux Lighting’s AVTL Series, or Paramount Industries Inc.’s Lume:

-20 degrees F ballast.

This lamp is rated 115 watts, 1500 ma., recessed double contact. For design guide use 135 watts total load per fixture for type fz-1. Use 7000 lumens for the lamp as design guide.

Lamp (F48T12/CW/VHO/LT).

* + - * 1. Type FZ-2: Two lamp, 4 foot ceiling mounted fixture (UL listed suitable for Wet Locations); Metalux Lighting’s AVTL Series or Paramount Industries Inc.’s Lume.

-20 degrees F ballast.

These lamps are rated 115 watts each, 1500 ma., recessed double contact. For design guide use 242 watts total load per fixture. Use 7000 lumens per lamp as design guide.

Lamp (F48T12/CW/VHO/LT).

The fixtures in the next 8 subparagraphs are fixtures suitable for docs medical units.

Type uc in the next 3 paragraphs means under-cabinet.

* + - * 1. Type UC-2: 1 lamp 2-foot under-cabinet fixture with acrylic diffuser and white finish; ALKCO SF317.
        2. Type UC-3: 1 lamp 3-foot under-cabinet fixture with acrylic diffuser and white finish; ALKCO SF325, GUTH ACR 72:

Electronic ballast.

Lamps (F025/35K).

* + - * 1. Type UC-4: 1 lamp 4-foot under-cabinet fixture with acrylic diffuser and white finish; ALKCO SF332, GUTH ACR 72:

Electronic ballast.

Lamps (F032/41K).

Use paragraph below for film illuminator for x-rays.

* + - * 1. Type FI: 2 lamp (F15T8D) film illuminator suitable for surface mounting having a 14 x 17 inch viewing panel with toggle switch mounted in upper front panel, separate ballast and starter for each lamp and exit on rear of fixture to allow for hard wiring; Maxant’s 200 Series.

Use paragraph below for night light.

* + - * 1. TYPE NL: 2 lamp (13W) recessed night light, cast aluminum louver or ribbed guard backed with glass enclosure satin aluminum finish and vandal resistant fasteners; McPhilben Lighting’s 942 RGD.

Use paragraph below for x-ray room sign.

* + - * 1. Type XRIU: 2 lamp (PL-7) directional signage with message “X-RAY IN USE” in green on white stencil. Suitable for surface mounting and operation on 120V; ALKCO AC-2.

Use paragraph below for inside handicapped accessible shower stalls.

* + - * 1. Type SF: 2 lamp recessed light suitable for wet locations; Lightron of Cornwall’s Series 129 having:

Lamps (13WCFL).

16 gage die formed steel housing and door.

.375 clear polycarbonate lens.

Vandal Resistant Fasteners: Security head Torx center pin.

Use paragraph below for dark room sign.

* + - * 1. Type DRIU: Two-lamp (PL-7) signage with message “DARK ROOM IN USE” in green on white stencil. Suitable for surface mounting and operation on 120V; ALKCO’s AC-2.
      1. VANDAL RESISTANT FLUORESCENT FIXTURES

Use type vh for standard hose light fixture.

* + - * 1. Type VH: Kenall Mfg. Co.’s 6521/9637-T Series:

Two lamps (F5TT/27K).

Two specific purpose ballasts.

The word “HOSE” imprinted in red (6 inch high letters).

Vandal resistant fasteners (spanner style).

Include subparagraph below for damp locations.

Gasket.

Mounting designed for:

VH 2 - Wall, surface.

VH 3 - Wall, extended (end mount), single face.

VH 4 - Ceiling, single face.

VH 6 - Wall, extended (end mount), double face.

VH 7 - Ceiling, double face.

* + - * 1. Type VS-1: 1 lamp vandal resistant surface mounted fixture, suitable for indoor and outdoor use, gasketed prismatic polycarbonate diffuser, with vandal resistant fasteners (spanner style); Kenall Mfg. Co. Inc.’s 7100 Series:

Electronic ballast.

Lamps (F032/41K).

Use type vs-2 where a surface mounted vandal resistant and/or gasketed type fixture is required. Available with 0 degrees f ballast (specify suitable lamps). Clear diffuser available from kenall.

* + - * 1. Type VS-2: 2 lamp vandal resistant surface mounted fixture, suitable for indoor and outdoor use, gasketed prismatic polycarbonate diffuser secured with vandal resistant fasteners (spanner style); Fail-Safe Lighting Systems Inc.’s Series FPS, Kenall Mfg. Co. Inc.’s 7200 Series, Lightron of Cornwall’s Series VPF, Marvin Electric Mfg. Co.’s Marco Durathon II Series N448019:

Electronic ballast.

Lamps (F032/41K).

Type vs-2a is suitable for use in shower rooms or other areas such as refrigerated rooms that are subject to condensation type moisture conditions.

For refrigerated rooms specify 0 degree ballast and suitable lamps.

For wet locations, specify painted stainless steel backplate if additional durability is desired. Allow an additional 6 weeks for delivery.

* + - * 1. Type VS-2A: 2 lamp vandal resistant surface mounted fixture, suitable for indoor use (UL listed suitable for wet locations), with gasketed polycarbonate prismatic diffuser secured with vandal resistant fasteners (spanner style); Fail-Safe Lighting Systems Inc.’s Series FPS, or Kenall Mfg. Co. Inc.’s 7200 Series:

Electronic ballast.

Lamps (F032/41K).

* + - * 1. Type VS-3: 1 lamp wall mounted vandal resistant fixture with prismatic polycarbonate diffuser and vandal resistant fasteners (spanner style); Fail-Safe Lighting Systems Inc.’s Series FBP, Kenall Mfg. Co. Inc.’s Mighty Lite 3707 Series, or Lightron of Cornwall’s VP58/7F Series.

Specific purpose ballast.

Lamp (F7TT/27K).

* + - * 1. Type VS-4: 2 lamp surface mounted fixture, suitable for indoor and outdoor use, gasketed prismatic polycarbonate diffuser secured with vandal resistant fasteners (spanner style); Kenall Mfg. Co. Inc.’s 4400 Series, or Fail-Safe Lighting System Inc.’s Series FSP:

Specific purpose ballast.

Lamps: Two (FC8T9/CW/RS) or two F18DTT/27K.

* + - * 1. Type VS-5: One or 2 lamp round drum style surface mounted ceiling fixture, with prismatic polycarbonate diffuser and vandal resistant fasteners (spanner style); Energy Conservation Products’ Series 420/422, Femco’s Vandal VR, or Lightron of Cornwall’s VPR Series:

Specific purpose ballast.

Lamps: One FC12T9/CW/RS or two F13TT/27K.

* + - * 1. Type VS-5A: One or 2 lamp square style surface mounted ceiling fixture, with prismatic polycarbonate diffuser and vandal resistant fasteners (spanner style); Kenall Mfg. Co. Inc.’s 3800 Series, or Lightron of Cornwall’s VPF-12 Series:

Specific purpose ballast.

Lamps: One FC12T9/CW/RS or two F13TT/27K.

Type vw-1 also available 18 inches (2 15w f15t8/cw lamps), 24 inches (2 20w f20t12d35 lamps), 36 inches (2 30w f30t12/cw/rs lamps), uplight, continuous row, pull switch, convenience outlet.

* + - * 1. Type VW-1: 2 lamp 4 foot wall mounted vandal resistant fixture, polycarbonate diffuser (no uplight), vandal resistant fasteners (spanner style); Fail-Safe Lighting System Inc.’s FWW Series:

Electronic ballast.

Lamps (F032/41K).

* + - * 1. Type VW-2: One lamp flat rectangular wall mounted fixture with prismatic polycarbonate diffuser and vandal resistant fasteners (spanner style); Brownlee Lighting’s Chapman 105, or Kenall Mfg. Co. Inc.’s 2000 Series:

Specific purpose ballast.

Lamp (F13TT/27K).

* + - * 1. Type VW-3: 2 lamp small fluorescent wall cylinder fixture with white polycarbonate diffuser; Femco’s Centurion VR Series, or Marvin Electric Co.’s Marco BNF2 Series:

Specific purpose ballast.

Lamps (F9TT/27K).

* + - 1. MINIMUM SECURITY FLUORESCENT FIXTURES
         1. Type MNR-1 thru MNR-7: Recessed minimum security lighting fixture:

Company and Series: Fail-Safe Lighting System Inc.’s FMR Series, Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17500 Series, Lightron of Cornwall’s 60F-19G Series, Mark Lighting Fixture Co. Inc.’s CP4-MD-R Series, Morlite Equipment Co.’s Empire Collection FMIN Series.

Housing: Minimum 19 gage steel.

Door Frame: Minimum 16 gage one piece steel frame with full length continuous piano hinge.

Lens Retention System: 16 gage (minimum) steel L-angles, full length and continuous on sides and ends, secured with machine screws.

Lens System: Consisting of 3 layers:

Environmental Side: .187 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted or welded to housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| MNR-1 | 2 (F032/41K) | 1 x 4 |
| MNR-2 | 3 (F032/41K) | 1 x 4 |
| MNR-3 | 2 (F032/41K) | 2 x 4 |
| MNR-4 | 3 (F032/41K) | 2 x 4 |
| MNR-5 | 4F032/41K) | 2 x 4 |
| MNR-6 | 2U (FB031/41K) | 2 x 2 |
| MNR-7 | 2 (F017/41K) | 1 x 2 |

* + - * 1. Type MNS-1 Thru MNS-7: Surface mounted minimum security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FMS Series, Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17700 Series, Lightron of Cornwall’s 60S-19G Series, Mark Lighting Fixture Co. Inc.’s CP4-MD-S Series, or Morlite Equipment Co.’s Empire Collection SH Series.

Housing: Minimum 19 gage welded steel.

Door and Frame: Minimum 16 gage one piece steel frame with full length continuous piano hinge bolted to door and housing.

Lens Retention System: 16 gage (minimum) steel L-angles, full length and continuous on sides and ends, secured with machine screws.

Lens System: Consisting of 3 layers:

Environmental Side: .187 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

|  |  |  |
| --- | --- | --- |
| **TYPE** | LAMPS | **NOMINAL SIZE** |
| MNS-1 | 2 (F032/41K) | 1 x 4 |
| MNS-2 | 3 (F032/41K) | 1 x 4 |
| MNS-3 | 2 (F032/41K) | 2 x 4 |
| MNS-4 | 3 (F032/41K) | 2 x 4 |
| MNS-5 | 4 (F032/41K) | 2 x 4 |
| MNS-6 | 2U (FB031/41K) | 2 x 2 |
| MNS-7 | 2 (F017/41K) | 1 x 2 |

Coordinate the following fixtures with section 095324 suspended metal panel ceiling system when recessed grid mounted minimum security lighting fixtures are required.

* + - * 1. Type MNRG-3 thru MDRG-6: Recessed grid mounted minimum security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FSR-TG Series, or Kenall Mfg. Co. Inc.’s RGD Series.

Housing: Minimum 18 gage welded steel.

Door Frame: Minimum 16 gage one piece steel frame with full length continuous piano hinge.

Lens Retention System: 16 gage (minimum) steel L-angles, full length and continuous on sides and ends, secured with machine screws.

Lens System: Consisting of 3 layers:

Environmental Side: .187 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted or welded to housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

For three lamp operation equip fixtures with a 3 lamp ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| MNRG-3 | 2 (F032/41K) | 2 x 4 |
| MNRG-4 | 3 (F032/41K) | 2 x 4 |
| MNRG-5 | 4 (F032/41K) | 2 x 4 |
| MNRG-6 | 2U (FB031/41K) | 2 x 2 |

* + - 1. MEDIUM SECURITY LIGHTING FIXTURES
         1. Type MDR-1 Thru MDR-7: Recessed medium security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FMR-D Series, Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17500 Series, Lightron of Cornwall’s 60F-16G Series, Mark Lighting Fixture Co. Inc.’s CP4-MX-R Series, Morlite Equipment Co.’s Empire Collection FMED Series.

Housing: Minimum 16 gage welded steel.

Door Frame: 16 gage (minimum) steel, one piece die formed door and fixture trim with full length 16 gage continuous piano hinge welded to frame and bolted to housing.

Lens Retention System: Double 16 gage (minimum) steel L-angles, full length and continuous on sides and ends, secured together with machine screws with provisions for adjustment to accommodate various lens thicknesses and combinations.

Lens System: Consisting of 3 layers:

Environmental Side: .250 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted or welded to housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| MDR-1 | 2 (F032/41K) | 1 x 4 |
| MDR-2 | 3 (F032/41K) | 1 x 4 |
| MDR-3 | 2 (F032/41K) | 2 x 4 |
| MDR-4 | 3 (F032/41K) | 2 x 4 |
| MDR-5 | 4 (F032/41K) | 2 x 4 |
| MDR-6 | 2U (FB031/41K) | 2 x 2 |
| MDR-7 | 2 (F017/41K) | 1 x 2 |

* + - * 1. Type MDS-1 Thru MDS-7: Surface mounted medium security fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FMS-D Series, Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17700 Series, Lightron of Cornwall’s 60S-16G Series, Mark Lighting Fixture Co. Inc.’s CP4-MX-S Series, or Morlite Equipment Co.’s Empire Collection SMH Series.

Housing: Minimum 16 gage steel, die formed and welded with exposed corners ground smooth and filled.

Door Frame: 16 gage (minimum) steel, one piece die formed door with full length 16 gage continuous piano hinge welded to frame and bolted to housing.

Lens Retention System: Double 16 gage (minimum) steel L-angles, full length and continuous on sides and ends, secured together with machine screws with provisions for adjustment to accommodate various lens thicknesses and combinations.

Lens System: Consisting of 3 layers:

Environmental Side: .250 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted or welded to housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| MDS-1 | 2 (F032/41K) | 1 x 4 |
| MDS-2 | 3 (F032/41K) | 1 x 4 |
| MDS-3 | 2(F032/41K) | 2 x 4 |
| MDS-4 | 3 (F032/41K) | 2 x 4 |
| MDS-5 | 4 (F032/41K) | 2 x 4 |
| MDS-6 | 2U (FB031/41K) | 2 x 2 |
| MDS-7 | 2 (F017/41K) | 1 x 2 |

Coordinate the following fixtures with section 095324 suspended metal panel ceiling system when recessed grid mounted medium security lighting fixtures are required.

* + - * 1. Type MDRG-3 thru MDRG-6: Recessed grid mounted medium security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FSR-TG Series, or Kenall Mfg. Co. Inc.’s RGD Series.

Housing: Minimum 16 gage welded steel.

Door Frame: Minimum 16 gage one piece steel frame with full length continuous piano hinge.

Lens Retention System: 16 gage (minimum) steel L-angles, full length and continuous on sides and ends, secured with machine screws.

Lens System: Consisting of 3 layers:

Environmental Side: .25 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted or welded to housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

For three lamp operation equip fixtures with a 3 lamp ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| MDRG-3 | 2 (F032/41K) | 2 x 4 |
| MDRG-4 | 3 (F032/41K) | 2 x 4 |
| MDRG-5 | 4 (F032/41K) | 2 x 4 |
| MDRG-6 | 2U (FB031/41K) | 2 x 2 |

* + - 1. MAXIMUM SECURITY FLUORESCENT FIXTURES
         1. Type MXR-1 Thru MXR-7A: Recessed maximum security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FMR-X Series, Holcor Corp.’s PRF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17500 Series, Lightron of Cornwall’s 60F-14G Series, Mark Lighting Fixture Co. Inc.’s CP-4-MX-R Series, Morlite Equipment Co.’s Empire Collection TG Series.

Housing: Minimum 14 gage welded steel.

Door Frame: 14 gage (minimum) steel, one piece die formed door and fixture trim, with full length 16 gage continuous piano hinge welded to frame and bolted to housing.

Lens Retention System: Minimum 14 gage angles, full length and continuous on sides and ends, secured to door with minimum 1/4-20 threaded studs and nuts. Studs welded to door. Minimum stud spacing 10 inches on center (sides), minimum 2 studs per end.

PPC Lens System: Consisting of 3 layers.

Environmental Side: .375 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

CTG Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear tempered glass.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **TROFFER SIZE** | **LENS** |
| --- | --- | --- | --- |
| MXR-1 | 2 (F032/41K) | 1 x 4 | PPC |
| MXR-1A | 2 (F032/41K) | 1 x 4 | CTG |
| MXR-2 | 3 (F032/41K) | 1 x 4 | PPC |
| MXR-2A | 3 (F032/41K) | 1 x 4 | CTG |
| MXR-3 | 2 (F032/41K) | 2 x 4 | PPC |
| MXR-3A | 2 (F032/41K) | 2 x 4 | CTG |
| MXR-4 | 3 (F032/41K) | 2 x 4 | PPC |
| MXR-4A | 3 (F032/41K) | 2 x 4 | CTG |
| MXR-5 | 4 (F032/41K) | 2 x 4 | PPC |
| MXR-5A | 4 (F032/41K) | 2 x 4 | CTG |
| MXR-6 | 2U (FB031/41K) | 2 x 2 | PPC |
| MXR-6A | 2U (FB031/41K) | 2 x 2 | CTG |
| MXR-7 | 2 (F017/41K) | 1 x 2 | PPC |
| MXR-7A | 2 (F017/41K) | 1 x 2 | CTG |

Coordinate the following fixtures with section 095324 suspended metal panel ceiling system when recessed grid mounted maximum security lighting fixtures are required.

* + - * 1. Type MXRG-3 thru MXRG-6A: Recessed grid mounted maximum security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FSR-TG Series, or Kenall Mfg. Co. Inc.’s RGD Series.

Housing: Minimum 16 gage welded steel.

Door Frame: 14 gage (minimum) steel, one piece die formed door and fixture trim, with full length 16 gage continuous piano hinge welded to frame and bolted to housing.

Lens Retention System: Minimum 14 gage angles, full length and continuous on sides and ends, secured to door with minimum 1/4-20 threaded studs and nuts. Studs welded to door. Minimum stud spacing 10 inches on center (sides), minimum 2 studs per end.

PPC Lens System: Consisting of 3 layers.

Environmental Side: .375 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

CTG Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear tempered glass.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate housing.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

For three lamp operation equip fixtures with a 3 lamp ballast.

| **TYPE** | **LAMPS** | **TROFFER SIZE** | **LENS** |
| --- | --- | --- | --- |
| MXRG-3 | 2 (F032/41K) | 2 x 4 | PPC |
| MXRG-3A | 2 (F032/41K) | 2 x 4 | CTG |
| MXRG-4 | 3 (F032/41K) | 2 x 4 | PPC |
| MXRG-4A | 3 (F032/41K) | 2 x 4 | CTG |
| MXRG-5 | 4 (F032/41K) | 2 x 4 | PPC |
| MXRG-5A | 4 (F032/41K) | 2 x 4 | CTG |
| MXRG-6 | 2U (FB031/41K) | 2 x 2 | PPC |
| MXRG-6A | 2U (FB031/41K) | 2 x 2 | CTG |

* + - * 1. Type MXS-1 Thru MXS-7A: Surface mounted maximum security lighting fixture:

Company and Series: Fail-Safe Lighting Systems Inc.’s FUS Series, Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17700 Series, Lightron of Cornwall’s 60S-14G Series, Mark Lighting Fixture Co. Inc.’s CP4-MX-S Series, Morlite Equipment Co.’s Empire Collection SX Series.

Backplate Assembly: Minimum 14 gage die formed reinforced steel pan.

Housing/Door: Minimum 14 gage die formed steel with continuously welded seams ground smooth. Minimum 16 gage full-length continuous steel piano hinge welded to housing/door and bolted to backplate assembly.

Lens Retention System: Minimum 14 gage angles, full length and continuous on sides and ends, secured to housing/door with minimum 1/4-20 threaded studs and nuts. Studs welded to housing/door. Minimum stud spacing 10 inches on center (sides), minimum 2 studs per end.

PPC Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

CTG Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear tempered glass.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate assembly.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **TROFFER SIZE** | **LENS** |
| --- | --- | --- | --- |
| MXS-1 | 2 (F032/41K) | 1 x 4 | PPC |
| MXS-1A | 2 (F032/41K) | 1 x 4 | CTG |
| MXS-2 | 3 (F032/41K) | 1 x 4 | PPC |
| MXS-2A | 3 (F032/41K) | 1 x 4 | CTG |
| MXS-3 | 2 (F032/41K) | 2 x 4 | PPC |
| MXS-3A | 2 (F032/41K) | 2 x 4 | CTG |
| MXS-4 | 3 (F032/41K) | 2 x 4 | PPC |
| MXS-4A | 3 (F032/41K) | 2 x 4 | CTG |
| MXS-5 | 4 (F032/41K) | 2 x 4 | PPC |
| MXS-5A | 4 (F032/41K) | 2 x 4 | CTG |
| MXS-6 | 2U (FB031/41K) | 2 x 2 | PPC |
| MXS-6A | 2U (FB031/41K) | 2 x 2 | CTG |
| MXS-7 | 2 (F017/41K) | 1 x 2 | PPC |
| MXS-7A | 2 (F017/41K) | 1 x 2 | CTG |

* + - * 1. Type MXS-8 and 8A: Surface mounted maximum security lighting fixture:

Company and Series: Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17700 Series, Lightron of Cornwall’s 60S-14SS Series, Mark Lighting Fixture Co. Inc.’s CPSS4-MX-S Series, Morlite Equipment Co.’s Empire Collection SX Series.

Backplate Assembly: Minimum 14 gage die formed reinforced stainless steel pan.

Housing/Door: Minimum 14 gage die formed stainless steel with continuously welded seams ground smooth. Minimum 16 gage full length continuous stainless steel piano hinge welded to housing/door and bolted to backplate assembly.

Lens Retention System: Minimum 14 gage stainless steel angles, full length and continuous on sides and ends, secured to housing/door with minimum 1/4-20 threaded stainless steel studs and nuts. Studs welded to housing/door. Minimum stud spacing 10 inches on center (sides), minimum 2 studs per end.

Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate assembly.

Finish: Natural stainless steel.

Gasketed and UL listed for use in wet locations.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| MXS-8 | 2 (F032/41K) | 1 x 4 |
| MXS-8A | 2 (F017/41K) | 1 x 2 |

* + - * 1. Type MXW-1 Thru MXW-7: Wall mounted maximum security lighting fixture:

Company and Series: Holcor Corp.’s PSF Series, Kenall Mfg. Co. Inc.’s Mighty Mac 17100 Series, Lightron of Cornwall’s 61W-14SS Series, Fail-Safe Lighting Systems Inc.’s FMW Series, Mark Lighting Fixture Co. Inc.’s CPSS4-MX-MUD Series, Morlite Equipment Co.’s Empire Collection WX Series.

Backplate Assembly: Minimum 14 gage die formed reinforced steel pan.

Housing/Door: Minimum 14 gage die formed stainless steel with continuously welded seams ground smooth. Minimum 16 gage full length continuous steel piano hinge welded to housing/door and bolted to backplate assembly.

Lens Retention System: Minimum 14 gage steel angles, full length and continuous on sides and ends, secured to housing/door with minimum 1/4-20 threaded studs and nuts. Studs welded to housing/door. Stud spacing maximum 10 inches on center (sides), minimum 2 studs per end.

PPC Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

CTG Lens System: Consisting of 3 layers:

Environmental Side: .375 inch thick clear tempered glass.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate assembly.

Finish: Natural stainless steel (housing/door); baked white enamel (backplate assembly, lens retention system).

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NO. UP** | **NO. DOWN** | **LENGTH** | **LENS** |
| --- | --- | --- | --- | --- | --- |
| MXW-1 | (F032/41K) | 1 | 1 | 4 feet | PPC |
| MXW-1A | (F032/41K) | 1 | 1 | 4 feet | CTG |
| MXW-2 | (F032/41K) | 1 | 2 | 4 feet | PPC |
| MXW-3 | (F017/41K) | 2 | 2 | 2 feet | PPC |
| MXW-4 | (F30T12/CW/RS/SS) | 1 | 2 | 3 feet | PPC |
| MXW-5 | (F032/41K) | 0 | 2 | 4 feet | PPC |
| MXW-6 | (F017/41K) | 0 | 2 | 2 feet | PPC |
| MXW-7 | (F30T12/CW/RS/SS) | 0 | 2 | 3 feet | PPC |

Use the following fixtures for department of corrections projects requiring super-maxi fixtures.

* + - 1. SUPER-MAXIMUM SECURITY FLUORESCENT FIXTURES
         1. Type XXS-1 and XXS-2: Severe location surface mounted, maximum security lighting fixture:

Company and Series: Holcor Corp.’s PSF Series, Fail-Safe Lighting Systems Inc.’s FUS Series, or Lightron of Cornwall’s 60 Series, Kenall’s Mighty Mac SSA Series.

Backplate Assembly: Minimum 12 gage die formed reinforced steel pan. Eight mounting holes recessed a minimum 1/8 inch below mounting plate’s perimeter edge.

Housing/Door: Minimum 12 gage die formed steel with continuously welded seams ground smooth. Minimum 16 gage full-length continuous steel piano hinge welded to housing/door and bolted to backplate assembly.

Lens Retention System: Minimum 12 gage steel angles, full length and continuous on sides and ends, secured to housing/door with minimum 1/4-20 threaded studs and nuts. Studs welded to housing/door. Minimum stud spacing 8 inches on center (sides), minimum 2 studs per end. Lens drilled to fit over studs with minimum 1 inch engagement on all sides.

Lens System: Consisting of 3 layers:

Environmental Side: .500 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket with Plug thru Wiring.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate assembly.

Delete item below if not required.

Night light with PL-9 watt (F9TT/27K) fluorescent lamp where indicated on drawings.

Finish: Baked white enamel.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **Type** | **Lamps** | **Nominal Size** |
| --- | --- | --- |
| XXS-1 | 2 (F032/41K) | 1 x 4 |
| XXS-2 | 3 (F032/41K) | 1 x 4 |

* + - * 1. Type XXS-8: Severe location surface mounted, maximum security lighting fixture:

Company and Series: Holcor Corp.’s PSF Series, Fail-Safe Lighting Systems, Inc.’s FUS Series, or Lightron of Cornwall’s 60 Series, Kenall’s Might Mac SSA Series.

Backplate Assembly: Minimum 12 gage die formed reinforced stainless steel pan. Eight mounting holes offset with a 1/8 inch difference between the offset base and the mounting plates perimeter edge.

Housing/Door: Minimum 12 gage die formed stainless steel with continuously welded seams ground smooth. Minimum 16 gage full length continuous stainless steel piano hinge welded to housing/door and bolted to backplate assembly.

Lens Retention System: Minimum 12 gage stainless steel angles, full length and continuous on sides and ends, secured to housing/door with minimum 1/4-20 threaded stainless steel studs and nuts. Studs welded to housing/door. Minimum stud spacing 8 inches on center (sides), minimum 2 studs per end. Lens drilled to fit over studs with minimum 1 inch engagement on all sides.

Lens System: Consisting of 3 layers:

Environmental Side: .500 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket with Plug thru Wiring.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate assembly.

Finish: Natural stainless steel.

Gasketed, UL listed and labeled for use in wet locations.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NOMINAL SIZE** |
| --- | --- | --- |
| XXS-8 | 2 (F032/41K) | 1 x 4 |

* + - * 1. Type XXW-6: Severe location wall mounted, maximum security lighting fixture:

Company and Series: Holcor Corp.’s PWF Series, Fail-Safe Lighting Systems Inc.’s FMW Series, or Lightron of Cornwall’s 60 Series, Kenall’s Mighty Mac WCH Series.

Backplate Assembly: Minimum 12 gage die formed reinforced steel pan. Eight mounting holes offset with a 1/8 inch difference between the offset base and the mounting plates perimeter edge.

Housing/Door: Minimum 12 gage die formed stainless steel with continuously welded seams ground smooth. Minimum 16 gage full length continuous steel piano hinge welded to housing/door and bolted to backplate assembly.

Lens Retention System: Minimum 12 gage steel angles, full length and continuous on sides and ends, secured to housing/door with minimum 1/4-20 threaded studs and nuts. Studs welded to housing/door. Minimum stud spacing 8 inches on center (sides), minimum 2 studs per end. Lens drilled to fit over studs with minimum 1 inch engagement on all sides.

Lens System: Consisting of 3 layers:

Environmental Side: .500 inch thick clear polycarbonate.

Middle: .125 inch thick injection molded prismatic acrylic.

Fixture Side: .005 inch thick ultra-violet absorbing overlay.

Lamp Socket with Plug thru Wiring.

Lamp Socket Mounting: Lamp sockets bolted to bridge, bridge bolted to backplate assembly.

Finish: Natural stainless steel (housing/door); baked white enamel (backplate assembly, lens retention system).

UL listed and labeled for use in damp locations.

Vandal Resistant Fasteners: Security head Torx center pin.

Electronic ballast.

| **TYPE** | **LAMPS** | **NO. UP** | **NO. DOWN** | **LENGTH** |
| --- | --- | --- | --- | --- |
| XXW-6 | 2 (F017/41K) | 0 | 2 | 2 feet |

* + - 1. MATERIALS
         1. Metal Parts:

Free of burrs and sharp corners and edges.

Sheet metal components shall be steel unless otherwise indicated.

Form and support to prevent warping and sagging.

* + - * 1. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
        2. Diffusers and Globes:

[**Tempered Fresnel glass**] [**prismatic glass**] [**diffuse glass**] [**clear glass**] [**prismatic acrylic**] [**clear, UV-stabilized acrylic**].

Retain "Glass" subparagraph below if first, second, third, or fourth option in "Diffusers and Globes" subparagraph above is retained.

Glass: Annealed crystal glass unless otherwise indicated.

Retain "Acrylic Diffusers" subparagraph below if fifth or sixth option in "Diffusers and Globes" subparagraph above is retained.

Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

Retain "Lens Thickness" subparagraph below for both glass and acrylic diffusers.

Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

* + - * 1. Housings:

[**Extruded-aluminum**] <**Insert material**> housing and heat sink.

[**Clear**] <**Insert color**> [**anodized**] [**powder-coat**] [**painted**] finish.

* + - * 1. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

Label shall include the following lamp characteristics:

"USE ONLY" and include specific lamp type.

Lamp diameter, shape, size, wattage, and coating.

CCT and CRI for all luminaires.

* + - 1. METAL FINISHES
         1. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.
      2. LUMINAIRE SUPPORT COMPONENTS
         1. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish shall match luminaire.
         2. Wires: ASTM A641, Class 3, soft temper, zinc-coated steel, [**12 gage**] <**Insert size**>.
         3. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
         4. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation.
          3. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. TEMPORARY LIGHTING
          1. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.
       3. INSTALLATION
          1. Comply with NECA 1.
          2. Remote Mounting of Ballasts: Distance between the ballast and luminaire shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
          3. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
          4. Install lamps in each luminaire.
          5. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them.
          6. Supports:

Sized and rated for luminaire weight.

Able to maintain luminaire position after cleaning and relamping.

Provide support for luminaire without causing deflection of ceiling or wall.

Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

NFPA 70 requires minimum support for luminaires. Retain "Ceiling-Grid-Mounted Luminaire Supports" paragraph below for more specific support requirements and for requirements exceeding code minimums. For projects requiring seismic design, additional supports, and restraining devices beyond those specified here may be required.

* + - * 1. Ceiling-Grid-Mounted Luminaire Supports: Use grid as a support element.

Install ceiling support system rods or wires[**, independent of the ceiling suspension devices,**] for each luminaire. Locate not more than 6 inches from luminaire corners.

Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.

Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

Retain subparagraph below if Project requires seismic design.

Install at least one independent support rod or wire from structure to a tab on luminaire. Wire or rod shall have breaking strength of the luminaire weight at a safety factor of 3.

Retain "Flush-Mounted Luminaire Support" for luminaires installed flush with finished ceiling.

* + - * 1. Flush-Mounted Luminaire Support:

Secured to outlet box.

Attached to ceiling structural members at four points equally spaced around circumference of luminaire.

Trim ring flush with finished surface.

* + - * 1. Wall-Mounted Luminaire Support:

[**Attached to structural members in walls**] [**Attached to a minimum 20 gauge backing plate attached to wall structural members**] [**Attached using through bolts and backing plates on either side of wall**] <**Insert means of attachment**>.

Do not attach luminaires directly to gypsum board.

* + - * 1. Suspended Luminaire Support:

Pendants and Rods: Where longer than 48 inches, brace to limit swinging.

Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.

Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and [**tubing or rod**] [**wire support**] for suspension for each unit length of luminaire chassis, including one at each end.

Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

* + - 1. IDENTIFICATION
         1. Identify system components, wiring, cabling, and terminals.
      2. FIELD QUALITY CONTROL
         1. Perform the following tests and inspections:

Coordinate "Operational Test" paragraph below with requirements in Section 260923 "Lighting Control Devices."

* + - * 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

* + - * 1. Luminaire will be considered defective if it does not pass operation tests and inspections.
        2. Prepare test and inspection reports.
      1. ADJUSTING

Verify with Owner that adjusting service is required for Project.

* + - * 1. Occupancy Adjustments: When requested within [**12**] <**Insert number**> months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to [**two**] <**Insert number**> visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265116