

**SECTION 26 5100
INTERIOR LIGHTING**

PART 1 GENERAL

1.01 SUMMARY

- A. Included in the work of this section are labor, material, and appurtenances required to complete the work of this Section as specified herein, including, but not limited to:
 - 1. Interior light fixtures, lamps, LEDs, reflectors, lenses or faceplates, ballasts, transformers, drivers and power supplies (includes exterior light fixtures normally installed on exterior surfaces of buildings).
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Light fixture supports.
 - 5. Coordination.
 - 6. Quality assurances.

1.02 SUBMITTALS

- A. General:
 - 1. Submit product data for light fixtures, drivers, lamps and emergency lighting equipment, including generator transfer devices.
 - 2. Submit all light fixtures, specified for use on this Project, in a single submittal package of portfolios, so that all light fixtures can be reviewed at one time.
- B. Prepare portfolios from manufacturer's standard specification sheets, and include the fixture tag indicated on the Light Fixture Schedule to identify each light fixture. Do not combine more than one light fixture type on a single sheet.
 - 1. Fixture or other materials shall not be shipped, stored, or installed into the work without approval of shop drawings.
 - 2. Modifications to fixtures shall be in accordance with Architect's comments.
- C. Product Data: For each type of light fixture, collated and bound in sets, and arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Summary page with the following for each light fixture type
 - a. The number, type and wattage of the light fixture lamps or LEDs (including, but not limited to, assemblies, arrays, bars or modules).
 - b. Light fixture ballast, driver or auxiliary device manufacturer, number and type.
 - 2. Fixture cut sheets with name of manufacturer and options to be provided marked, including, but not limited to, voltage, lensing, and finish/color.
 - a. Descriptive information providing physical characteristics of light fixture, including, but not limited to, materials, dimensions, fixture efficacy and/or efficiency, and verification of indicated parameters.
 - b. For LED fixtures, include also L70 lifetime and wattage of luminaire including driver/power supply losses.
 - 3. Light fixture mounting details, including non-standard outlet boxes.
 - 4. Construction of light fixture housing and door (if applicable).
 - 5. Power supply, transformer, and/or driver cut sheet with options marked, providing physical description of auxiliary device including, but not limited to, voltage, power factor, amperage, wattage, and maximum remote distance charts between device and light fixture.
 - 6. Light fixture finish and color (if applicable).
- D. Shop Drawings: Show details of non-standard or custom light fixtures. Indicate dimensions, finish color, including, but not limited to, custom color, weights, methods of field assembly, components, features, accessories, and modifications. Scaled documents shall be provided for custom fixtures.
- E. Control Wiring

- F. Coordination Drawings: Refer to architectural reflected ceiling plans or details for exact location of light fixtures; engineering documents shall not be referenced for exact fixture positions. Contractor shall check and verify dimensions and details on drawings before proceeding with the work. If any question arises about the true meaning of drawings, refer the matter to the Architect, whose decision is final. In no case proceed with work with any uncertainty. Architectural documents shall show and coordinate with assistance from installers of items involved:
 - 1. Light fixtures.
 - 2. Suspended ceiling components.
 - 3. Structural members to which suspension systems for light fixtures will be attached.
 - 4. Other items in finished ceiling including the following:
 - 5. Air outlets and inlets.
 - 6. Speakers.
 - 7. Sprinklers.
 - 8. Smoke and fire detectors.
 - 9. Occupancy sensors.
 - 10. Access panels.
 - 11. Perimeter moldings.
- G. Qualification Data: For agencies providing photometric data for light fixtures.
- H. Field quality-control test reports.
- I. Operation and Maintenance Data: For lighting equipment and fixtures to include in operation and maintenance manuals.
- J. Warranties: Special warranties specified in this Section.

1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled as defined in NFPA 70, Article 100, by an NRTL as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 2. Marked for intended use.
- B. Comply with NFPA 70.
- C. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- D. Regulatory Agencies: Provide fixtures conforming to nationally- or internationally-recognized accredited testing agencies, such as U.S., ETL, ARL, or others in acceptance with local code enforcement policy.
- E. Electrical Components and Devices: Provide only fixtures that comply with National Electric Code (NEC), and in particular to Section 410. All ceiling recessed fixtures, whether indicated in a catalog number or not, shall be equipped with an integral thermal protection device.

1.04 COORDINATION

- A. Unless otherwise noted, perform all electrical Work required for the proper installation and operation of equipment, furnishings, devices and systems specified in other Divisions of these Specifications, furnished under other contracts, and/or furnished by the Owner for installation under this Contract.
- B. Coordinate layout and installation of light fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including, but not limited to, HVAC equipment, fire-suppression system, and partition assemblies. Contractor shall arrange his installation in proper relation to other work so that there shall be no interference, damage or delay to other trades' work
- C. Give ample notice of any special openings or rough-in work required for placing electrical/lighting work so as to avoid cutting or removal of completed work.

- D. Where work of this Section is to be flush or concealed, install it so it does not project beyond finished lines of walls, ceilings or floor surface.
- E. Verify all ceiling systems and coordinate light fixture type and accessories prior to ordering light fixtures. Coordinate and cooperate with ceiling installer in regards to the location and installation of light fixtures.

1.05 WARRANTY

- A. General Guarantee: For a period of one year after Owner's initial acceptance and establishment of the beginning date of the guarantee period, and at no cost to the Owner, Contractor shall promptly furnish and install replacements for any fixtures or components deemed by the Owner as defective in workmanship under normal operating conditions, excluding lamp replacement as noted in Section 1.10.A.1. Contractor shall repair installed equipment on the job site to Owner's satisfaction. For any time during said guarantee period that fixtures are not fully functional due to defects in material or workmanship, Contractor shall provide or pay for suitable temporary light fixtures, and shall remove said temporary fixtures upon installation of replacement elements. Contractor shall furthermore guarantee replacement fixtures for a period of one year following replacement.
- B. LED Warranties: Shall be free from defects in materials and workmanship for the period indicated from date of factory shipment.
 - 1. LED Luminaires, including LED modules, arrays and drivers: Ten years.
 - 2. LED Lamps: Ten years.

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

- A. Buc-ee's has secured a special terms program with the lighting fixture manufacture LSI. For details and pricing contact Tim Brundrett or Tom Wright:
 - 1. LSI
 - a. Tim Brundrett at Rice Christ Inc., 7002 Briton Centre Court, Houston, Tx 77069, phone: 832 418 9255, timb@rice-christ.com.
 - b. Thomas S. Wright, Regional Sales Manager, LSI Lighting Solutions; phone 214-553-9526(Office),832-866-1155(Mobile);tom.wright@lsi-industries.com.
 - 2. Current Lighting
 - a. Jon Thornton (Factory Representative) at Whiteway, Phone 281 744 6223 (Office), Email: Jthornton@vsareps.com
- B. Provide products produced by manufacturers shown or scheduled for each type of lighting in Light Fixture Schedule

2.02 LIGHT FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. General: Provide lighting fixtures of the size, type, and rating indicated.
- B. Fixture Types:
 - 1. LED Fixtures:
 - a. DLC or Energy Star qualified unless specified otherwise.
 - b. Minimum 10-year replacement warranty for driver and light engine.
 - 2. Downlight Fixtures: Provide recessed downlight fixtures with trim rings compatible with the ceiling material where fixture is to be installed
 - 3. LED Exit Signs: The exit lighting fixtures shall meet the requirements of Federal, State, and Local Codes.
 - 4. Emergency Lighting Units: Lead Calcium batteries with self-diagnostics. Provide full light output at 90 minutes of battery operation.

- C. LED sources shall meet the following requirements:
 - 1. Operating temperature rating shall be between -40 degrees F and 120 degrees F.
 - 2. Color Rendering Index (CRI): >75.
 - 3. The manufacturer shall have performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows: High Temperature Operating Life (HTOL), Room Temperature Operating Life (RTOL), Low Temperature Operating Life (LTOL), Powered Temperature Cycle (PTMCL), Non-Operating Thermal Shock (TMSK), Mechanical Shock Variable Vibration Frequency, and Solder Heat Resistance (SHR)
- D. LED drivers shall meet the following requirements:
 - 1. Drivers shall have a minimum efficiency of 85%.
 - 2. Starting Temperature: -40° F [-40° C].
 - 3. Input Voltage: 120 to 480 (±10%) V.
 - 4. Power Supplies: Class I or II output.
 - 5. Surge Protection: The system must survive 250 repetitive strikes of "C Low" (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. "C Low" waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
 - 6. Power Factor (PF): ≥ 0.90.
 - 7. Total Harmonic Distortion (THD): ≤ 10%.
 - 8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
 - 9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.
- E. Voltage: Equipment for use on 120V systems shall be suitable and guaranteed for voltage range of 100V to 130V. Equipment for use on 277V systems shall be suitable and guaranteed for voltage range of 225V to 290V. Dual rated universal equipment shall be rated for 100-290 Volt.
- F. Light fixture housing for exterior use: Provide aluminum or stainless housing. Where stainless steel hardware is used, both male and female fasteners shall be stainless steel.

2.03 EXIT SIGNS

- A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2.04 AUXILIARY DEVICES FOR LOW VOLTAGE AND LED FIXTURES

- A. Provide remote power supplies, drivers and/or transformers for light fixtures as required for a complete and operational system. Where equipment is not indicated as plenum rated, provide an additional enclosure for the device(s) suitable for the installed environment.

2.05 LIGHT FIXTURE SUPPORT COMPONENTS

- A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify conditions of equipment and installation prior to beginning work.
- B. Verify that equipment is ready for connecting, wiring, and energizing.

3.02 INSTALLATION

- A. General: Install lighting fixtures of the types indicated, where shown, and at indicated heights in accordance with the fixture manufacturer's written instructions and industry practices to ensure that the fixtures meet the specifications. Fixtures shall fit the type of ceiling system scheduled.
- B. Standards: Comply with NEMA standards, applicable requirements of NEC pertaining to installation of interior lighting fixtures, and with NECA Standard of Installation.
- C. Attachment: Fasten fixtures to the indicated structural support members of the building. Provide four separate wire supports for recessed ceiling mounted lighting fixtures, one at each corner of fixture. Check to ensure that solid pendant fixtures are plumb. Provide T-bar locking clips on all four sides for lay-in fixtures.
- A. Coordination: Field coordinate and locate lighting fixtures in open ceiling areas including mechanical and electrical rooms so that light is not obstructed by piping, ductwork, etc. Locate light fixtures in front of electrical and mechanical equipment to provide adequate illumination for testing and maintenance. Relocate installed light fixtures as directed by Owner / Architect at no additional cost.
- D. Final adjustment of all aimable exterior light fixtures shall be in coordination with, and to the satisfaction of, the Owner's designated representative. Pre-aim all fixtures prior to scheduled final aiming and adjustment with Architect/owner. Verify that all rotatable optics are in the proper orientation prior to final aiming.
- E. Provide exit sign directional arrows as required. Provide minimum of two and a maximum of 10% spare exit signs to be installed as directed by Architect.
- F. Install in accordance with manufacturer's instructions.
- G. Locate recessed ceiling luminaires as indicated on the Architectural reflected ceiling plan.
- H. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- I. Install recessed luminaires to permit removal from below.
- J. Install wall-mounted luminaires at height as directed by Architect.
- K. Install accessories furnished with each luminary.
- L. Connect luminaires to branch circuit outlets using flexible conduit as specified.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaires.
- N. Bond products and metal accessories to branch circuit equipment grounding conductor.
- O. Provide emergency transfer devices for light fixtures powered by generator or inverter emergency lighting circuits which are used for normal lighting and to be switched with the switched normal lighting circuit in the same room, corridor or area.
- P. Provide un-switched, constant-hot circuit to all battery powered emergency lighting equipment and emergency load control relay (ELCR/GTD). Where normal light fixture circuit is switched, or contactor controlled, non-switched battery charging or ELC circuit shall originate from same branch circuit breaker as switched lighting circuit.
- Q. Provide emergency powered light fixture in front of all electrical switchgear, including but not limited to panelboards, switchboards, motor control centers, low voltage control panels, transfer switches, motor controllers and disconnect switches.
- R. Provide emergency battery-operated light fixtures at all transfer switch locations and at all central battery emergency lighting inverters.
- S. Provide automatic controls for exterior light fixtures. Exterior building mounted light fixtures shall be circuited through lighting contactors. Lighting contactors shall be controlled by the Square D IPac Z10 Controller.
- T. 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 lighting fixtures without causing the ceiling or partition to deflect.
- U. Hardware for surface mounting fixtures to suspended ceilings
1. In addition to being secured to any required outlet box, fixtures shall be bolted to a grid ceiling system at four points spaced near the corners of each fixture. The bolts shall be not less than 1/4 inch secured to channel members attached to and spanning the tops of the ceiling structural grid members. Non-turning studs may be attached to the ceiling structural grid members or spanning channels by special clips designed for the purpose, provided they lock into place and require simple tools for removal.
 2. In addition to being secured to any required outlet box, fixtures shall be bolted to ceiling structural members at four points spaced near the corners of each fixture. Pre-positioned 1/4-inch studs or threaded plaster inserts secured to ceiling structural members shall be used to bolt the fixtures to the ceiling. In lieu of the above, 1/4-inch toggle bolts may be used on new or existing ceiling provided the plaster and lath can safely support the fixtures without sagging or cracking.

3.03 DIMMING

- A. For dimmable light fixtures, provide both control and power wiring between light fixture and control device and between light fixtures. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations. At a minimum, provide the following based on control type at either 120V or 277V, unless recommended otherwise by the manufacturer:
1. 0-10V – two low voltage conductors and two line voltage conductors plus ground
- B. Coordinate light fixture and control device dimming types for compatibility.

3.04 COORDINATION

- A. Light fixtures shown on the Electrical Drawings represent general arrangements only. Refer to Architectural Drawings for exact locations.
- B. Coordinate the installation and location of light fixtures with other work and all other trades before installation to avoid conflicts. Coordinate light fixture locations in mechanical rooms with final installed piping and ductwork layouts.
- C. Verify all ceiling systems and coordinate light fixture type and accessories prior to ordering light fixtures. Coordinate and cooperate with ceiling installer in regards to the location and installation of light fixtures.
- D. Coordinate final light fixture locations in walk-in coolers and freezers with refrigeration coils and other trades.
- E. Wall-Mounted Light fixtures
1. Coordinate all wall-mounted light fixtures with the architectural features of the building. Where specific elevations or dimensions are not indicated, verify the correct location with the Architect prior to beginning any work.

3.05 FIELD QUALITY CONTROL

- A. General: Upon installation of lighting fixtures, and after building circuits are energized, apply electrical energy to demonstrate proper operations of lighting fixtures, emergency lighting, and controls. When possible, correct malfunctioning units at the site, then retest to demonstrate proper operation; otherwise, remove and replace with new units, and proceed with retesting.
- B. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- C. Clean light fixtures of dirt and debris upon completion of the installation. Protect installed light fixtures from damage during the remainder of the construction period.

- D. Pre-Inspection Tasks: Immediately before final inspection, clean fixtures inside and out, including plastics and glassware, adjust trim to fit adjacent surfaces, replace broken or damaged parts, and lamp and test fixtures for electrical and mechanical operation. Any fixtures, or parts of fixtures that show signs of rust or corrosion at the time of completion, shall be removed, and replaced with protected metal parts.
- E. At the time of final acceptance of this project by the Owner, ensure that all lamps are in working order and all light fixtures are fully lamped.
- F. Final aiming and Adjustment: Aim and adjust aimable and adjustable lighting fixtures for their intended purpose. Re-aim and re-adjust as required to the satisfaction of the Architect/ Owner, including nighttime adjustment of exterior lighting in the presence of the Architect/ Owner.

END OF SECTION