SECTION 265000 – LIGHTING

1. GENERAL
   * + 1. SUMMARY
          1. Related Documents:

Drawings and general provisions of the Subcontract apply to this Section.

Review these documents for coordination with additional requirements and information that apply to work under this Section.

* + - * 1. Section Includes:

Interior luminaires and accessories.

Emergency lighting units.

Exit signs.

Ballasts.

Fluorescent dimming ballasts and controls.

Fluorescent lamp emergency power supply.

Lamps.

Light Emitting Diode (LED) fixtures and drivers

Luminaire accessories.

Outdoor area lighting units.

* + - * 1. Related Sections:

Division 01 Section "General Requirements."

Division 01 Section "Special Procedures."

Division 03 Section "Cast-in-Place Concrete".

Division 26 Section "Common Work Results for Electrical".

Division 26 Section “Inspections and Testing for Electrical Work”.

Division 26 Section "600 Volt Conductors and Cable."

Division 26 Section "Electrical Conduit".

Division 26 Section "Boxes for Electrical Systems".

Division 26 Section "Wiring Devices".

* + - 1. REFERENCES
         1. General:

The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

Unless otherwise noted, the edition of the referenced code or standard that is current at the time of the “date of record” for the Work shall be considered the effective code or standard for the duration of the project.

Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

Refer to specific Division 26 Sections for additional referenced codes and standards.

* + - * 1. ANSI/NFPA 70 - National Electrical Code.
        2. ANSI – American National Standards Institute:

ANSI C78.379 Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.

ANSI C82.1 Ballasts for Fluorescent Lamps -Specifications.

ANSI C82.4 Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

ANSI/NFPA 101 Life Safety Code.

ANSI/IES RP-8 Recommended Practice for Roadway Lighting.

ANSI/IES RP-20 Lighting for Parking Facilities.

* + - * 1. LBNL Construction Details and Design Guidelines; Vol. 3 Construction Details; Part VI Electrical Details
        2. LBNL Electrical Authority having Jurisdiction: Standard Procedure for Safe Electrical Installations (IAHJ Program)
        3. LBNL Electrical Safety Manual
        4. LBNL Facilities Department Lateral Force Design Criteria.
        5. LBNL Pub-3000 Chapter 8 - Electrical Safety Program
        6. LBNL Pub-3000 Chapter 14 – Electrical Equipment Safety Program
        7. LBNL Pub-3000 Chapter 18 - Lockout/Tagout Program
        8. IES – Illuminating Engineering Society
        9. NEMA – National Electrical Manufacturers Association:

NEMA WD 6 - Wiring Devices-Dimensional Requirements.

* + - * 1. OSHA Illumination Standards
        2. RoHS
        3. UL – Underwriters Laboratories:

UL 924

* + - 1. SUBMITTALS
         1. Submit under provisions of Division 01 Section "General Requirements" Paragraph 1.8.F, Submittals, and Division 01 Section "Special Procedures" Paragraph 1.7, Drawings and Specifications, Division 26 Section "Common Work Results for Electrical - Submittals" and as required by other sections of the Specifications."
         2. Shop Drawings: The Subcontractor shall submit for approval Shop Drawings prepared in accordance with Division 01 Section "General Requirements", Paragraph 1.8.F and as required by other sections of the Specifications.
         3. All submittals and shop drawings shall be reviewed and approved by the Facilities Division Utility Group Electrical Engineer before procurement or fabrication of material and equipment.
         4. Product Data: Submit catalog cuts, drawings, descriptive matter and lighting performance characteristics as required to completely define the materials and construction details employed, finishes applied, dimensions, hinging, latching and relamping provisions, and electrical characteristics.
         5. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
         6. Project Record Documents: Accurately record actual locations of each luminaire.
      2. QUALITY ASSURANCE
         1. Products shall be tested, approved and labeled/listed by Underwriters Laboratories, Inc., or by a nationally recognized testing laboratory (NRTL) as listed in Division 26 Specification "Common Work Results for Electrical."
         2. Electrical equipment and materials shall be new and within one year of manufacture, complying with the latest codes and standards. No used, re-built, refurbished and/or re-manufactured electrical equipment and materials shall be furnished on this project.
      3. COORDINATION
         1. Refer to Division 01 Section "General Requirements" Paragraph 1.7.
         2. Refer to Division 01 Section “Special Procedures” Paragraph 1.6 and Supplement for Equipment Energization Plan and Energization Validation and Authorization Package.
         3. Refer to the LBNL Electrical Authority Having Jurisdiction: Standard Procedure for Safe Electrical Installations (IAHJ Program) in regards to the Facilities Energization Validation and Authorization Package (EVAP) process necessary before equipment energization.
      4. DELIVERY, STORAGE, AND HANDLING
         1. Deliver materials to site in unopened cartons or bundles as appropriate, clearly identified with manufacturer's name, Underwriter's or other approved label, grade or identifying number.
         2. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
         3. Handle in accordance with manufacturer's written instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.
      5. Warranty
         1. Warranty period of one (1) year minimum shall start at the date the equipment is energized after acceptance by the University.

1. PRODUCTS
   * + 1. GENERAL
          1. Descriptions, type letters, manufacturers' names and general characteristics are shown on the drawings. Manufacturers' names noted are for defining quality of construction only and do not limit other manufacturers' products.
          2. Metal Parts of Fluorescent Fixtures: Reflectors shall be as indicated on schedule. Channels shall be steel with a baked enamel finish.
          3. Metal Parts of Exterior Fixtures: Corrosion resisting metal, (non-ferrous or stainless steel) and in all cases suitable for outdoor service without tarnishing or other damage due to exposure; manufacturer's standard colors, unless specified otherwise; cadmium plate all metal parts concealed by canopies, including screws, plates and brackets.
          4. Special Adapters, Plates, Brackets, and Anchors: Provide where required by construction features of the building to suitably mount lighting fixtures; all such appurtenances and mounting methods approved by the University prior to fabrication and installation.
          5. Lighting fixtures replacement shall not require removal or alteration to a permanent section of the structure i.e. permanent ceiling. Fixtures shall be easily replaceable otherwise a different type of fixture should be provided.
       2. LAMPS
          1. Provide Sylvania, General Electric, Westinghouse, or equal lamps of size and types as indicated on the drawings. Lamps shall be operating before final review of the work is requested. Fluorescent lamps shall be tri-stimulus 3500˚K color.
          2. LED lamp-life hour is approximately 50,000 hours.
       3. LED DRIVER
          1. LED driver shall be installed in an electrical enclosure.
          2. Wiring inside enclosure shall comply 600V/105 degrees rating or higher.
          3. LED driver shall comply with UL standard UL1012.
          4. LED driver shall have Class A sound rating.
          5. LED driver shall be UL certified for use in a dry or damp location.
          6. LED driver shall tolerate sustained open circuit and short circuit output conditions without damage.
          7. LED driver shall comply with the requirements of the FCC rules and regulations, Title 47 CFR Part 15 Non-Consumer (Class A).
       4. LIGHT EMITTING DIODE (LED) FIXTURES
          1. Luminaires shall be controlled by photocells or automatic profile dimming & motion response override as required by the design.
          2. Outdoor luminaires shall have provisions for house side shield to prevent glare to uphill neighbors.
          3. Luminaire shall have door frame and lens with LED arrays and integral airflow ventilation system.
          4. The light distribution pattern of the luminaires shall be suitable for a S/H ratio of approximately 1.8.
          5. Pole mounted lights shall have in line/in pole fusing.
          6. The lighting system shall consist of the type and manufacturer as shown on the drawings or approved equal. If other than fixture shown is submitted complete illumination calculations are required to show equality.
       5. FLUORESCENT FIXTURES
          1. Lighting fixtures shall include wiring channel, end plates, end caps, side panels, top reflectors, bottom closures, lamp holders, lamps, ballasts, suspension stems, wiring and all other necessary materials and devices. The wiring channel, end plates, and other sheet steel enclosure components shall be cold-rolled carbon sheet steel of commercial quality not less than No. 20 USS gauge in thickness.
          2. Wireway Channel Housings: Steel, not less than 20 gauge unless specified otherwise, fully enclosed, where mounted end-to-end, on fixtures where channel is exposed, internal type connection straps to prevent projections at connections. The ballasts and wiring shall be completely enclosed in the wiring channel and shall be accessible without the use of tools other than a common screwdriver or pliers. The ballast shall be replaceable without removing the fixture from its mounting. Lamps shall be replaceable without the use of tools and without the prior removal of other lamps and equipment.
          3. Fixtures shall be completely assembled, wired and ready for connection to the building lighting distribution system.
          4. Hangers for Pendant Fixtures: Rigid type, with not less than 5-thread engagement at each end, consisting of iron pipe, with brass or aluminum tubing casing, or supporting tubing not less than 0.040 inches thick; two hangers for fixtures 8 feet or shorter; one more than number of fixtures in each row for fixtures of longer length; install at the connector plates between fixtures.
          5. Installation of Ballast within Fixtures: Such that the ballast case temperature will remain below 90 deg C. for full ballast life.
       6. BALLASTS
          1. Solid-state, high frequency, electronic, as manufactured by Magnetek-Triad, Electronic Ballast Technology, Inc., or equal.
          2. Have power factor above 90 percent and lamp current crest factor of 1.5 or less.
          3. Be sound rated "A" and have FCC certification under part 18-15J and UL listing.
          4. Have metal oxide varistor line transient protection.
          5. Be potted in a steel case interchangeable with core and coil ballasts.
          6. Have a 3-year warranty with a replacement allowance for labor.
       7. Emergency Light Fixture
          1. Manufacture:

For fixtures with emergency ballasts, see "Fixture Types" as shown on the drawings.

For dedicated “bug-eye” type lighting fixtures, Dual-Lite EZ-2 with Spectron® self-test/self-diagnostics, or approved equal using the same battery as the Dual-Lite EZ-2.

* + - * 1. Mounting Method: For ceiling, back, end mounting or recessed as indicated on drawings. Subcontractor is cautioned to coordinate emergency lights locations with Architectural details. Verify all emergency light fixtures locations with Executive Architect-Engineer prior to installation of outlet boxes.
        2. Flame-rated, UV-stable thermoplastic housing. Textured white finish.
        3. Fully automatic constant voltage current limited charger which includes low voltage disconnects to prevent deep discharge of the battery.
        4. External push-to-test switch and AC-on indicator. Self-test/self-diagnostics monitors lamp status, lamp load transfer circuit and battery capacity and displays any fault detection by means of a flashing code.
        5. Universal wall mounting pattern. Conduit entry knock-out located at the top center. Indoor and Outdoor rated.
        6. Battery re-charge per UL time limits. Maintenance-free Environmentally Friendly battery.
        7. User initiated 1, 5, 30, or 60-minute system test feature.
        8. Unit provides a full 90 minutes of emergency lighting.
        9. 15 minute re-transfer delay.
        10. Minimum output 70W.
        11. 120/277VAC, 60 Hz. with isolation transformer.
        12. Operating Temperature Range 68°F to 86°F (20° to 30°C).
        13. Temperature compensated charger.
        14. Damp Location Option.
        15. Five-year warranty.
      1. EXIT SIGNS
         1. Manufacture: See "Fixture Types" as shown on the drawings.
         2. Mounting Method: For ceiling, back, end mounting or recessed as indicated on drawings. Subcontractor is cautioned to coordinate exit sign locations with Architectural details. Mounting height, in general, up 90 inches or one inch above door casing where mounted over doors; verify all exit sign locations with Executive Architect-Engineer prior to installation of outlet boxes.
         3. Finish: White face for both with clear baked enamel protective coating.
         4. Height of Letters: 6 inches (150 mm).
         5. Conduit Knockouts: Construct all exposed back, top, bottom and side surfaces of any fixture so that no conduit knockout provisions are visible.
         6. Number of Faces: As required for the position of the fixture as shown on the drawings.
         7. Directional Arrows: Provide for all exit signs, except those shown to be recessed or located directly above the exit door.
         8. Lamps: Light-emitting diode (LED), RED color.
      2. HIGH INTENSITY DISCHARGE (HID) FIXTURES
         1. The luminaires construction shall consist of a ballast aluminum housing and reflector system.
         2. The luminaires are open and ventilated.
         3. The light distribution pattern of the luminaires shall be suitable for a S/H ratio of approximately 1.8.
         4. Ballasts shall operate at 120 or 277 volts and be designed specifically for use with lamps specified. Ballasts shall be fully encapsulated, regulating type with a maximum crest factor of 1.6. All HID ballast shall be fused for short circuit protection.
         5. The lighting system shall consist of the type and manufacturer as shown on the drawings or approved equal. If other than fixture shown is submitted complete illumination calculations are required to show equality.

1. EXECUTION
   * + 1. INSTALLATION, general requirements
          1. Fixture Location: Locations shown are approximate only. Install at locations shown on architectural drawings and as required to coordinate with tile patterns, architectural features, and Mechanical Work. In mechanical rooms, locate to clear mechanical installations.
          2. Fixture Supports: Where no specific method is shown or specified use steel channel sections, concrete anchors, 3/8-inch diameter steel rods and appropriate miscellaneous fittings. Install 12-gauge galvanized steel wires from flush-mounted fluorescent fixture bodies to 3/8-inch minimum concrete anchors, or as approved, attachment to building structure. Provide two wires for each 2 by 4-foot and each 1 by 4-foot fixture. Where installed in removable tile ceiling systems attach diagonally opposite corners of each fixture to the ceiling support members by bolting with No. 8-32 bolts.
       2. INDOOR INSTALLATION
          1. Install in accordance with manufacturers instructions.
          2. Surface Mounted Fixtures: Where mounted on accessible ceilings, hang from metal channels fastened to furring members by means of hanger rods through ceiling to fixture; hanger rods with backup locking device that will allow fixture to be raised on an elevation tight to the ceiling; but not allow raising the ceiling by tightening fixture mounting nuts.
          3. Support of Recessed Fluorescent Fixtures: Integral mounting bars which rotate into position after fixture is lifted into the ceiling cavity or fixtures supported by the ceiling suspension system. Provide two safety wires secured to structural members or slab above suspended ceiling or clip the fixture frame to the ceiling grid.
          4. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
          5. Support luminaires larger than 2’ x 4’ (600 mm x 1200 mm) size independent of ceiling framing.
          6. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
          7. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
          8. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure.
          9. Install recessed luminaires to permit removal from below.
          10. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
          11. Install clips to secure recessed grid-supported luminaires in place.
          12. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on the drawings.
          13. Install accessories furnished with each luminaire.
          14. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Division 26 Section "Boxes for Electrical Systems" using flexible conduit or as indicated on the drawings.
          15. Make wire connections within fixtures using solderless connectors as specified; automatic splicing devices or connectors will not be allowed. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
          16. Bond products and metal accessories to branch circuit equipment grounding conductor.
          17. Install specified lamps in each luminaire , emergency lighting unit and exit sign.
       3. OUTDOOR INSTALLATION
          1. Install in accordance with manufacturers' instructions.
          2. Install lighting poles at locations indicated.
          3. Install poles plumb. Provide double nuts to adjust plumb. Grout around each base.
          4. Install lamps in each luminaire.
          5. Bond luminaires, metal accessories and metal poles to branch circuit equipment grounding conductor or provide supplementary grounding electrode at each pole as shown on the drawings.
       4. ADJUSTING
          1. Aim and adjust luminaires to provide illumination levels and distribution indicated on the drawings.
          2. Re-lamp luminaires which have failed lamps at Date of Substantial Completion.
       5. CLEANING
          1. Clean electrical parts to remove conductive and deleterious materials.
          2. Remove dirt and debris from enclosure.
          3. Clean photometric control surfaces as recommended by manufacturer.
          4. Clean lighting control elements, lamps, fixture interiors and exposed exterior surfaces thoroughly before requesting final inspection.
          5. Clean finishes and touch up damage.
       6. DIFFUSERS AND ENCLOSURES
          1. Install lighting fixture diffusers and enclosures only after construction work, painting and clean up are completed. Handle with clean white canvas gloves.
       7. PHOTOCELLS
          1. Outdoor fixtures shall be controlled by photocells as shown on the drawings.
       8. FIELD QUALITY CONTROL
          1. Tests shall be made in the presence of an LBNL Inspector or the Electrical AHJ’s designated representative. The application or interruption of power shall be programmed and directed in accordance with the approved EVAP, inclusive of the Equipment Energization Plan and necessary permits, work tasks and safety compliance steps.
          2. Operate each luminaire after installation and connection. Inspect for improper connections and operation.
          3. Measure and record illumination levels of indoor spaces and outdoor areas to verify conformance with performance requirements.
          4. Take outdoor area measurements during night sky, without moon or with a heavy overcast of clouds that effectively obscure the moon.
          5. The Subcontractor shall submit to the Project Manager five (5) copies of test results, certified in writing, witnessed, signed and dated, immediately upon completion of work for review and acceptance by the University. An unsatisfactory condition revealed by these test results, or unsatisfactory methods of tests and/or testing apparatus and instruments, shall be bought to the attention of the Project Manager, Responsible Design Professional and the Facilities Division Utilities Group Electrical Engineer and/or the AHJ designated representative. Corrections by the Subcontractor shall be validated by re-tests to the satisfaction of the Project Manager, the Registered Design Professional and the Facilities Division Utilities Group Electrical Engineer and/or the AHJ designated representative.
          6. The Project Manager reserves the right to require that the Subcontractor perform and repeat tests that are deemed necessary to complete or check the tests or the certified records of the Subcontractor at any time during the course of the work. The Subcontractor shall correct unsatisfactory portion of his work that is revealed by the tests or that may be due to progressive deterioration during this period, unless the item in question was a direct specification.

END OF SECTION 265000