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Oakhurst Dairy – New Milk Cooler**SECTION 16525 - EXTERIOR LIGHTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes exterior lighting fixtures, lamps, ballasts, and accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 16 Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; also for exterior fixtures normally mounted on buildings.

**1.3 DEFINITIONS**

- A. Fixture: A complete lighting device. Fixtures include a lamp or lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.
- B. Lighting Unit: A fixture or an assembly of fixtures with a common support, including a bracket plus mounting and support accessories.
- C. Luminaire: A fixture.

**1.4 SUBMITTALS**

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data describing fixtures, lamps, ballasts, and accessories. Arrange Product Data for fixtures in order of fixture designation. Include data on features, accessories, finishes, and the following:
  - 1. Outline drawings indicating dimensions and principal features of fixtures.
  - 2. Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps.
- C. Field test reports indicating and interpreting test results specified in Part 3 of this Section.
- D. Maintenance data for products to include in the operation and maintenance manual specified in Division 1.

**1.5 QUALITY ASSURANCE**

- A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
- B. Comply with ANSI C2.

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- C. Listing and Labeling: Provide fixtures and accessories specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
  - 1. Special Listing and Labeling: Provide fixtures for use underwater that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
  - 2. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  - 3. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

**1.6 WARRANTY**

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty signed by manufacturer and Installer agreeing to replace external parts of lighting fixtures exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies the Owner may have under the Contract Documents.
  - 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
  - 2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
  - 3. Special Warranty Period: 5 years from date of Substantial Completion.

**1.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - 1. Lamps: 10 lamps for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 4. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide products of the type specified in Exterior Lighting Unit Schedule shown on the Drawings and of the quantity needed to satisfy the requirements of the plans.

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- A. Metal Parts: Free from burrs, sharp edges, and corners.
- B. Sheet Metal Components: Corrosion-resistant aluminum, except as otherwise indicated. Form and support to prevent warping and sagging.
- C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.
- E. Exposed Hardware Material: Stainless steel.
- F. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
- G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- H. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.
- I. Photoelectric Relays: Conform to UL 773.
  - 1. Contact Relays: Single throw, arranged to fail in the ON position and factory set to turn light unit on at 1.5 to 3 foot-candles and off at 4.5 to 10 foot-candles with 15-second minimum time delay.
  - 2. Relay Mounting: In fixture housing, unless noted otherwise.
  - 3. Amperage rating shall be sufficient for connected load.
- J. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.
- K. HID Ballasts: Conform to UL 1029, and ANSI C82.4. Constant wattage autotransformer (CWA) or regulating high-power-factor type, unless otherwise indicated.
  - 1. Operating Voltage: Match system voltage.
  - 2. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.
  - 3. Open circuit operation will not reduce average life.
  - 4. High-Pressure Sodium (HPS) Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
  - 5. Noise: Uniformly quiet operation, with a noise rating of B or better.
- L. Incandescent Fixtures: Conform to UL 1571.

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- M. Lamps: Comply with ANSI C78 series that is applicable to each type of lamp. Provide fixtures with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a fixture, provide medium wattage lamp recommended by manufacturer.

**2.3 FIXTURE SUPPORT COMPONENTS**

- A. Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings that correctly position luminaire to provide indicated light distribution.

**2.4 FINISHES**

- A. Metal Parts: Manufacturer's standard finish, except as otherwise indicated, applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects.
- B. Other Parts: Manufacturer's standard finish, except as otherwise indicated.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Set units plumb, square, level, and secure according to manufacturer's written instructions and approved Shop Drawings.
- B. Concrete Foundations: Construct according to Division 3 Section "Cast-in-Place Concrete."
  - 1. Comply with details and manufacturer's recommendations.
  - 2. Finish: Trowel and rub smooth parts exposed to view.
- C. Fixture Attachment: Fasten to indicated structural supports.
- D. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.
- E. Lamp fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

**3.2 GROUNDING**

- A. Ground fixtures according to Division 16 Section "Grounding."

**3.3 FIELD QUALITY CONTROL**

- A. Inspect each installed unit for damage. Replace damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests and Observations: Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include the following:

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1. Photometric Tests: Measure light intensities at night at locations where specific illumination performance is indicated. Use photometers with calibration referenced to National Institute of Standards and Technology (NIST) standards.
  2. Check for intensity of illumination.
  3. Check for uniformity of illumination.
  4. Check for excessively noisy ballasts.
  5. Prepare written report of tests indicating actual illumination results.
- E. Replace or repair damaged and malfunctioning units, make necessary adjustments, and retest. Repeat procedure until all units operate properly.

**3.4 ADJUSTING AND CLEANING**

- A. Clean units after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16525