SECTION 16520

OUTDOOR LIGHTING SYSTEMS SPECIFICATIONS

PART 1 GENERAL

1.1 SUMMARY
Section includes outdoor lighting fixtures for roads, parking lots and pathways. Types of lighting must be approved by University Architect / Campus Planning and Design office. Lighting installation and modification must be coordinated with Utilities, High-Volt shop.

1.2 RELATED WORK
A. University Architect / Campus Planning and Design: Standards for Lights
B. FDG Section 02321: Trenching, Backfilling, and Compacting
C. Reference: NECA (National Electrical Contractors Association) - Standard of Installation.

1.3 SUBMITTALS
A. FDG Section 01330 - Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate fixture outline and construction, circuit arrangements, lamp, connection diagram for external wiring, and details of conduit and wiring connections and terminations.
C. Product Data: Submit electrical characteristics and connection requirements for fixtures.

1.4 CLOSEOUT SUBMITTALS
Project Record Documents: Record actual locations of fixtures.

1.5 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING
Protect products from moisture and dust by storing them in a clean, dry location remote from areas involved in construction operations. Provide additional protection in accordance with manufacturer's instructions.

1.7 COORDINATION
A. Call Underground Service Alert (USA), (800) 227-2600, two (2) working days prior to any excavation. USA will mark existing utilities. After placing your call, contact Stanford Maps & Records USA Marking Staff.
B. New light installation or modifications to existing ones must be coordinated with the Utilities, High-Volt shop, which is responsible for maintenance and repair of most outdoor lighting systems.
C. Contractor shall repair damage to marked, existing utilities without charge to the Owner. Repair of damage to irrigation systems (whether marked, or not) and restoration of any all planting, landscape and pavement to its original condition shall be performed by the Contractor without additional charges to the Owner. If trees or shrubs are damaged, the contractor will replace in kind and to comparable size. If the disrupted area is to an existing asphalt path or road, repair shall include a slurry seal of the entire path/road to a determined juncture acceptable to the University Architect/Planning Office. If the disrupted area is to a concrete or paver area, match in kind quality is assumed. Replacement of damage to any existing signs or site furnishing is assumed.

1.8 SYSTEM DESCRIPTION

A. For lighting fixture selection criteria and other information on the historical basis for the Outdoor Lighting standards for the campus, please refer to Exterior Lighting Plans available through the University Architect/Planning Office.

B. There are several types of standard outdoor lighting types for the Stanford University Campus. Each light type has been identified to fit with the campus plan and layout of pedestrian oriented zones of the campus and vehicle oriented campus areas. The lights fall into 4 typologies:

Type 1: Pedestrian Core lighting
Type 2: Vehicle and bicycle Corridor pathway lighting
Type 3: Roadways, Parking Lots and Intersection lighting
Type 4: Special Conditions/Accent lighting

C. Outdoor lighting systems shall generally be group controlled by a contactor with a 120 volt control circuit to a plug-in type photocell. A bypass switch shall be provided adjacent to the contactor. Mount the photocell on top of the first luminaire that is not shaded, or obstructed. Where specifically directed, the luminaires will be connected to a continuously energized circuit and controlled by individual photocells on top of each luminaire.

D. Refer to ES-25 in the FDG for outdoor lighting controls wiring.

E. Time switch control is not permitted.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: All electrical materials shall be new and UL listed.

B. Fixtures: The drawings and fixture schedule indicates the type, specification and distributor for each fixture.

C. All deviations from these approved fixtures must be submitted to the Stanford University Architect/Planning Office for approval.
2.2 TYPOLOGY of fixtures:

The following are general guidelines for the use of the various standard campus light fixtures. All new installations shall be approved by the Project Manager and the University Architect / Campus Planning and Design office. All existing installations shall be repaired or added to in keeping with the existing hardware.

A. SU-1 globe fixture to be used in the pedestrian dominant zone of campus and to be used primarily in area/gathering spaces and along malls. There are three varieties of the SU-1 globe light, depending upon the location and conditions. SU-1 globe lighting shall be mounted at a height of 12-feet except in smaller (scaled) courtyards, where a 10-foot pole height is acceptable. The 15-foot height pole is only use on Serra Mall. All luminaires and poles installed shall be secured in a truly plumb position and grouted. Exception: SU-1 luminaires on pave surfaces shall be set plum on the pavement and not grouted.

B. Holophane 350 luminaires are to be used in the pedestrian and bicycle pathways outside of the pedestrian core zone. They are to be installed on existing foundations, old anchor bolts shall be cut off and ground flush. Install new expansion anchors as required. Base covers are to be installed on all poles.

C. Gardco Form 10A are to be used in the parking lots.

D. SU II Acorn type luminaires are to be used at the street intersections of the campus’ major roadways.

E. SU III Cobrahead type luminaires to be used at the roadway intersection and as street lighting.

F. Special Conditions and Accent lighting are individually approved by the University Architect / Campus Planning and Design office in consultation with other offices. Included in this typology are lighting for/of Recreational areas/fields, Service Yards, Outdoor Sculpture, Directory Signage, Podium Signage, Bollard lights, Tree lighting, Exterior wall lights, stair lights, lantern lighting, entryway lighting, flood lighting and temporary lighting.

2.3 EQUIPMENT

A. General: All electrical equipment shall be new and UL listed.

B. Luminaires, poles, and accessories shall be furnished to the Contractor by the Owner, unless specified otherwise by the Project Manager.

C. Color: All outdoor lighting fixtures will be carbon black in color.

D. Pull boxes: Pull boxes shall be Christy N16 with N16-D lids in landscaped and pedestrian areas and N16-61J covers in traffic areas. Substitutions shall be only as specifically approved. Lids and covers shall be marked "STREET LIGHTING."

E. Contactors: Contactors shall be sized in accordance with load requirements but in no case smaller than NEMA size 1 (30 ampere). Enclosures shall be NEMA 1 for dry locations and NEMA 12 or 3R for manholes or damp locations. Control circuits shall be 120 volt only.
F. Circuit Breakers: Provide thermal magnetic breakers with interrupting rating adequate for the application. Circuit breakers are to be equipped with NO and NC auxiliary contacts for breaker status monitoring. Provide NEMA 1 enclosures for dry locations and NEMA 12 or 3R for manholes or damp locations.

G. Photocells: Plug-in type designed for outdoor use. Provide approved outdoor receptacles, where the receptacle is not integral with the fixture.

H. Ballasts: Ballasts shall be constant wattage, high power factor type.

I. Fuses for Individual Luminaires:
   1. Fuse holders: Buss Tron type HEB (single-pole) for circuits with one ungrounded conductor, or type HEX (two-pole) for circuits with two ungrounded conductors.
   2. Fuses: five ampere (5 A), Buss type KTK.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
   1. Luminaire Installation: Refer to Standard Drawings ES-2, -3, -4, -5 and –10 for installation details of RSL 350, SU-1 (pathway), Roadway (SU-III) and Gardco Form 10 luminaires, respectively.
   2. Locations of luminaires and electrical wiring indicated on the drawings are generally diagrammatic. Specific locations of all fixtures will be established by University personnel in the presence of the Contractor's representative after award of the Contract.
   3. Pruning of trees and shrubs in construction areas will be accomplished by University personnel. Contractor shall not cut or damage any trees, or shrubs. Contractor parking under trees is not acceptable.

B. Conduit Installation:
   1. Underground conduits in landscaped areas shall be PVC, schedule 40, 1-1/4 inch minimum size with solvent weld couplings, except conduits from concrete pull boxes to lighting fixture bases shall be one (1) inch minimum and stubbed up six (6) inches from the bottom of pull box.
   2. Minimum depth of bury shall be eighteen (18) inches in landscaped areas and twenty-four (24) inches in traffic areas. Trench shall be cleared of rocks and loose dirt and backfilled with smooth sand to depth of three (3) inch under and six (6) inch over conduit. Refer to Section 02321: Trenching, Backfilling, and Compacting.
   3. Field-cut ends of rigid steel conduits shall be reamed smooth. Running threads shall not be used.
   4. Insulated throat grounding bushings shall be installed at each end of all metallic conduit runs. Terminations of PVC conduits at pull boxes shall be provided with
end-bells or suitable bushings and stubbed up six (6) inches from the bottom of pull box.

5. Pull boxes shall be installed firmly on a bedding of gravel and shall be set at grade in pavement and two (2) inches above grade in unpaved areas. Seal the bottoms of pull boxes against rodents with at least one inch (1") of concrete grout. Provide a pull box adjacent to each luminaire.

C. Wiring:

1. Wire shall be sized in accordance with the drawings, but in no case smaller than No. 10 AWG, except fixture wire shall not be smaller than No. 16 AWG. Color coding shall be phase A - black, B - red, C - blue, for 208Y/120 volts and A - brown, B - yellow, C - purple for 480Y/277 volts; neutral - white, and Ground - green.

2. Splices in wires No. 8 and smaller shall be made with twist-on, expandable, spring-type, solderless connectors with insulated metal shell, Scotchlok or approved equal. Splices in pull boxes and other damp locations shall be epoxy encapsulated with Scotchcast or approved equal waterproof material.

3. Splices in wires No. 6 and larger shall be made with copper split-bolt connectors, enveloped in insulating putty (Scotchfil or approved equal), taped, and painted with Scotchkote or approved equal. Exception: compression sleeves insulated with approved heat shrink or cold shrink watertight kits may be used.

4. Splices in equipment grounding conductors shall be made with uninsulated copper split-bolt connectors.

5. Provide each luminaire with an individual fuse in a weatherproof fuseholder described above. Install fuses in the concrete pull boxes adjacent to the luminaire. Do not install fuses behind the handholes in the poles.

D. Grounding:

1. Metal poles and metallic parts of luminaires shall be grounded.

2. Ground wires shall be connected to grounding studs, where provided, with compression lugs.

3. Ground wires for old-style SU-I and SU-II luminaires shall be secured to fixture anchor bolts by means of ground clamps inside the poles.

4. Ground rods shall be driven in pullboxes where required so that no luminaire is more than 400 feet from a ground rod.

5. An equipment grounding conductor shall be run with phase and neutral wires in each conduit and shall interconnect all ground rods and luminaires. Grounding conductors shall be sized in accordance with the CEC, except minimum size shall be No. 10 AWG, copper.

E. Fixture Installation:

1. As noted above, new and used luminaires, poles, and fixture accessories will be furnished to the Contractor by the University, unless specified otherwise by the Project Manager. The Contractor shall inspect all material carefully, noting
defective, broken, or missing parts. The Contractor shall notify the Project Manager in writing immediately of any defects.

2. Luminaires removed from existing installations as part of work under the Contract shall be inspected carefully prior to reinstallation at a new location. Any damage, serious deterioration of paint, unsuitable ballast or lamp, or missing parts shall be reported in writing to the Project Manager. No such luminaire shall be reinstalled until the Project Manager has determined it to be suitable.

3. All luminaires and poles installed shall be secured in a truly plumb position and grouted. Exception: SU-1 luminaires on pave surfaces shall be set plum on the pavement and not grouted.

4. After installation of new luminaires and poles, all areas of damaged paint shall be repaired using equivalent and matching paint, carbon black in color.

5. All luminaires installed but not operating, shall be covered with burlap sack or equal until they are placed in service. Protection of the paint on the fixtures is assumed.

6. Each foundation from which a luminaire has been removed and that is to be abandoned shall have all projections above the concrete removed flush and conduits grouted. Grind all burrs and sharp edges smooth.

7. Luminaire foundations shall be constructed as shown on the drawings or as recommended by the manufacturer.

3.2 FIELD QUALITY CONTROL

A. Contractor shall test each completed system and verify that it is fully operational.

B. All switching of existing circuits shall be performed by Owner personnel; however, the Contractor shall independently verify that all circuits are safely de-energized.

END OF SECTION