EXHIBIT B
RFP 580 Lighting Replacement Project

Technical Specifications for Implementation of Energy Efficiency Retrofits

Prop 39 Lighting Projects

Prepared For:
Oxnard Union High School District
309 South K Street
Oxnard, CA 93030

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A Project Supported by SoCalREN

Southern California Regional Energy Network (SoCalREN) Public Agency Program, administered by Los Angeles County, was authorized by the California Public Utilities Commission to help eligible public agencies in Southern California harness their collective action, save energy, reduce operating costs and protect precious resources. To expand public agency participation in utility energy efficiency programs, SoCalREN is offering a range of free energy efficiency services to assist public agencies with accelerating energy retrofits.

The Lighting Retrofit at the Oxnard Union High School District (OUHSD) is being supported by SoCalREN. The services provided as Construction Management Support are defined on a separate document titled Roles and Responsibilities for Construction Management Support. Please refer to this document to better understand the relationship and role of SoCalREN Project Manager and assigned Energy Consultant.

Participation of SoCalREN is entirely at the discretion of OUHSD and SoCalREN may modify or terminate its services based on funding availability.

Disclaimer

Estimates of potential Investor-Owned Utility (IOU) incentives are based on the most up-to-date information available from the corresponding utility. Utilities reserve the right to change and/or terminate funding for Energy Efficiency projects based on evolving priorities as determined by California Public Utilities Commission directives. These changes can happen without notice. Furthermore, errors in submitted documentation, delays in project implementation, and lack of adherence to utility program requirements can all impact the final IOU Incentive values and approvals.
1. Description of Scope

1.1. Summary of Scope

1.1.1. Interior Lighting Replacement

The majority of the interior lights at most OUHSD schools were replaced within the last 5 years with more efficient lighting technology. Due to the recent upgrades, the District chose not to prioritize widespread interior lighting retrofits. However, during the audit District staff identified select CFL, linear fluorescent, metal halide, and halogen interior light fixtures at Adolfo Camarillo HS, Rio Mesa HS, Channel Islands HS, Hueneme HS, and Oxnard HS that need to be replaced. In addition, the District was interested in replacing the exit signs at Oxnard HS which have 20-watt lamps and are more than 20 years old. It is recommended that these fixtures are replaced with light-emitting diode (LED) fixtures. For all interior lighting retrofits, the retrofit can consist of full fixture replacements, installation of LED retrofit kits, and/or lamp replacements. LED technology is more energy efficient, provides better light quality, requires less maintenance, and has a longer effective useful life (EUL).

It is important that the newly installed fixtures meet or surpass the lighting power density and control requirements set forth by the California Building Standards Code Title 24.

1.1.2. Exterior Lighting Replacement

The exterior lighting at OUHSD schools is comprised of variety of fixtures types, which utilize inefficient lighting technologies. It is recommended that the exterior lights at each school be replaced with LED fixtures. Typically, for exterior lights, it is recommended that the full fixture be replaced to address heat dissipation and ensure proper photometric distribution. However, there are a few instances that could consider lamp replacement or installing fixture retrofit kits instead of a full fixture replacement for financial reasons. These situations include bollard retrofits and linear fluorescent fixtures. For bollards, the full fixture replacement would include replacing the whole bollard, which is quite costly. Alternatively, there are fixture retrofit kits and lamp replacement options for the fraction of the price of a new LED bollard. For canopy fixtures that utilize linear fluorescent fixtures, an alternative option to full fixture replacements are LED tube replacements, which are a cheaper option. OUHSD does prefer fixture replacement in most instances.

It is important that the newly installed fixtures meet or surpass the lighting power density and control requirements set forth by the California Building Standards Code Title 24.
1.1.3. Exterior Lighting Controls Upgrade

Many of the exterior lights at the schools are controlled by mechanical time clocks, which are scattered around the campuses. This controls technology allows for limited customizability and requires frequent maintenance to ensure efficient operation. In parallel with the exterior lighting replacement initiative, the District will replace the controllers with newer technologies that allow for a more customizable controls strategy. This may include controlling the fixtures utilizing photocells, an astronomical timeclock, and/or networked lighting control system. The new lighting control system along with the Title 24 required controls, such as motion sensors, can be paired to deliver significant energy savings. The Contractor shall incorporate the following schedules into the new controls:

- 5:45 am Monday through Friday, exterior lights are turned on
- 15 minutes before sunrise Monday through Friday, exterior lights are turned off
- 15 minutes after sunset Monday through Friday, exterior lights are turned on
- At 12:10 am, seven days per week, the exterior lights turn off
- The controls shall be capable of alternate schedules to include holidays and special event weekend scheduling with web-based programming
1.3. Campus Overview

1.3.1. Adolfo Camarillo High School

Figure 1 – Adolfo Camarillo High School Map

Existing lighting design consists mostly of metal halide, compact fluorescent, and high-pressure sodium lamps. There are no existing controls for exterior hallway lights. The Interior fixtures to be retrofitted are located in the Little Theatre, Classroom D-1 and Classroom D-2. Exterior fixtures to be retrofitted are located on the outside of Buildings A through S, Buildings T1 through T4, Portable T-16, Buildings U through Z, as well as in the Quad and the Stadium, Stadium Press Box and Stadium Walkways.
1.3.2. Channel Islands/Channel Islands High School Extension (Shared Campus)

Figure 2 – Channel Islands High School/Channel Islands High School Extension Campus Map
- Channel Islands High School -

Existing lighting design consists mostly of metal halide, T-8s, and compact fluorescent lamps. There are no existing controls for exterior hallway lights. The interior fixtures to be retrofitted are located in the Administration Building. Exterior fixtures to be retrofitted are located outside of Buildings A through D, the Fieldhouse, Girls Locker room, Lunchroom, Maintenance, Math Lab ML4, Office, portable P11, Portable P12, Quad, SL-1, SL-2, T1, T2, Unit G, Unit T, and Unit P, as well as in the parking lots, basketball courts, and walkways.

- Channel Islands High School Extension -

Existing lighting design consists mostly of metal halide, compact fluorescent lamps, and high-pressure sodium lamps. There are no existing networked controls. The exterior fixtures to be retrofitted are located around the perimeter, and in the canopy, the Quad.
1.3.3. Hueneme High School

Figure 3 – Hueneme High School Map

Existing lighting design consists mostly of metal halide, T-8s, and compact fluorescent lamps. There are no existing controls for exterior hallway lights. The Interior fixtures to be retrofitted are located in the Maintenance Barn. Exterior fixtures to be retrofitted are located outside of the 100 section, Fieldhouse, Kitchen, Maintenance, Maintenance Barn, Administration, P 1 through 6, Units A through I, Units M through P, Unit R, Unit S, as well as in the playground.

1.3.4. Oxnard High School
Existing lighting design consists mostly of metal halide, compact fluorescent lamps, mercury vapor, incandescent, and high-pressure sodium lamps. There are no existing networked controls. The Interior fixtures to be retrofitted are located in Building L and the site wide exit signs. The Exterior fixtures to be retrofitted are located outside of Building A1, Building A2, Buildings B through G, Buildings I-1 and I-2, Buildings J through N, Building P1 through P4 as well as in the Quad.

1.3.5. Pacifica High School
Figure 5 – Pacifica High School Map

Existing lighting design consists mostly of metal halide and compact fluorescent lamps. There are no existing networked controls. The Exterior fixtures to be retrofitted are located outside of Units A through H and J, the Fieldhouse, as well as in the Parking Lot and Quad.

1.3.6 Rio Mesa High School
Figure 6 – Rio Mesa High School Map

Existing lighting design consists mostly of metal halide, compact fluorescent lamps, and incandescent. There are no existing networked controls. The Interior fixtures to be retrofitted are located in Building G. The Exterior fixtures to be retrofitted are located outside of Buildings A through U and W, as well as in the Parking Lot, Sports Fields, Walkways, Pool and Quad.
### 1.4. Survey of Existing Conditions

Bid documents require a preliminary design solution for all lighting listed in the documents for the interior and exterior areas. Potential bidders are required to undertake a mandatory site walk at each site to become familiar with the areas addressed in the preliminary survey documents. Bidders shall refer to the ‘Existing Fixture Survey’ for information on the location, fixture type, lamp, wattage of existing fixtures.

The proposed design shall include assessments of all existing survey documents in order to understand their condition and implications for system design, construction and operation. Visual/Non-Destructive Examination (NDE) inspection and written summary with inventory list to be submitted to the District required for light poles over 35 feet in height.

The selected Contractor shall utilize AutoCAD electronic files whenever they are available to represent the layout of the building and/or the construction of the existing lighting systems. Where AutoCAD drawings of the existing lighting system are not available, the Contractor shall use scanned drawings. Where building plans are not available, the Contractor shall use site plans to display the layout of the existing lighting.

### 1.5. Retrofit/Replacement Requirements

Bidders shall propose design solutions to improve the lighting and control for each lighting retrofit. The Bidders may propose either retrofit, such as installation of new lamps and driver/ballast in existing housing, or replacement for each Entry listed on the ‘Existing Fixture Survey’. In instances where replacement is cost-prohibitive, retrofit must be approved by the District in advance. The ‘Existing Fixture Surveys’ may note additional guidelines that dictate which type of fixtures, controls or retrofits can be proposed in specific applications. It is recommended to replace lighting in the existing location to utilize the existing circuits. Provide universal voltage for initial design, fixtures are to be field verified by the selected Contractor for circuiting and voltage once contract is awarded.

Retrofit and/or replacement fixtures shall meet OUHSD’s desired aesthetic for each campus. Uniformity in luminaire’s appearance, performance, and control capability shall be considered by the Bidder and approved by the OUHSD during the design review process.

Bidders shall describe their proposed modifications for each lighting solution proposed. This includes an identification of the proposed ballasts, lamps, fixtures, retrofit kits and controls. When the project includes a change in the total number of fixtures, schematic drawings showing each proposed new and removed fixture shall be included for OUHSD review.

For LED-based fixtures, Bidders shall provide the power draw for each fixture in the proposed case from the DesignLights Consortium Appendix E Pre-Qualified LED Fixture List. For non-LED-based fixtures, power draw for each fixture in the proposed case shall be provided from the PG&E 2018 Statewide Customized Offering Procedures Manual for Business, Appendix B Table of Standard Fixture Wattages. For fixtures with two lighting levels, provide the power and light level
information for both levels. For fixtures with dimming capability, provide the power and light level information at 100%, 50% and minimum light levels. State the specific minimum light levels achieved by the luminaire.

During the design process, the selected Contractor shall provide a count of each of the proposed luminaires, the total power draw for the luminaires in each zone, and the proposed installed lighting power density (W/square foot) in each Lighting Zone.

Bidders shall summarize proposed fixtures and energy usage using the provided template in the Existing Fixture Survey workbook and submit a qualitative description of their controls system/approach. The information will be used by the Oxnard UHSD to run energy calculations and compare bids.

For each campus, provide the following information:
- Proposed fixture description
- Proposed fixture quantity
- Proposed Lamps fixture
- Proposed Nominal Fixture Wattage (W)
- Proposed Actual Fixture Wattage (kW)

The selected Contractor shall ultimately be responsible for proper disposal of removed or replaced lighting components and shall include the decommissioning, removal and proper disposal of existing lighting control panels and associated equipment in their design.

2. Design and Design Review

2.1. General

Upon the OUHSD’s written Notice to Proceed, selected Contractor shall review their Design Proposal with the OUHSD Representative and make changes to the documents as directed that are typical of final revisions to Schematic Design and do not materially change the scope of the Work. Upon OUHSD’s written approval of the revised Design Proposal, the Contractor shall prepare Design Development documents for approval by Oxnard UHSD’s Representative. These documents shall consist of such drawings, audit Sheets and narratives as are needed to establish and describe the size and character of the entire Project and allow the Oxnard UHSD to initiate Scope Compliance Review(s). The Contractor shall incorporate into the Design Development documents electrical (power and lighting) systems, materials, and such other elements and other systems as required for the Work and as described in Contract Documents.

The Contractor shall submit documentation supporting the design criteria for the electrical and lighting systems, and other specialized building systems affected by this project.
The Work of this phase is subject to independent reviews, both internal and external, and value engineering.

Prior to finalizing the design drawings, the Contractor will compare the design against the SCE Incentive program and the Prop 39 program requirements. If there are any issues that they foresee, the Contractor will alert the District and/or their representative. It is the Contractor’s responsibility to ensure compliance with the requirements of both of these programs.

2.2. Electrical Requirements

The power layouts shall be shown on one set of drawings, and the lighting layouts shall be shown on a different set of drawings. Use standard symbol conventions.

2.2.1. Floor Plans

a. Scale: Not less than 1/8 inch = 1 foot 0 inches
b. Indicate the location of each load center unit substation, distribution switchboard, panel board for power and lighting.
c. Indicate the types and locations of lighting fixtures and controls and use a schedule for detail.

2.2.2. Large-Scale Drawings

a. Scale: Not less than ¼ inch = 1 foot 0 inches.
b. Provide a layout of all equipment rooms and closets to ensure the proposed equipment with proper clearances will fit in the allotted space.

2.2.3. Schedules

a. Provide schedules for light fixtures, lamp types, ballasts, watts, controls and retrofit kits.
b. Provide panel schedules.
2.3. Design Submittals

The Contractor shall prepare a comprehensive submittal package for each phase of the Work that will be reviewed and approved by OUHSD. Each submittal package shall include, at a minimum, the required elements that convey in sufficient detail for each phase of the design, the necessary documentation as follows:

- Site Layout Drawings
- Illuminance Calculations
- Energy Savings Calculations
- Construction Specifications (trenching, mounting, etc.)
- Equipment Layout Drawings
- Detailed Drawings
- Single-Line Diagrams
- IT Network Connection Diagrams
- Control System Architecture
- Structural Drawings
- Manufacturer’s Cut Sheets
- Equipment Specifications
- Installation Details and/or Directions
- Graphical representation of grouping/zoning of fixtures

As a part of the design submittal, the Contractor shall submit photometric studies for approval by the District for measures in the following locations:

- Oxnard High School Auditorium
- Adolfo Camarillo Little Theatre

Contractor shall include adequate time for OUHSD review and approval of submittals, as well as re-submittals and re-reviews. Minimum OUHSD review time shall be ten (10) days from the date of receipt of each submittal package during each phase of the Design Review.

2.4. Division of the State Architect (DSA) Review

Construction Documents must be reviewed and approved where applicable by the Division of the State Architect (DSA). Contractor shall be responsible for obtaining all DSA approvals and shall account for DSA requirements in their system designs, project pricing, and schedule. OUHSD will not grant Contractor relief based on the Contractor’s incomplete or incorrect understanding of DSA requirements.
3. **Construction**

3.1. **General**

The Contractor shall provide all materials, equipment, labor, and services required by the Contract Documents to construct the Work for the Contract Sum and within the Contract Time during the Construction Phase.

3.2. **Testing and Inspection**

Testing and inspection shall follow the approved Quality Control Plan and the Specifications. The Contractor shall:

a. Participate in punch list inspections for beneficial occupancy, substantial completion and final completion. Punch lists shall be prepared by the Contractor on the project to confirm code and design compliance.

b. Assist OUHSD’s Representative in reviewing test and inspection results.

c. Not authorize deviations from the Contract Documents.

d. Assure the Construction Work is in compliance with the Quality Control Plan and Specifications.

3.3. **Record Documents**

Any revisions or changes that have been made during construction shall be incorporated in the Record Documents. During construction, OUHSD’s Representative shall have reviewed all revisions and changes and shall have approved the set of drawings and specifications maintained by the Contractor prior to their preparation of the final Record Documents. The Contractor shall provide reproducible Record Documents to OUHSD in all the following formats: (1) hardcopy and (2) electronic copy in pdf, Excel & Word (for Specifications) and AutoCAD formats.

Electrical drawings shall include the following items:

a. The final control sequence for each lighting system, if modified.

b. Revisions of each schedule in the original Contract Documents reflecting the actual equipment installed (by manufacturer’s name and model number).

3.4. **Guarantee to Repair Period Inspections**

The Contractor shall review the work no later than 11 months after Substantial Completion, or Final Completion, as applicable and shall submit written recommendations to the district for the correction of any deficiencies. The Contractor shall be accompanied by the district representative during these inspections. Dates for inspections shall be as mutually agreed by the parties.

3.5. **Quality Assurance and Quality Control**
The Contractor shall implement a Quality Assurance / Quality Control (QA/QC) plan for construction activities on OUHSD sites. At least 30 days prior to the planned commencement of construction, the Contractor shall submit a copy of the QA/QC Plan for review and approval by the Oxnard UHSD.

To ensure the highest quality of the installation, the Contractor shall:

a. Implement policies and procedures to ensure proper oversight of construction work, verification of adherence to construction documents and contractual requirements, and rapid identification and mitigation of issues and risks.
b. Utilize best practice methods for communicating progress, performing work according to the approved Project schedule, and completing the Project on-time.
c. Keep the Site clean and orderly throughout the duration of construction. All trash and rubbish shall be disposed of off-site by licensed waste disposal companies and in accordance with applicable Law.
d. Provide equipment marking, as well as labeling and signage for the materials that shall be removed after Project completion.
e. Fully comply with all applicable notification, safety and Work rules (including OUHSD safety standards) when working on or near OUHSD facilities.
f. Route all electrical collection system wiring and conduits in a neat and orderly fashion and in accordance with all applicable code requirements. All cable terminations, excluding module-to-module and module-to-cable harness connections, shall be permanently labeled.
g. Provide all temporary road and warning signs, flagmen or equipment as required to safely execute the Work. Street sweeping services shall also be provided as required to keep any dirt, soil, mud, etc. off of roads.
h. Temporary restroom facilities shall be provided for all site staff employed by contractor.
4. Training

The Contractor shall conduct at least twelve (12) hours total of on-site training for OUHSD personnel in all aspects of operation, routine maintenance, and safety of the lighting systems. At a minimum, training topics shall include the following:

a. Review of as-built documentation
b. Review of warranty coverages and limitations
c. System safety, including shut-down procedures
d. Fixture maintenance, repair and troubleshooting
e. Fixture mounting elements maintenance and repair guidelines
f. Calibration and adjustment procedures for the fixture and mounting systems (if any)
g. Fixture/lamp replacement
h. Control system hardware, software and any associated interface
i. How to identify and troubleshoot wireless and wired network issues

The Contractor shall submit a proposed Training Plan during the design process for approval and provide all training materials and manuals to support on-site training in advance of scheduled training sessions (see schedule of submittals in Section 2.2.3, “Submittals”). The on-site portion of the training program shall be scheduled to take place at the jobsite at a time agreeable to both the Oxnard UHSD and the Contractor.
5. Technical Requirements

5.1. Applicable Codes, Rules, Regulations, Regulatory Agency Approvals, & Independent Review(s)

It is the Contractor’s responsibility to design the Project in compliance with applicable requirements of federal and state laws, codes, rules, regulations, ordinances, and standards, including, but not limited to, those outlined below. The Contractor shall have copies available of applicable codes and regulations for ready reference.

a. California Building Standards Code, Title 24 2016, California Code of Regulations (CCR):
   - Part 1, Building Standards Administrative Code
   - Part 2, California Building Code
   - Part 3, California Electrical Code
   - Part 4, California Mechanical Code
   - Part 5, California Plumbing Code
   - Part 6, California Energy Code
   - Part 7, California Elevator Safety Construction Code
   - Part 8, California Historical Building Code
   - Part 9, California Fire Code
   - Part 12, California Reference Standards Code

b. General: Reference standards and guidelines include but are not limited to the latest adopted editions from:
   i. 1. ADA Americans with Disabilities Act
   ii. ANSI American National Standards Institute
   iii. APWA American Public Works Association
   iv. ASCE American Society of Civil Engineers
   v. ASHRAE Guideline, the Commissioning Process
   vi. IEEE Institute of Electrical and Electronics Engineers
   vii. IESNA Illuminating Engineering Society of North America
   viii. ISO International Organization for Standardization
   ix. NEC National Electric Code
   x. NEMA National Electrical Manufacturers Association
   xi. NFPA National Fire Protection Association
   xii. OSHA Occupational Safety and Health Administration
   xiii. UL Underwriters Laboratories Inc.
5.2. Site Lighting System Performance

5.2.1. Energy Conservation

Lighting within the parking lot (excluding dedicated emergency lighting) shall not exceed a maximum of 0.18 W/ft. Assume 4100 operating hours per year. Both parking lot and other area system performance should aim to produce the highest energy savings within the given requirements.

5.2.2. Lighting Requirements

Lighting levels shall follow and comply with the recommended levels indicated within the current IESNA lighting handbook and RP-20.

Below are the recommended lighting levels values for the relevant areas of the campuses.

<table>
<thead>
<tr>
<th>Application Area</th>
<th>Horizontal Illuminance (fc)</th>
<th>Uniformity ratio (maximum to minimum)</th>
<th>Vertical Illuminance (fc) *</th>
<th>Luminance (cd/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking Lot Basic</td>
<td>0.2 Minimum</td>
<td>20:1</td>
<td>0.1 minimum</td>
<td></td>
</tr>
<tr>
<td>Parking Lot Enhanced Security</td>
<td>0.5 minimum</td>
<td>15:1</td>
<td>0.25 minimum</td>
<td></td>
</tr>
<tr>
<td>Roadways</td>
<td>0.4</td>
<td>6</td>
<td>N/A</td>
<td>0.4 on grade</td>
</tr>
<tr>
<td>Pathways</td>
<td>0.5 average</td>
<td>N/A</td>
<td>0.5 average</td>
<td></td>
</tr>
</tbody>
</table>

* Measured at height of observer 1.5m, 5 feet

5.2.3. Color Rendering and Color Temperature

Selected interior fixtures shall have a color rendering of greater than 80 CRI and a color temperature of 4100K. Where other interior fixtures have already been retrofitted with more efficient lighting, contractor will match color temperature of other fixtures. Selected exterior fixtures shall have a color temperature of 5000K to match the previously installed exterior SEEP fixtures. The Contractor shall provide the photometric analysis for the proposed fixtures demonstrating compliance with applicable guidelines and District preferences. The voltage of the new luminaires shall be verified on site with the existing circuits available before ordering. All selected fixtures
shall be approved and accepted by the Oxnard UHSD and be eligible for the SCE incentives where incentives are available.

5.3. Lighting Controls

It is estimated that an additional 40% savings can be had by adding lighting controls to the exterior fixtures. The exterior fixtures should be controlled by photocells and networked astronomical clocks.

The new control system implemented as part of this project should adhere at a minimum to the following controls capabilities outlined below:

a. The user shall be able to modify occupied and unoccupied status for all new fixtures globally within the lighting control system without having to modify them for each fixture. The light level setpoints can reside anywhere in the lighting control system but have to be globally adjustable by the user without having to adjust the level for each fixture separately

Fixture Modes:

a. Fixture OFF / Fixture ON / Fixture Occupancy Mode

The modes Fixture OFF and Fixture ON are user selected conditions and only active if the user overrides the Automatic Mode. Manual states of any group shall be reported daily in a status log if the zone is in manual mode after the occupancy mode ends each day.

b. Fixture Occupancy Mode is defined as the time between sunset and 12:10 AM when the school is considered in operation. The default school operational schedule shall be to 6:00 AM to 12:00 AM Monday Thru Friday with a different schedule for Saturday and Sunday. Sunset and Sunrise shall be determined by an astronomical clock calculating the time based on the location of the campus. The astronomical clock shall also be capable of automatically adjusting for daylight savings time.

c. Fixture Offline Mode is defined as whenever any of the fixtures are no longer reporting on the network. The fixtures shall operate based on the stored program whenever they lose communication and automatically return to normal mode once they communicate again. The specific function and profile for the off-line mode shall be user selectable and be globally changeable at the remotely accessible user interface using internet connectivity.

d. All outdoor lighting installed below 24 feet must have an integral motion sensor as per Title 24 2016 code requirements, exceptions are pole mounted luminaires <= 75W, non-pole mounted luminaires < 30W and linear lighting < 4W per foot. The motion sensor must reduce the light level during occupied periods between 40-80%. This can be achieved by means of
dimming or other power reduction methods. Lighting shall be zoned per use and no more than 1,500 watts of lighting shall be controlled together.

5.4. **Luminaire Warranty**

All warranties shall be based from the date of OUHSD acceptance of the fixtures.

a. Provide a comprehensive written 5-year warranty including luminaire finish, onsite replacement of material, and workmanship. On-site replacement includes transportation, removal, and installation of new products. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

b. Provide a written 5-year replacement material warranty for defective or non-starting LED source assemblies.

c. Provide a written 5-year replacement material warranty on all Power Supply Units.

d. Provide a written 5-year replacement warranty for non-maintained illuminance levels on all light sources (for example, LED package, LED array, or LED module) including, but not limited to the LED die, encapsulate, and phosphor. If the expected useful life of the luminaire system as defined in section 2.4 C is not maintained, then the manufacturer shall replace the light source(s) or luminaire as needed.

e. Provide a written 5-year warranty that LED color shift from initial shall color be less than 0.007 on the CIE 1976 (u’,v’) diagram. This requirement is comparable to a seven-step MacAdam ellipse.

END OF DOCUMENT