**LED Tube Requirements**

These requirements are for LED Tube replacement lamps. Customized guidelines still apply.

1. LED tubes must use existing LF ballast
   1. Only T8 baseline with electronic ballasts
   2. Specification sheet must clearly state ballast and wiring compatibility
      1. Up to user to verify this
   3. LED Tube must be dimmable if dimmable ballast is existing
      1. Specification sheet must clearly state dimming and wiring compatibility
2. Be listed on DLC’s QPL and filtered as shown for top 50% of products resulting in 876 products**\***
   1. This list includes all 3 types of LED tubes
      1. Tubes using existing ballast
      2. Tubes using internal LED driver (not allowed)
      3. Tubes using external LED driver (not allowed)
   2. Family products of the qualifying product are allowed

|  |  |
| --- | --- |
| **Detail** | **Lamp Count** |
| Filter for 4-foot replacement lamps | 7720 |
| Remove family | 1641 |
| Life - remove below 50k hours | 1631 |
| CRI – remove below 80 CRI | 1631 |
| THD - remove >20% | 1366 |
| Efficacy - remove <100lm/W | 1129 |
| PF - remove <0.9 | 876 |

\*The 50% filter is based on the direction given by the Commission Staff. The filtering criteria will change once this measure officially deploys. New products not listed must use same filter for qualification.

1. Document the baseline (lamp, ballast, wattage, type of fixture)
   1. Document the measure (frosted/unfrosted lens, wattage, model#)
2. Ballast documentation follow-up required **[Attachment 1]**
   1. Document the number of ballasts that were replaced in 6 weeks
   2. Document the number of ballasts that were replaced in 4,380 hours or 1 year (whichever comes first)
3. Verify DLC’s warranty listed on the QPL matches manufacturer’s spec. sheet
4. Qualified fixture types – Pictures shown on next page
   1. Strip
   2. Industrial w/reflector
   3. Cove
   4. Wrap
   5. Indirect – wall mount or suspended
   6. Troffer - prismatic
5. Light verification measurement – must document pre & post **[Attachment 1, 2 & 3]**
   1. Responsibility of the customer accepting the level and quality of lights
6. Verify the existing ballast life **[Attachment 2]**
   1. Installation document OR
   2. Picture of ballast with a date stamp AND Verbal statement of install date
7. Consumer Satisfaction Survey and Check-list filled and submitted to [EAS@sce.com](mailto:EAS@sce.com) after post inspection. **[Attachment 4 & 5]**

**Attachment 1 - Ballast follow-up**

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**Attachment 2 – Sampling Guideline**

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At this point, no data is available on sample means or variance for lumens output of LED tubes. For lumens output and illuminance, manufacturer technical specs can provide some information on expected values. However, there is no data on the distribution of ballast and tubes types, because T8s were not previously covered by IOU programs. With an unknown effect size, it is not possible to calculate the needed sample size.

Instead, it is recommended to make some assumptions about the effect size to determine an appropriate sample size. The international guidelines for EM&V [Attachment 2] provide simple reference tables for sample sizes at given levels of variance. To be conservative, it is suggested to assume a coefficient of variance on the large side. Therefore, for a total population of 500 sites and cv=0.5, it is recommended to follow the guidelines to sample 60 sites, at 90% confidence level and 10% precision (Table G2 of Attachment 2).

This measurement exercise can also deliver valuable data for future studies. It is recommended to track certain baseline characteristics pre and post installation so actual sample means and variances can be determined at a later stage. The guidelines also recommend generating usage groups for measurement purposes. Such subsets of the population with similar characteristics will decrease the variance of the outcome variable of interest, thereby allowing for smaller sample sizes, or, vice versa, increased statistical power to pick up an effect with a given sample size. Therefore, it would be helpful for future evaluations to track variables like operating characteristics and building type, so measurements can adequately be grouped into usage groups.

For all custom projects, SCE maintains a partnership audit form that tracks building characteristics such as location and area description, pre and post installation foot candles, ceiling height etc., which can be adapted to meet the needs of this study and collect valuable light verification and usage group data.

**Attachment 3 – Light Measurement Protocol**

-See Attachment 1

**Attachment 4 - Customer Satisfaction Survey**



**Attachment 5 - Check-list**



Types of eligible fixtures

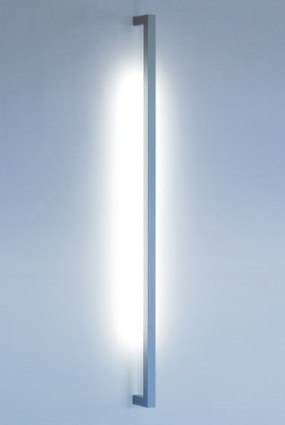


Strip

Industrial strip w/reflector

 Cove

Wrap



Indirect – wall mount

Indirect – suspended

 High Performance troffer – consider other options

Troffer – prismatic

 Direct/Indirect - consider other options