V4.2 Category Nuances and Allowances
Presenter

David Ryan
D+R International
Notes

• Slides will be posted following the Stakeholders Meeting
• Send additional questions to info@designlights.org
• Purpose of this session: to discuss the V4.2 Technical Requirements
  – New categories/requirements
  – Allowances
  – Transition
• Limited: ability to change policies in short-term. Policy development and revision has a process.
Agenda

• Spec Development Overview
  – Prioritization and Stakeholder Input Process

• Final V4.2 Technical Requirements
  ▪ T5, T5HO replacement lamps;
  ▪ Hazardous Location lighting;
  ▪ CRI and CCT Allowances;
  ▪ Multiple LEDs policy clarification
  – (Transition)
  – (Allowance Implementation Examples)

• Questions
Policy Development Overview
General DLC Development Process

**DLC Aggregates Requests/Suggestions for Development**
- Maintain "wish lists"
- Spec Development (new primary uses)
- Spec Revision (new performance thresholds)
- Policy Development
- Policy Revision

**Prioritize Wish Lists Periodically**
- Active review with DLC Technical Committee
- Surveys of entire DLC Membership

**Prioritized Tasks Undertaken for Development**
- Any new spec development or program change goes through Stakeholder Input Process

**Iterative as needed**
- Prioritized Category evaluated, researched
- Draft requirements presented to Technical Committee; adjustments made based on feedback
- Draft distributed for industry input via Stakeholder Input Process
- Commenters call held to discuss feedback received
- Stakeholder input summarized and discussed with TC
- Revisions made based on Stakeholder and TC input
- New Policy Released
Linear Replacement Lamps
TLED Background

• Previous TLED General Applications were developed with T8 fluorescent replacements in mind
  – No explicit rules regarding form-factor of TLEDs seeking qualification
  – Implicit restrictions: testing requirements (reference troffer, reference ballast for “Type A”)  

• “Loopholes” used to qualify TLED T5 and T5HOs
  – T5 versions of reference troffers
  – Claims of T5 replacements being tested on Instant-Start ballasts

• Technical requirements and incentive measure confusion
  – T5HOs necessitate different technical requirements than T8s
  – Utility incentive offerings are different for T8s, T5, and T5HOs
V4.2 TLED Replacements Summary

- In addition to T8, covers both T5 and T5HO, addressing each distinctly
  - Similar to T8, CFLEDs: General Approach, limited testing

- New Requirements for T5s:
  - Similar baseline to T8s, similar approach to T8s (i.e., test in troffers)

- New Requirements for T5HOs:
  - Similar approach to T8s (i.e., test in high bays), distinct baseline
Eligibility, Marketing, and Testing

**T8**
- G13 Base
  - Nominal 48" length
- Replacement lamps for G13 Base, 48” fluorescent lamps, excluding UL Type A T12
- Testing in reference troffer
  - 0.88 BF Instant-Start ballast

**T5**
- G5 Base
  - Nominal 46” length
- Replacement lamps for T5 fluorescent lamps
- Testing in reference troffer
  - Normal (1.0) BF Programmed-Start Ballast

**T5HO**
- G5 Base
  - Nominal 46” length
- Replacement lamps for T5HO fluorescent lamps
- Testing in reference high bay
  - Normal (1.0) BF Programmed-Start Ballast
## Updated Technical Requirements Table

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>General Application</th>
<th>Minimum Light Output (lm)</th>
<th>DLC Standard</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>T8 Four-Foot Linear Replacement Lamps</td>
<td>In luminaire: 2 lamps: 2,000 3 lamps: 4,500 4 lamps: 6,000 Bare lamp: 1,500</td>
<td>In luminaire: 100 Bare lamp: 110</td>
<td>5</td>
<td>$5,000 / ±80 / ±50,000</td>
</tr>
<tr>
<td>18</td>
<td>T8 Four-Foot Linear Replacement Lamps</td>
<td>In luminaire: 2 lamps: 3,000 3 lamps: 4,500 4 lamps: 6,000 Bare lamp: 1,500</td>
<td>In luminaire: 100 Bare lamp: 110</td>
<td>5</td>
<td>$5,000 / ±80 / ±50,000</td>
</tr>
<tr>
<td>19</td>
<td>T8/840 Four-Foot Linear Replacement Lamps</td>
<td>In luminaire: 2 lamps: 7,500 4 lamps: 10,000 6 lamps: 15,000 Bare lamp: 3,200</td>
<td>In luminaire: 105 Bare lamp: 110</td>
<td>5</td>
<td>$5,000 / ±80 / ±50,000</td>
</tr>
<tr>
<td>20</td>
<td>T8 Two-Foot Linear Replacement Lamps</td>
<td>In luminaire: 2 lamps: 1,350 3 lamps: 2,000 4 lamps: 2,700 Bare lamp: 800</td>
<td>In luminaire: 100 Bare lamp: 110</td>
<td>5</td>
<td>$5,000 / ±80 / ±50,000</td>
</tr>
<tr>
<td>21</td>
<td>U-Bend Replacement Lamps</td>
<td>In luminaire: 2 lamps: 2,500 3 lamps: 3,750 Bare lamp: 1,400</td>
<td>In luminaire: 100 Bare lamp: 110</td>
<td>5</td>
<td>$5,000 / ±80 / ±50,000</td>
</tr>
</tbody>
</table>

- See Primary Use Zonal Luminance Density Requirements in Table 4, below.
## Lamp-Level Criteria: T5/T5HO

<table>
<thead>
<tr>
<th>Individual Lamp Criteria</th>
<th>Four-Foot Lamps, T8 replacements</th>
<th>Two-Foot Lamps, T8 replacements</th>
<th>U-bend Lamps, T8 replacements</th>
<th>Four-Foot Lamps, T5 replacements</th>
<th>Four-Foot Lamps, T5HO replacements</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Efficacy</td>
<td>≥ 110 lm/W</td>
<td>≥ 110 lm/W</td>
<td>≥ 110 lm/W</td>
<td>≥ 110 lm/W</td>
<td>≥ 110 lm/W</td>
</tr>
<tr>
<td>Initial Light Output</td>
<td>≥ 1,600 lm</td>
<td>≥ 800 lm</td>
<td>≥ 1,400 lm</td>
<td>≥ 1,600 lm</td>
<td>≥ 3,200 lm</td>
</tr>
<tr>
<td>Correlated Color Temp. (CCT)</td>
<td>≤ 5000K</td>
<td>≤ 5000K</td>
<td>≤ 5000K</td>
<td>≤ 5000K</td>
<td>≤ 5000K</td>
</tr>
<tr>
<td>Color Rendering Index (CRI)</td>
<td>≥ 80</td>
<td>≥ 80</td>
<td>≥ 80</td>
<td>≥ 80</td>
<td>≥ 80</td>
</tr>
<tr>
<td>Power Factor</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
</tr>
<tr>
<td>Total Harmonic Distortion</td>
<td>≤ 20%</td>
<td>≤ 20%</td>
<td>≤ 20%</td>
<td>≤ 20%</td>
<td>≤ 20%</td>
</tr>
<tr>
<td>Warranty</td>
<td>≥ 5 Years</td>
<td>≥ 5 Years</td>
<td>≥ 5 Years</td>
<td>≥ 5 Years</td>
<td>≥ 5 Years</td>
</tr>
</tbody>
</table>
## In-Situ Criteria: T5/T5HO

### In-situ Lamp Criteria

<table>
<thead>
<tr>
<th></th>
<th>Four-Foot Linear T8 and T5 Replacement Lamps</th>
<th>Four-Foot Linear T5HO Replacement Lamps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Luminaire Efficacy</strong></td>
<td>≥ 100 lm/W</td>
<td>≥ 105 lm/W</td>
</tr>
</tbody>
</table>
| **Minimum Initial Luminaire Light Output** | 2 lamps installed = 3,000 lm*  
3 lamps installed = 4,500 lm  
4 lamps installed = 6,000 lm | 3 lamps installed = 7,500 lm  
4 lamps installed = 10,000 lm*  
6 lamps installed = 15,000 lm |
| **Spacing Criteria** | Spacing Criteria:  
0-180° = 1.0 - 2.0  
90-270° = 1.0 - 2.0  
Zonal Lumen Distribution:  
0-60°: ≥ 75% | Zonal Lumen Distribution:  
20-50°: ≥ 30% |
| **Lumen Maintenance L₇₀** | 50,000 hours                               | 50,000 hours                           |
Spec Sheet and Marketing Claim Requirements

• Marketing material shall indicate the lamp type (i.e., T8, T5, T5HO, or other) and length (i.e., 46” or 48”) the product is intended to replace
  – For example: Spec sheet: “Intended to replace T5 fluorescent lamps”.

• Not eligible:
  – Products of other lengths and bases
  – UL Type A (or dual-mode) products intended to replace T12 fluorescent lamps
  – Products that can operate off magnetic ballasts

• Manufacturers of products that were previously qualified in the “four-foot” General Application that do not meet these new requirements will need to submit update applications to maintain their listings
Hazardous Location Lighting
Hazardous Location Lighting Background

• With development of “Specialty” Primary Use Designation, increased requests for “Hazardous” descriptors
  – Appears to be driven by product marketing, rather than performance

• Challenge:
  – Previously, no policies specific to whether products were appropriate for “Hazardous” locations
  – Concern about expectation that DLC is verifying that products are appropriate for hazardous location use

• DLC sought initial comment and proposals under V4.1 comment period

• Consensus around requiring safety listing to UL 844 standard
  – UL 844: Standard for Luminaires for Use in Hazardous (Classified) Locations
Hazardous Location Lighting Policy Summary

- Products submitted under the Specialty Use Designation with the descriptor “Hazardous” must provide documentation to demonstrate the appropriateness of the product for Hazardous Locations
  - Certification of Compliance, Notice of Authorization to Mark, or directory listing from an applicable safety organization
  - Must explicitly state that the model numbers in question are certified to the UL 844, including the Class and Division to which the products are certified
Timeline and Transition Policies
V4.2 Implementation Timeline

April 28
- V4.2 Released
- Submissions under V4.2 accepted
- Submissions under V4.1 accepted

May 19
- Submission Grace Period Ends
- All new submissions must meet V4.2

July 28
- Update Grace Period Ends
- All listed products must meet V4.2
V4.2 Transition Requirements

• All T5, T5HO, and Hazardous Location products listed in Specialty Designations must update to V4.2 by 7/28, or they will be delisted
  – Normal review timelines apply! Please get your submissions in ASAP!
  – Original submissions must be updated before private labels can be updated

• Individualized lists of affected products sent to manufacturers on 5/17 and 6/21
  – If you believe your products are mischaracterized, please let us know immediately!

• Hazardous Location products need only supply the safety documentation showing UL 844 listing.
  – No update application fee

• T5 and T5HO products must provide complete new testing
  – Normal application fees
Submitting Update Applications

1. Download from the QPL the list of products you’d like to update
2. Create a new application under the NEW application portal
3. Identify the application being submitted as an “Update” application in the application type and the description sections
4. Upload the necessary documents
   - Hazardous: safety doc
   - T5, T5HO: complete application documents
5. Click submit!
Allowances
Allowances: Background and Motivation

• Effort grew out of conversations and following V4.0 steep efficacy increase
  – Efficacy levels set at General Application, mismatched effects on Primary Uses due to unique considerations
  – e.g., optical/distribution needs

• Technical Challenges in meeting proposed levels for specific types of products
  – “Architectural” Indoor products,
  – “Historical/Decorative” Outdoor Products,
  – High CRI/Low CCT products
  – Products with particular Optical Qualities (glare mitigation/diffusing lenses)
Efficacy: Special Cases

• Sensitive to feedback about impact on specific product types
  – No desire to exclude high-quality products from QPL
  – Don’t want to drive poor optics, high CCTs, or other effects

• Challenge: difficult to define “quality” parameters

• Challenge: lowering requirements for a whole category to accommodate specific product types allows more products to qualify that don’t have the features we are trying to accommodate
  – How do we isolate just those products we need to accommodate?

• Challenge: creating additional categories is administratively burdensome
  – Any approach requires rigor to isolate specific products/features (as above)
Adopted Allowances V4.2

<table>
<thead>
<tr>
<th>Feature or Performance Metric</th>
<th>Allowance to Efficacy Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCT: ≤3000K, &gt;2700K</td>
<td>-3%</td>
</tr>
<tr>
<td>CCT: ≤2700K</td>
<td>-5%</td>
</tr>
<tr>
<td>CRI*: Ra ≥ 90</td>
<td>-5%</td>
</tr>
<tr>
<td>(*must also conduct TM-30 testing and report results per the TM-30 policies)</td>
<td></td>
</tr>
</tbody>
</table>

- Allowances are not cumulative.
  - Product that has CCT of 2700K AND 90 CRI will only receive 5% allowance

- Allowances were applied retroactively to products on the QPL prior to 4/1/2017 (prior to the V4.0 de-listing)
  - Automatic relisting on 4/28 if met requirement with V4.2 allowance
Allowance Example #1

Linear Ambient Luminaire w/ performance:
- 98 LPW
- 92 CRI
- 3500K CCT

FIRST apply the Allowance:
105 LPW (base requirement, DLC standard)
- 5% allowance (CRI ≥ 90)
  = 99.75 LPW

THEN apply the Tolerance:
99.75 LPW allowed requirement – 3% tolerance = 96.75 LPW

PRODUCT MEETS DLC STANDARD
Allowance Example #2

• PRODUCTS MUST ALWAYS BE BRACKET BY PASSING TEST DATA
• 2x4 Troffers: 3000K, 4000K (80 CRI)
  – 96, 99 LPW, respectively
• 3000K product must be tested, meets via allowance + tolerance
  – 100 LPW standard efficacy requirement – 3% (<3000K CCT allowance) – 3%
    (tolerance) => functional minimum efficacy of 94.09 LPW
  – However, test result of 96 LPW for 3000K product DOES NOT BRACKET 4000K product.
• 4000K product must ALSO be tested
  – 100 LPW – 3% (tolerance) => functional minimum efficacy of 97 LPW
  – 96 LPW OF 3000K PRODUCT DOES NOT MEET THIS REQUIREMENT
• (Reminder: pre-allowances, 3000K product would not pass at all)
Allowances Display on QPL
Multiple LED Policy
Multiple LED Policy Update

• The DLC Multiple LEDs policy has been updated, removing the reference to white-light LEDs:

• Prior to V4.2:

  “Products employing multiple types of white-light LEDs are eligible under the following conditions: 1) the types and quantities of the LED packages/modules/arrays are known, and 2) the LEDs are not dynamically controlled, other than for dimming purposes.”

• V4.2:

  “Products employing multiple types of LEDs are eligible under the following conditions: 1) the types and quantities of the LED packages/modules/arrays are known, and 2) the LEDs are not dynamically controlled, other than for dimming purposes.”
Additional Efforts
Under Development
Additional Efforts Under Development

- Color Tunable Products
- DC/PoE Luminaires
- Flicker
- Replacement Lamps (various)
- Field Adjustable Performance
- Additional Allowances
Questions!
Thank you!

Irina Rasputnis  irasputnis@designlights.org  781-538-6425 x133
Michael McGaraghan mmcgaraghan@energy-solution.com  510-482-4420 x242
Dave Ryan  dryan@drintl.com  301-588-9387 x1078

For questions regarding new requirements, please email: applications@designlights.org