



Family Grouping Applications for LED-based Horticultural Lighting

Version 2.0 – Draft 1

Proposed Effective Date January 4, 2021

The DLC is proposing to allow family grouping applications with the V2.0 Technical Requirements revision. Family grouping applications are designed to reduce the total testing and application fees required by manufacturers to list groups of products to comply with the Family Grouping definition, compared to testing and listing all products individually. Typically, parent products are based on tested data from worst-case models within a family group and child products are based on reported data. Generally, limited testing can be provided if the worst-case models demonstrate compliance with the Technical Requirements.

Family grouping application eligibility, testing, and application guidance are described below.

Family Grouping Application Eligibility

To submit a family grouping application, a product family must meet the following definition:

- A family may contain a single LED package/module/array, a standardized set of LED packages/modules/arrays, and/or variations in standardized sets of LED packages/modules/arrays.
 - Families comprised of different models that correlate to fixture-level variations of spectral distribution will be grouped in spectral sub-groups.
 - Child products are required to emit the same relative Spectral Quantum Distribution (SQD) as the representative parent. If not the same relative SQD, a separate application is required.
 - The DLC acknowledges that different lumen packages, optics, etc. can cause small changes to SQD. To limit testing burden, SQD images generated from parent-level spectral data will be used to represent child products.

- Products employing multiple types of LEDs – that is, those that are not dual-sourcing and/or utilizing ‘equivalent’ LEDs – are eligible, so long as the construction, types and quantities of the LED packages/modules/arrays are documented.
 - An LM-80, ISTMT, and TM-21 projection is required for each type of LED present in the product. As per normal testing rules, ISTMTs should measure the applicable TMP and must be conducted on the hottest LED of each type.
 - Each LED must demonstrate the required $Q_{90} \geq 36,000$ hours, with exceptions noted in the [Draft Testing and Reporting Requirements for LED-based Horticultural Lighting V2.0 policy](#).
 - If variable numbers of LEDs are dynamically chosen, and therefore the precise construction of any given product is not defined, the products are not eligible for family grouping applications. Policy development for appropriate evaluation of this type of product is under consideration.
- The fixture must demonstrate scalability or modular use of the identical LED packages/modules/arrays, electronics, optics, heat sinking, and any other applicable features employed in the fixture.
- Provided that the impact on performance is well understood and explained by the applicant, other design parameters and components, such as electronics, optics, heat sinking, and other performance-affecting and non-performance affecting features, are typically allowed to vary. The DLC reserves the right to request additional information confirming that these features do not affect performance.
- A family may contain multiple driver variations as well as different LED drive currents achieved by an adjustable driver.
- The overall physical fixture housing and assembly of the fixtures in the family group is of identical material, construction, and differs primarily in overall physical dimensions for different models within the grouping.
- Decisions on whether a given group of fixtures are eligible to be submitted in the same family grouping application are at the sole discretion of the DLC. Variation in materials, designs that change the position of key components relative to one another, and other variations that, in the judgement of the DLC, have potential to cause differences in optical, electrical, or thermal performance, will not be allowed within the same family group.
- A family may contain variations in fixture mounting systems provided that the mounting systems do not change thermal management characteristics.
- If multiple driver variations are included within the family grouping, please refer to the testing requirements for fixtures with multiple drivers described in the [Draft Testing and Reporting Requirements for LED-based Horticultural Lighting V2.0 policy](#) for specific instructions.
- In all application submissions, manufacturers must list full and complete model numbers that clearly demonstrate all fixture options offered in the family grouping.

- “Full and complete model numbers” means model numbers that include all performance-affecting and non-performance affecting variations offered, and which do not omit any option that is available to customers in the market. In general, options that do not affect the performance of the fixture can be submitted as a single model number with multiple options bracketed in the model number. For example, a fixture that has multiple non-performance affecting mounting options may include all mounting options in brackets (e.g. “[M1, M2, M3]”). Low and high voltage options can be submitted as a single model number (e.g. “ABC PAR [120V-277V, 347V-480V] M1”) with the worst-case performance reported. Multiple or alternate drivers can also be listed in a single model number as long as the drivers perform nominally the same. If the alternate drivers perform nominally differently (that is, they are not presented to customers as having the same performance other than input voltage, and result in different ordering codes) then the unique drivers will need to be listed in separate model numbers. Options that affect photosynthetic photon flux (PPF) output, presence or lack of fans, dimming, or spectral tuning capabilities, etc. may not be bracketed and submitted as a single model number.
- DLC reviewers may check web listings and other marketing materials and reserve the right to request additional information to document the full and complete model number. A lack of clarity in model numbers will result in delayed application processing. Misrepresentation of model numbers discovered outside the application process will generally be considered a violation of the DLC program rules and [Logo and Trademark Use Guidelines](#).
- Each model number may only represent the fixture under a single brand. If the fixture can be sold under multiple brands, model numbers will need to be listed separately for each brand.

Please review the [V2.0 Draft Testing and Reporting Requirements](#) for additional policy clarifications and contact horticulture@designlights.org with any questions about submitting an application to the DLC.

Testing Family Grouping Products

The family grouping testing policy is designed to reduce testing burden as well as to reduce the total application fees required by manufacturers to list groups of horticultural products. By identifying the models with the worst-case performance within a family group, limited testing can be provided if the worst-case models demonstrate compliance with the Technical Requirements.

Testing Product Families for Technical Requirements V2.0

An example of the typical required testing and reporting required under V2.0 for a family of products is provided in **Table 1**. Specific testing and reporting requirements for each of the Technical Requirements can be found in the corresponding sections of the V2.0 policy.

- Family groups can be further separated into spectral sub-groups. In general, a product family application with configurations correlated to different spectral distribution variations will be required to report spectral sub-groups.
- Each family group or spectral sub-group, as applicable, requires testing and reporting for each of the criterion below. Descriptions of all the criterion in Table 1 (below) can be found in the guidance section that follows for each family or each spectral sub-group, as applicable.

Table 1: Worst-case Criteria Descriptions

Criterion	Which Model(s)	Test Required
Minimum PPF	Worst-case photosynthetic photon flux output variation	LM-79, including accompanying TM-33-18 document. Note: A single LM-79 report may fulfill several criteria
Minimum Photosynthetic Photon Efficacy (PPE)	Worst-case efficacy	
Photosynthetic Photon Intensity Distribution (PPID)	Each unique optical and distribution pattern	
Minimum Q_{90} Photon Flux Maintenance, Photosynthetic (PFM _p)	ISTMT at worst-case thermal conditions for each unique LED type	ISTMT
	LM-80 for each LED package/module/array as required for flux maintenance projection	LM-80/LM-84
		TM-21/TM-28
Driver Reliability	Worst-case driver temperature for each unique driver	ISTMT
Power Quality Total Harmonic Distortion – Current (THDi) and Power Factor (PF)	Worst-case performing driver	Benchtop Electrical Testing Worst-case value will be reported, independent of it appearing in LM-79 test report or benchtop electrical testing.

Testing Guidance for Technical Requirements V2.0

The following provides detail on the proposed testing requirements for worst-case fixtures within family applications under the V2.0 Draft Technical Requirements.

Minimum PPF Output

- The fixture in each family group or spectral sub-group that is expected to have the lowest overall photosynthetic photon flux output must be tested and an LM-79 report must be provided.
- In general, this is expected to be the fixture with the fewest number of LEDs, lowest drive current, and least efficient optic within the family group or each spectral sub-group, as applicable.

Minimum PPE

- The fixture in each family group or each spectral sub-group, as applicable, that is expected to have the lowest micromoles per Joule must be tested and an LM-79 report must be provided.
- When determining minimum PPE, manufacturers must demonstrate that they are factoring in all variations that will affect this metric, including light output (LED counts and drive current), optical efficiencies, driver and applicable operating conditions, and thermal effects.
- There are many factors that can influence efficacy. Manufacturers shall determine and justify the combination of factors that result in the worst-case efficacy of the family or each spectral sub-group, as applicable. The DLC reserves the right to ask for additional information to clarify or verify technical justification.
- If the family group or spectral sub-group contains multiple drivers, benchtop electrical testing must be provided documenting the fixture wattage at the applicable loading conditions and at the applicable input voltages for each driver.

PPID

- All fixture variations that result in a different optical and/or distribution pattern in each family group or spectral sub-group, as applicable, must be tested and an accompanying TM-33-18 document must be provided for each PPID variation within the family group or spectral sub-group, as applicable.

Minimum Q_{90} PFM_p

- To demonstrate compliance with the minimum Q_{90} PFM_p (Photosynthetic Photon Flux Maintenance) requirement, thermal testing must be conducted on the worst-case configuration within the family group or spectral sub-group, as applicable.
- In general, this is expected to be on the fixture where the LED is operating at its highest temperature within the group. An ISTMT conducted on the hottest LED (for each LED type) in this (hottest) fixture must be submitted to support TM-21 projections for Q_{90} PFM_p.

- Worst-case thermal measurements are required for each family group or spectral sub-group, as applicable.

Driver Reliability

- The family group must demonstrate that the driver(s) used in the family meet the driver warranty requirements. An ISTMT of the driver(s) must be conducted on the worst-case fixture within the family or spectral sub-group, as applicable, and must be supplied along with the appropriate driver specification sheets showing TMP location and reliability under allowable operating temperatures.
- In general, the worst-case model is expected to be the highest wattage model within the family or spectral sub-group, as applicable.
- The ISTMT report must be conducted at the applicable TMP location on the driver for the fixture where the driver operating temperature is worst-case.
- If multiple drivers exist within the family group or spectral sub-group, manufacturers are required to demonstrate which driver will result with the worst-case condition. Thermal testing for each non-relatable driver variation is required. The DLC reserves the right to require thermal test data on each unique driver if rationale is not specific enough to demonstrate worst-case.

Power Quality (THDi and PF)

- Electrical testing must be provided for the fixture that is expected to have the worst-case THDi and PF in the family group or the spectral sub-group, as applicable.
 - In-house (i.e. non-accredited lab) testing is allowed.
- In general, this is expected to be on the fixture with the driver with the worst-case loading and output condition. In situations where there is more than one driver in the group or spectral sub-group, in-house testing will be needed to demonstrate that the worst-case driver, loading condition, and input voltage have been selected for testing.
- For each unique driver used within a family group or spectral sub-group, manufacturers must provide electrical testing to demonstrate which driver variation will result in the overall worst-case metrics identified.
- The testing should include the input voltage, current and wattage, the output voltage, current and wattage, and the THDi and PF, for the worst-case loading condition of each driver within the family group or spectral sub-group, as applicable. This information should be factored into the scaled performance methodology and identification of worst-case efficacy and power quality.

Family Grouping Application Instructions

The process for implementing family grouping applications is under development. Instructions will be available prior to the effective date of the V2.0 Technical Requirements.

Key Questions

1. Because of multiple different axes of performance and product variability, the DLC is proposing to implement family grouping applications with a major interest on spectral and spatial distributions variations. The DLC has proposed that fixture-level spectral variations require spectral sub-grouping, where each family group or spectral sub-group, as applicable, requires worst-case testing for each of the criterion described above. What are the major questions or complicating issues you have with this proposal and what are your suggestions to address them?
2. For product families containing multiple types of LEDs, the DLC is proposing to collect information related to quantities of LEDs as part of the application process. This information will only be collected to ensure that products utilizing variable numbers of LEDs that are dynamically chosen are not listed on the QPL. This information would not be reported on the QPL, nor used outside of the application review process. What, if any, are the major questions or complicating issues you have with this proposal and what are your suggestions to address them?

Please provide your responses to these key questions in Excel-based Horticultural Lighting V2.0 Comment Form, under the Family Grouping Applications tab.