



Family Grouping Application Requirements for LED-based Horticultural Lighting

Version 2.0

Effective Date: March 31, 2021

The DLC allows family grouping applications for horticultural lighting products starting with the V2.0 Technical Requirements effective date (March 31, 2021). Family grouping applications are designed to reduce the total testing and application fees required to list groups of products that comply with the family grouping definition. 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. For additional information on the Technical Requirements, please review the [V2.0 Testing and Reporting Requirements for LED-based Horticultural Lighting](#).

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.
 - Spectral sub-groups are defined as distinct product offering spectrum variations within the family. This is commonly shown on specification sheets as a “light color” or “spectrum” options.
 - Child products are required to emit the same relative Spectral Quantum Distribution (SQD) as a representative parent. If not the same relative SQD, a separate spectral sub-group is required.
 - The DLC acknowledges that different lumen packages, optics, etc. can cause small changes to SQD. These variations do not typically result in different

- 29 spectral sub-groups. However, differences that result from changes to specific
30 LED type, relative quantities of LEDs, etc., do specifically require spectral sub-
31 groups or separate family grouping applications.
- 32 ▪ To limit testing burden, SQD images generated from parent-level spectral data
33 will be used to represent child products.
 - 34 ○ Products employing multiple types of LEDs – that is, those that are not dual-sourcing
35 and/or utilizing ‘equivalent’ LEDs – are eligible, so long as the construction, types, and
36 quantities of the LED packages/modules/arrays are documented.
 - 37 ▪ An LM-80, ISTMT, and TM-21 projection is required for each type of LED present
38 in the product. As per normal testing rules, ISTMTs should measure the
39 applicable temperature measurement point (TMP) and must be conducted on
40 the hottest LED of each type.
 - 41 ▪ Each LED must demonstrate the required $Q_{90} \geq 36,000$ hours, with exceptions
42 noted in the [Testing and Reporting Requirements for LED-based Horticultural
43 Lighting V2.0 policy](#).
 - 44 ▪ If variable numbers of LEDs are dynamically chosen, and therefore the precise
45 construction of any given product is not defined, the products are not eligible
46 for family grouping applications. Policy development for appropriate evaluation
47 of this type of product is under consideration.
 - 48 ○ Products employing varying output channels beyond simple, single-axis dimming of the
49 whole product (i.e. spectrally-tunable products) are eligible so long as testing and
50 reporting requirements as described in the “Special Considerations for Spectrally-
51 Tunable Devices” subsection of the [Testing and Reporting Requirements for LED-based
52 Horticultural Lighting V2.0 policy](#) are satisfied.
 - 53 • The family must demonstrate scalability or modular use of the identical LED
54 packages/modules/arrays, electronics, optics, heat sinking, and any other applicable features
55 employed in the fixture.
 - 56 • Provided that the impact on performance is well understood and explained by the applicant,
57 other design parameters and components, such as electronics, optics, heat sinking, and other
58 performance-affecting and non-performance-affecting features, are typically allowed to vary.
59 The DLC reserves the right to request additional information confirming that these features do
60 not affect performance.
 - 61 • A family may contain multiple driver variations as well as different LED drive currents achieved
62 by a programmable driver. Please refer to the testing requirements for fixtures with multiple
63 drivers described in the [Testing and Reporting Requirements for LED-based Horticultural
64 Lighting V2.0 policy](#) for specific instructions.
 - 65 • The overall physical fixture housing and assembly of the fixtures in the family group must be of
66 identical material and construction, and may only differ in overall physical dimensions for
67 different models within the grouping.

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- A family may contain variations in fixture mounting systems provided that the mounting systems do not change thermal management characteristics.
 - 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 may 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 may 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 must 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 must be listed separately for each brand.
 - 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, by the judgement of the DLC, have potential to cause differences in spectral, optical, electrical, or thermal performance, will not be allowed within the same family group or spectral sub-group, as appropriate.

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

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106 **Testing Family Grouping Products**

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

112 **Testing Product Families under Technical Requirements V2.0**

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

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

122 **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 Lifetime	Worst-case driver temperature for each non-relatable driver	ISTMT
Fan Lifetime	Worst-case fan temperature for each unique fan	ISTMT



Power Quality: Total Harmonic Distortion – Current (THDi) and Power Factor (PF)	Worst-case performing driver	Benchtop Electrical Testing or LM-79
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123 **Testing Guidance for Technical Requirements V2.0**

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

126 **Minimum PPF Output**

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

133 **Minimum PPE**

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

147 **PPID**

- 148 • All fixture variations that result in a different optical and/or distribution pattern in each family
149 group or spectral sub-group (as applicable) must be tested. An accompanying TM-33-18
150 document and .jpg image must be provided for each PPID variation within the family group or
151 spectral sub-group (as applicable). To facilitate time for accredited labs to develop or purchase
152 TM-33-18 reporting software, the DLC offers a 9-month grace period for applicants to provide
153 LM-63 and TM-27 (i.e. .ies and .spx files, respectively) for parent products.

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155 **Minimum Q₉₀ PFM_p**

- 156 • To demonstrate compliance with the minimum Q₉₀ PFM_p (Photosynthetic Photon Flux
157 Maintenance) requirement, thermal testing must be conducted on the worst-case configuration
158 within the family group or spectral sub-group (as applicable).
 - 159 ○ In general, this is expected to be on the fixture where the LED is operating at its highest
160 temperature within the group. An ISTMT conducted on the hottest LED (for each LED
161 type) in this hottest fixture must be submitted to support TM-21 projections for Q₉₀
162 PFM_p.
- 163 • Worst-case thermal measurements are required for each family group or spectral sub-group (as
164 applicable).

165 **Driver Lifetime**

- 166 • The family group must demonstrate that the driver(s) used in the family meet the driver lifetime
167 requirements. An ISTMT of the driver(s) must be conducted on the worst-case fixture within the
168 family and spectral sub-group (as applicable) and must be supplied along with the appropriate
169 driver specification sheets showing TMP location and reliability under allowable operating
170 temperatures.
- 171 • In general, the worst-case model is expected to be the highest wattage model within the family
172 and spectral sub-group (as applicable).
- 173 • The ISTMT report must be conducted at the applicable TMP location on the driver for the fixture
174 where the driver operating temperature is worst-case. The temperature at the tested TMP
175 location must be equal to or lower than temperature noted on the driver specification sheet to
176 predict a lifetime ≥ 50,000 hours.
- 177 • If multiple drivers exist within the family group or spectral sub-group, manufacturers are
178 required to demonstrate which driver will result with the worst-case condition. Thermal testing
179 for each non-relatable driver variation is required. In general, drivers are considered to be
180 relatable if defined on driver specification sheets as being in the same series by the driver
181 manufacturer. The DLC reserves the right to require thermal test data on each unique driver if
182 rationale is not specific enough to demonstrate worst-case.

183 **Fan Lifetime**

- 184 • The manufacturer must demonstrate that the fan(s) used in the family group meet the fan
185 lifetime requirements. An ISTMT of the fan(s) must be conducted on the worst-case fixture
186 within the family and spectral sub-group (as applicable) and must be supplied along with the
187 appropriate fan specification sheets showing TMP location and reliability under allowable
188 operating temperatures.
 - 189 ○ In general, the worst-case model is expected to be the highest wattage model within the
190 family and spectral sub-group (as applicable).
- 191 • The ISTMT report must be conducted at the applicable TMP location on the fan for the fixture
192 where the fan operating temperature is worst-case. The temperature at the tested TMP location



193 must be equal to or lower than temperature noted on the fan specification sheet to predict a
194 lifetime $\geq 50,000$ hours.

195 **Power Quality (THDi and PF)**

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

