Energy · Quality · Controllability℠

# Horticultural Lighting V3.0
# Draft 1

April 13, 2021

Date

# Agenda

- Introduction
- Webinar Logistics
- V3 Overview and Timeline
- V3 Baseline Requirement Proposal
- V3 Topic Review
  - Application Information
  - Controllability
  - Surveillance Testing
- Q&A

# Introductions

## Presenters

**Kasey Holland**
*Technical Manager*

**Adrian Martin**
*Technical Analyst*

**Andrew Tiebout**
*Project Manager of Technical Development*

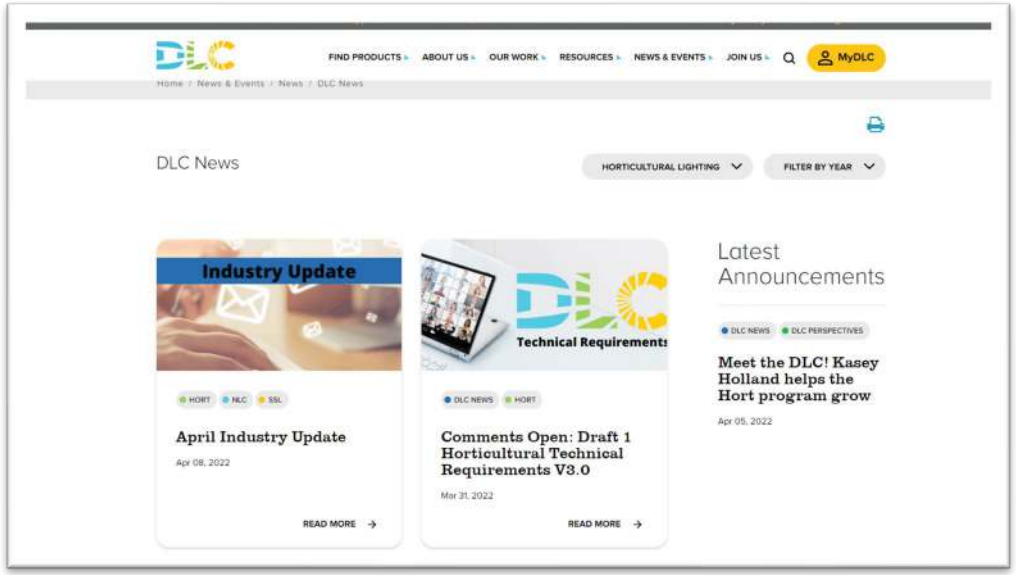
## Q&A Support

**Leora Radetsky**
*Senior Research Scientist*

**Stuart Berjansky**
*Technical Director*

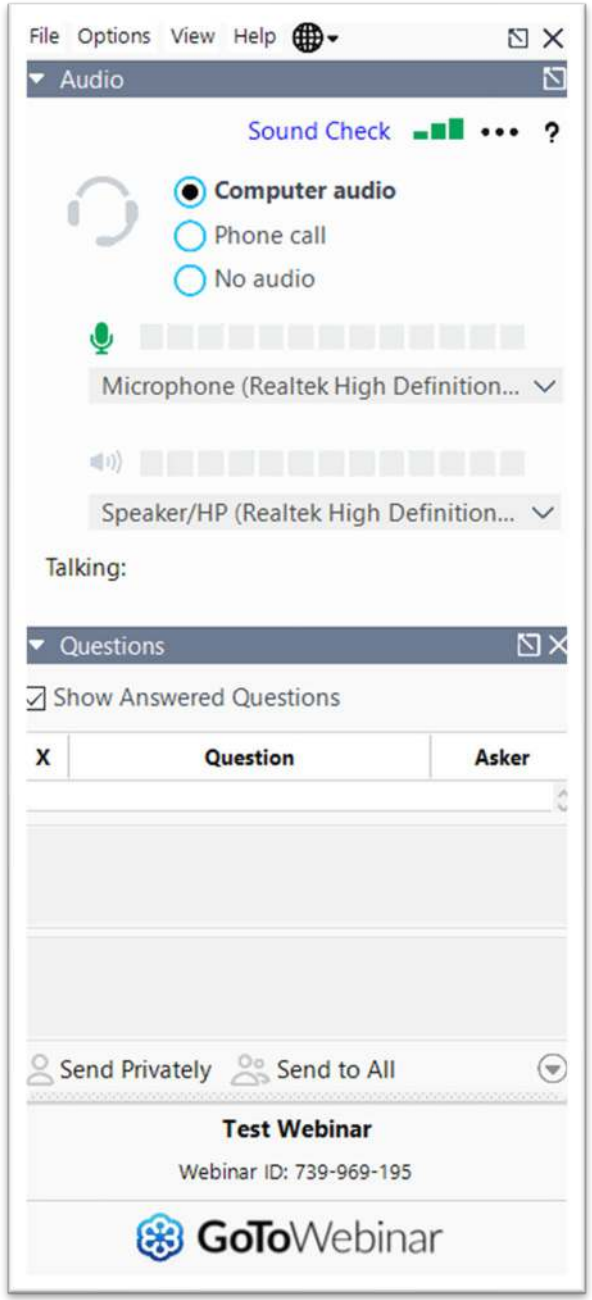
# Webinar Logistics

- **Slides and recorded webinar will be posted** on the *DLC News & Events* page at www.designlights.org shortly after today's presentation
- All attendees are automatically muted
  - If you experience technical issues, please use the Chat feature to let us know




# Questions and Answers

- We will leave **15 minutes** after the presentation to answer questions. Please enter your Questions pane in GoToWebinar.
  - DLC technical support team will answer questions as they come in via the Questions pane
  - Some questions will be answered aloud (anonymously) at the end during the Q&A session



# Comment Forms

All comments must be submitted using DLC Comment Forms. Please download the Comment Form and submit the completed forms to comments@designlights.org

| | Comment Form Instructions |
|---|---|
| Document: | Technical Requirements for Horticultural Lighting V3.0 |
| Version: | Draft 1 |
| Comments Due: | Close of business, Thursday, May 12, 2022 |
| Instructions and Background: | **Please follow these steps to ensure your comments are received and considered by the DLC:**<br><br>1. Enter your Organization, Name, Email Address, and Phone Number in Row 8 of this worksheet.<br><br>2. There are three (3) new sections included in this release: Application Information Requirements, Controllability Requirements, and the Surveillance Testing Policy. Navigate to the tab at the bottom of this worksheet corresponding to the section of the Hort V3.0 draft on which you'd like to comment. Comments to Hort V3.0 that are not related to a specific section or topic may be added at the "General Comments" tab.<br><br>3. After your review of the draft documents, please consider each Key Question in Columns B, C, and D and submit your answer in Column D and potential solutions in Column E. Comments to the Technical Requirements that are not related to a specific Key Question may be added to the remainder of each worksheet. Please enter the line number of the draft corresponding to your comment into Column B starting on Row 16.<br><br>4. Save this Excel file with your comments and include your organization name appended to the end of the filename (for example: "DLC_Hort-V3.0Draft1_CommentForm_AcmeLightingCo").<br><br>5. Email the file to **comments@designlights.org** by close of business, **Thursday, May 12, 2022.** |

# V3.0 Overview and Timeline

# Hort Version 3.0

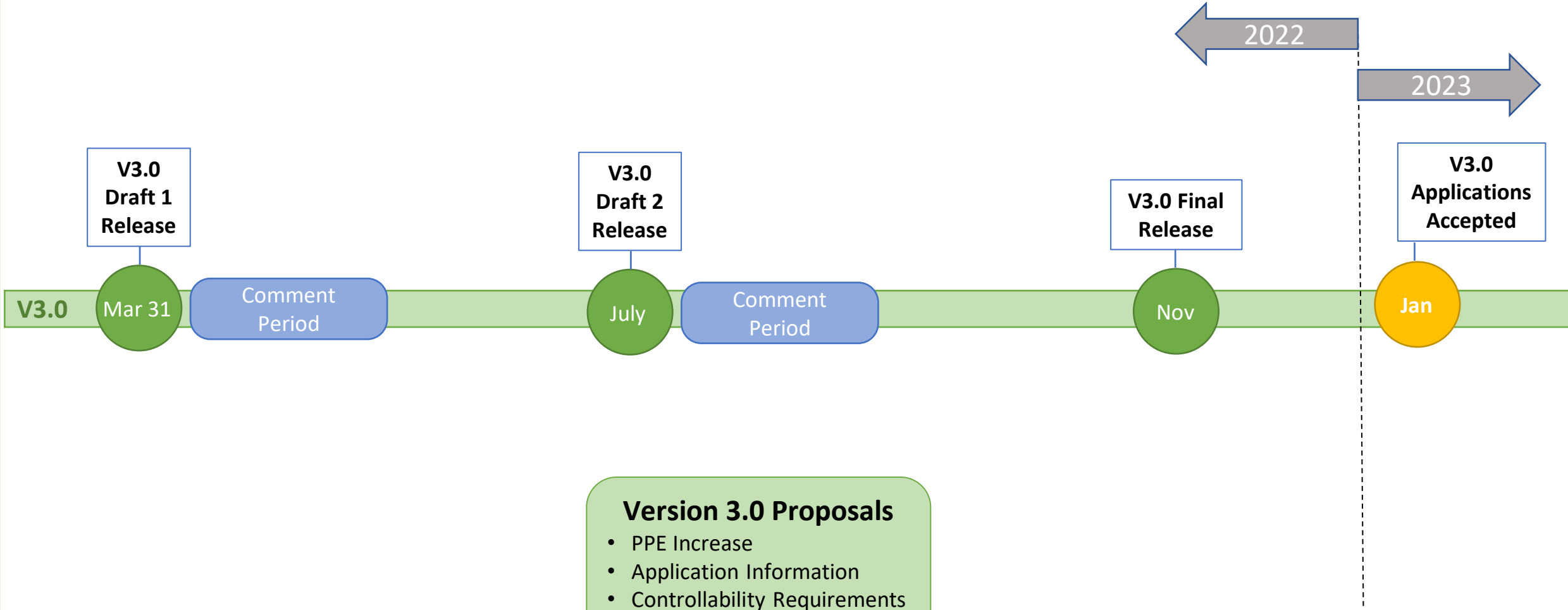
- Version 3.0 is a major revision that proposes four key updates
  - Increased Efficacy Threshold
  - Introduction of
    - Application Information requirements
    - Controllability requirements (at the product-level)
    - Surveillance Testing
- Draft 1 covers technical proposals
  - Implementation (application or fee) details will be provided before the application acceptance date (tentatively January 2023)

# Hort Version 3.0 Goals

- Accelerate energy efficiency of lighting in CEA
- Support EE programs development and aid end users using the QPL to identify and select products that are eligible for rebates
- Protects the integrity and value of the QPL for all stakeholders

| | |
|---|---|
| Increase | Photosynthetic Photon Efficacy |
| Introduce | Application-oriented requirements |
| Include | Fixture-level controllability requirements |
| Develop | Surveillance test program |

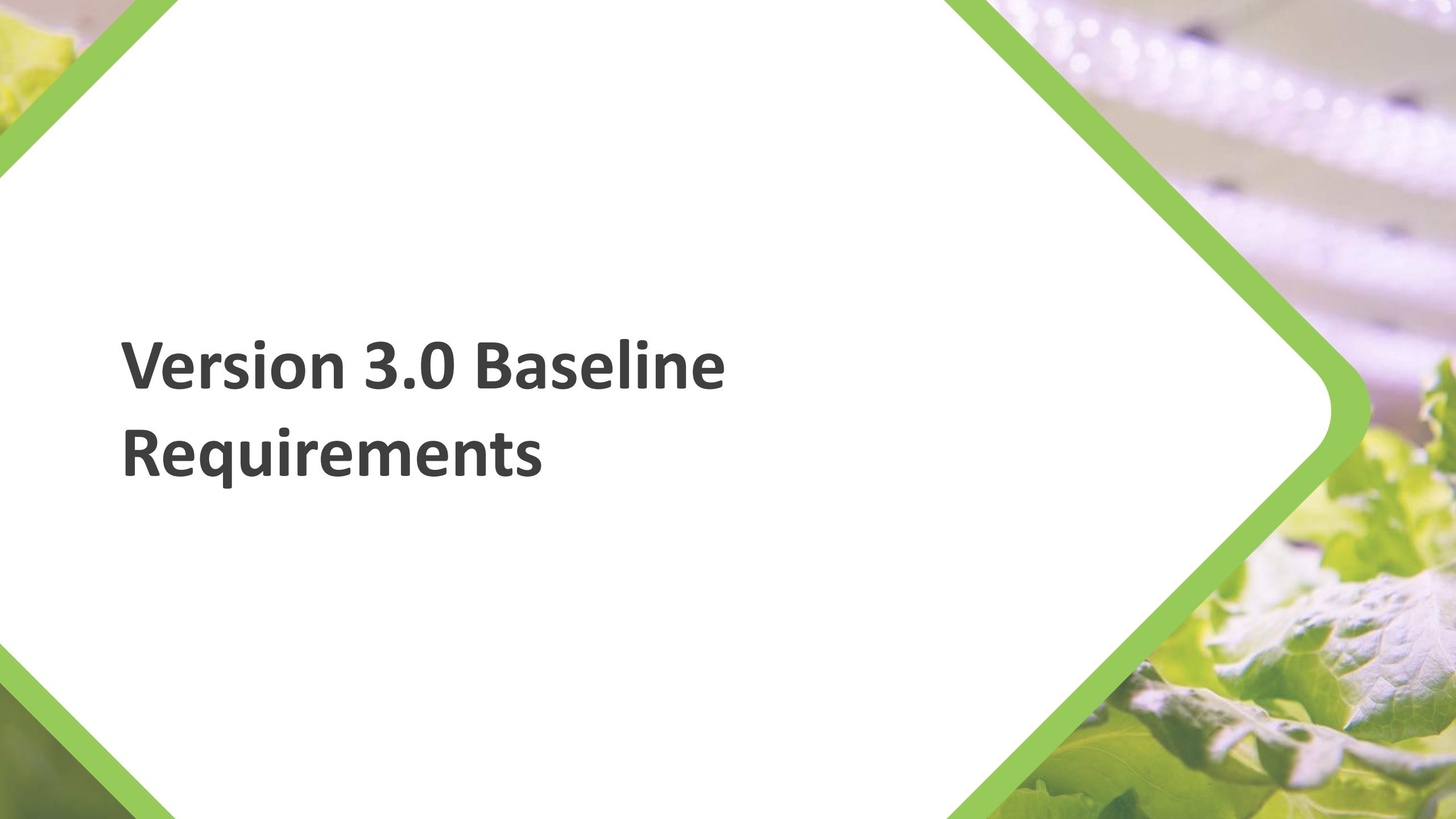
# Hort Version 3 Timeline




**Version 3.0 Proposals**

- PPE Increase
- Application Information
- Controllability Requirements
- Surveillance Testing

# Version 3.0 Baseline Requirements



# Baseline Requirements

Current requirements for Hort QPL listed products include

- Safety Certification
- Warranty
- Component lifetime
- Power Quality
- **Efficacy**

| | | | |
|---|---|---|---|
| **Photosynthetic Photon Efficacy [1] ($K_P$ or PPE)** ($\mu mol \times J^{-1}$) | ≥1.90 $\mu mol \times J^{-1}$ | Required/ Threshold | (ANSI/IES LM-79) 400-700nm range |

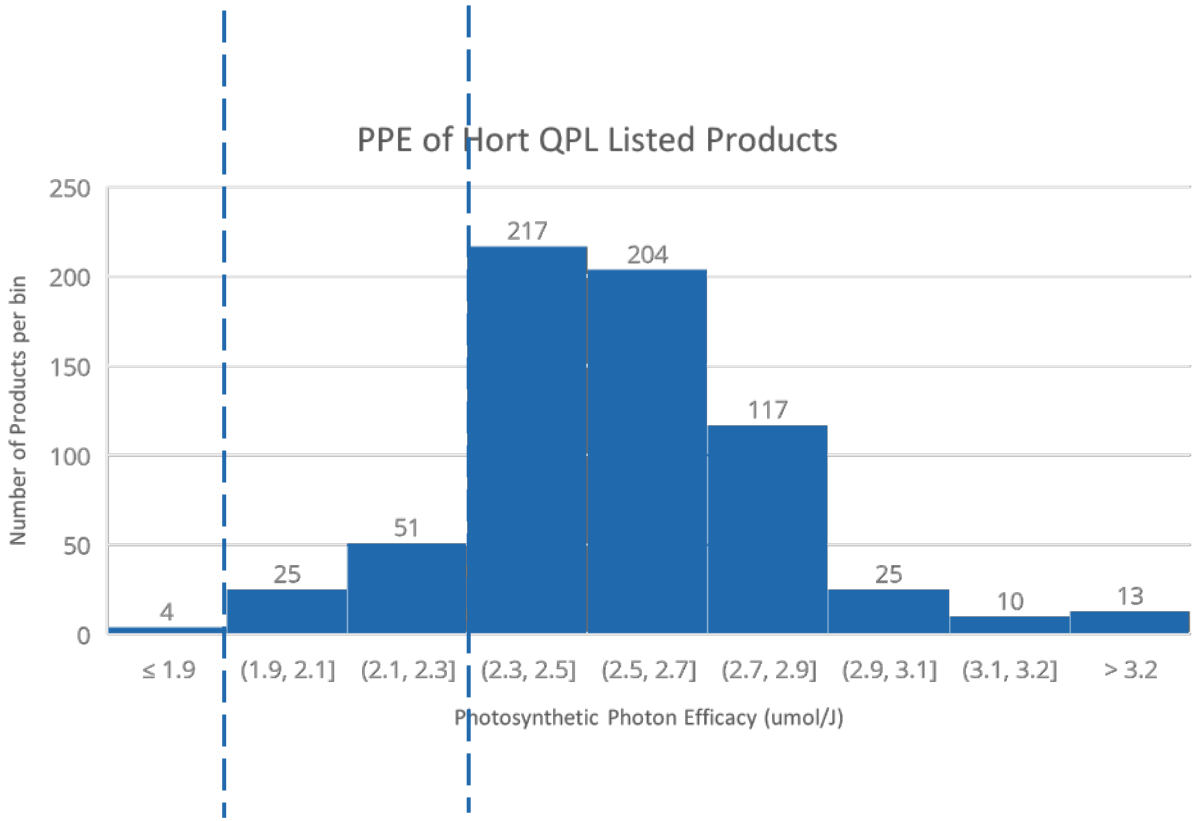
| Parameter/Attribute/Metric | Requirement | Requirement Type | Method of Measurement/Evaluation |
|---|---|---|---|
| **Photon Flux Maintenance, Photosynthetic ($PFM_P$)** | $Q_{90}$ ≥36,000 hours | Required/ Threshold | (ANSI/IES LM-80 / IES TM-21 or IES LM-84 / IES TM-28) 400-700nm range, fixture technical specification sheet, and *In-Situ Temperature Measurement Test* (ISTMT) |
| **Photon Flux Maintenance, Far-Red ($PFM_{FR}$)** | Report time to $Q_{90}$ | Reported | (ANSI/IES LM-80 / IES TM-21 or IES LM-84 / IES TM-28) 700-800nm range |
| **Driver Lifetime** | ≥50,000 hours | Required/ Threshold | Driver technical specification sheet, fixture technical specification sheet, and *In-Situ Temperature Measurement Test* (ISTMT) |
| **Fan Lifetime** | ≥50,000 hours | Required/ Threshold | Fan technical specification sheet, fixture technical specification sheet |
| **Warranty** | Fixtures: ≥5 years Lamps: ≥3 years | Required/ Threshold | Legal warranty terms & conditions |
| **Power Factor (PF)** | ≥0.9 | Required/ Threshold | Benchtop electrical testing or ANSI/IES LM-79 |
| **Total Harmonic Distortion, Current (THDi)** | ≤20% | Required/ Threshold | Benchtop electrical testing or ANSI/IES LM-79 |
| **Safety Certification** | Horticultural Lighting designation by OSHA NRTL or SCC-recognized body | Required/ Threshold | ANSI/UL 8800 (**ANSI/CAN/UL 8800**) |

# Version 3.0 proposes an efficacy increase

To accelerate EE in CEA, the DLC has proposed a Major Revision every 2 years to drive energy efficient lighting in CEA by increasing PPE to delist the bottom 15% of listed products

Version 2.1 Efficacy:
1.9 µmol/J

***Version 3.0 Proposed Efficacy:***
***~2.3 µmol/J***




Current PPE → V3 Proposed PPE

# Application Information

# Version 3.0 – Application Information

***Rationale***

The current QPL is one-size-fits-all and leaves out critical intended use information

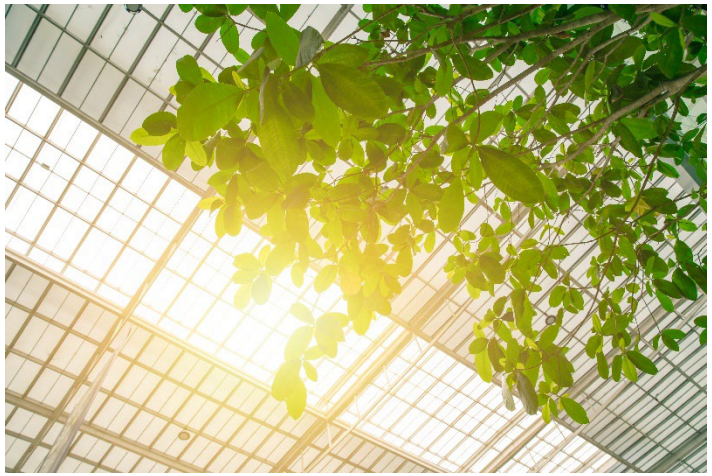
Version 3.0 proposes to require the reporting of the intended **controlled environment** and **lighting strategy** for listed products

Aims to support development of midstream/prescriptive EE Programs and stakeholders looking to better identify and compare QPL listed products

# Version 3.0 – Application Information

***Controlled Environment* Reporting Options**

- Indoor (Stacked or Non-Stacked )
  - Fully enclosed controlled environments with stacked or non-stacked layers.
- Greenhouse
  - Rely on sunlight as a primary light source, but often require supplemental electric lighting

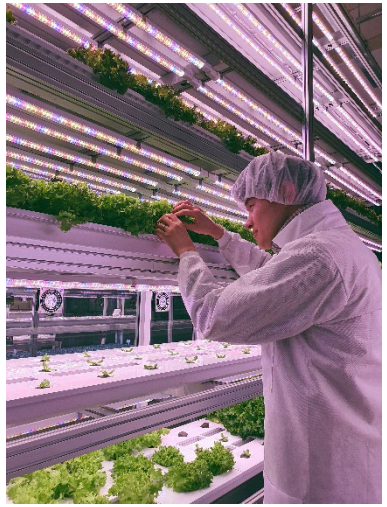


# Version 3.0 – Application Information

## *Lighting Scheme Reporting Options*

### Sole-Source and/or Supplemental

- Products reporting to be **sole-source** shall be intended for applications where the **lighting fixture is the primary source of optical radiation** for inducing photobiological responses in crops.
- Products reporting to be **supplemental** shall be intended for applications where the **lighting fixture is not the primary source of optical radiation** for inducing photosynthesis.



# Version 3.0 – Application Information

## *Lighting Scheme Reporting Options*

**Top light, Intra-canopy, or Other**

- Products reporting to be a **Top light** shall be intended to be mounted with the emission area **facing down, toward the canopy**.
- Products reporting to be an **Intra-canopy light** shall be intended to be mounted **within the canopy**.
- To account for innovative technologies in this developing field, the DLC proposes an **"Other (text)"** option to support **products that do not fit within the top lighting or intra-canopy** lighting categories.
    - For instance, "Other (Bottom lighting)".

# Version 3.0 – Application Information

| Controlled Environment | | Lighting Scheme | | Requirement Type | Method of Measurement/Evaluation |
|---|---|---|---|---|---|
| **Indoor** | (Stacked) | Top light, Intra-canopy, Other (text) | Sole-Source or Supplemental | Reported | Product specification sheet* |
| | (Non-stacked) | | | | |
| **Greenhouse** | | Top light, Intra-canopy, Other (text) | Sole-Source or Supplemental | Reported | Product specification sheet* |

To compliment reported application information, Version 3.0 proposes to **report fixture physical dimensions** and **a representative image (or an active link** to the product on the manufacturer's website) on the QPL for all listed products.

V3 proposes that **a single listed product may report** that they are intended for **multiple controlled environments and lighting schemes.**

# Version 3.0 – Application Information

## Key Questions for Application Information Requirements Section

Version 3.0 Draft 1 proposes specific controlled environments and lighting schemes to be reported on the QPL for listed products.

1. Should the DLC include "residential" as a reported controlled environment option? If so, what lighting scheme options should be considered for residential controlled environments for Draft 2?

2. Considering existing and/or anticipated CEA applications, are there controlled environments or lighting schemes that are not covered by Draft 1? If so, please specify these applications and provide terminology recommendations for consideration in Draft 2.

3. What additional information should be potentially required and/or reported to relate listed products to the application(s) they are intended to operate in?

Answer Key Questions and submit comments to:
comments@designlights.org

# Controllability

# Introduction

- In previous versions of the horticultural lighting policy, dimmability was a reported attribute
- Draft 1 of V3.0 proposes to require dimmability and collect more detailed information on how the product is controlled
- Rationale
  - Save energy
  - Promote interoperability
  - Lay groundwork for demand response programs

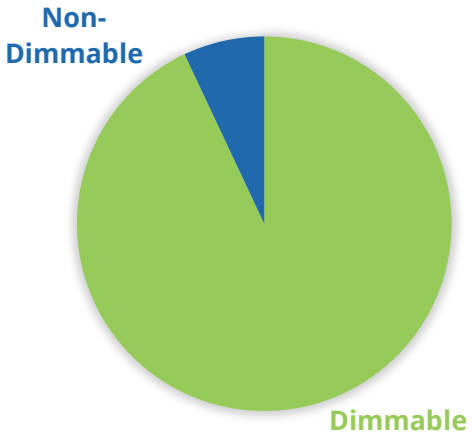
# Summary of Controllability Requirements

| Parameter/Attribute/ Metric | Requirement | Requirement Type | Method of Measurement/ Evaluation |
|---|---|---|---|
| **Dimming Capability** | Products must have the ability to dim | Required | Product Technical Specification Sheet |
| **Dimming Range** | n/a | Reported | Product Technical Specification Sheet or Supplemental Documentation |
| **Dimming and Control Method Designations to the Product** | n/a | Reported | Product Technical Specification Sheet or Supplemental Documentation |
| **Control Attributes** | n/a | Reported | Product Technical Specification Sheet or Supplemental Documentation |
| **Connector / Transmission Hardware** | n/a | Reported | Product Technical Specification Sheet or Supplemental Documentation |

# Dimming Capability

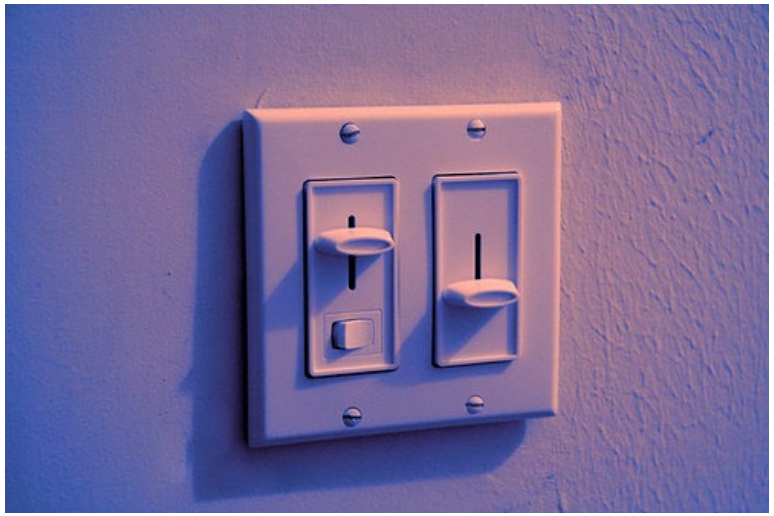
| | | | |
|---|---|---|---|
| **Dimming Capability** | Products must have the ability to dim | Required/ Threshold | Product Technical Specification Sheet |

- Requirement:
  - Products must be capable of dimming through line voltage, low voltage or wireless signal.
  - Product specification sheet must state that the product is dimmable
- 93% of products currently on the hort QPL are dimmable



# Dimming Range

- Reported values:
  - The input power (in Watts) to the product at the minimum dimming level, expressed as a percentage of the maximum power
  - The minimum dimming level, expressed as a percentage of the maximum PPF
  - Default PPF
- All above information must be stated on the product specification sheet or supplemental material



# Dimming and Control Method Designations to the Product

- Protocols or methods of communication between the product and other devices / controllers
- Must select at least one wired or wireless option from the tables on the following slides
- Must be stated on the product specification sheet or supplemental material

# Wired Dimming and Control Method Designations to the Product

| Control Type | Definition | Acceptable Terms |
|---|---|---|
| **0-10V IEC 60929 Annex E** | Wired analog low-voltage control that varies DC voltage between 0 and 10 volts (or 1 and 10 volts) to produce varying light output. | 0-10V, 1-10V, 10V, 10V0 |
| **0-10V ANSI C137.1-2019 (8-Volt)** | | |
| **0-10V ANSI C137.1-2019 (9-Volt)** | | |
| **0-10V Other** | | |
| **DALI** | Digital Addressable Lighting Interface Protocol, a wired digital communication protocol registered by the DALI alliance. | DALI |
| **DALI2** | | DALI2, DALI-2 |
| **Other Wired** | Other wired communication protocol as specified by the manufacturer. | N/A |

# Wireless Dimming and Control Method Designations to the Product

| Control Type | Definition | Acceptable Terms |
|---|---|---|
| **Zigbee** | | |
| **Zigbee 3.0** | Wireless digital communication protocol developed by the Connectivity Standards Alliance. | Zigbee 3.0, ZB3 |
| **Zigbee Proprietary** | | ZigBee |
| **Bluetooth** | | |
| **BLE MDP v2** | Wireless digital communication protocol developed and maintained by the Bluetooth Special Interest Group (SIG). | Bluetooth SIG mesh version 2,BLE SIG mesh v2 |
| **BLE SIG Mesh v1.x** | | Bluetooth SIG mesh version 1,BLE SIG mesh v1 |
| **BLE Proprietary** | | Bluetooth mesh, BLE mesh |
| | | |
| **Wi-Fi** | Wireless networking protocol based on IEEE 802.11. | Wi-Fi, WIFI, IEEE 802.11, Wi-Fi Certified |
| **EnOcean** | Wireless digital communication protocol developed by EnOcean. | EnOcean |
| **Other Wireless** | Other wireless communication protocol as specified by the manufacturer. | N/A |

# Special Considerations for DC Products and Lamps

- For DC products with a specified power source, “Dimming and Control Method” refers to communication to the power source
- For DC products without a specified power source, “Dimming and Control Method” refers to communication to the product

- For lamps where the dimming or control method depends on the ballast, this field may be left blank

# Control Attributes

- All attributes from this table that apply to the product must be reported
- Must be stated on specification sheet or supplemental material
- If none are applicable, this field may be left blank

| Control Attributes | Definition | Acceptable Terms |
|---|---|---|
| **Dim to Off** | The ability for a product to be turned on or off via the control signal. | Dim to off, Dimming: 0%-100% |
| **High End Trim** | The capability to set the maximum light output to a less-than-maximum state of an individual luminaire/lamp at the time of installation or commissioning. High-end trim must be field reconfigurable. | High-End Trim, Task Tuning |
| **Energy Monitoring** | The capability of a system to report the energy consumption of a luminaire/lamp. | Power/Energy Monitoring, Power/EnergyMetering, Power/Energy Measurement,Power/Energy Reading |
| **Manual Dimming** | A knob or other control device integrated into the fixture used for manual dimming. | Manual Dimming, Knob Dimming, Dimming Knob, Fixture Integrated Dimming, Dimming Switch |

# Connector / Transmission Hardware

- Hardware integrated into the product that enables it to physically connect with and receive signals from a controller or other device.
- All Connector / Transmission Hardware from this table that apply to the product must be reported
- Must be stated on specification sheet or supplemental material

| Connector / Transmission Hardware | | Acceptable Terms |
|---|---|---|
| Wired | **RJ-11** | RJ-11, RJ11 |
| | **RJ-12** | RJ-12, RJ12 |
| | **RJ-45** | RJ-45, RJ45 |
| | **Terminal Block** | Terminal Block |
| | **Other Wired** | N/A |
| **Wireless Radio** | | Wireless, Bluetooth, BLE, Wi-Fi, WIFI, IEEE 802.11, Zigbee, EnOcean |

# Version 3.0 – Controllability

## Key Questions for Controllability Requirements Section

1. Draft 1 proposes that all products qualified under V3.0 shall be dimmable. Is this requirement reasonable? If not, what is the value proposition for non-dimmable products?
2. Draft 1 proposes to include default PPF as a reported value. This may be valuable in cases where the default PPF is lower than the maximum PPF. Are there products on the market today that are designed this way, or is it standard for products to come with the maximum PPF as the default?
3. Table 5 aims to capture the dimming and control method designations that are prominent in horticultural lighting products. Are there any dimming or control method designations or additional attributes used in horticultural fixtures that are not listed here and would be valuable to include in Table 5 (e.g., DMX or other Zigbee classifications)? For those that are listed in Table 5, are the acceptable terms provided sufficient?
4. Table 6 aims to capture the prominent control attributes that are important for interoperability and design considerations. Are there any control attributes not listed in Table 6 that would be valuable to include and list on the QPL?
5. Draft 1 proposes to include connector/transmission hardware as a reported attribute. Should this information be captured and listed on the QPL, and if so, a) are the acceptable terms provided sufficient or are more needed, and b) are there any connector/transmission hardware options not listed here that are commonly used in horticultural lighting?
6. In the Special Considerations for DC-Powered Products section of this document, the DLC has stated that for DC-powered fixtures that do not specify a power source intended for use, the "Dimming and Control Method Designations to the Product" refers to the method of communication to the fixture. Are there any dimming or control methods that should be added to Table 5 that are used by DC-powered fixtures with an unspecified power source? Are there any other special considerations needed for controllability of DC-powered products that are not captured here?



Answer Key Questions and submit comments to:
comments@designlights.org

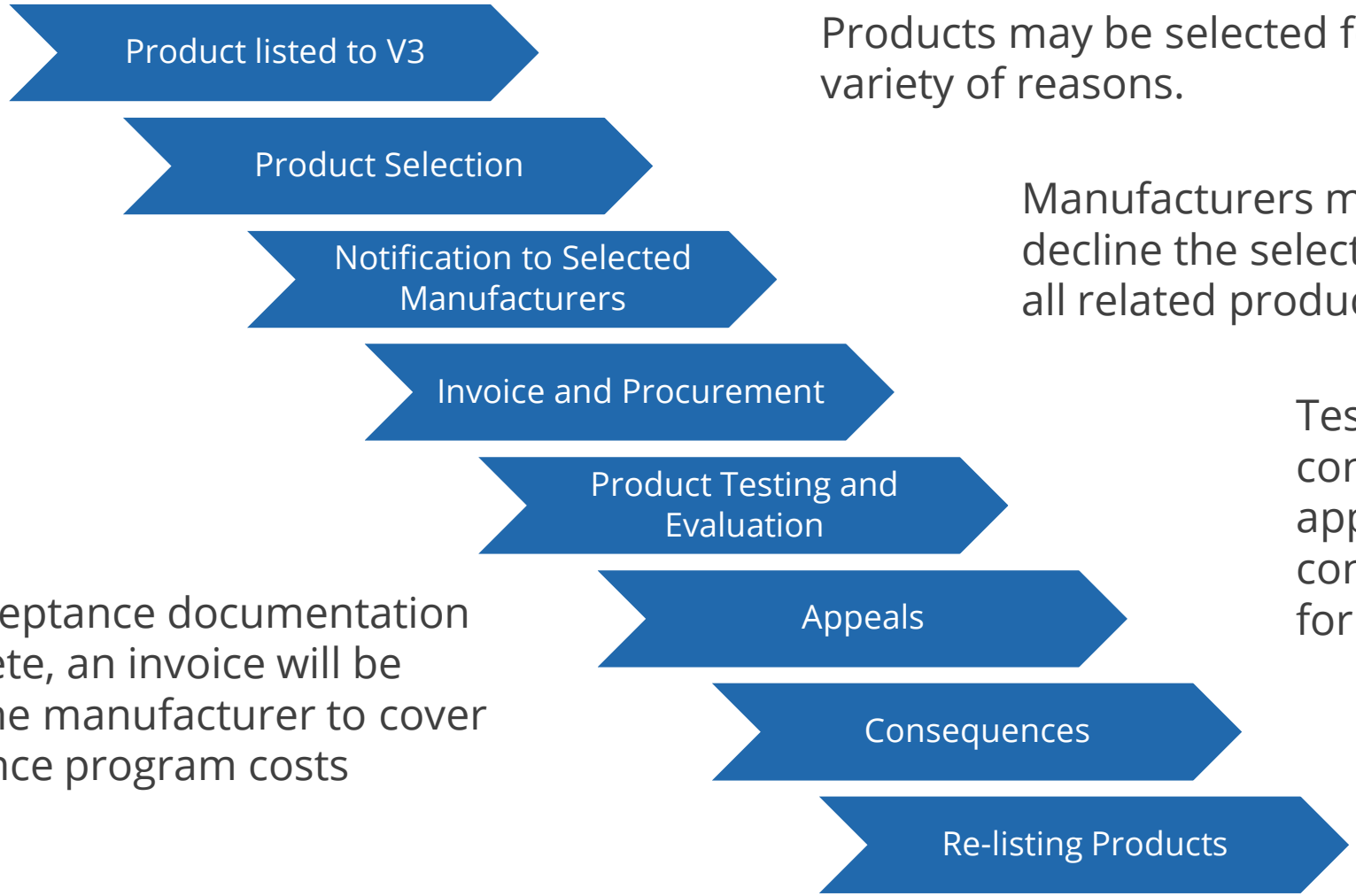
# Surveillance Testing

# Surveillance Testing

***Objective***

Protect the integrity and value of the Hort QPL for all stakeholders by actively monitoring the validity of data and other information submitted to the DLC Hort QPL

# Surveillance Testing Process




Products may be selected for a variety of reasons.

Manufacturers may accept or decline the selection. If declined, all related products to be delisted.

Testing will be conducted only by pre-approved labs contracted by the DLC for surveillance testing.

Once acceptance documentation is complete, an invoice will be sent to the manufacturer to cover surveillance program costs

# Surveillance Testing Product Evaluation

Table 1 used to verify product meets the TR

**Table 1:** Verifying the Product Meets the Technical Requirements

| Metric | Tolerance |
|---|---|
| PPF Output | -10% |
| PPE | -5% |
| Power Factor | -3% |
| THD | +5% |
| PPID | -5% at all angles |
| Spectral output | -10% within all 100nm buckets (400-500nm, 500-600nm, and 600-700nm) |
| Beam Angle (linear replacement lamps and 2G11 lamps only) | -5° |

Table 1 non-compliance due results in removal from the QPL.

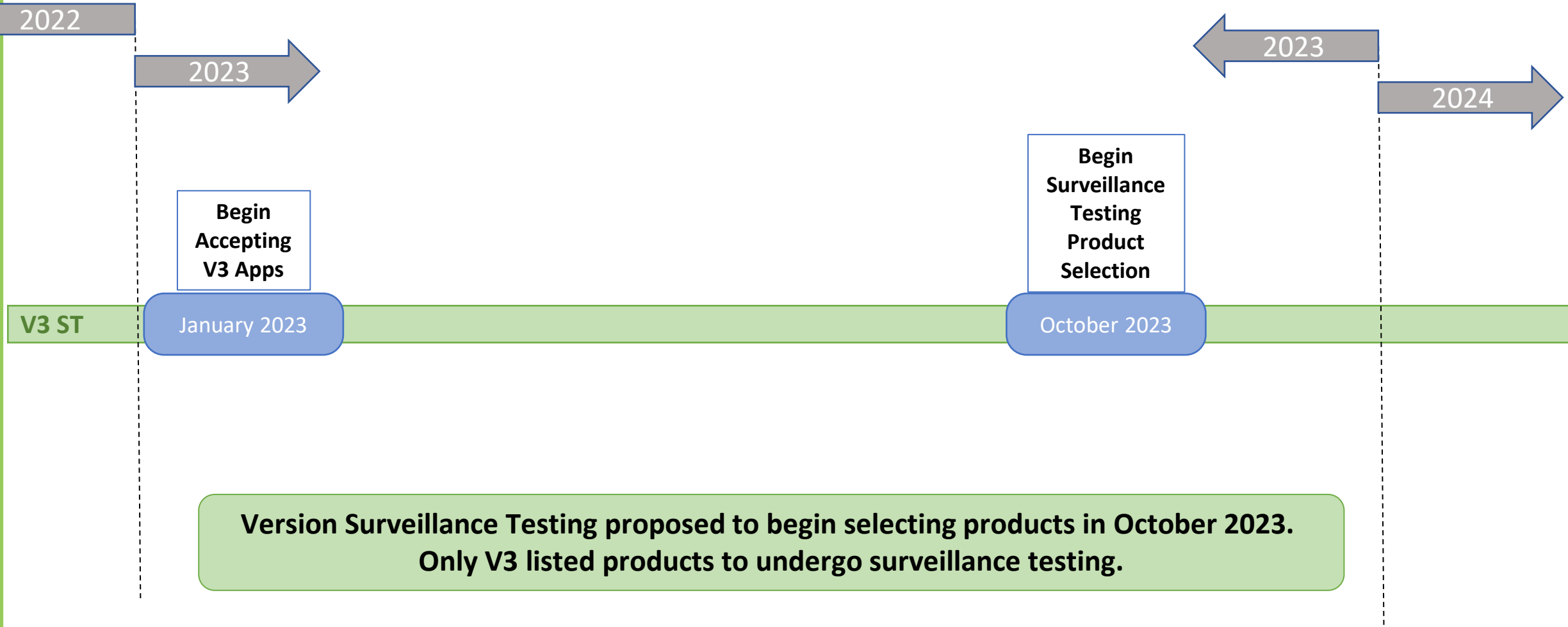
Table 2 ensures product lists accurate information on the QPL

**Table 2:** Verifying Accuracy of QPL Product Data

| Metric | Tolerance |
|---|---|
| PPF Output | -9.6% |
| System Wattage | +12.7% |

Table 2 non-compliance results in update or delisting.

# Surveillance Testing Proposed Timeline




**Version Surveillance Testing proposed to begin selecting products in October 2023. Only V3 listed products to undergo surveillance testing.**

# Surveillance Testing: Key Questions

## Key Questions for Draft 1 Surveillance Testing Policy, Horticultural Lighting Version 3.0

Version 3.0 Draft 1 proposes surveillance testing policy requirements to actively monitor the validity of data and other information for Hort QPL listed products to protect the integrity and value of the QPL for all stakeholders.

1. The DLC is looking for input from accredited test labs regarding the proposed Table 2 tolerances. Proposed Table 2 tolerances come from DLC SSL surveillance testing, and are based on industry input on acceptable tolerances for confirming listed products are performing as originally qualified. How do these tolerances compare to what performance differences may occur when testing a single product at two different accredited testing labs?
2. What additional considerations should the DLC be aware of when determining how to actively monitor the validity of data and other information for listed products?

Answer Key Questions and submit comments to:
comments@designlights.org

# V3.0 Recap

# Hort Version 3.0

- Version 3.0 is a major revision that proposes four key updates
  - Increased Efficacy Threshold
  - Introduction of
    - Application Information requirements
    - Controllability requirements (at the product-level)
    - Surveillance Testing

# Question and Answers

# Next Steps

- Hort V3.0
  - Six-week comment period, comments due 5/12
  - DLC will digest comments and revise draft as appropriate
  - Draft 2 expected July 2022
  - Additional comment period, followed by revision
  - Final Requirements expected in November 2022, effective January 2023

# DLC SUMMIT '22

May 24, 2022 • Boston, MA

Aloft Boston Seaport

# LIGHTING THE PATH TO A DECARBONIZED FUTURE

**KEY TOPICS:**

- Driving energy and financial savings in buildings and outdoor environments while reducing environmental impact
- Addressing stakeholder needs and overcoming barriers to adoption
- Applying a systems approach to new versions of the DLC technical requirements

**WHEN:**

Welcome Reception May 23rd 4-6:00 pm

DLC Summit Meeting May 24th 8:30 am-5:00 pm

**WHERE:**

Aloft Boston Seaport District

**Register by May 1st for Early Bird Rate!**

**designlights.org/events/2022-dlc-summit-meeting**

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# Thank you!

Comments are due **May 12**!

Send completed comment forms to:

comments@designlights.org

| | |
|---|---|
| | **Comment Form Instructions** |
| **Document:** | **Testing and Reporting Requirements for Horticultural Lighting V2.0** |
| **Version:** | Draft 1 of Hort V2.0 |
| **Comments Due:** | Close of business, Tuesday, June 16, 2020 |
| **Instructions and Background:** | **Please follow these steps to ensure your comments are received and considered by the DesignLights Consortium:**<br><br>1. Enter your Organization, Name, Email Address, and Phone Number in Row 8 of this worksheet.<br><br>2. There are three (3) documents included in this release: V2.0 Draft Technical Requirements, Family Grouping Applications, and Private Label Applications. Navigate to the tab at the bottom of this worksheet corresponding to the document of the Hort V2.0 draft on which you'd like to comment. Comments to Hort V2.0 that are not related to a specific section or topic may be added at the "General Comments" tab.<br><br>3. After your review of the draft documents, please consider each Key Question in Columns B, C, and D and submit your answer in Column D and potential solutions in Column E. Comments to the Technical Requirements that are not related to a specific Key Question may be added to the remainder of each worksheet. Please enter the line number of the draft corresponding to your comment into Column B starting on Row 16.<br><br>4. Save this Excel file with your comments and include your organization name appended to the end of the filename (for example: "DLC_Hort-V2.0Draft1_CommentForm_AcmeLightingCo").<br><br>5. Email the file to **comments@designlights.org** by close of business, **Tuesday, June 16, 2020**. |

| Reviewer Organization | Reviewer Name | Reviewer Email Address | Reviewer Phone # |
|---|---|---|---|
| | | | |

Questions about applications and general inquiries should be sent to:
horticulture@designlights.org