



U.S. Department of Energy

# Prototype Phase Technical Performance and Scoring Form Luminaire Track

This form is to be used by the competitor to report key performance metrics or capabilities of their prototype and the associated points they expect would be earned for these performance or capabilities. This form is in addition to the technical documentation that must be submitted as described in Appendix B of the Official Rules for each requirement. A summarized checklist of these technical documentation requirements is provided in Appendix D of the Official Rules. The L-Prize Expert Reviewer Panel will use this Technical Performance and Scoring Form in combination with submitted documentation and physical evaluation (where applicable) to determine the total number of points earned for a submission.

## Instructions

1. Review Section III.6 of the L-Prize Official Rules to understand how this form will be used about how the total score for a submission will be determined.
2. Report the performance or capability and associated number of points earned for each requirement in this form, based on Appendix A of the Official Rules.
3. Provide any additional notes you would like the Expert Reviewer Panel to know about the performance, capability, or points earned.
4. Forms must be completed digitally; handwritten forms will not be accepted.
5. Save the file as a PDF and submit as part of your Prototype Phase submission at <https://www.herox.com/LPrize>

<b>Luminaire Efficacy</b>	<b>The total emitted luminous flux from the luminaire divided by the total source electrical input power, expressed in lumens per watt (lm/W).</b>	
<b>Minimum Requirement(s)</b> The initial luminous efficacy of each luminaire must be $\geq 150$ lumens per watt.	<b>Possible Points</b> Four points (+4) will be awarded for each additional increment of 10 lumens per watt above 150 up to a maximum of 20 points.  $\geq 160$ lumens per watt = 4 additional points $\geq 170$ lumens per watt = 8 additional points $\geq 180$ lumens per watt = 12 additional points $\geq 190$ lumens per watt = 16 additional points $\geq 200$ lumens per watt = 20 additional points	
<b>Enter the lumens per watt of the prototype luminaire:</b>		
<b>How many efficacy points are earned based on this lm/W? (Enter 0, 4, 8, 12, 16, or 20)</b>		
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the luminaire efficacy performance or points earned.</b>		

<b>Light Output</b>	<b>The luminous flux output by a light source.</b>	
<b>Minimum Requirement(s)</b> The initial luminous flux must be $> 2,000$ lumens.	<b>Possible Point(s)</b> n/a	
<b>Enter the luminous flux of the prototype luminaire:</b>		
<b>Points are not applicable for this requirement.</b>	n/a	
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the luminous flux output performance or points earned.</b>		

<b>Dimming Range</b>	<b>The range over which it is possible to vary the intensity of the light output of a lamp or luminaire from a maximum to a minimum without unstable performance.</b>
<p><b>Minimum Requirement(s)</b> Luminaire dimming range must extend from maximum lumen output (100%) to a minimum lumen output value that is <math>\leq 5\%</math> of maximum lumen output.</p> <p>The change of chromaticity over the dimming range must be <math>\leq 0.004</math>, calculated as the distance between coordinate pairs on the CIE 1976 (u',v') diagram.</p>	<p><b>Possible Points</b> n/a</p>
<p><b>Enter the minimum dimmed light output in lumens and the dimming range of the prototype in terms of percent light output (e.g., 1%–100%):</b></p>	
<p><b>Enter the change in chromaticity across the dimming range:</b></p>	
<p><b>Points are not applicable for this requirement.</b></p>	n/a
<p><b>Provide any additional notes you would like the Expert Reviewer Panel to know about chromaticity performance or points earned.</b></p>	

<b>Color Rendition</b>	<b>How a light source makes the color of an object appear to human eyes and how well subtle variations in color shades are revealed.</b>
<p><b>Minimum Requirement(s)</b> The color rendition performance must meet a preference rating of P2 and fidelity rating of F3 in accordance with ANSI/IES TM-30-20, Annex E</p> <p><math>R_f \geq 85</math>; <math>R_{f,h1} \geq 85</math>; <math>R_{cs,h1} \geq -7\%</math>; <math>R_g \geq 92</math></p>	<p><b>Possible Points</b> Five points (+5) will be awarded for a preference rating of P1 and fidelity rating of F3.</p> <p><math>R_f \geq 85</math>; <math>R_{f,h1} \geq 85</math>; <math>R_{cs,h1} \geq -1\%</math>; <math>R_g \geq 95</math></p>
<p><b>Enter the <math>R_f</math>, <math>R_{f,h1}</math>, <math>R_{cs,h1}</math>, and <math>R_g</math> values of the prototype luminaire:</b></p>	
<p><b>How many color rendition points are earned based on this performance? (Enter 0 or 5)</b></p>	
<p><b>Provide any additional notes you would like the Expert Reviewer Panel to know about the color rendition performance or points earned.</b></p>	

<b>Chromaticity</b>	<b>The quality of color, independent of brightness.</b>
<b>Minimum Requirement(s)</b> The nominal correlated color temperature (CCT) must be 4000K as defined in ANSI C78.377-2017.  The Duv must be between -0.006 and 0.000 as defined in ANSI C78.377-2017.	<b>Possible Points</b> n/a
<b>Enter the as-tested CCT of the prototype luminaire:</b>	
<b>Enter the Duv of the prototype luminaire:</b>	
<b>Points are not applicable for this requirement.</b>	n/a
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about chromaticity performance or points earned.</b>	

<b>Temporal Light Modulation (TLM, aka "flicker" waveform)</b>	<b>TLM is the light modulation (stimulus) that may produce unwanted visual or non-visual responses. TLM should minimize undesired visual responses of light by (direct) flicker, the stroboscopic effect, and the phantom array effect.</b>
<b>Minimum Requirement(s)</b> Every unit in the test sample must exhibit a fundamental TLM frequency > 90 Hz and a stroboscopic effect visibility measure (SVM) ≤ 0.9 at dimming levels of 100%, 50%, and the minimum dimmed light output.	<b>Possible Points</b> Five points (+5) will be awarded for SVM ≤ 0.4 at dimming levels of 100%, 50%, and the minimum dimmed light output.
<b>Enter the expected fundamental TLM frequency and SVM performance at 100%, 50%, and the minimum dimmed light output:</b>	
<b>How many TLM points are earned? (Enter 0 or 5)</b>	
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the temporal light modulation performance or points earned.</b>	

Standards-based Sensor Port and Connector	A Zhaga Book 20 or NEMA compliant sensor port with pre-wired connections to the D4i driver.	
<b>Minimum Requirement(s)</b> Luminares must incorporate a standardized sensor receptacle aperture with physical shape and minimum keep-out area dimensions in compliance with Zhaga Book 20 or NEMA LS 20000-2021 shapes RR1, RR2, CC1, CC3, ORC5, or EM1. The sensor receptacle must be pre-wired with a Zhaga Book 20 compliant 2-wire connection to the DALI-bus terminals of the D4i driver. See supplemental testing guidance (below) for important additional information about this requirement.	<b>Possible Points</b> n/a	
<b>What is the shape/size of the sensor port used in the luminaire? (Enter one of the following shapes from Zhaga Book 20: R44x17, R60x22, C22-T1A, C22-T1B, C22-T2, and/or one of the following shapes from NEMA LS 20000-2021: RR1, RR2, CC1, CC3, ORC5, EM1)</b>		
<b>Points are not applicable for this requirement.</b>	n/a	
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the temporal light modulation performance or points earned.</b>		

<b>Circular Design</b>	<b>Circular design supports a closed-loop economic system that minimizes raw resource inputs as well as minimizing waste, pollution, and carbon emissions. Circular design aims to eliminate waste and maximize the continual reuse, repair, and remanufacturing of components.</b>	
<b>Minimum Requirement(s)</b> Complete the TM66 CEAM-Make digital tool and receive a score of 1 or higher.	<b>Possible Points</b> Four points <b>(+4)</b> will be awarded for luminaires that achieve a TM66 CEAM-Make score of $\geq 2$  An additional four points <b>(+4)</b> will be awarded for luminaires that achieve a TM66 CEAM-Make score of $\geq 3$ (8 points total)	
<b>Enter the total score from TM-66 CEAM-Make tool for the prototype luminaire:</b>		
<b>How many circular design points are earned based on this score? (enter 0, 4, or 8)</b>		
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the circular design performance or points earned.</b>		

<b>Lumen Maintenance</b>	<b>The elapsed operating time at which the specified percentage of the initial light output is reached, expressed in hours.</b>	
<b>Minimum Requirement(s)</b> The luminaire must maintain 70% of the initial light output for at least 50,000 hours. ( $L_{70} \geq 50,000$ hrs)	<b>Possible Points</b> Two points <b>(+2)</b> will be awarded if 90% of the initial light output is maintained for at least 36,000 hours. ( $L_{90} \geq 36,000$ hrs)	
<b>Enter the <math>L_{70}</math> and <math>L_{90}</math> values of the prototype luminaire in hours:</b>		
<b>How many lumen maintenance points are earned? (enter 0 or 2)</b>		
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the lumen maintenance performance or points earned.</b>		

<b>Chromaticity Maintenance</b>	<b>A shift in the appearance of color of a light source that occurs over time.</b>	
<b>Minimum Requirement(s)</b> The change of chromaticity over the initial 6,000 hours of operation must be $\leq 0.002$ , calculated as the distance between coordinate pairs on the CIE 1976 (u',v') diagram.	<b>Possible Points</b> n/a	
<b>Enter the expected change in chromaticity of the prototype luminaire over the initial 6,000 hours of operation:</b>		
<b>Points are not applicable for this requirement.</b>	n/a	
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the chromaticity maintenance performance or points earned.</b>		

<b>Driver Lifetime</b>	<b>The amount of time an LED driver is expected to perform its intended functions under a specific set of environmental, electrical, and mechanical conditions, expressed using an appropriate statistical metric.</b>	
<b>Minimum Requirement(s)</b> The measured temperature of the driver at the temperature measurement point (TMP), specified by the driver manufacturer and tested in situ, must be less than or equal to the maximum case temperature for which the driver is designed to last $\geq 50,000$ hrs.	<b>Possible Points</b> n/a	
<b>Enter the estimated driver lifetime of your prototype luminaire (in hours) based on the expected operating conditions:</b>		
<b>Points are not applicable for this requirement.</b>	n/a	
<b>Provide any additional notes you would like the Expert Reviewer Panel to know about the driver lifetime performance or points earned.</b>		