



TROV 101 - Handbook

Complete Guide to TROV including an
extensive list of Frequently Asked Questions

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Design

1. What's the idea behind the TROV design?
 - a. The design philosophy for TROV was to create a first-to-the-world linear luminaire platform, able to be used in cove and wall grazer and wall wash applications, by utilizing a minimum number of core parts. These core parts can then be assembled into thousands of unique combinations, providing Lighting Designers with a seemingly limitless palette of options. All this packaged in a petite and elegant form factor that produces clean beautiful light.

2. What does the name TROV mean?
 - a. We designed TROV to be a collection of highly-valued lighting tools for a designer. This product line was designed to meet the very exacting need of every designer. As we researched hundreds of product names we landed on the word "trove" which by definition is "a collection of valuable things". We thought this fit our line of 20,000 product configurations perfectly. So we dropped the "e" to make it ownable and introduced TROV into the world.

3. What is Flip to Flat™ and what are the benefits of it?
 - a. Flip to Flat references the uniquely designed hinge that allows the fixture to be easily rotated from 0 degree to 180 degree, putting light exactly where you want it. A key benefit of Flip to Flat is the ability to reduce the height by 30% to fit in the smallest architectural profiles. With this design we deliver the thinnest cove and wall graze luminaires in the market.

4. What materials are used for the lenses? How will they hold up to cracking and fading?
 - a. The secondary lens that sits above the LED board is made of acrylic and will never yellow or discolor in anyway. The tertiary lens that sits above the secondary lens is made of Polycarbonate Copolymer (Sabic Lexan SLX) and has better UV resistance than standard UV-stabilized PC, which results in lower haze over long term exposure and better strength against impact. This superior UV stabilization will prevent yellowing for up to 10 years depending on UV exposure.

5. What is the IP rating for TROV?
 - a. TROV exterior products are rated IP66 which means they can withstand a very strong spray of water for long periods of time. TROV interior fixtures are rated IP54 for L35 and L50 Interior. See the chart below for the explanation of IP ratings.

IP54 is the international equivalent to UL Damp Location, which is required for use in bathrooms and other high humidity environments. Although the IP54 test does involve spraying the fixture with water it does not mean the fixture should be installed in an application that allows it to get wet. Damp locations can be exterior, but are usually protected from direct water contact.

IP First number - Protection against solid objects

0	No special protection
1	Protected against solid objects over 50 mm, e.g. accidental touch by persons hands.
2	Protected against solid objects over 12 mm, e.g. persons fingers.
3	Protected against solid objects over 2.5 mm (tools and wires).
4	Protected against solid objects over 1 mm (tools, wires, and small wires).
5	Protected against dust limited ingress (no harmful deposit).
6	Totally protected against dust.

IP Second number - Protection against liquids

0	No protection.
1	Protection against vertically falling drops of water e.g. condensation.
2	Protection against direct sprays of water up to 15° from the vertical.
3	Protected against direct sprays of water up to 60° from the vertical.
4	Protection against water sprayed from all directions - limited ingress permitted.
5	Protected against low pressure jets of water from all directions - limited ingress.
6	Protected against temporary flooding of water, e.g. for use on ship decks - limited ingress permitted.
7	Protected against the effect of immersion between 15 cm and 1 m.
8	Protects against long periods of immersion under pressure.

6. What is the finish on the housing and how does that hold up to elements?
 - a. TROV is made of aluminum and is finished with a clear anodized process. The anodizing process is a type of oxidation that prevents any further oxidation. It holds up very well to corrosion and fading. The end caps and driver cover are made of UV stabilized polycarbonate which is extremely corrosion resistant. The UV stabilization will prevent any fading or cracking.

7. Are the fixtures paintable?
 - a. Yes, TROV housing can be painted in a select offering of custom colors. There is a charge for this premium service and a longer delivery time. This will not void the warranty.

8. Do I need any special mounting brackets for TROV | Asymmetric luminaire?
 - a. No, a special mounting bracket is not required however, the Asymmetric fixture is installed differently than most cove fixtures. Instead of mounting to the horizontal surface that the fixture sits on, TROV | Asymmetric is mounted to the back wall. This does not require any special hardware. There are labels on the end of each fixture indicating installation direction.

9. What is a Gore® vent and how does it work?
 - a. A Gore® vent is a thin membrane material that allows air to pass through it, but not moisture or dust. The purpose of the Gore® vent is to keep the internal pressure from rising as temperature increases inside a sealed vessel, like our LED housing. Without this pressure release the gaskets that seals the LED housing can fail.

10. How does EcoSense test TROV for water tightness?
 - a. EcoSense performs a nitrogen leak down test on every exterior TROV fixture. This test is done by injecting nitrogen gas through the Gore® vent holes before the Gore® vent is installed. Once pressure has been reached inside the fixture a nitrogen gas sniffer is used to detect any nitrogen that might be leaking out of the fixture. Nitrogen molecules are smaller than water molecules, so if nitrogen does not leak out it would be impossible for water to get in.

11. Why can't I lock the aiming by tightening the screw?
 - a. The hinge screw is actually a shoulder bolt which functions as an axle for the upper LED housing to rotate about. The shoulder bolt

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bottoms out at a set height in order to maintain a constant spring force for the ratcheting mechanism. Additionally, the shoulder bolt is not accessible when multiple luminaires are mounted end-to-end, so it would not function well as a locking mechanism even if it could be locked by tightening the screw.

Optics

12. What materials are used for the optics and lenses?

- a. The secondary lens that sits above the LED board is made of acrylic and will never yellow or discolor in anyway. The tertiary lens that sits above the secondary lens is made of Polycarbonate Copolymer (Sabic Lexan SLX) and has better UV resistance than standard UV-stabilized PC, which results in lower haze over long term exposure and better strength against impact. This superior UV stabilization will prevent yellowing for up to 10 years depending on UV exposure.

13. Why did EcoSense design their own optics?

- a. We designed an exclusive optical system for TROV so that we could optimize for the smallest form factor possible, while still delivering beautiful beam angles and high quality of light. With our unique optical system, we are able to deliver 24 unique beam angle options for any application.

14. Why did EcoSense choose this set of beam angles?

- a. We focused on the needs of our customers that are designing with coves and textured walls that require a graze light or a wall wash of light. We designed beam angles that are widely used in the market today as well as introduce new beam angles to give designers fresh ideas on lighting design.

15. How do I select the right beam angle for my application?

- a. Start with the application. Is it a cove, accent, wall grazing, or wall washing application? If it is a Cove then you will most likely want a 120 degree angle to provide glowing light in that cove. If you are grazing a surface and are required to mount the fixture close to the surface, then you will want a tight beam angle such as 9x9, 9x17, 9x29 or 9x59. This will create contrast within the texture. If you are washing a wall with light and prefer less contrast in the texture, then you would use a medium beam angle such as 25x25, 40x40, or 40x90. For more information, visit www.ecosenselighting.com/trov.

16. Does the Line of Light (LOL) optics change the CRI or CCT?

- a. The Line of Light (LOL) optic will shift the CCT 200K warmer, so a 3500K LOL will be approximately 3300K. CRI is not affected by the LOL optic.

17. What is the ideal installation for TROV | Asymmetric?

- a. The lip of the cove should be 1.25" high, the front of the fixture should be 4" from the lip, and the lip should be 12" from the ceiling to achieve the best ceiling uniformity possible.

18. The TROV Asymmetric fixture is installed differently than most conventional cove fixtures. How do we ensure the contractor will install it correctly?

- a. There is a label on the end caps of every Asymmetric fixture with an arrow that points to the "Surface being illuminated". There is also an installation guide included with every fixture that shows the proper asymmetric cove installation.



19. Why does the TROV | Asymmetric optic look different?

- a. The Asymmetric optic and lens looks different because it defines a unique beam angle. This highly sought-after beam angle, not only extends light evenly and uniformly onto a surface, but it also fills the cove pocket to avoid shadows. Our goal was to design the smallest Asymmetric luminaire, while still delivering powerful and uniform light output. We succeeded. This TROV | Asymmetric is 3x smaller than any competitive asymmetric fixture on the market today.

20. Will the unpainted surface of my cove affect the light output?

- a. It will depend on the color of the unfinished surface. If the surface is white it will not affect the light in the cove. If the surface is raw wood or any other non-white color, that color might be reflected back into the pocket of the cove. We recommend painting the inside of the cove with a matte white finish.

21. What is the lumen and efficacy hit of Line of Light?

- a. It's a 45% decrease compared to the grazing optics.

22. Do you perform IES test on every option available with TROV.

- a. No, we do a test for every beam option and then do a test for all power, CCT, and CRI options on the same beam. This gives us enough data to calculate the rest of the IES files. There are 1100 IES files for TROV.

Power Supply / Driver

23. Why did EcoSense design the fixture with a digital power supply?
- The digital power supply allows TROV to have a proprietary driver that can be customized specific to the luminaire design for optimal performance. Unlike off-the-shelf analog drivers that limit the performance of a fixture design. Some of the benefits of a digital driver include: smooth, flicker-free dimming at extremely low levels (0.07% measured light); when connected to a dimmer, digital drivers deliver 100% light at high output levels (100% output power), where analog drivers tend to cap light output at 85-95% at 100% output power; digital drivers allow for easy firmware updates, so that updates can be made real-time resulting in better performing products for customers.
24. What is a hybrid PWM-CC driver and why is it good?
- TROV has the only PWM-CC (Pulse Width Modulation - Constant Current) ELV driver in the world. By creating a hybrid design, we are able to benefit with the unique advantages of both PWM and constant current. By combining an ultra-high PWM frequency of 60kHz, with the smooth constant power reduction of constant current dimming we are able to harness smooth, flicker free light and color consistency at every output level – even down to 0.07% - the lowest available for Electronic Low Voltage drivers.
25. What is Multi-volt and why is it better?
- Multi-Volt allows TROV to operate on any input voltage from 110VAC to 277VAC. The same units can be used anywhere in the

world. This prevents mix ups that are common with ordering and installing the incorrect voltage and prevents massive fixture failure.

26. What is potting?

- a. Potting is a compound used to fill an electrical assembly. In TROV we use a silicone based potting compound in our power supply that provides resistance to shock and vibration, a seal to prevent water ingress, and also provides a thermally conductive mass that cools the driver PCBA components.

27. Why is there no ground wire and what UL code does it comply with?

- a. TROV fixtures do not require a ground wire because the fixture has been designed with double insulation around the circuit– one of the safest methods available and certified by UL for designing a light fixture. Double insulation is a more complex design so other manufacturers tend to opt out and go straight to a single insulation + ground wire design. This method leaves electrical safety in the hands of a properly connected ground wire. EcoSense has spent extra time and resources to ensure we deliver the safest fixture to the market and so we've double insulated the fixture and eliminated the ground wire, guaranteeing a safe fixture out of the box. See UL1598 Section 6.12 or IEC 60598-1 Section 7.2.1 for more information.

28. What materials were used to build the driver?

- a. The driver housing is made of two materials: The metal portion of the housing is made from extruded aluminum; the polymeric portion of the housing is made from polycarbonate.

29. Is the power supply protected from the mounting screws?

- a. The driver is protected by an extruded aluminum and polymeric housing. In order to damage the driver electronics, an installer would have to torque a screw to the point of crushing both housings and compressing the potting material more than 1mm. In reality the screw head would strip before such a force could be applied.

30. What is the power factor, and THD?

- a. On TROV the Power Factor is $\geq .90$ and the THD is $\leq .20$ (Exceptions include the 1' length of 2W)

31. Will TROV work on an emergency inverter?

- a. TROV will not work on older square-wave emergency invert systems. If the system uses a pure sine wave then TROV should work. TROV has been tested with Bodine ELI-S pure-sine wave inverters.

32. What happens if power supply fails?

- a. TROV is available in 1' and 4' lengths. If a power supply fails on a 1' fixture the entire fixture will be out. On a 4' fixture there are 2 drivers, one for each 2' board, so if one drive fails then one 2' section will be out. The drivers in TROV are not replaceable and the entire fixture will need to be replaced. Driver failure will NOT prevent power from continuing to the remaining units in the run.

33. Is the cable plenum-rated?

- a. No, none of the cables are plenum rated. Typically an electrical inspector will allow fixture power cords to go approx. 1' - 2' into the plenum before it has to be terminated into a junction box. In stricter municipalities the cord will have to be terminated right as it enters the plenum space. The majority of lighting products do not use plenum rated cables.

34. What is the UV rating on the cable?

- a. There is no specific UV rating for our cables, but they do meet UL outdoor UV requirements which are required for outdoor products.

Connector

35. Why did EcoSense choose the material for the connector and the design?

- a. We chose the materials to meet regulatory (UL) requirements for connectors rated for outdoor use, to have a pleasing aesthetic feel and finish, and to maintain an IP66 seal. The connector is designed to be user friendly and provide the lowest profile outdoor rated interconnect in the lighting industry.

36. What materials were used to make the connector?

- a. The connector is made of a polyamide insert with TPV over mold and silicone rubber seal.

37. What is an over molded connector?

- a. An over molded connector is a two part connector composed of an insert and the over mold itself. This is beneficial because it allows us to use two materials. One material to meet the safety requirements per UL and the second material to provide a more pleasing aesthetic feel and look. The insert part is made on a separate machine, then inserted into the over mold machine. The outer material of the connector is injected into the tool and molded over the insert. Hence the name over mold.

38. Does the connector need to be filled with silicone for additional safety?

- a. No, the connector has been designed with an integrated silicone seal that protects the pins internally.

39. How do the connectors make the water tight seal?
- a. When connected, the connectors make a water tight seal using compressible gaskets and bushings that create an interference fit thus becoming impermeable to water intrusion.
40. Why are there 3 pins in the connector if there is no ground wire?
- a. There are 3 pin holders, but only 2 pins are being used with the TROV design. We designed this patent-protected connector exclusively for EcoSense and added the 3rd pin holder to provide us flexibility in the future for product line extensions and other product platforms.
41. What is the pull test rating of the connector?
- a. The connector is rated to withstand a pulling force of 35 lbs. for 1 min.
42. How many fixtures can I connect together in a single run and how is this calculated?
- a. The number of fixtures that can be connected in a single run, or maximum run length, is calculated based on the maximum amperage on the wire and connector, the fuse rating of the wire, in-rush current of the driver, and voltage drop. All of these factors are different depending on the power per foot and voltage of the fixture. Please see the fixture spec sheet for the max run length for each option.

LEDs

43. Why did EcoSense choose 16 LEDs and the LED pitch?

- a. The pitch and number of LEDs was purposely selected in order to enable the best quality of light and beam angle options. The pitch, or distance from LED to LED, is optimized for optical control and allows us to achieve a very tight beam. The tight pitch also reduces the look of pixilation and eliminates shadows in between LEDs.

44. Why did EcoSense choose Lumileds?

- a. We chose Philips Lumileds LEDs because they are one of the top LED manufactures in the world and trusted for their high-performing, high-quality LEDs. Lumileds LEDs are the smallest LED that can run at high power and is available in a wide range of CCTs, allowing us to deliver a very competitive product platform. The LEDs small profile also allows us to deliver unique beam angle distributions.

45. What is the binning strategy on TROV?

- a. EcoSense has an exclusive contract with Lumileds that provides us with a single bin strategy for all of our CCTs. This exclusive binning strategy guarantees that we'll always get the same color bin of CCT every time, eliminating the need to mix LED bins for color consistency. Most other manufactures use mixed bin LED strategy in order to achieve a desired CCT and the result is often inconsistent colors within the same product. Using a single bin strategy results in uniform and consistent light that falls within 2 Step MacAdam Ellipse.

46. Can I get the same CCT across all products?
- TROV offers 2200K, 2700K, 3000K, 3500K, 4000K, and 5000K across the entire product line. In addition, we have introduced the 2500K in the 2W, 4W, 6W, and 8W TROV L35 Interior Cove series. 2500K CCT is not available in the 10W and 12W TROV L35 and not available at all in the TROV L50.
47. What happens when 1 LED goes out? Does the fixture turn off?
- No, 1 LED failure will not prevent the rest of the LEDs from going out.
48. Can I replace the LED board if an LED goes out?
- No, the LED board is not field replaceable.
49. Can I get High CRI in all CCTs?
- No - 2200K, 2500K, and 5000K are not available in 90 CRI.
50. How is the performance of 90CRI different than 80CRI
- 90CRI is typically 10% less output than an 80CRI equivalent.
51. Will the Amber LED meet Florida Wildlife Commission Sea Turtle standards?
- No, the standard Amber LED will not meet FWC Sea Turtle requirements of no light below 560nm. We can use a Red-Orange LED that will meet this standard as a custom fixture. Red-Orange leds have 65% less lumen output as our 2700K. There is a minimum order quantity of 120 feet. No extra charge, but longer lead-times will apply.

52. Can we get other colors and CCTs?

- a. Depending on Lumileds available selection we can offer other CCTs and colors as a custom. There will a minimum order quantity for white leds of 300 feet for L35 and 120 feet for L50. Colored leds have an MOQ of 120 feet for both L35 and L50. Consult your EcoSense sales representative for available options.

53. Are our Monocolors saturated?

- a. Yes, our monocolors are saturated colors and available in Blue, Green and Amber.

54. How long do the LEDs last?

- a. See the lumen maintenance table below for lifetime information.

L35 & L50 LOL	L70 @ 25C	L70 @ 50C	L90 @ 25C	L90 @ 50C
2W-8W	>73,000	>60,000	>22,000	>18,000
10W-12W	>150,000	>70,000	>50,000	>25,000
L50	L70 @ 25C	L70 @ 50C	L90 @ 25C	L90 @ 50C
2W-12W	>150,000	>70,000	>50,000	>25,000

55. Why does the 10W and 12W have a longer LED lifetime than the lower wattages on the L35 and L50 Line-of-Light (LOL)?

- a. The 10W L35 and L50 LOL use high power LEDs that can withstand higher temperatures better. This gives the 10W LEDs longer life than the lower power LEDs.

56. How long do the drivers last?

- a. TROV drivers are designed to last longer than the L70 of the fixture at 50C ambient conditions. TROV is warranted for 5 years.

Dimming

57. What kind of dimmers are compatible with TROV?

- a. TROV is dimmable on most ELV dimmers. Please see updated dimmer compatibility chart on our website for the performance results of the most popular dimmers available.

58. What happens if I connect TROV to a non-compatible dimmer?

- a. TROV will probably still operate, but the dimming will not be stable and will probably flicker.

59. Is TROV forward or reverse phase?

- a. TROV uses reverse phase dimming.

60. What is ELV?

- a. ELV stands for Electronic-Low-Voltage. ELV is reverse phase dimming, which means the voltage is turned off on the back of the sine wave, unlike forward phase which turns off voltage on the front of the sine wave. Reverse phase is quieter and more stable. ELV does not mean the fixture is low voltage.

61. Is TROV compatible with the EcoSense LDCM (0-10V-ELV Linear Dimming Control Module)?

- a. Yes, TROV is compatible with the LDCM. The LDCM converts a 0-10V input into an ELV signal. Using the LDCM, TROV is able to accept a 0-10V signal for dimming control.

62. How efficient is the LDCM?

- a. The LDCM is 95% efficient, which means if a fixture load of 100W is being used the LDCM will use 5W, making the total wattage 105W.

63. What is the lowest dimming level before TROV is turned off?

- a. TROV will dim smoothly down to 0.07% measured light, which is 3% perceived light.

64. What is the lowest level TROV will turn on at?

- a. TROV will start up at 0.3%, which is 5% perceived light.

65. Is TROV compatible with DALI or DMX?

- a. No, at this time TROV is not compatible with any DALI or DMX system.

66. Why does the fixture flicker when there are only one or two connected to a dimmer?

- a. When the minimum load of a dimmer is not met the fixtures on that dimmer can flicker or strobe. Any led fixture, not just TROV, can cause a dimmer to misbehave if there is not enough load on the circuit. This load varies greatly depending on the dimmer. The best way to deal with minimum load is to always have at least 20W of load on a dimmer. If this cannot be achieved with the fixtures a phantom load module can be added to simulate more fixtures. Lutron has a phantom load, model LUT-LBX, that works great with TROV.

Certifications & Compliance

67. Is TROV UL or ETL listed?
- a. TROV is ETL listed to UL standards.

Operations

68. Can we say Made in America for TROV?
- a. No, 50% of the fixture has to be made in the USA to meet this requirement.
69. Will we meet the Buy American and Buy America Acts?
- a. No, the fixture has to be "Made in America" for these acts.
70. Will the fixtures and boxes be labeled "Made in Mexico"?
- a. Yes, they both say "Designed in the US, Made in Mexico."
71. Will we meet NAFTA standards?
- a. No, TROV fixtures do not meet NAFTA requirements

Accessories

72. Does the frosted lens change the CRI or CCT?

- a. No the frosted lens will not affect the CRI or CCT.

73. When should a louver be used?

- a. Louvers should be used to reduce glare on fixtures with grazing optics. Louvers should not be used with wide beam angles since most of the light will be cut off by the louver. If glare protection is required for wide beam angles a masking plate should be used instead of a louver.

74. How much light is lost when using a louver?

- a. About 35-80% depending on the beam angle and louver used.

75. How do I determine the most appropriate louver for my installation?

- a. If the fixture can only be viewed from one side, typical of wall grazing, an Asymmetric Louver can be used. If the fixture is visible for either side a Symmetric Louver can be used. If the application doesn't allow for the extra height of the asymmetric or symmetric louver, the honeycomb louver provides excellent cutoff with minimal height.

76. Will the Angle Lock work in the Flip to Flat position?

- a. Yes, with the 15° tab the angle lock will prevent the L50 and L35 from changing angles when flipped to flat.

77. What is the Fine Adjustment Bracket (FAB) used for and how does it work?

- a. The Fine-Adjustment-Bracket, or FAB, is used for very small angle adjustments when aiming. TROV has built-in aiming that can be adjusted in 15° increments. When tighter adjustments (1-15 degrees) are needed, typically with wall grazing, the FAB will be needed. The FAB is first mounted to the fixture, then it is screwed to the mounting surface. A Phillips head screw is then turned to tilt the fixture between 0-15°.

78. Will the Fine Adjustment Bracket work in flip to flat?

- a. Yes, the FAB will work when the fixture is flipped to flat.

79. Why do TROV leader cables have two connectors and no flying leads?

- a. The aiming mechanism on TROV moves only in one direction so this means the power feed can either come from the left or the right. We have designed our leader cable with BOTH Male and Female Connections so that the installer can use the most appropriate end for their installation. Installer can then cut off the end that would be hard wired into a junction box.

80. How do the Mounting Arms work?

- a. The mounting arms hold the fixture on each end. One arm can be used at the joint of 2 fixtures in a run with a joiner plate. The first and last arm of each run will use an end plate set that includes a left and right end plate. One arm is needed per fixture + one arm to end the run. One end set is needed per run and one joiner plate is need per joint which is -1 per fixture. For example, a 10' run with 2 4' fixtures and 2 1' fixtures will need 5 arms, 1 end set, and 3 joiner sets.

77. Are the accessories paintable?

- a. The masking plates, wall mount arms, and landscape stakes can be field painted. We can also custom paint these parts for an additional cost and increased lead-time.

78. Why would I need mounting track and how does the track work?

- a. The Mounting Track serves two purposes. The first is an alternative mounting method when the fixture mounting holes do not align with application mounting. Secondly, the mounting track is also useful if you want to rough in the mounting and then go back later and mount fixtures. In this case, the track is measured and mounted onto job site, then clips are installed into the fixture and snapped onto the track.

79. Is conduit necessary for wiring the Landscape Stake?

- a. No, conduit is not required to use the Landscape Stake. The cord will have to be terminated into a junction box, but the stake does not need to mount to that junction box.

80. Can I get different heights for the Masking Plate?

- a. Yes, the masking plates can be produced in custom heights. Please consult the factory for MOQ, lead-time, and price.

81. Can I get custom accessories?

- a. Yes, we can custom design and manufacture accessories if feasible and there is a business case to support it. Please consult the product manager for MOQ, lead-time, and price.