



ACROBAT WALL WASH

White Paper

Abstract:

Designing optics for recessed downlighting wall wash applications can be challenging and several factors must be considered. This work is an exploration of what the current wall wash solutions do and demonstrates the improvements that CSL has developed and built into the all new Acrobat wall wash optic system.

Introduction:

Fixtures intended for wall wash applications are specifically designed to provide illumination of a perpendicular surface, most commonly walls inside or outside buildings. When evaluating a wall wash fixture, it is important to consider the main objective which is illuminating the intended surface with uniform light distribution, with no artifacts, discoloration and with minimal glare. Good wall wash luminaires provide a user-friendly installation method, making it easy for the installer to place and aim the lights correctly at the intended surface for ideal light distribution using the fewest number of fixtures possible. A specific application that CSL considered when designing wall wash optics is the perfect illumination for works of art.

In addition to the design considerations and ease of installation, communication of proper installation guidelines to the installers is important for accuracy. One particularly useful feature is being able to convert existing standard luminaires into wall wash fixtures in the field after installation. This work represents an exploration of the present wall wash solutions that exist on the market, and demonstrates the improvements that CSL's design team has made on wall wash optics and fixture design.

Wall washing art work:

While the intention of wall washing is not explicitly for illuminating artwork, many applications of wall wash fixtures are for accenting artwork, or other decorative features on a wall. Typical examples where wall wash fixtures illuminate decorative features might be a painting hung on a wall in an art museum; a display shelf mounted on a wall in a store; illuminating an informative display at a museum. Wall wash luminaires should provide light to accent features in uniform high-quality light that highlights the features and colors of the object that is being illuminated. Because of the varying types of applications, special consideration should be taken with regards to how a wall wash fixture is designed and installed for best results.

See figure #1

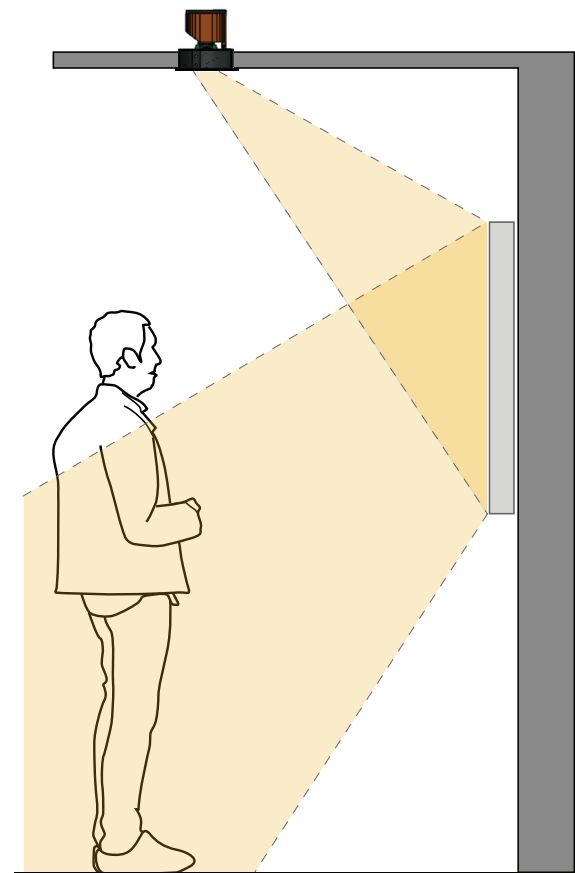


Figure #1

Considerations for fixture spacings from the wall:



Figure #2

Special consideration was taken to determine the ideal set back distance of a fixture from the wall intended to be illuminated. A fixture placed 2 feet from the wall has an advantage in terms of reducing the glare angle viewed at eye level by an observer. The disadvantage of placing fixtures so close to the wall are the harsh shadows at an acute angle that begin to show the wall's texture. On the art work, shadows may be cast from the picture frame on to the art work inside the frame. **See Figure #2**

When fixtures are placed at 4 feet from the desired surface, the resulting light distribution was especially even from floor to ceiling. However, this distance introduces the problem of glare on the observer. Additionally, the wall wash fixture may show glare when reflected off the smooth cover glass of a picture frame. **See Figure #3**



Figure #3

In general, the industry standard of fixture setback from a wall is 3 feet and it is not a coincidence that this is the correct distance **See figure #4**. A 3 foot setback is ideal because this is the sweet spot between glare and shadowing. At 3 feet glare is mostly absent as long as art is hung no higher than 18 inches from the ceiling. At 3 feet walls are illuminated evenly so long as the texture on the wall is kept to a minimum.



Figure #4

Considerations for fixture spacings from each other:

Unlike distance from the wall, the spacing between fixtures is not well defined by any industry standard. A closer fixture spacing has the benefit of providing a more even light distribution on a wall if budget allows. With a very close 2 foot spacing between fixtures, scalloping and hot spots can be nearly eliminated. With a 3 foot spacing, some scalloping and hot spots are present but not particularly visible. At 4 foot and beyond, scalloping becomes increasingly visible and the space between fixtures is noticeably dimmer than directly under. A fixture spacing greater than 4 feet also tends to cast harsh lateral shadows which is not ideal for most wall wash applications.

The limitation of films for wall washing applications:

Like many downlight manufacturers, CSL previously relied on direction turn films to provide wall wash solutions. While these films work to some extent, there is a limitation to the performance of wall wash fixtures that rely on direction turn films. In order to meet the needs of a wide variety of clients, the companies who produce these films design them without a specific focal point. Rather the films work best with light that is highly collimated in order to function properly. Shining a laser through one of these films causes the beam to come out the other end in a near perfect uniform distribution. The problem is typical downlights rely on LED rather than a laser diode and don't produce a collimated light output without additional optical assemblies to tighten the beam. *Using wall wash films for downlighting applications will typically have 4 major issues:*

1.

A limitation to how uniform the beam can be. There will always be a hot spot at the center of the beam. There will always be scalloping between wall wash fixtures. The wall cannot be illuminated at the top, and often times the wall is poorly illuminated from waist level down.

2.

Wall wash films tend to have a lot of glare when viewed from behind. This is because non-collimated light hitting the film becomes scattered rather than being directed to the wall surface.

3.

Film solutions are not ideal for directing a non-collimated light source. While most of the light illuminates the wall, a significant portion is wasted in lighting an area behind the wall.

4.

The primary optic needs to be tilted and then aligned with the trim. This complicates installation since it's difficult to ensure both are aligned properly.

After identifying these limitations with existing technology, CSL decided that a dedicated wall wash optic would have significant performance advantages over traditional techniques for wall washing applications.

Advantages of a dedicated optic:

Dedicated optics have several advantages over a film solution. The primary reason for this is a dedicated optic can be designed around a pre-defined focal point. *This creates several advantages in comparison to films:*

1. The resulting beam is much more uniformly distributed across the wall surface. This is because the optic design is based off a defined focal point. The optic is effective at illuminating evenly from floor to ceiling. The scalloping effect between fixtures is reduced considerably.
2. Because light is distributed more toward the desired direction there is less glare shining back on the observer or being scattered where not desired.
3. The overall system efficiency is greater because the optical system is more controlled and less light is being scattered and wasted.
4. Since the primary optic shines directly down, you can rotate the wall wash trim. This allows the user to aim the wall wash fixture after it's been installed and adjust as needed.

Strategy of light distribution:

The new dedicated optic wall wash is designed to have two distinct optical regions. First there is a kicker plate that directs a portion of light coming from the primary optic towards the top of the ceiling. The second feature is a series of vertical and lateral optical ridges which focuses the distribution of light toward the mid and lower portions of the wall. **See figure #5**

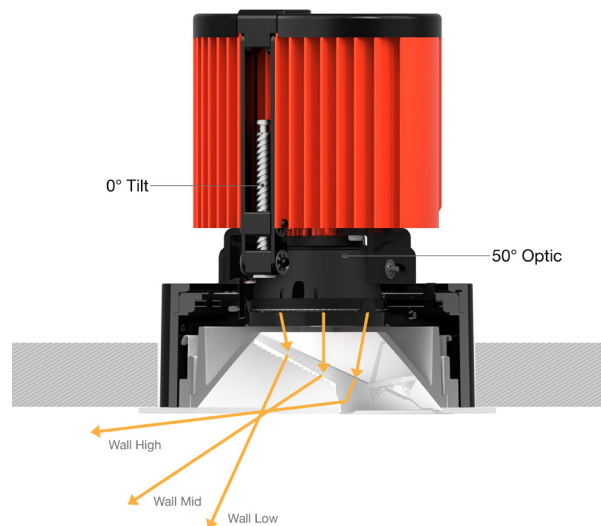


Figure #5

Glare shield:

A magnetic glare shield is attached to the underside of the trim. This provides visual comfort by completely blocking glare from being observed by a viewer at eye level.

Improved Beam Distribution:

By using a dedicated optic, we are able to improve the system's light distribution from the original Acrobat wall wash fixture. Whereas the original design distributes light to un-intended areas, the new wall wash fixture puts all of the light output on the target.

User experience aiming and adjustments:

For the purpose of aiming the fixture, it significantly simplifies installation by having the LED module always aimed directly downwards.

This decouples the primary and secondary optic in terms of alignment. Now with the two optical systems separated, the trim can be rotated and aimed on its own. This makes it much simpler for the installer to aim and adjust the system to get the desired wall washing effect.



Figure #6

Pop in optic:


Another distinct advantage of the new CSL wall wash optic is how it is installed onto the trim itself. Our new Acrobat wall wash optic can be easily popped into any standard Acrobat trim and converts it into a wall wash trim. This has advantages for the end user, as any standard trim Acrobat can be retrofitted with the wall wash fixture at any time after installation. **See figure #6**

Conclusion:

CSL lighting's new patented wall wash optic has made significant improvements over many of the deficiencies of existing designs. Its unique method of installation, combined with added optical control and uniform light output results in a user experience and beam distribution on the wall that is vastly improved compared to other solutions on the market and previous CSL designs. Combined with the high-quality light source used in our Acrobat downlight line, today we believe that CSL has one of the strongest solutions for wall wash out on the market.



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