WHITE PAPER

HOW AMBIENT LIGHT REJECTION WORKS

AUDIOVISUAL SCREENS

Visual examples of screens in ambient light: ALR screens on top, Non-ALR screens on bottom.

Ambient light rejection (ALR) projection screen technology has been around for a while now. Despite this, there is still confusion about how ALR works. Some of this confusion is caused by manufacturers making inaccurate claims or promoting non-ALR surfaces as a solution.

EVERY SCREEN REFLECTS LIGHT IN TWO WAYS: THROUGH DIFFUSE OR SPECULAR REFLECTION

DIFFUSE REFLECTION

Diffuse reflection is when light hits a surface and is reflected at many angles. Most of the light is actually reflected by "scattering centers" just beneath the surface. Because all light is treated equally and reflected at all angles, **diffusive surfaces** do not make good ambient light rejecting screens.

The **color of the viewing surface** also plays a role in diffuse reflection. Material color affects the color of the light reflected, or how much white light is reflected. For example, a surface with red tints will reflect light with more red. A pure white screen will reflect as much light as possible of all colors and does not absorb any light. A grey screen will absorb some of the reflected light. The darker the grey, the more reflected light will be absorbed by the material.

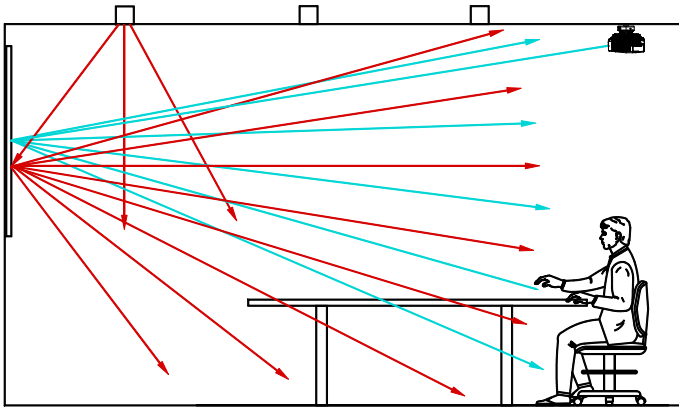
White screen surfaces are not perfect diffusers. Some light is not fully diffused, depending on how smooth or rough the surface is or what components are used in a film formulation if it is a formulated surface. A surface that is too smooth can have an elevated level of gloss and cause hot spotting. A surface that is too rough can interfere with the image resolution.

SPECULAR REFLECTION

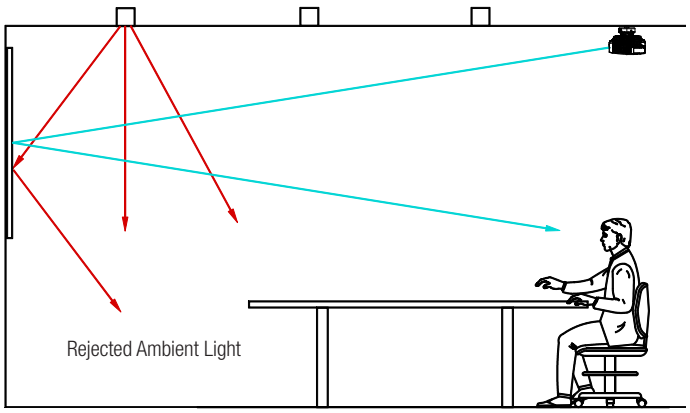
Specular reflection is when light hits a surface and is reflected away at a single, opposite angle. ALR screen surfaces use specular reflection to keep non-projector light from reflecting to viewers. Most do this by using a combination of things. They use specular reflective elements in the screen formulation. These elements reflect off-axis ambient light away from viewers. The amount of specular reflection is a key indicator of the amount of ALR performance in a surface. ALR surfaces also use a dark grey color to absorb stray ambient light and improve the contrast.

There can be trade-offs. The more specular reflective a surface is, the narrower the optimal viewing cone will typically be. However, the more specular reflective elements that are added also help increase the gain of the surface, which might otherwise be low due to the dark grey color.

continued on next page



Red = Ambient Light, Blue = Projection Light



Red = Ambient Light, Blue = Projection Light

A GREY TINT DOESN'T MAKE IT ALR

Most grey screens have a light or moderate grey tint but are still mostly diffuse reflective surfaces. Again, the color aids in the diffuse reflection. The grey tint only helps to absorb some stray ambient light and improve contrast a little in moderate ambient light conditions. But that does not make it an ALR screen surface. Most ALR surfaces are a much darker grey than a regular grey surface.

MORE THAN A NUMBER

There are two ways ambient light rejection is typically communicated: by reporting **how much ambient light gets through or how much is rejected**. Draper® uses the amount of ambient light being rejected to communicate ALR performance.

However, choosing the right ALR solution is about more than just a number. Achieving a good level of ALR requires a balancing act. **Surface color, smoothness, gloss, and gain also impact the viewing experience.** As material characteristics are adjusted to reject more ambient light, other performance specifications, such as viewing angle and image resolution, will be affected.

To choose the best ALR screen for your application consider all manufacturer **specifications and recommendations**, not just the amount of diffuse reflection (or lack thereof). Also look at each surface's full gain curve and observe how quickly it loses gain at wider viewing angles.

LEFT: basic white screen. RIGHT: TecVision MS1000X ALR with 3000 lumen projector. Photo and demonstration by Brian Kunz, LEED®AP, CTS

DRAPER® TECVISION® ALR

TecVision® ALR surfaces contain uniformly placed reflective components to make the surface more **angular reflective**. Projection light that hits the screen surface directly reflects right back at an opposite angle of incidence into the audience. Off-axis ambient light hits the surface at a more indirect angle, then reflects off the surface at an opposite angle of incidence away from the audience.

There are currently **five TecVision ALR materials** with uses dependent upon seating configuration and lens/throw distance ratio. Because these materials have a darker grey tint which absorbs more light from a projector than white material, the **projector should be 15%-18% brighter** than one used with typical matt white material. This compensates by bringing the image's white levels up to an appropriate level, while the material helps produce better black levels. See pages 3-4.

THE HIGHER THE ALR PERCENTAGE, THE MORE OFF AXIS AMBIENT LIGHT IS REFLECTED AWAY FROM THE VIEWERS.

All Draper® ALR TecVision® surfaces are **8K ready and ISF certified for color accuracy and fidelity.** The screens do not affect the color of the image enough for the human eye to perceive based on chromaticity measurements. These screens are also available as an **acoustically transparent** nano perforated surface in limited sizes.

XH800X ALR

AMBIENT LIGHT REJECTING SURFACE

Wide Viewing Cone / High Contrast / On-Axis Gain of 0.8 / ALR: 57%

XH800X ALR performs well for short throw projectors in moderate to high ambient light and wide viewing angles. Lens / Throw distance ratio for best brightness uniformity: 0.7:1 or longer.

XH900X ALR

AMBIENT LIGHT REJECTING SURFACE

Wide Viewing Cone / High Contrast / On-Axis Gain of 0.9 / ALR: 60%

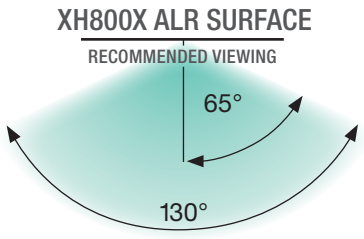
XH900X ALR performs very well in spaces where there is moderate ambient light and wide viewing angles. Lens / Throw distance ratio for best brightness uniformity: 1.2:1 or longer.

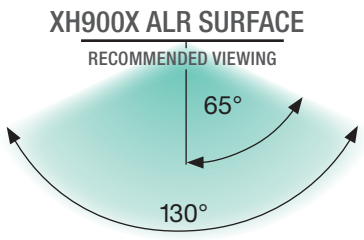
MS1000X ALR

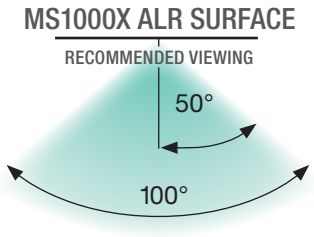
AMBIENT LIGHT REJECTING SURFACE

Moderate Viewing Cone / Very High Contrast / On-Axis Gain of 1.0 / ALR: 73%

MS1000X ALR performs very well in spaces where there is moderate to high ambient light and moderate viewing angles. Lens / Throw distance ratio for best brightness uniformity: 1.4:1 or longer.

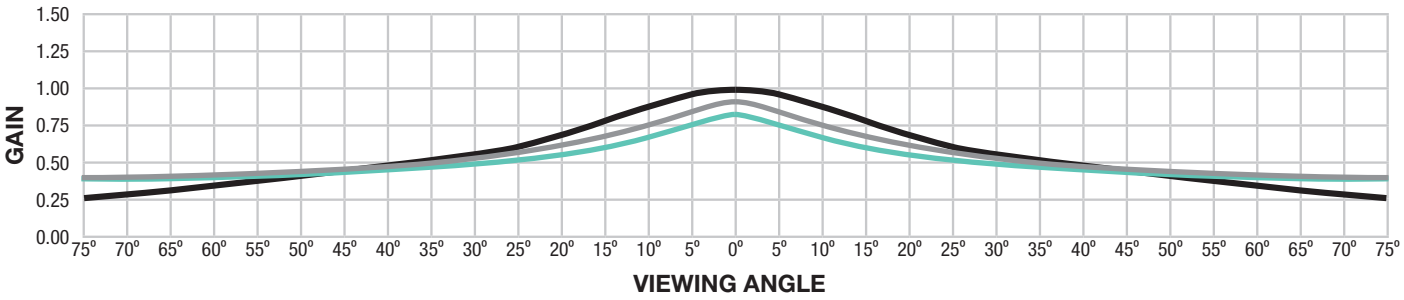






Gain Charts

XH800X ALR	**Half Gain Angle: 50°**	**Tint: Grey**
XH900X ALR	**Half Gain Angle: 50°**	**Tint: Grey**
MS1000X ALR	**Half Gain Angle: 35°**	**Tint: Dark Grey**



continued on next page

CS1000X ALR

AMBIENT LIGHT REJECTING SURFACE

Narrow Viewing Cone / Superior Contrast / On-Axis Gain of 1.0 / ALR: 82%

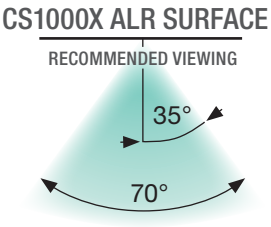
CS1000X ALR performs very well in spaces where there is high ambient light and narrow viewing angles. Lens/Throw distance ratio for best brightness uniformity: 1.6:1 or longer.

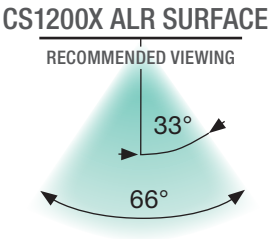
CS1200X ALR

AMBIENT LIGHT REJECTING SURFACE

Narrow Viewing Cone / Superior Contrast / On-Axis Gain of 1.2 / ALR: 82%

CS1200X ALR performs very well in spaces where there is high ambient light and narrow viewing angles. Lens/Throw distance ratio for best brightness uniformity: 1.7:1 or longer.

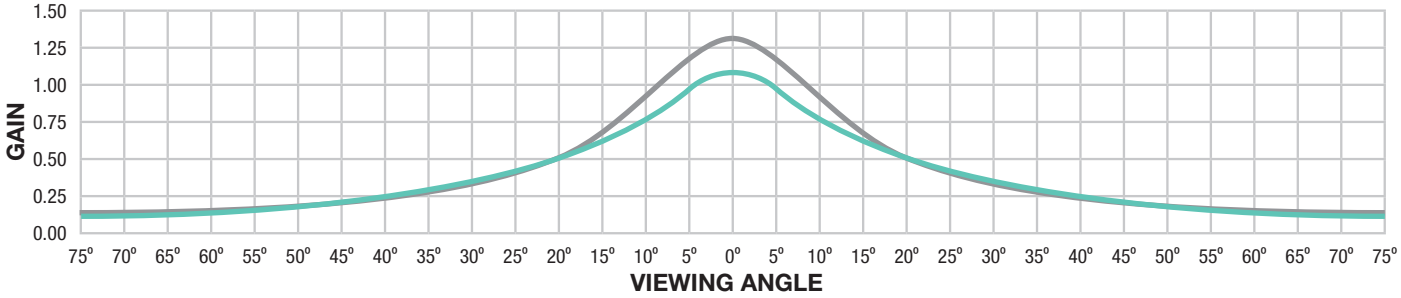




Gain Charts

CS1000X ALR **Half Gain Angle: 20°** **Tint: Dark Grey**

CS1200X ALR **Half Gain Angle: 18°** **Tint: Dark Grey**



For more information on choosing your projection surface, visit:

www.draperinc.com/projectionscreens/surfaces.aspx

www.draperinc.com/casestudies/

MADE IN USA WITH AMERICAN & GLOBAL COMPONENTS

DRAPER® FOCUSED ON INNOVATIVE SOLUTIONS

Draper, Inc. | 411 S. Pearl St. Spiceland, IN 47385
draperinc.com | 765.987.7999 | 800.238.7999