

BS EN 14501 Glare Classification

Summary

- ✓ Classifications for glare control have changed in the new revision of BS EN 14501 and are now more accurate.
- ✓ Current visual performance data can be used to classify shading products on a 0 - 4 scale, with 0 representing a 'Very Little Effect' and 4 representing a 'Very Good Effect'.
- ✓ The 0 - 4 scale is an easier way of comparing glare control performance of one shading product against another.

1. Introduction

One of the important benefits of solar shading is its ability to protect occupants from experiencing glare. Solar shading that is positioned vertical to the window attenuates the bright sunlight, so it does not cause annoying reflections on computer screens or furnishings (e.g., kitchen surfaces). The European Standard BS EN 14501 : 2021 classifies solar shading products for their ability to attenuate sunlight and minimise glare. This provides a simpler way of identifying how effective a shading product is at preventing glare being experienced. Products are ranked on a 0 - 4 scale with 0 representing 'Very Little Effect' and 4 representing 'Very Good Effect'.

Class	Glare Control				
	0	1	2	3	4
	very little effect	little effect	moderate effect	good effect	very good effect

2. Scientific Background

The new standard considers real-world research carried out by several European research institutions to try and predict when people experience discomfort glare. This type of glare is hard to predict because it varies depending on individual factors as perceptions of glare are highly subjective.

To carry out this study offices that could rotate were built. These offices were also designed so the amount of glazing and the type of shading could be altered on the office façade. Within the offices people were asked to perform tasks on a computer. The person within the office was either positioned parallel or diagonal to the window and the office was rotated to identify how changes in the sun's position affected occupants' perceptions of glare.

An indicator called Daylight Glare Probability (DGP) was developed as a result of the study. It was determined that if the DGP is less than 35% glare is considered to be "mostly imperceptible" (i.e., not noticeable). If it is above 40% the glare perceived can be considered as "disturbing" to occupants. More details describing the DGP can be found in BS EN 17037 : 2018 - Daylight in Buildings.

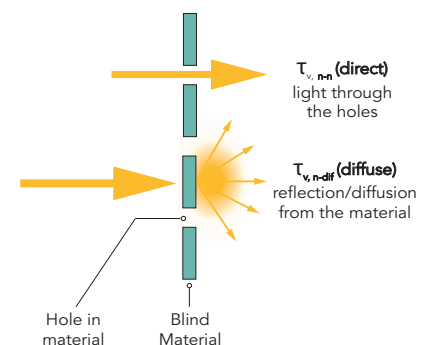
3. Glare Control of Shading Products

Glare control is a function of the Direct Visible Light Transmittance ($\tau_{v,n-n}$) - the transmittance through the openings in the shading product if any - and the Diffuse Visible Light Transmittance ($\tau_{v,n-dif}$) - the reflection/diffusion of light from the material itself. Together they make up the Visible Light Transmittance referred to as τ_v (or $\tau_{v,n-h}$) within standard BS EN 14501. Some also use the expression T_{vis} or T_v - as long as they are calculated to standard BS EN 14500 then the measures will be the same irrespective of the abbreviation.

The glare classes in the 2005 version of BS EN 14501 were based on industry experience. The new glare class table in BS EN 14501 : 2021 is more accurate and has smaller thresholds based on the research study carried out to determine the Daylight Glare Probability Index.

Visible Light Transmittance (τ_v) =

Direct Light ($\tau_{v,n-n}$) + Diffuse Light ($\tau_{v,n-dif}$)



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3. Classifications

The table shows the percentage of Direct ($\tau_{v, n-n}$) and Diffuse ($\tau_{v, n-dif}$) Visible Light Transmittance to obtain a certain class. Across the top row are thresholds for the amount of direct light and in the left column are thresholds for the amount of diffuse light. The goal of this table is to be able to compare the performance of different materials to each other under the same set of circumstances. Therefore it is a simplification of reality.

The table is based on the following:

Location: Frankfurt-am-Main, Germany
Orientation: South
Glazing Amount: 50% to 100%
Distance to the window: 2m

In reality the following aspects may vary:

- The location of the building,
- The orientation of the façades,
- The amount of glazing,
- The type of glazing,
- The viewing direction of the occupant (parallel, perpendicular, or diagonal to the window).

		BS EN 14501 : 2021					
$\tau_{v, n-dif} \%$	$\tau_{v, n-n} \%$						
	$\tau_{v, n-n} = 0.00$	$0.00 < \tau_{v, n-n} \leq 0.01$	$0.01 < \tau_{v, n-n} \leq 0.02$	$0.02 < \tau_{v, n-n} \leq 0.03$	$0.03 < \tau_{v, n-n} \leq 0.05$	$\tau_{v, n-n} > 0.05$	
$\tau_{v, n-dif} \leq 0.03$	4	4	3	3	1	0	
$0.03 < \tau_{v, n-dif} \leq 0.06$	4	3	2	2	1	0	
$0.06 < \tau_{v, n-dif} \leq 0.10$	4	3	2	1	0	0	
$0.10 < \tau_{v, n-dif} \leq 0.15$	3	2	1	1	0	0	
$0.15 < \tau_{v, n-dif} \leq 0.20$	2	2	1	1	0	0	
$0.20 < \tau_{v, n-dif} \leq 0.25$	1	1	0	0	0	0	
$0.25 < \tau_{v, n-dif}$	0	0	0	0	0	0	

Tables taking all these factors into account can be found in the annexes of BS EN 14501:2021 and BS EN 17037:2018.

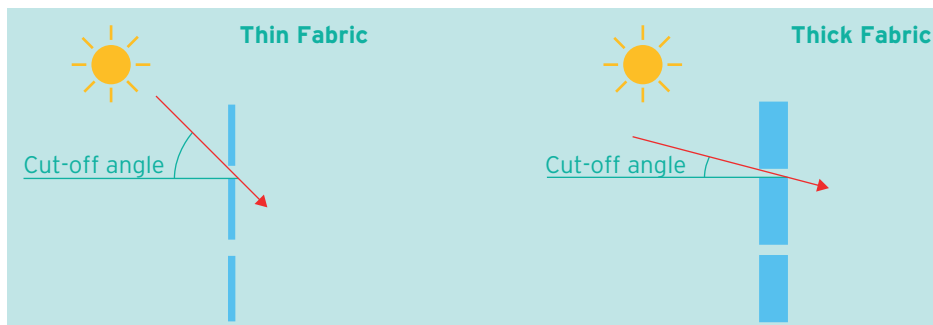
In the table you can see that a Direct Visible Light Transmittance ($\tau_{v, n-n}$) of more than 3% is already too high to have a good glare control class. The Direct Visible Light Transmittance ($\tau_{v, n-n}$) increments are very small, they increase by 1% each time, so an accurate measurement of your data is crucial.

4. Improvement in class for mesh fabrics

Mesh shading products that are inside the highlighted area of the table may be able to obtain a higher class if they can prove the shading fabrics cut-off angle is less or equal to 65°. The cut-off angle is determined according to BS EN 14500 : 2021. The cut-off angle describes the ability of a solar shading device to block the transmission of direct light above a certain angle of incidence.

Cut-off Angle Definition: The cut-off angle is the first angle of incidence at which the direct light transmittance is no longer perceivable.

Mesh Fabric Example: If the fabric is thin the sun's rays will go through, but they may be blocked if the fabric is very thick and the incident angle is sharp.



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5. Glare evaluation of solar shading devices in the Daylight Standard BS EN 17037

Below you can find some guidelines for achieving a low Daylight Glare Probability (DGP) with different types of solar shading from the Daylight in Buildings standard BS EN 17037 : 2018 Annex E.

For Opaque Materials:

Low values of DGP for most of the usage time can be achieved if:

- The device can be operated by the occupant
- There is no view towards all sun positions when fully extended and closed

Venetian and Vertical blinds will fulfil these conditions if:

- Holes for inner cords are hidden
- No reflection of slats in closed position
- No direct view of the sun through gaps

For Fabrics, Film or Perforated Opaque (Screen) Materials:

Low values of DGP for most of the usage time can be achieved depending mainly on:

- Material optical properties - Direct ($\tau_{v,n-n}$) and Diffuse Visible Light Transmittance ($\tau_{v,n-dif}$), and cut-off angle
- Location and sunshine probability
- Viewing direction
- Façade orientation
- Glazing fraction of the façade
- Glazing transmittance
- Distance of the user to the façade

7. Further Information

Guidance Note L-02 Glare Control - <https://www.shadeit.org.uk/type/guidance-notes/>

BBSA video on glare - <https://www.shadeit.org.uk/resource/effective-control-light-glare/>

BS EN 14501 : 2021 Blinds and shutters – Thermal and visual comfort – Performance characteristics and classification - <https://shop.bsigroup.com/ProductDetail?pid=000000000030371887>

BS EN 14500 : 2021 Blinds and shutters. Thermal and visual comfort. Test and calculation methods - <https://shop.bsigroup.com/ProductDetail?pid=000000000030371884>

BS EN 17037 : 2018 Daylight in buildings - <https://shop.bsigroup.com/ProductDetail?pid=000000000030342286>

ES-SO Solar Shading for Low Energy Buildings - https://www.shadeit.org.uk/wp-content/uploads/2019/01/ES-SO_Technical_GuideBook_BD_Final.pdf

ES-SO Webinar Master the revised Standards EN 14500 and EN 14501 - June 2021 - <https://www.youtube.com/watch?v=mmd-MDBOKU0&t=11s>