

Design Note

Project MMU Library
Subject Glare Impact - Qualitative Assessment
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001	Glare Impact - Qualitative Assessment	FH	25/08/23	

Disability Glare Design note

Introduction

The proposed development is in the centre of Manchester Metropolitan University in Manchester. It is to be a new library and educational facility with the main mass of the building developed being the new library. The development consists of one building block with a tower on the eastern wing.

Due to the potential proximity of the proposed development to existing dwellings and amenity spaces, a qualitative assessment has been undertaken to determine the sensitivity of existing nearby buildings to sunlight and daylight impacts. For those buildings which are deemed as sensitive to the development, assess whether the impact of the proposed development experienced is sufficient to require further analysis.

Disability Glare

Glare is a phenomenon occurring in the eye that is caused by the presence of bright light sources within the visual field. It can lead to visual discomfort and, if the glare source is very bright compared to its surrounding, even be disabling in the sense that objects become hard or impossible to see. This is because they are cloaked by the high intensity glare source, whose light gets scattered within the eye.

The CIE 146:2002 Collection on Glare expresses the latter type of glare more formally as: "Disability glare is glare that impairs vision (CIE, 1987). It is caused by scattering of light inside the eye [...]. The veiling luminance of scattered light will have a significant effect on visibility when intense light sources are present in the peripheral visual field and the contrast of objects to be seen is low. "

"Disability glare is most often of importance at night when contrast sensitivity is low and there may well be one or more bright light sources near to the line of sight, such as headlights, streetlights or floodlights. But even in daylight conditions disability glare may be of practical significance: think of traffic lights when the sun is close to them, or the difficulty in viewing paintings hanging next to windows."

Glare is of particular concern if it affects drivers of motor vehicles or trains, since it might impair the visibility of signals and traffic signs, potentially putting the driver, passengers, or other parties at risk.

Criteria

Glare is a phenomenon caused by a bright source of light that inhibits the ability to view a task or scene, due to an uncomfortable or even blinding effect on the viewer. In the built environment glare or dazzle can occur when sunlight is reflected from a reflective facade onto an observer on roads, trains, buildings, and pedestrian areas. The problem can occur when buildings incorporate large areas of reflective material (glazed elements or specular metal cladding) and

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when the bright area caused by the incident sunlight is within the observer's field of view. Solar reflections off buildings are particularly important in train lines where glare can cause temporary blinding on drivers. When the level of discomfort due to glare prompts evasive action, such as turning away from the reflection or shielding the eyes, this is called disability glare. Disability glare is a frequent occurrence when drivers drive directly into the sun when the sun is at a lower altitude and within the field of view.

At this stage, no statutory rules are available regarding the sunlight disability glare phenomenon in the UK. However, in 2017 the City of London produced a Planning Guidance, that requires developers and architects to consider Best Practice Design in relation to glare ("Guidance and best practice for assessing solar glare in the City of London – A planning advice note").

The guidance above provides clarity on potential microclimate impact arising from developments and how they need to be considered as part of the planning process.

Furthermore, the guidance suggests that: "Solar glare impact should be assessed as part of development proposals at the planning stage; this will enable applicants and architects to address the potential for solar glare at an early phase of design and will avoid the need to retrospectively address unforeseen impacts. [...] key objectives to protect amenity, maintain a high-quality public realm and ensure safety on the highways."

Solar glare desktop study

To analyse the risks of glare to nearby transport and traffic, the surrounding area was assessed to identify any train lines or traffic signals that might be affected by the new MMU building. Two traffic signals on Oxford Road are expected to be at risk of glare from the new proposal. Due to the distance away from the new MMU development and the heights of buildings in between, there is not expected to be any risk of glare to the nearby train line.



Figure 0—7 Transport glare risks

Traffic signals that are expected to be impacted are those identified at 1 and 2 whilst driving northwards along Oxford Road which can be seen in the images below. The selected viewpoints aim to represent some of the most likely sensitive receptors on the road for drivers,



Figure 0-1 View from Traffic light 1 travelling North, existing building

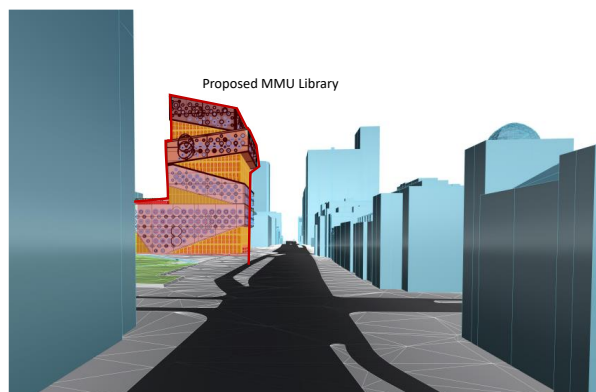


Figure 0-2 View from Traffic light 1 travelling North, proposed building



Figure 0-3 View from Traffic light 2 travelling north, existing building

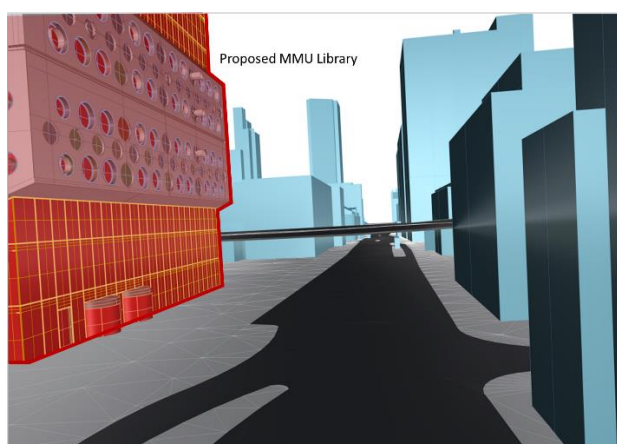


Figure 0-4 View from Traffic light 2 travelling north, proposed building

Qualitative Study

This glare study uses traffic signal 1 to represent some of the most sensitive receptors close to the new MMU development. This location is behind the traffic signals at a 12-metre distance. This is due to the typical stopping distances for vehicles at the roads indicated speed limit of 20mph. The selected viewpoint on the road was placed at a height of 1.8 meters above the road representing a bus drivers eye level due to the Road having a high volume of bus traffic and the respective importance of the safety of the driver and vehicle occupants. The study analyses the critical field of view of the driver which is up to 30 Degrees. At this point, any discomfort or disability glare would pose the greatest risk to safety.

An initial assessment was made of the following days at 2-hour intervals to ascertain an understanding of potential risk to the indicative viewpoint:

- December 21st (winter solstice),
- September 21st (equinox), and
- June 21st (summer solstice)

The assessment uses Daylight Glare Potential to analyse the level of risk:

Daylight Glare Potential:

- <35% Imperceptible Glare
- 35-40% Perceptible Glare

- 40-45% Disturbing Glare
- >45% Intolerable Glare

Reflectivity Assumptions

Element	Reflectivity
Ground (typical of asphalt)	0.1
Walls (typical of concrete)	0.4
Glass	0.5 LTV, 0.5 specular reflectivity
Grass/vegetation	0.25

Changes between the existing MMU building and the new development were observed to act as an indicator of the level of risk of additional glare to the signals from the new development. Changes observed are indicated in the tables below and show a slight reduction in glare in summer which is most likely due to reduction in overall sky visibility, but are not considered to be statistically significant:

Winter					Summer					Equinox				
Time	Existing	Proposed	Change		Existing	Proposed	Change			Existing	Proposed	Change		
8	0	0	0	0	8	44	44	0		8	35	35	0	
10	20	20	0	0	10	60	59	-1		10	50	49	-1	
12	27	27	0	0	12	55	53	-2		12	52	52	0	
14	25	25	0	0	14	49	47	-2		14	45	44	-1	
16	6	6	0	0	16	42	40	-2		16	40	38	-2	
18	0	0	0	0	18	25	25	0		18	20	19	-1	

Conclusions

The preliminary solar glare study has been carried out in relation to MMU Library development in Manchester. The aim of the study was to investigate potential solar glare instances from the proposed development that could cause disability glare issues to car drivers and the potential times during the day that the reflections may occur.

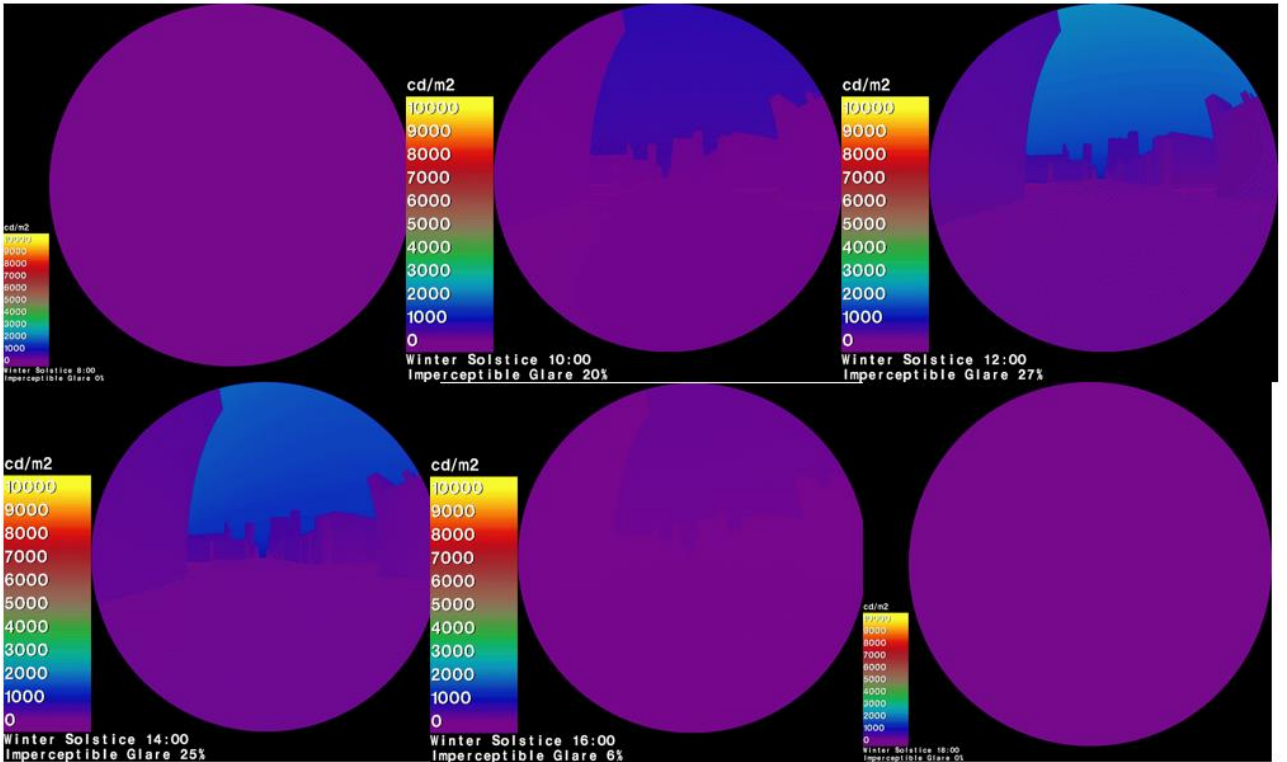
This preliminary study has been based on a desktop analysis to establish if sunlight may be reflected by the façades of the proposed development towards critical viewpoints at specific times throughout the year.

It is anticipated from the study that there is a low risk of increasing glare to the traffic signals from the new development when compared to the existing building. However, non-reflective or Matte finishes should be specified wherever possible to keep any risk to a minimum. Any increases to the reflectivity of glazing or other should be further studied for their impacts.

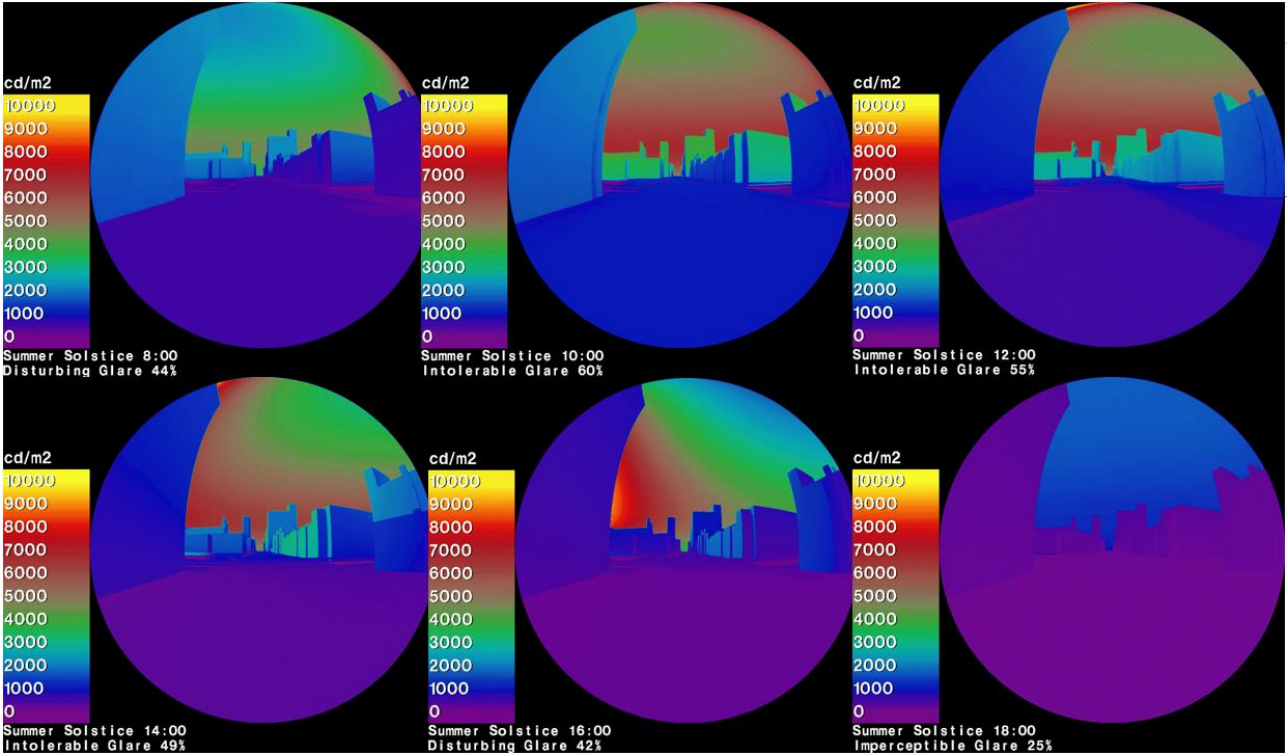
Further computational analysis is recommended to confirm the possibility of disability glare from each of these locations on an annual basis. The computational analysis will determine the magnitude and the general duration of these reflections. If the sunlight reflections from the facades to the key points are inside the driver field of view (25°-30°), this would inform the extent of mitigation measures to be considered. Thus, the next steps of analysis should also consider key site obstructions and other characteristics of the surrounding environment, façade glazing properties and Manchester's annual weather can also reduce the sunlight rays that are reflected from conditions through software modelling.

Appendix A Glare Results

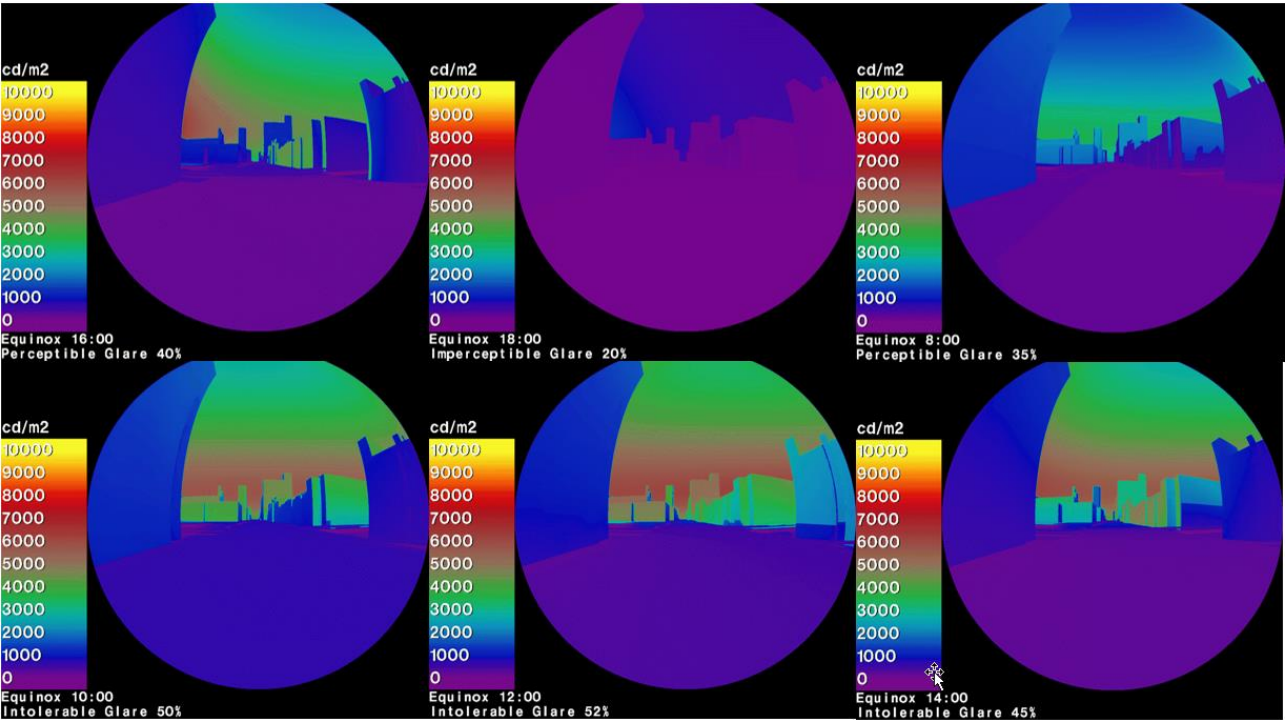
Existing Winter



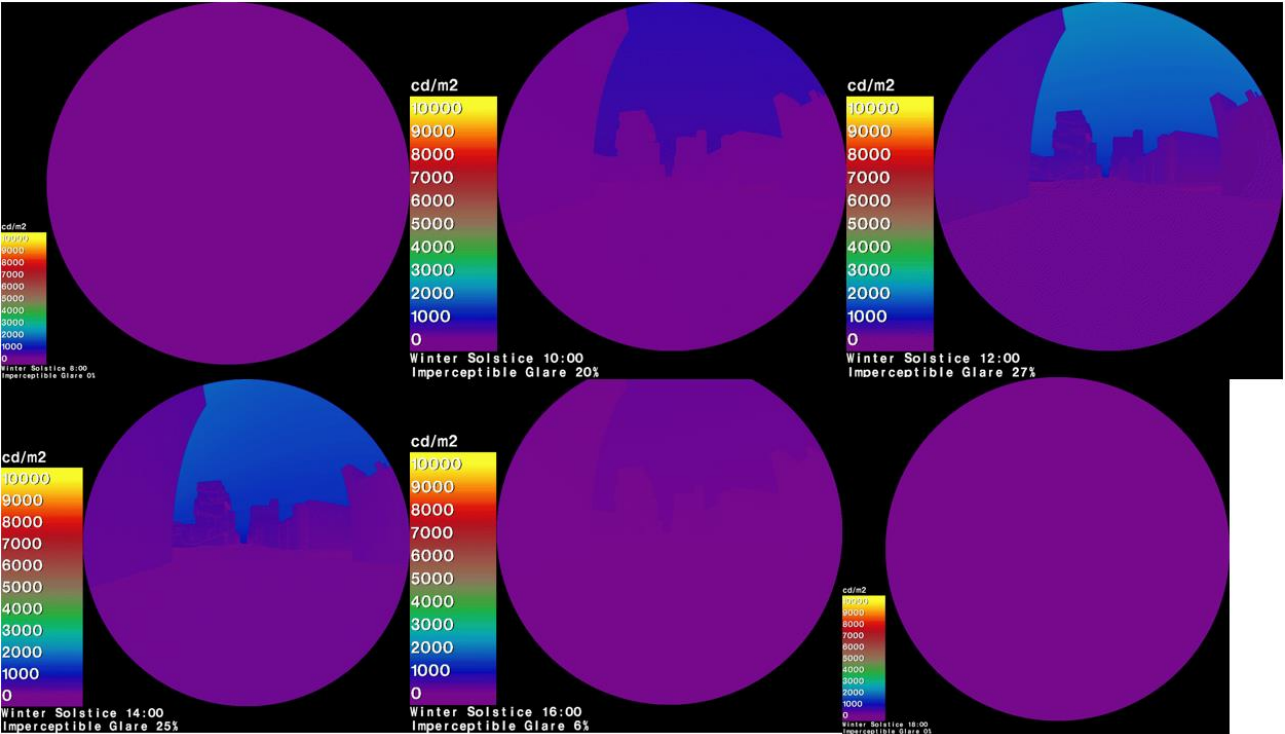
Existing Summer



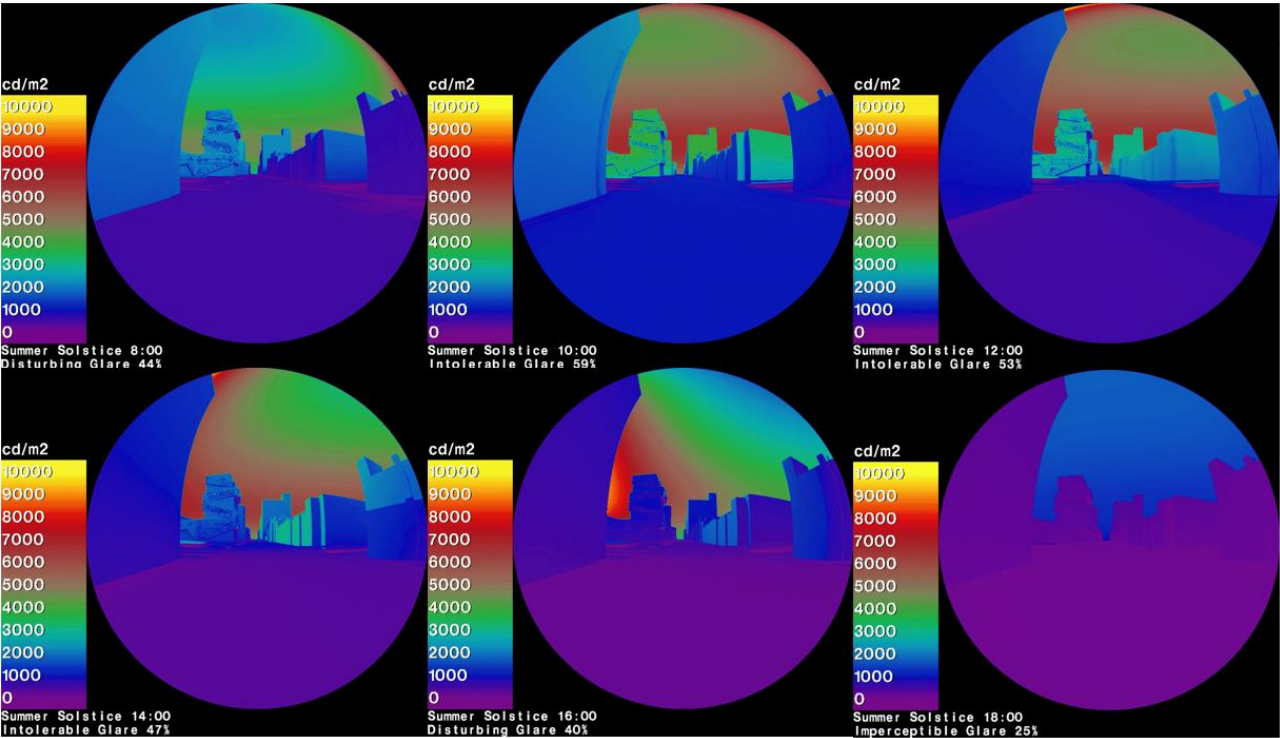
Existing Equinox



Proposed Winter



Proposed summer



Proposed Equinox

