Planning Advice Note

Solar Glare

Guidelines and best practice for assessing solar glare in the City of London

CITY OF LONDON

Planning Advice Note
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Guidelines and best practice for assessing solar glare in the City of London

Contents

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The City of London Corporation is the Local Authority for the financial and commercial heart of Britain, the City of London.

Introduction

This Planning Advice Note is one of a series of Advice Notes being prepared by the City Corporation covering microclimatic issues in the City of London. The Notes will provide clarity of advice on potential microclimatic impacts arising from development and how they need to be considered as part of the planning process.

Solar glare or dazzle can occur when sunlight is reflected from a glazed façade or area of metal cladding. This can affect road users and train drivers, and the occupants of nearby buildings. When drivers are blinded, even momentarily by dazzle from a reflective building, this is a serious safety issue.

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.

This Planning Advice Note contributes to the City's key objectives to protect amenity, maintain a high quality public realm and ensure safety on the highways.

Policy Context

The planning policy framework, which comprises the context for the development of the advice note, is set out below. The framework includes the documents below as well as other documents produced by the City Corporation e.g. the Public Realm Supplementary Planning Document which gives guidance on the City's street scene and public realm.

City Corporation Corporate Plan

The overall vision seeks to support, promote and enhance the City of London as the world leader in international finance and business services. The relevant Key Policy Priority aims to support and promote the UK financial based services sector by encouraging quality developments in the built environment.

National Planning Policy

The National Planning Policy Framework (NPPF) sets out the Governments planning policies for England and how they are to be applied. The NPPF establishes a presumption in favour of sustainable development and seeks to establish a strong sense of place using streetscapes and buildings to create attractive and comfortable places to live, work and visit.

London Plan

The London Plan is the Mayor's spatial development strategy which forms part of the development plan for Greater London. The Mayor's vision is that London should excel among global cities, achieving the highest environmental standards and quality of life, and leading the world in its approach to tackling the urban challenges of the 21st century, particularly that of climate change. (Relevant London Plan policies are listed on Page 11).

City of London Local Plan

The Local Plan was adopted in 2015, and provides a spatial framework that brings together and co-ordinates a range of strategies prepared by the City Corporation, its partners and other agencies and authorities. The strategic objectives of the Plan include maintaining the City's position as the world's leading international financial and business centre, and seeking to promote a high quality of architecture and street scene appropriate to the City's position at the historic core of London. (Relevant Local Plan policies are listed on Page 11).

Guidance

Types of solar glare

There are two types of reflected glare problem that can occur. Discomfort glare causes visual discomfort without necessarily affecting the ability to see. Disability glare happens when a bright source of light (such as the reflected sun) impairs the vision of other objects. The bright light is scattered in the eye, making it harder to see everything else.

Outdoors, disability glare is easily the more serious problem, as it can affect motorists' ability to drive safely. It is especially important at locations where a driver has to make a key decision, for example approaching a road junction, traffic signal or pedestrian crossing. It can also affect train drivers, particularly if they are looking at illuminated signals.

In principle, disability glare can also cause problems for pedestrians, especially if they are looking along a road before crossing it, and fail to see an oncoming vehicle because of the glare of the sun in their direct line of sight. In general, though, disability glare to pedestrians is less likely to cause accidents, because they have more time to react and can more easily take avoiding action such as shielding their eyes from the reflection, or moving backwards out of the path of the reflected beam.


Example of solar glare

Discomfort glare is a less dangerous problem because it does not impair the ability to see. It can be important where work involves continuous viewing of the outdoor space from a fixed vantage point, for example in security surveillance. Inside a building where glare could be an issue, shading devices such as blinds or curtains are generally provided, and occasional discomfort glare can easily be controlled using them. In such spaces, discomfort glare due to reflected sun would be a significant issue if it happened so often that people needed to use blinds and curtains over long periods.

Causes of solar glare

Solar glare can occur either when there are large areas of reflective glass or cladding on the façade, or when there are areas of glass or cladding which slope back so that high altitude sunlight can be reflected along the ground. Photovoltaic panels tend to cause less glare because they are designed to absorb light.

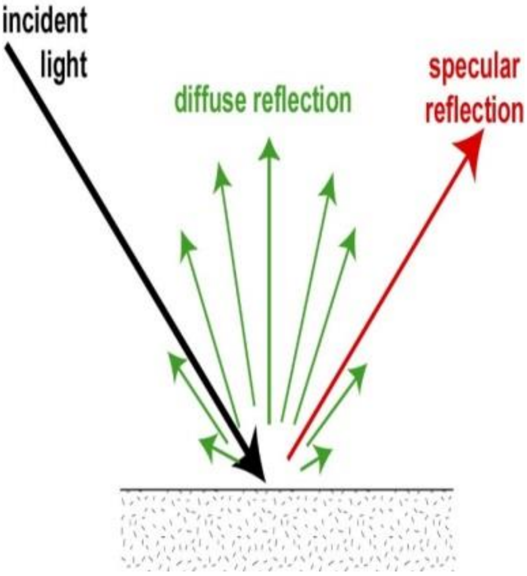


Diagram showing causes of solar glare

The severity of glare depends on the type of glazing or cladding. The glare caused depends on the specular reflectance of the glazing. This is the mirror-like direct reflection of sunlight. For glasses, the reflection is nearly all specular. Metals often combine specular reflection with diffuse reflection (where the reflected light is scattered in all directions). Surfaces like brick or matt cladding give mainly diffuse reflection, which is unlikely to cause disability glare.

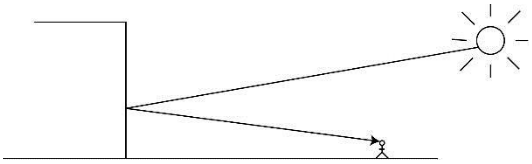
It is therefore possible to reduce reflected glare by choosing glazing or cladding with a low specular reflectance. For glare, the visible light reflectance is important, rather than the total solar reflectance. Glass manufacturers quote the reflectance at normal incidence, with the sun assumed to be directly opposite the façade. Under these circumstances, standard low emissivity double glazing has a specular reflectance of around 13%, which can be enough to cause glare. Solar control glasses used to reduce overheating in buildings can have higher reflectances, typically in the 15-40% range.

Example of solar glare on a building facade

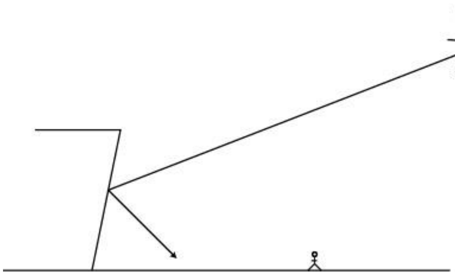
When the sun reaches the building at a glancing angle, more of it is reflected. For clear double glazing, the reflectance rises to 15% if the sun is at 45 degrees to the glazing, 22% at 60 degrees, and 49% at 75 degrees. Glare also depends on the angle of the sun and the angle at which the building is viewed.

For motorists in particular, disability glare is most likely when the reflected sun is directly in the field of view and close to their direction of vision. Glare sources off to one side, or above the observer, are less likely to cause disability glare. Usually, glare sources at more than 25 degrees to the line of sight can be discounted. The worst problems occur when drivers are travelling directly towards the building, and sunlight can reflect off surfaces in the driver's direct line of sight. Usually this will be off the lower parts of the building.

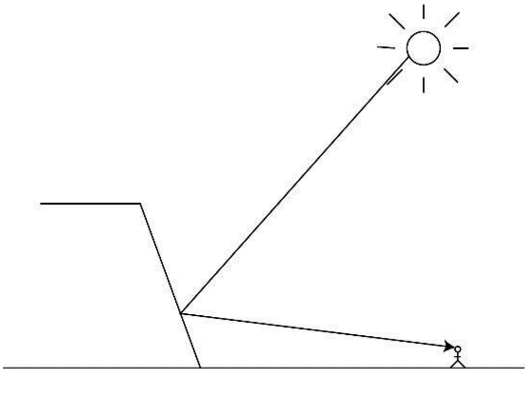
If the glazing is flat and well maintained, the intensity of solar glare does not decrease substantially with distance unless the window is small. If the window is small and viewed from a long way away, it will not reflect the whole of the sun's disk, which will reduce the intensity of glare. The duration of time for which glare can occur generally decreases with distance, but even a short duration might be enough to cause an accident.



The slope of the glass is important. With a vertical façade, the worst disability glare normally occurs when the sun is low in the sky.



A façade that slopes forward, so that the top of the building forms an effective overhang, is unlikely to cause significant reflected solar glare.



A façade or canopy that slopes back from the vertical can reflect high angle sun along the ground. This is of particular concern as motorists will not be expecting it, the high angle sun is brighter, and the sun is less likely to be intercepted by other buildings before it reaches the glass.


Solar glare on a sloping facade

The photo to the left shows reflection of sunlight at the bottom of a sloping façade. The sun was high in the sky when the picture was taken. Flat facades reflect the sun without concentrating it. Facades which are concave can focus the sunlight and create areas of concentrated solar radiation. A separate Planning Advice Note 'Solar Convergence' gives advice on this issue.

Assessment of solar glare

New buildings with extensive areas of glazing, highly reflective glass or metal cladding, or areas of sloping glass may present a risk of solar glare if they are visible from roads or railways. The exact scale of the problem should be evaluated at the planning stage. Solar glare is a specialist issue and expert advice should be sought.

The first stage in the assessment is to identify key locations from which the building could be seen and where solar glare could be an issue. These could include road junctions, traffic lights, pedestrian crossings and railway lines at the approach to signals. The most important locations are those where drivers will be travelling directly towards the building; glare is much less likely if the building is well to one side of the field of view. Normally, one way streets where traffic is going away from the building need not be analysed, unless there are side roads joining them where drivers will have to look up the street to check if it is safe to proceed.

The choice of viewpoints should take into account potential future developments near to the proposed reflective façade. In most cases, future buildings would be expected to block the sun's rays and reduce the potential for glare from a specific proposed development. However, if nearby buildings are to be demolished prior to new ones being constructed, there could be a period of time when the proposed development would be visible over the demolition site, and reflected glare might result.

The next stage is to work out whether sunlight can be reflected to these viewpoints, and if so at which times of year. A BRE Information Paper IP 3/87 'Solar dazzle reflected from sloping glazed facades' (IHS BRE Press, Bracknell, 1987) gives details on how to carry out the calculations.

Sometimes a façade, especially a north facing one, may only reflect the sky or other buildings, and not direct sunlight.

Where solar reflection can happen, the next step is to calculate the angle between the driver's line of view and the reflected sun. For vertically mounted clear double glazing facing the driver, solar dazzle could be a significant issue if this angle is less than 10 degrees. With a sloping façade (reflecting bright sun from high in the sky), or high reflectance glazing or cladding, solar dazzle might be a problem at higher angles of view as well. Sunlight that reflects off the façade at a glancing angle might also be bright enough to cause problems at higher angles of view.

If the reflected sun would be visible close to the driver's line of sight, then either a more detailed calculation of solar glare is required, or measures should be taken to reduce the glare (see Mitigation Measures over the page).

The assessment method above covers disability glare to motorists or train drivers. Discomfort glare is less important, but should be considered if there are locations nearby for which glare could be an issue, and sunlight could be reflected there for a significant duration. These could include offices, schools, hospitals and security posts. Reflected glare is likely to be more of a concern for north facing windows which may be unshaded, and less important for windows which already receive direct sunlight for much of the year and where blinds may be lowered most of the time.

For discomfort glare, the key issue is the total duration of time for which the sun can be reflected to the sensitive location. Durations of less than 50 hours per year are unlikely to cause serious problems, except in very sensitive locations. Longer durations of reflection could result in significant discomfort glare issues depending on the type of space, the height of the reflected sun (low angle sun usually presents the most problems), whether shading devices are already in use, and the way the space is used. If people have fixed workstations facing the window (for example, receptionists or security staff) they will be more susceptible to glare.

Mitigation measures

At the design stage, solar glare can be remedied in various ways:

- By reducing areas of glazing, using matt cladding instead;
- Reorienting elements of the building to avoid reflection;
- Replacing areas of tilted glass by either vertical or nearly horizontal glazing;
- Changing the glazing or cladding to a less reflective type. Special low reflectance glass is available;
- Using low reflectance film or fritting (a ceramic coating on the glass);
- Using sandblasted or other diffusing glass, for example for balustrades;
- External shading such as louvers or motorised blinds. Vertical fins may be effective in situations where the sun is reflected off a building at a glancing angle;
- Some form of opaque screening at street level, though this will usually need to be large;
- Planting trees, though the type of tree will depend on the times of year when glare occurs. Glare may occur in the winter when deciduous trees will not be in leaf;
- Where discomfort glare is an issue, providing shading devices in the affected building or other location (such as a canopy above a security post).

These mitigation measures can provide additional benefits such as reducing overheating in buildings, improved carbon reduction and resilience to climate change.

Contacts

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Policies

Relevant London Plan policies relating to the microclimate

5.3 Sustainable Design and Construction
7.5 Public Realm
7.6 Architecture
7.7 Location and Design of Tall and Large Buildings

Relevant City of London Local Plan policies relating to the microclimate

CS 3 Safety and Security
CS 10 Design
CS 14 Tall Buildings
CS 15 Sustainable Development and Climate Change
DM 10.1 New Development
DM 10.4 Environmental Enhancement
DM 10.7 Daylight and Sunlight