

SOLAR GLARE TECHNICAL NOTE: Block C, First Street (MCC ref 138831/FO/2023) - Condition 39

GIA has been instructed to undertake a detailed solar glare intensity assessment of the final facade design and material specifications of Block C, First Street to support the discharge of Condition 39. Condition 39 states that:

Prior to the installation of the proposed exterior façades, a detailed solar glare intensity assessment report shall be submitted for approval in writing by the City Council, as Local Planning Authority. The assessment shall detail any areas of mitigation in order to minimise solar glare and avoid safety concern to nearby road users. The approved assessment (and any associated mitigation) shall be implemented as part of the façade installation and thereafter retained and maintained in situ.

Reason - In the interest of minimising the effect of solar glare on the adjacent road infrastructure and road safety pursuant to policy DM1 of the Manchester Core Strategy (2012).

Since the assessment undertaken in support of the application in 2023, initial solar glare intensity assessment identified the potential for safety concern at one location (SLIP2). In response to this potential for safety concern, mitigation strategies in terms of both facade materials and glazing specification have been embedded within the final design to minimise the effect of solar glare on the adjacent road infrastructure and road safety to the greatest degree feasible.

The detailed solar glare intensity assessment provided herein has been undertaken based on a 3d model of the final facade design provided by Simpson Haugh in February 2026, which includes the facade material mitigation strategies as identified in Appendix 2, and the proposed glazing specifications provided by Focchi, which are provided in Appendix 3.

The ES Chapter submitted with the approved development (MCC ref: 138831/FO/2023) cited the following locations as having potentially significant effects resulting from reflections from the facades of the proposed development and as a result requiring further detailed analysis once further information was known about the facade materials and their reflectivity:

- Mancunian Way Eastbound (Views MW4, MW5 and MW6);
- Mancunian Way Slip Road/Medlock St Junction (Slip1);
- Mancunian Way Slip Road/Medlock St Junction (Slip2);
- Medlock Street junction with Mancunian Way on ramp (MS2);
- Chester Street junction with Cambridge Street (CS1); and
- Chester Street junction with Wilmott Street (CS2).

A summary of the detailed solar glare intensity assessment results are provided in the following pages. The technical analysis as well as assessment methodology are provided in Appendix 1. Overall, the assessment results have shown that based on the final facade design and material specifications, reflections from the proposed development have been appropriately mitigated to minimise the effect of solar glare on the adjacent road infrastructure and road safety, and that whilst reflections remain visible, they are not expected to result in safety concern for road users.

Mancunian Way Eastbound (Views MW4, MW5 and MW6)

The detailed potential intensity assessment for viewpoint MW4 provided in Appendix 1, page 22, shows that the peak intensity of the reflections is below the threshold for glare and so would not impact driver visibility. Further along the road, at viewpoints MW5 (page 23) and MW6 (page 24), the peak reflections have an intensity of 587 cd/m² and 566 cd/m² respectively however for both viewpoints, the exceedance of the threshold is marginal, they are outside 10° of a drivers line of sight, within a small area of the field of view and well above the drivers visor cut-off line so are not expected to impact driver visibility. All reflections occurring within 10° of a drivers direct line of sight are below the threshold of 500cd/m².

Therefore, the potential solar glare effects have been appropriately mitigated for drivers on this road, via selection of suitable glazing.

Mancunian Way Slip Road/Medlock St Junction (Slip1)

The detailed potential intensity assessments provided in Appendix 1, pages 32–33 show exceedances of the glare threshold of 500cd/m² for both viewpoints, therefore a further visual appraisal assessment has been undertaken for the time of day and year that the peak reflection intensity could occur at viewpoint Slip1b, this being 21st December at 10:57. At this time, the probability of the sun shining is 20%.

The visual appraisal results provided on pages 34 and 35 show that for Slip1, the peak intensity of the reflections at viewpoint Slip1a (drivers looking straight ahead) is 254 cd/m² which is below the threshold for glare and so would not impact driver visibility. The peak intensity of the reflections at viewpoint Slip1b (drivers looking at the right traffic lights) is 507 cd/m², the exceedance of the threshold is marginal, it is only just within 10° of a drivers line of sight and well above the drivers visor cut-off line so is not expected to impact driver visibility.

As shown on pages 32 and 33, all other reflections occurring within 10° of a drivers direct line of sight are below the threshold for glare of 500cd/m².

Therefore, the potential solar glare effects have been appropriately mitigated for drivers at this intersection, via selection of suitable glazing.

Mancunian Way Slip Road/Medlock St Junction (Slip2)

The detailed potential intensity assessments provided in Appendix 1, pages 42–43 show exceedances of the glare threshold for both viewpoints, therefore a further visual appraisal assessment has been undertaken for the time of day and year that the peak reflection intensity could occur at viewpoint Slip2b, this being 26th December at 14:38. At this time, the probability of the sun shining is 20%.

The visual appraisal results provided on pages 44 and 45 show that at Slip2a (drivers looking straight ahead), the peak intensity of the reflections is below the threshold for glare and so would not impact driver visibility. The peak intensity of the reflections at viewpoint Slip2b (drivers looking at the left traffic lights) is 1,331 cd/m², which is above the threshold for glare.

Within viewpoint Slip2b, the location of the reflected sun sits almost entirely above the drivers visor cut-off line, therefore the majority of the time, the reflections could be mitigated by drivers deploying their visor. When deploying their visor is not sufficient to shield the reflection of the sun, drivers when looking straight ahead (viewpoint Slip2a), would be able to clearly identify the signal shown by the lights on the right side of the road or the opposite side of the intersection.

The reflection occurs from only one single 750mm wide glazed panel at any one time and only a portion of the solar disc is reflected rather than the full solar disc, as such the reflection from that individual panel would occur for less than 2 minutes per day for less than two months of the year.

Furthermore, viewpoint Slip2b is a static view when drivers are located exactly 30 metres from the intersection, looking precisely at the signal. In reality, the view of drivers is dynamic as they approach the intersection, with the viewing angle, and consequently the reflections, constantly changing. As drivers approach this intersection, reflections above the glare threshold visible when looking at the left side traffic lights, would occur for just 15 metres of road so less than less than 2 seconds when travelling at 20mph. Drivers would only enter this section of road if signalled by the early traffic lights before passing over Medlock St Junction and accordingly, drivers within this stretch of road are likely to be traveling at speeds below the speed limit, thus allowing greater time to observe and react to the signals.

It should also be noted that it is highly likely that reflections at this location would occur from any building with glazing coming forward within this site, and indeed there are likely to be similar reflections occurring in the existing condition

from Acer Building, Square Garden and Unite Students - Parkway Gate. It is also true that similar reflections would have occurred at this location had the site been implemented in accordance with the original planing consent (MCC ref: 125573/FO/2019).

In light of the factors above and the extensive mitigation strategies embedded in the final design, it is considered that the solar glare effects have been mitigated to the greatest degree feasible and are not expected to result in safety concern for road users at this intersection.

Medlock Street junction with Mancunian Way on ramp (MS2)

The detailed potential intensity assessments provided in Appendix 1, pages 52-53 show exceedances of the glare threshold for both viewpoints, therefore a further visual appraisal assessment has been undertaken for the time of day and year that the peak reflection intensity could occur at viewpoint MS2b, this being 17th February at 09:12. At this time, the probability of the sun shining is 20%.

The visual appraisal results provided on pages 54-55 show that at MS2a (drivers looking straight ahead), no reflections would occur and so driver visibility is not affected. At viewpoint MS2b (drivers looking at the left traffic lights), the peak intensity of the reflections are below the threshold for glare of 500cd/m² and so would not impact driver visibility. It should also be noted that at this time, there is a direct view of the sun, closer to the direct line of sight which has a higher intensity than reflections generated by the proposed development.

Therefore, the potential solar glare effects have been appropriately mitigated for drivers at this intersection, via selection of suitable glazing.

Chester Street junction with Cambridge Street (CS1)

The detailed potential intensity assessments provided in Appendix 1, page 60 shows that at viewpoint CS1, the peak intensity of the reflections is below the threshold for glare of 500cd/m² and so would not impact driver visibility at this location.

Therefore, the potential solar glare effects have been appropriately mitigated for drivers at this intersection, via selection of suitable glazing.

Chester Street junction with Wilmott Street (CS2)

The detailed potential intensity assessments provided in Appendix 1, page 66 shows that at viewpoint CS2, the peak intensity of the reflections is 535 cd/m² however, the exceedance of the threshold is marginal. Furthermore it occurs from a single window panel, so would only occur for a very short duration, less than 2 mins per day for no more than two months of the year, in the very early morning outside peak traffic times (c 04:45 to c. 05:15 GMT) and is located above the drivers visor cut-off line so is not expected to impact driver visibility at this location.

Therefore, the potential solar glare effects have been appropriately mitigated for drivers at this intersection, via selection of suitable glazing.

Overall, the potential solar glare effects of the proposed development have been appropriately mitigated for drivers on the adjacent road infrastructure, via selection of suitable glazing and the inclusion of additional facade mitigation. The detailed solar glare intensity assessments have demonstrated the design minimises solar glare and avoids safety concern to nearby road users in accordance with Condition 39.

Yours sincerely

For and on behalf of GIA



Krystle Stewart

Director



APPENDIX 1 - SOLAR GLARE INTENSITY ASSESSMENT



Unlocking potential for a better built environment

APPENDIX 1: SOLAR GLARE INTENSITY ASSESSMENT

Block C, First Street South, Manchester

Downing Living (Manchester South) Limited Partnership
Incorporated

29 April 2026

GIA No: **19830**

PROJECT DATA:

Client **Downing Living (Manchester South) Limited Partnership Incorporated**
Architect **Simpson Haugh**
Project Title **Block C, First Street South, Manchester**
Project Number **19830**

REPORT DATA:

Report Title **Solar Glare Intensity Assessment**
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Prepared by **CN**
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DISCLAIMER:

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1 INTRODUCTION

GIA have assessed the proposed scheme in order to ascertain whether solar reflections given off the proposed building's facade will be visible from sensitive viewpoints which may affect road users and train drivers.

1.1 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 (Fig. 01 and Fig. 02). 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 car 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 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.

1.2 GLARE FROM REFLECTED SUNLIGHT

Whether or not a sun reflection will cause an instance of glare depends upon a number of factors, these are summarised below:

- The location of the observer and his view direction;
- The sun's position in the sky, which changes not only with the hour of the day, but with the seasons too;
- The location and orientation of the reflective surface, e.g. a glazed facade, in relation to the observer's view direction;
- The specific quality of the reflective surface, e.g. sheen, specularity, etc.;
- The observer's physiology, e.g. age and eye pigmentation; and
- The background brightness defining the state of adaptation in the observer's eye;

This final point is an important one as the same brightness which could cause glare against a dark background may be perfectly acceptable when looked against a light one. A typical example of adaptation is illustrated in Fig. 01-02 where the same headlights cause glare at night whereas they do not during daytime hours.

Understanding whether solar glare is likely to occur is based on the observer's position and view direction. Given the transitory nature of the phenomenon, due to the sun's constant movement, any glare assessment should be carried out for a number of representative locations and view directions.

Such studies are often carried out with the help of sun path protractors or with the aid of a full three-dimensional computer simulation.

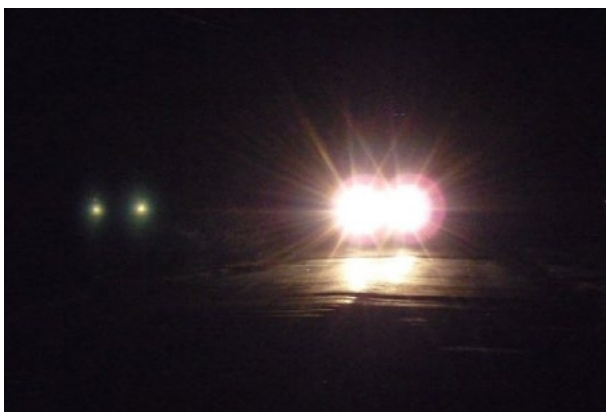


Fig. 01: Headlights at night



Fig. 02: Headlights during day

2 GUIDANCE

In the UK, guidance that is relevant to glare assessments is limited to a short section in the BRE's guidance "Site Layout Planning for Daylight and Sunlight: a guide to good practice" (BR209 - 2022 edition). It suggests that:

"If it is likely that a building may cause solar dazzle the exact scale of the problem should be evaluated. This is done by identifying key locations such as road junctions and windows of nearby buildings, and working out the number of hours of the year that sunlight can be reflected to these points. BRE Information Paper IP 3/87 gives details."

BR IP3/87 provides more detailed instructions on why and how solar dazzle can be calculated:

"Glare or dazzle can occur when sunlight is reflected from a glazed facade. For vertical façades this problem usually occurs only when the sun is low in the sky; but some types of modern design incorporate sloping glazed façades which can, under certain circumstances, reflect unwanted high altitude sunlight into the eyes of motorists, pedestrians and people in nearby buildings."

Both BR 209 and BR IP3/87 only deal with geometrical considerations of glare by identifying when and where reflections occur. However, neither pieces of guidance suggest any threshold values above which reflected sunlight may give rise to an instance of glare. That such a threshold exists in theory becomes clear from the guidance in BR 209:

"... Substituting clear or absorbing glass for reflective glass can also help although sometimes even clear glass may cause reflected glare if, eg. a motorist has the reflected sun close to the centre of their line of sight."

The City of London (CoL) published their own guidance in the form of a Planning Advice Note in July 2017. The aim was to establish "Guidelines and best practice for assessing solar glare in the City of London".

The CoL Guidelines distinguish between discomfort glare and disability 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."

"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."

"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."

Because discomfort glare a) does not impair the ability to see; and b) it only needs to be looked at where work involves continuous viewing of the outdoor space from a fixed vantage point – which is clearly the case for a train driver – GIA's solar glare assessments do not assess discomfort glare.

The CoL Guidelines also explains with regard to disability glare that:

"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."

However, it does not elaborate how such a more detailed calculation should be carried out. For this, one needs to look elsewhere.

The severity of glare can be calculated as the equivalent veiling luminance which is caused by the excess light being scattered in the eye thereby creating a 'veil' through which objects are seen. If the brightness of the veil is sufficiently high compared to that of the actual object, the latter becomes less visible. In very severe cases of disability glare, the object cannot be seen at all.

$$L_{seq} [\text{cd/m}^2] = K * E_{gl} / \theta^n < \text{threshold}$$

- **K**, which is a factor accounting for the observer's sensitivity to glare (eg. age);
- **E_{gl}**, which is the illuminance from the glare source, measured at the eye of the observer;
- **θ**, the angle between the line of sight and the glare source;
- **n**, indicating the power with which **θ** affects the outcome;

Fig. 03: Hassall's Protractor

- θ^3 for angles between 0.1° and 1° ;
- θ^2 for angles between 1° and 30° ; and
- θ for angles beyond 30° ;

As stated in CIE 146:2002, occurrences at angles beyond 30° would be of little significance in most situations, but may be relevant in exceptional circumstances. When seated in a driving seat of a typical car, for example, the limits of the windscreen would generally obstruct the driver's view at angles beyond 30° from the line of sight. We have therefore adopted the 1° to 30° domain as a reference for our calculations.

Whilst Hassall's approach is based on protractor (Fig. 03) onto which the outline of the proposed building is meant to be drawn by hand, whilst working at GLA, Gil in 2016 picked up on Hassall's methodology and showed how this solar glare assessment could be done with computer software (V L-R Gil: *Evaluation of solar glare from reflective façades: A general method*; Lighting Research & Technology, Vol48, 2016), Fig. 04

BLOCK C, FIRST STREET SOUTH, MANCHESTER
SOLAR GLARE INTENSITY ASSESSMENT (19830)

3 GIA'S APPROACH AND METHODOLOGY

Following the guidance documents referenced above, GIA have developed specialised computer software to undertake reflected glare assessments, which are carried out following a three-stage approach.

The preparation of reflected solar glare assessments is based upon the steps described below:

- The construction of a 3d-computer model that includes the proposed building and its relevant setting (Paragraph 3.1);
- The physically accurate description of the reflective surface properties (Paragraph 3.2);
- Rendering of stills of the solar reflections (Paragraph 3.3);
- Masking the images to represent the Human Field of View (Paragraph 3.4); and
- Image analysis for:
 - » Stage 1 - Static assessment (Paragraph 3.5)
 - » Stage 2 - Potential Intensity of reflections (Paragraph 3.6)
 - » Stage 3 - Intensity of reflections and visual assessment (Paragraph 3.7)
- The limitations of this approach and methodology are set out in Paragraph 3.8.

3.1 3D-COMPUTER MODEL

The detailed geometry of the proposed building, and specifically of its facade and glazing configuration, is provided by the project architects either in 2d format (i.e. plans, sections and elevation drawings) or 3d format as a computer model. The received information is processed by GIA and prepared for assessment with our proprietary software. GIA also prepares the context 3d-model from photogrammetry and high resolution stereoscopic aerial photographs, including details relevant for assessment such as rail tracks, sleepers, gantries and signals as well as road junctions and traffic lights. An example of the details included in the solar glare context 3d-model is provided in Fig. 05-Fig. 08.

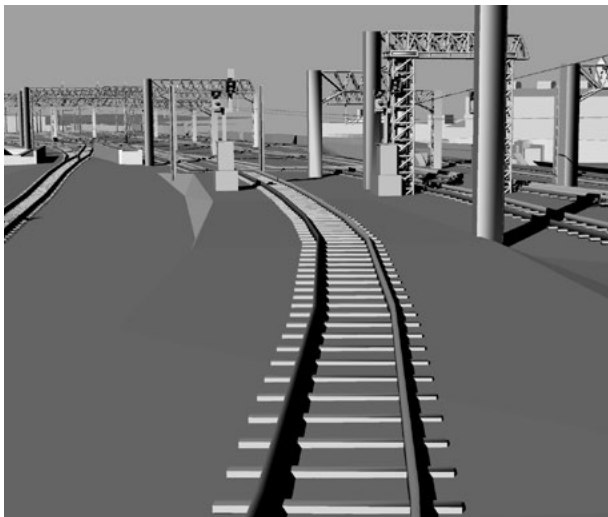


Fig. 05: Computer model of train tracks & signals from photogrammetry



Fig. 06: High-resolution aerial photograph

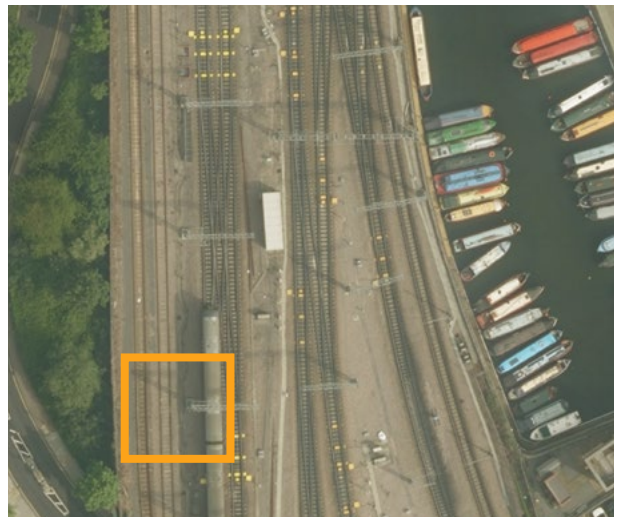


Fig. 07: High-resolution aerial photograph (close-up)



Fig. 08: High-resolution aerial photograph (close-up)

3.2 REFLECTIVE SURFACE PROPERTIES

In order to undertake the glare studies it is necessary to acquire physically accurate computer representations of all materials adopted in the Proposed Development that have the potential of specularly reflecting sunlight, thereby becoming sources of glare. Such materials would include all vertical or sloped glazing, but also certain facade materials such as metal cladding or glazed building tiles.

Diffuse surface reflectance values and object colours can be measured relatively easily however, the same cannot be said of their specular characteristics. These parameters are very hard to estimate yet critical for the study of glare. It is therefore best practice to have samples of the glazing or cladding materials studied in specialised optical laboratories. An example of such a data set is given in Fig. 09. It shows the angular dependency of the reflective properties of a glazed cladding tile.

The City of London guidance states that “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.”

GIA’s approach is based on three stages which vary in level of detail:

- *Stage 1 - Static assessment* assumes all potential reflective portions of the Proposed Development as “mirrors”, therefore portraying an absolute worst-case scenario which is however aimed at identifying whether a reflection can occur or not.
- *Stages 2 and 3 - Potential Intensity of reflections assessment and visual assessments*, however, are more advanced and considers the bespoke material specifications of the Proposed Development which are necessary to identify the potential intensity of reflections.

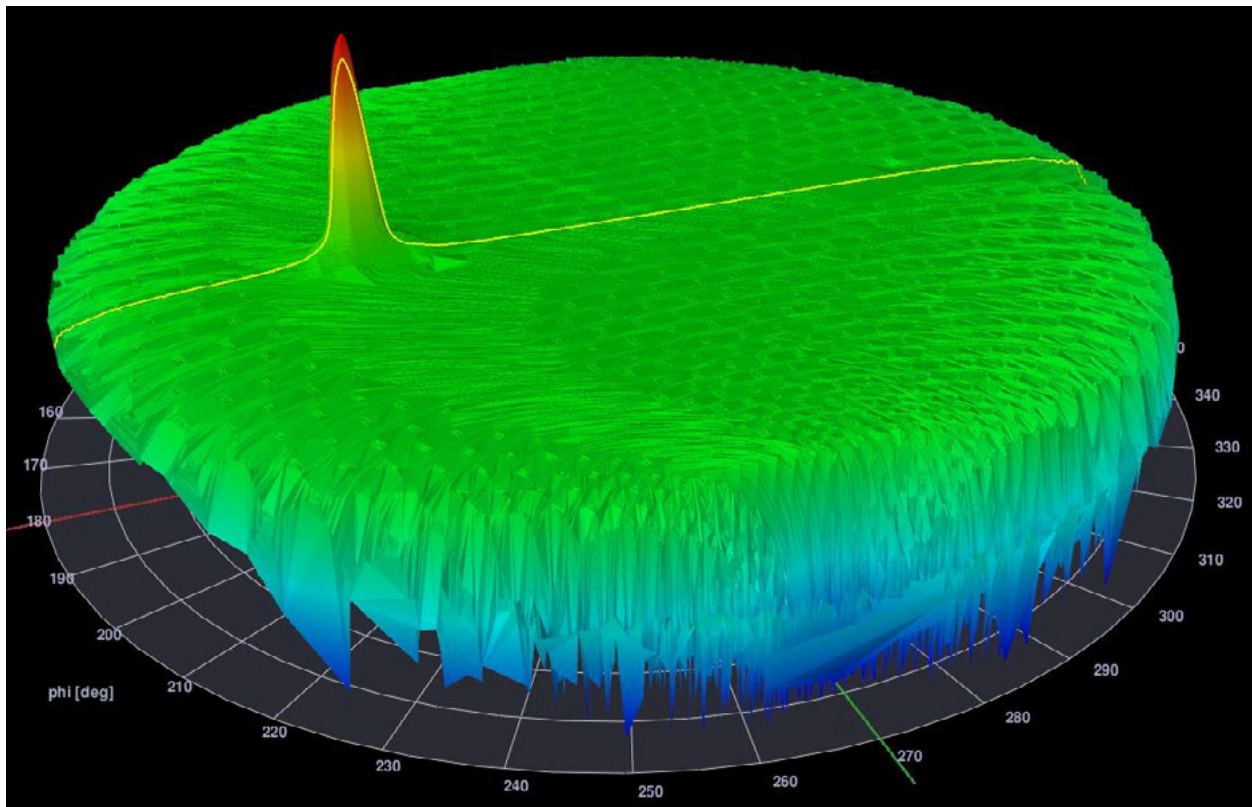


Fig. 09: Reflective properties measurement of a glazed tile

3.3 RENDERING OF STILLS

As mentioned above, glare is a phenomenon that depends on the observer's location, but also on his view direction.

For train drivers, the view direction is defined by the rail tracks. UK recommendations set the eye level of the driver at 2.75 m above the rails. The view point is centred between the tracks for ease of reference. Although train drivers sit slightly to the left within the cabin, this bears no material effect on the analysis of the images as the signals are visible at a distance of hundreds of metres at which point the slight shift in the cabin equates to a very small angular change. Fig. 10 shows the typical set up of our viewpoints. Actual trains and driver's cabin are not included in our 3d computer model.

Individual virtual cameras located accordingly in our 3d computer model are spaced between 1 and 3m apart in the direction of travel. Before the stills are compiled, a human field of view mask is overlayed onto them in order to define the angular distance between the instance of reflection and the observer's line of sight.

This procedure allows for the assessment of entire stretches of railway tracks providing a complete overview of potential risks as well as information about signal sighting.

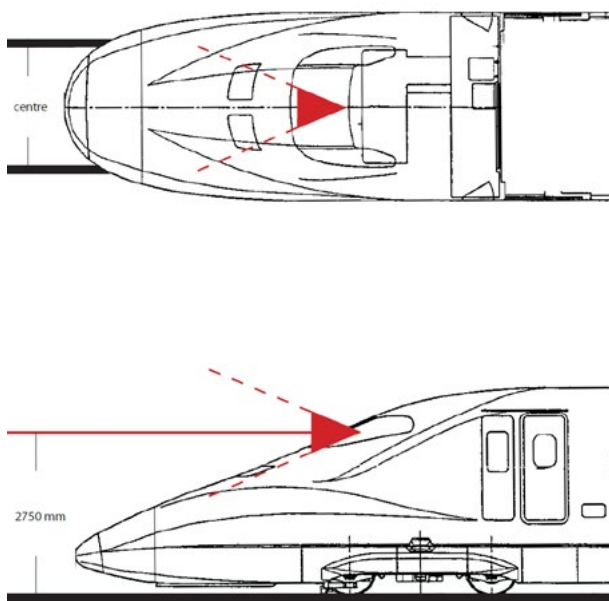


Fig. 10: Driver Viewpoint

3.4 HUMAN FIELD OF VIEW

The field of view is the angular extent within which objects can be observed by one or both eyes. Owing to the arrangement of the human eyes, the stereoscopic visual field extends to approximately 60° either side on the vertical and 90° either side on the horizontal.

In the United Kingdom, the minimum field requirement for driving is 60° either side of the vertical meridian, and 20° above and below horizontal.

The fovea centralis is the central area of the retina. It extends about 3° in all directions. The fovea is responsible for sharp vision that is used for reading, driving, and any other activity where visual detail is important. Fig. 11 shows our typical field of view overlay.

The CIE 146:2002 suggests that occurrences at angles beyond 30° would be of little significance in most situations, but may be relevant in exceptional circumstances. Any reflection within 30° is looked at in greater detail in terms of its duration, size of the reflective surface and where appropriate, predicted intensity.

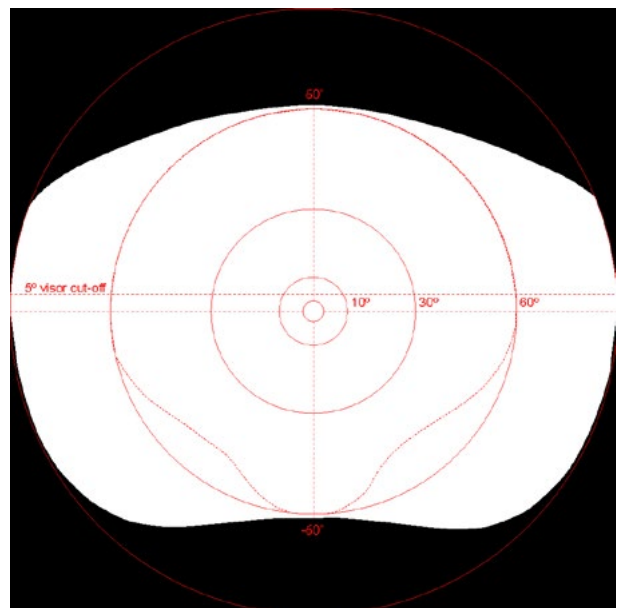


Fig. 11: Typical human field of view

3.5 STAGE 1: STATIC ASSESSMENT

The methodology described below is aimed at addressing the occurrence and duration throughout the year and the location of this occurrence in respect of a driver's line of sight. This will inform the necessity of implementing mitigations at either early or detailed design stage.

For this purpose the glazed facade of the Proposed Development is assumed to have the same properties of a mirror, i.e. it is fully reflective and all of its reflected component is specular. This therefore portrays a worst-case scenario.

The potential for reflected solar glare or dazzle from the glazed or reflective façades of the development are assessed using specialist lighting software.

In Stage 1, stills or a computer animation are generated with which the potential for the occurrence of reflected sunlight is evaluated with regards to the times of the year and hours of the day when this may happen, as well as its relative location to the observer's line of sight.

In order to achieve this, the yearly sun path is mapped onto the sky and colour-coded so that the hours of the day and the period of the year can be distinguished. This sun path is picked up by the reflective elements of the proposed buildings in our rendered stills.

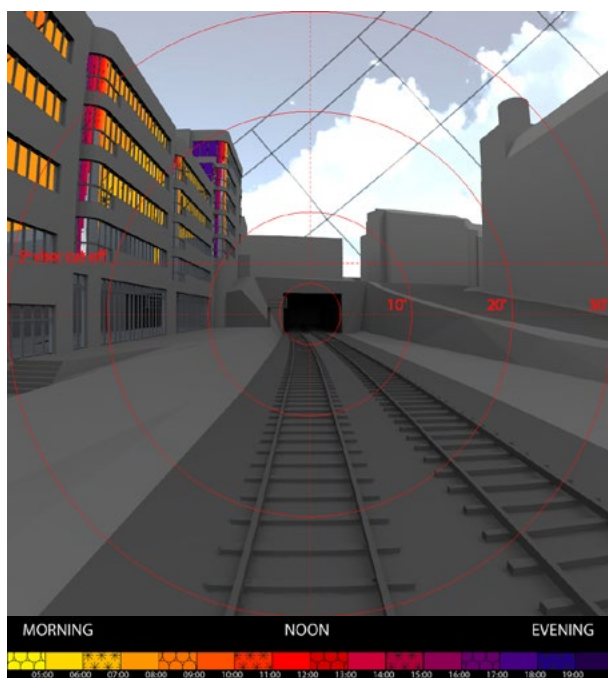


Fig. 13: Stage 1 Example - Hours

Fig. 12 shows the colour coded sunpaths projected onto the sky dome to visualise the time of day and season during which solar reflections occur.

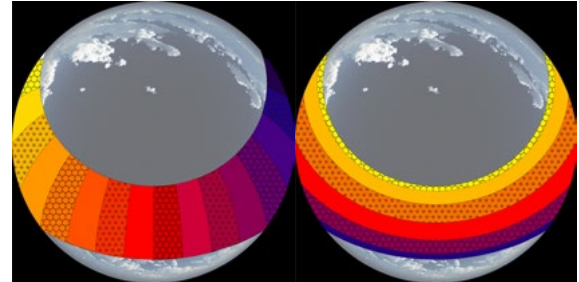


Fig. 12: Stage 1 - Colour coded sunpath for time of day and seasons

Two identical viewpoints are rendered as shown in Fig. 13 and Fig. 14: one focusing on the times of the day when the reflection would be visible, and the second looking at the months throughout the year.

The following guidance is used to determine whether an intensity study is necessary:

- Solar reflections are visible within 30° to 10° of the driver's line of sight for a long period of time (large reflective surface) or between 10° to 5° for a short period of time;
- Solar reflections are visible within 10° and 5° of the driver's line of sight occurring for a long period of time;
- Solar reflections are visible within 5° of a driver's line of sight;

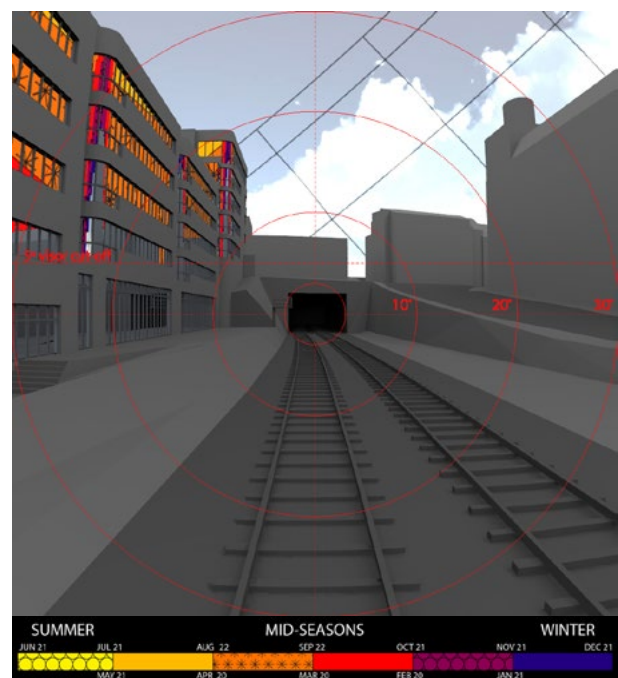


Fig. 14: Stage 1 Example - Months

3.6 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

Stage 2 predicts the intensity of the reflected sunlight, using the Holladay formula. An example is provided in Fig. 15. Only one view is necessary to portray the equivalent veiling luminance. Any value exceeding 500 cd/m^2 is further looked into and discussed within the conclusions of our report.

A limitation of this Stage 2 methodology is that it can flag false positives when the reflector, i.e. a window, is too small to actually reflect the full extent of the solar disc. As a result of this, even a single bright pixel in the computer image is capable of producing a peak veiling luminance equivalent to that of the full solar disc.

In our 60° images, which are rendered out at a resolution of $1,000 \times 1,000$ pixels, the sun's disc has a diameter of 8 pixels and a total area of 50 pixels. After the assessment, the peak intensity detected is weighted proportionally based on the ratio between to the number of pixels from which the reflection would be visible and the total area of the sun disc (50 pixels).

To account for such situations, an additional Stage 3 solar glare methodology was developed.

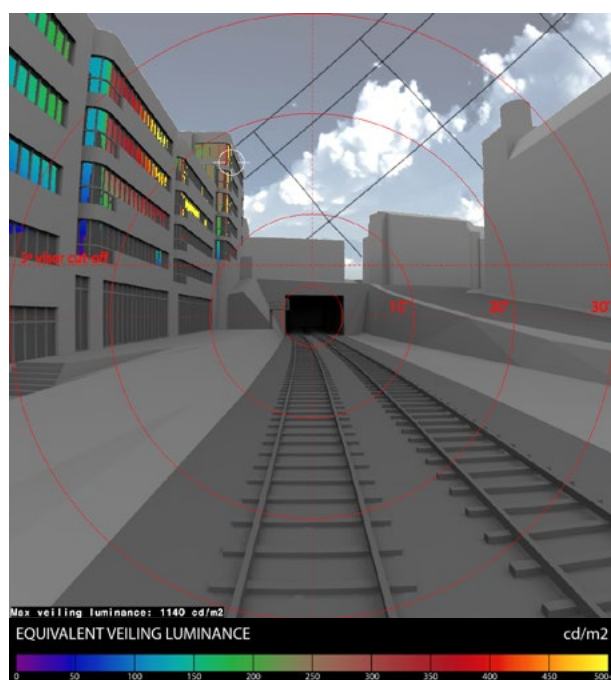


Fig. 15: Stage 2 Example - Veiling Glare Luminance

3.7 STAGE 3: INTENSITY OF REFLECTIONS AND VISUAL ASSESSMENT

Stage 3 has been developed to provide a visual assessment of the solar reflections by rendering out computer images which are then post-processed to mimic how a human observer might perceive the scene (Fig. 16). In addition, Stage 3 can also provide veiling luminance values without potentially highlighting false positives from very bright, but individual pixels within the image. Unlike a Stage 2 analysis, however, which looks at the entire year, a Stage 3 analysis is limited to a specific time of day, and day of the years, as informed by the Stage 2 results.

3.8 LIMITATIONS

Great care is taken in identifying typical viewpoints around a new development. However, this does not guarantee that all sensitive locations where reflected solar glare could present a particular risk are covered, especially where these are farther away from the site.

IMPORTANT: The hours shown in the diagrams and described in the text reflect solar time and therefore do not take British Summer Time into account.

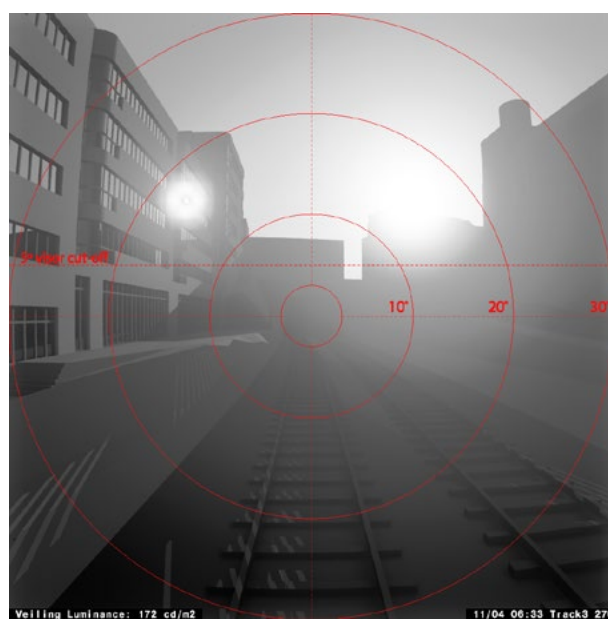


Fig. 16: Stage 3 Example - Veiling Glare Luminance

4 SCENARIO OVERVIEW

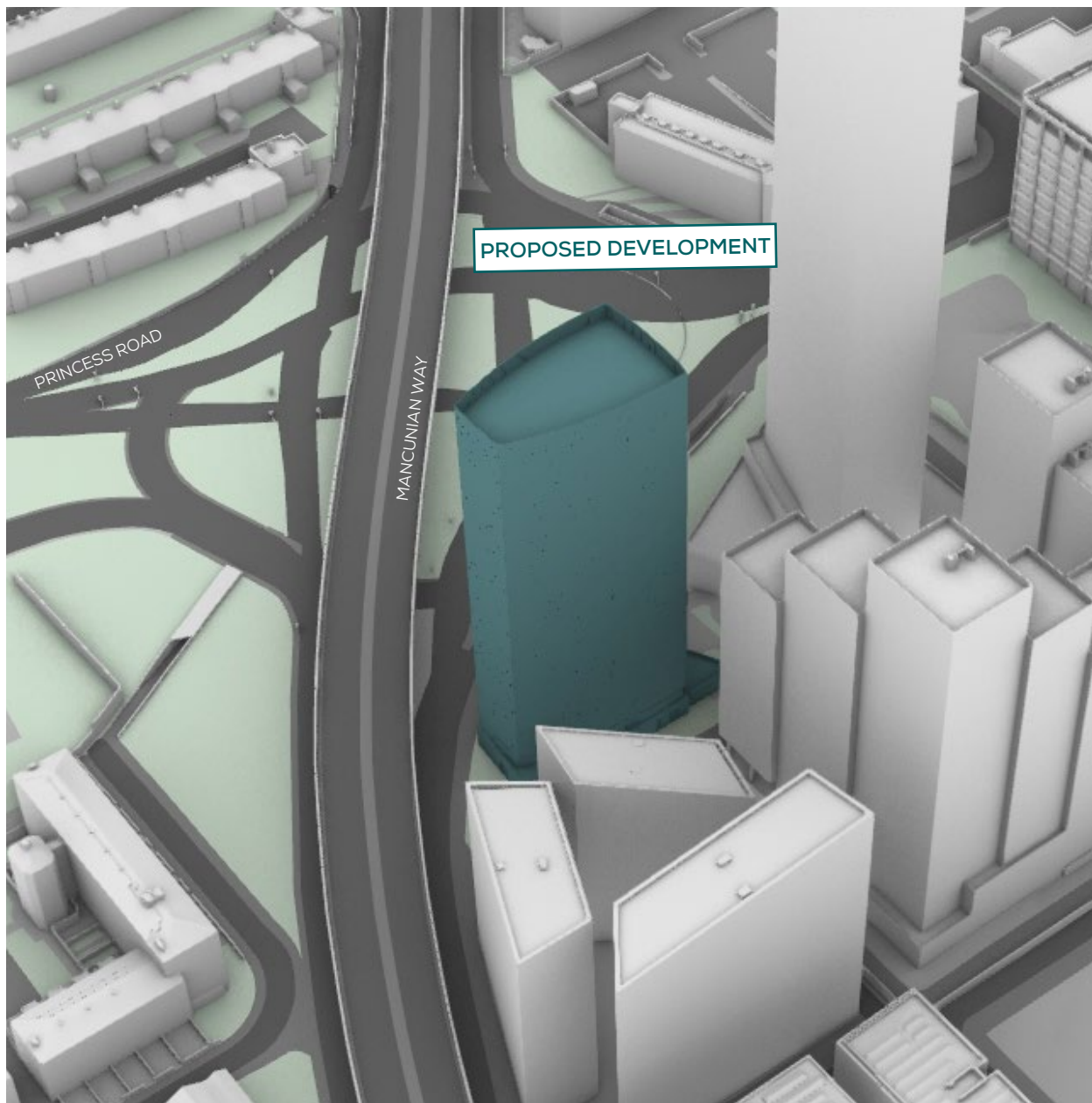


Fig. 17: Site Overview Perspective



Fig. 18: Site Overview Plan

5 SENSITIVE RECEPTOR LOCATIONS

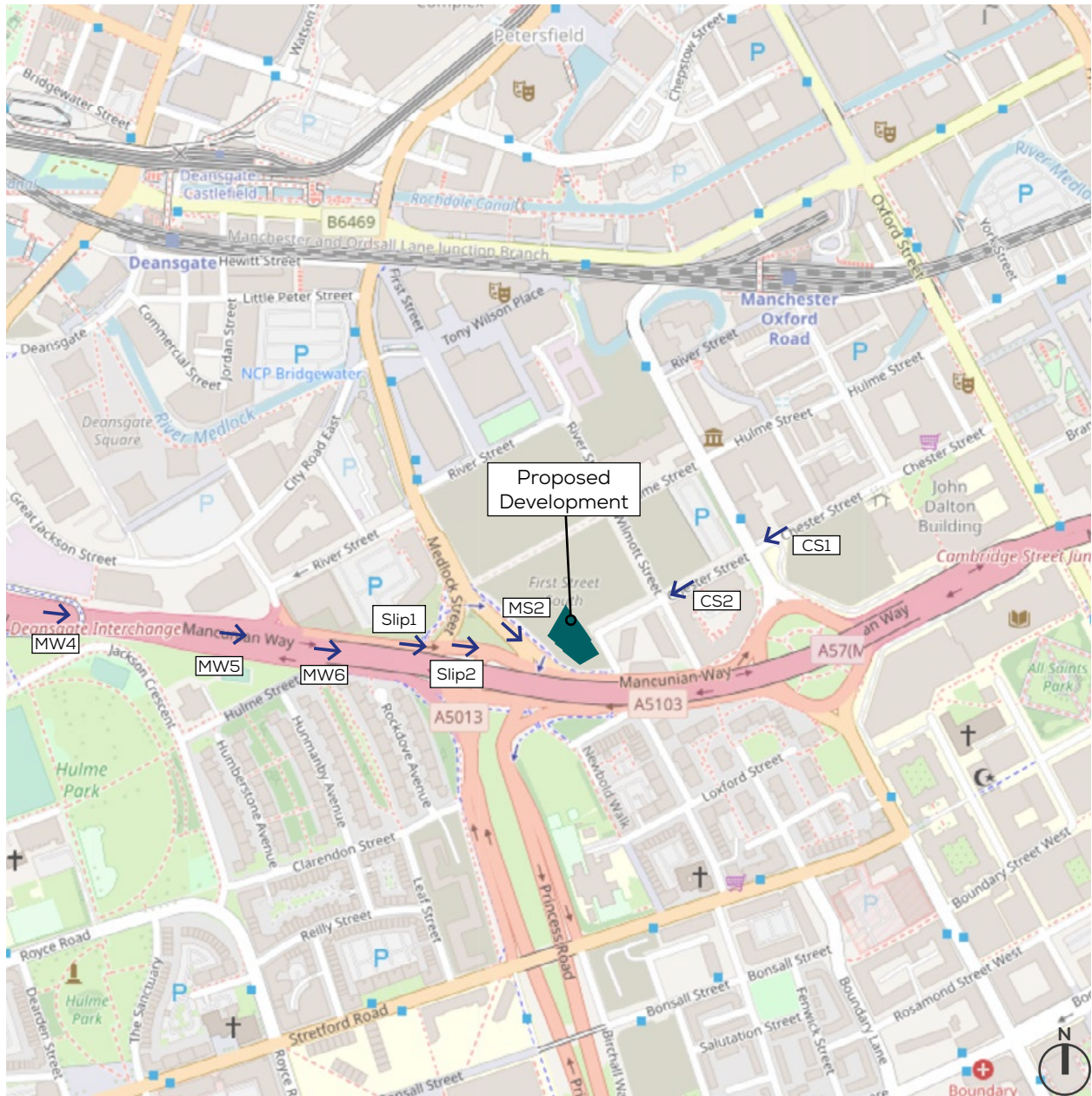


Fig. 19: Site Plan - Junctions

Viewpoint Key

MW4 - Mancunian Way/Ring Road Eastbound 4 merging with Deansgate interchange on-ramp (page 20 - 23)

MW5 - Mancunian Way/Ring Road Eastbound 5 approaching the Medlock Street junction off-ramp (page 24 - 27)

MW6 - Mancunian Way/Ring Road Eastbound 6 passing over Medlock Street junction (page 28 - 31)

Slip1 - Mancunian Way off-ramp with Medlock Street junction (page 32 - 37)

Slip2 - Mancunian Way off-ramp within Medlock Street junction (page 38 - 43 | 52 | 53)

MS2 - Medlock Street junction with Mancunian Way on-ramp (page 62 - 67)

CS1 - Chester Street junction with Cambridge Street (page 44 - 47)

CS2 - Chester Street junction with Wilmott Street (page 48 - 51)

6

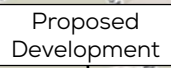


Fig. 20: Viewpoint Location



Fig. 21: Driver's View



Fig. 22: Viewpoint



Fig. 23: Driver's View



Fig. 24: Viewpoint



Fig. 25: Driver's View



Fig. 26: Viewpoints

6.1 STAGE 1: STATIC ASSESSMENT

60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT MW4 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

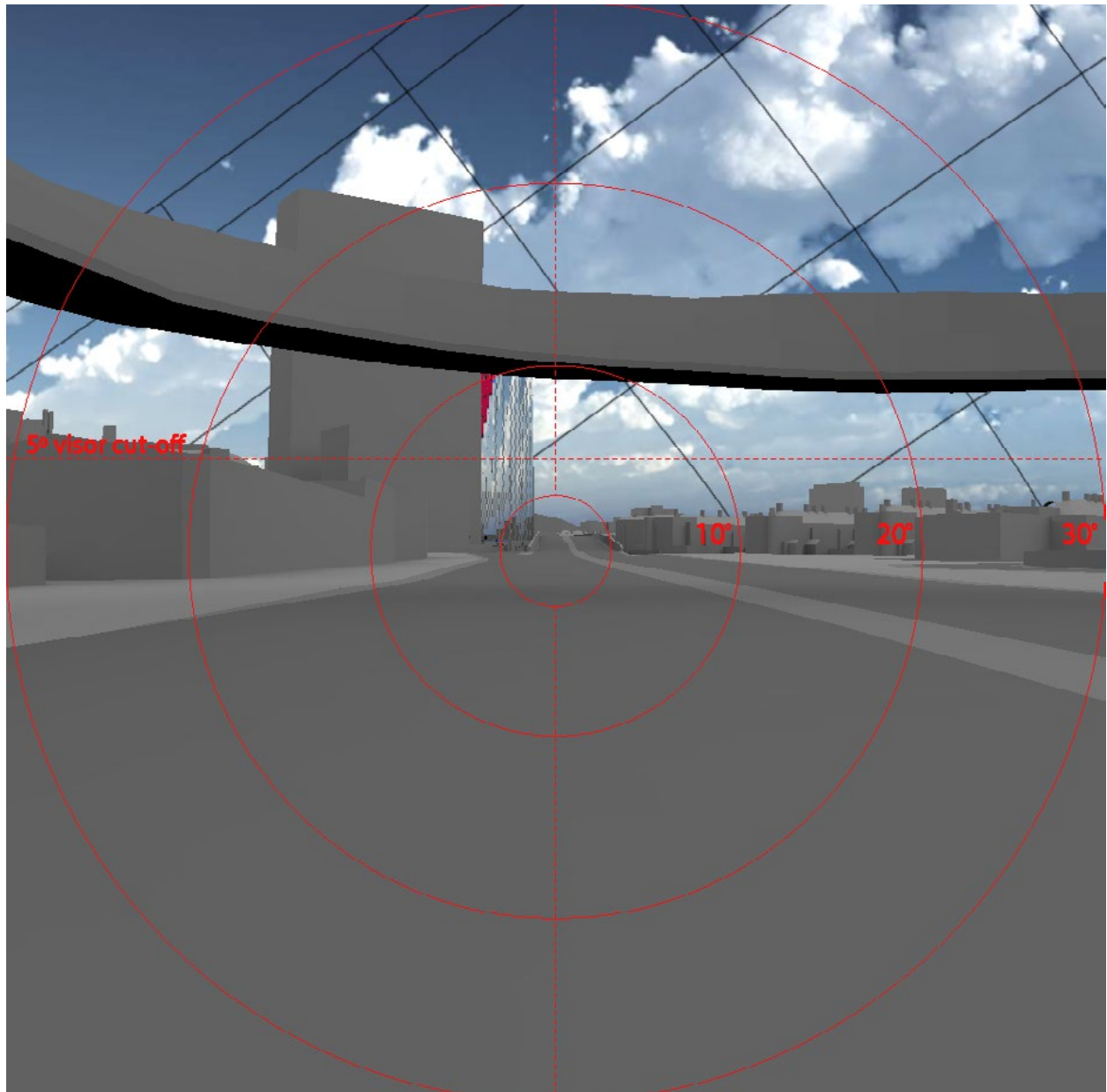
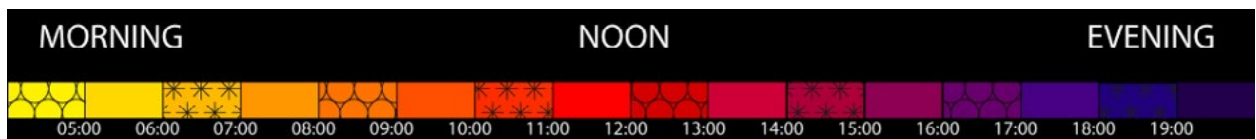


Fig. 27: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT MW4 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

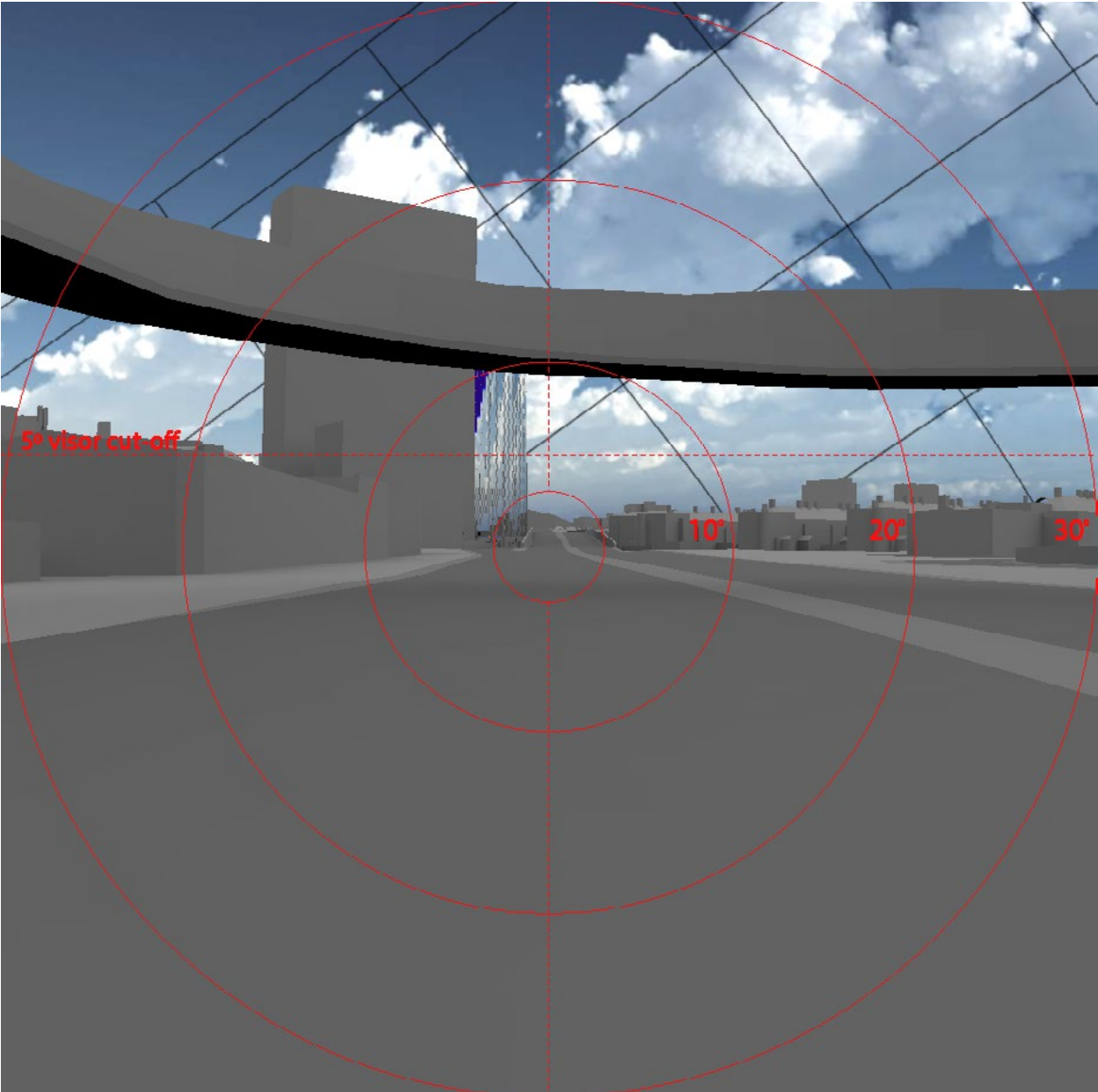


Fig. 28: Solar reflections



60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT MW5 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

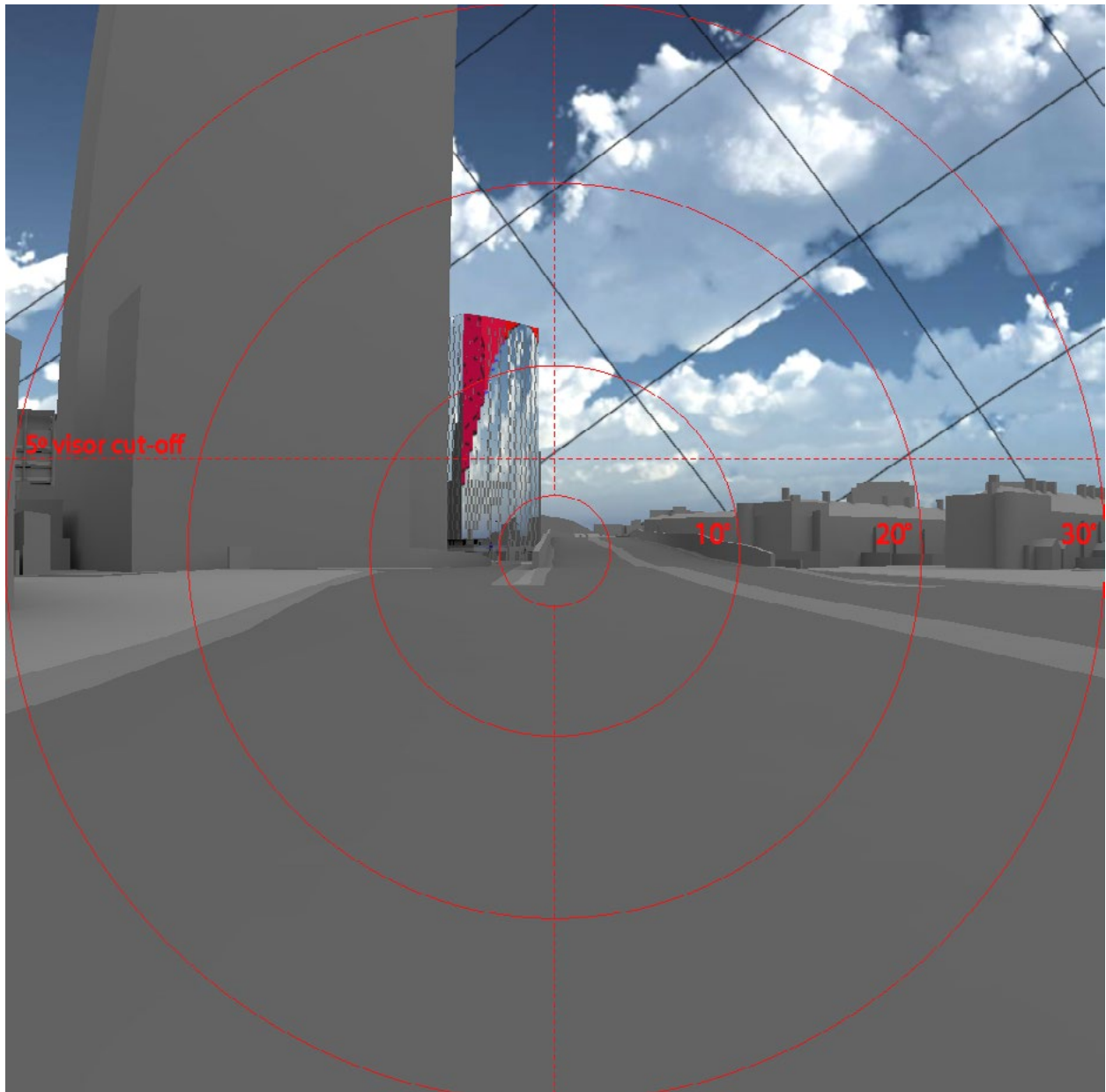
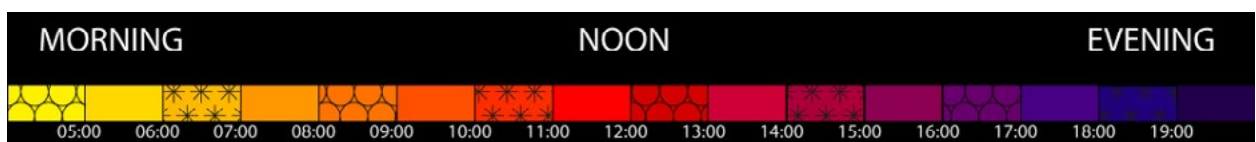


Fig. 29: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT MW5 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

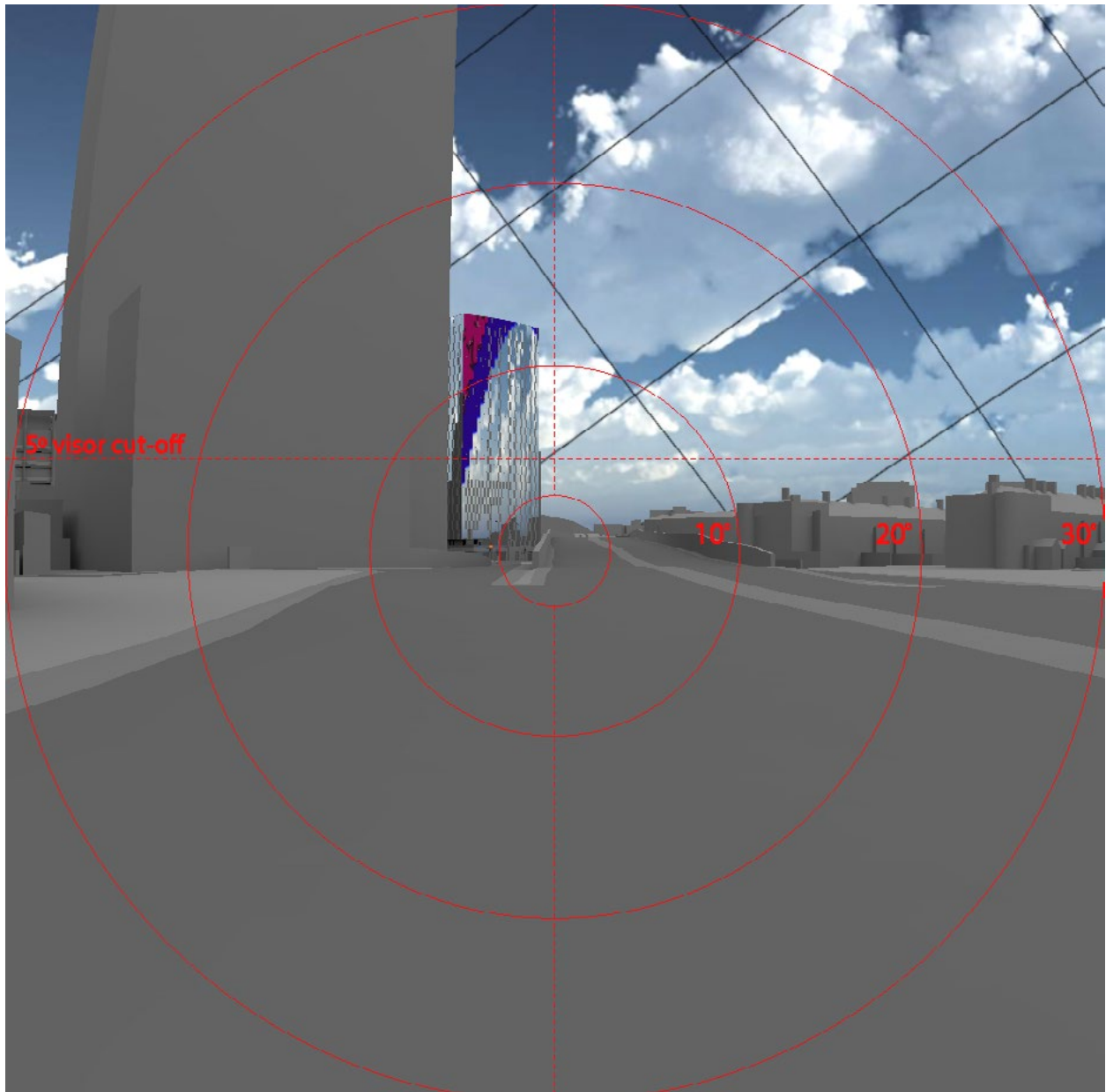


Fig. 30: Solar reflections



60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT MW6 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

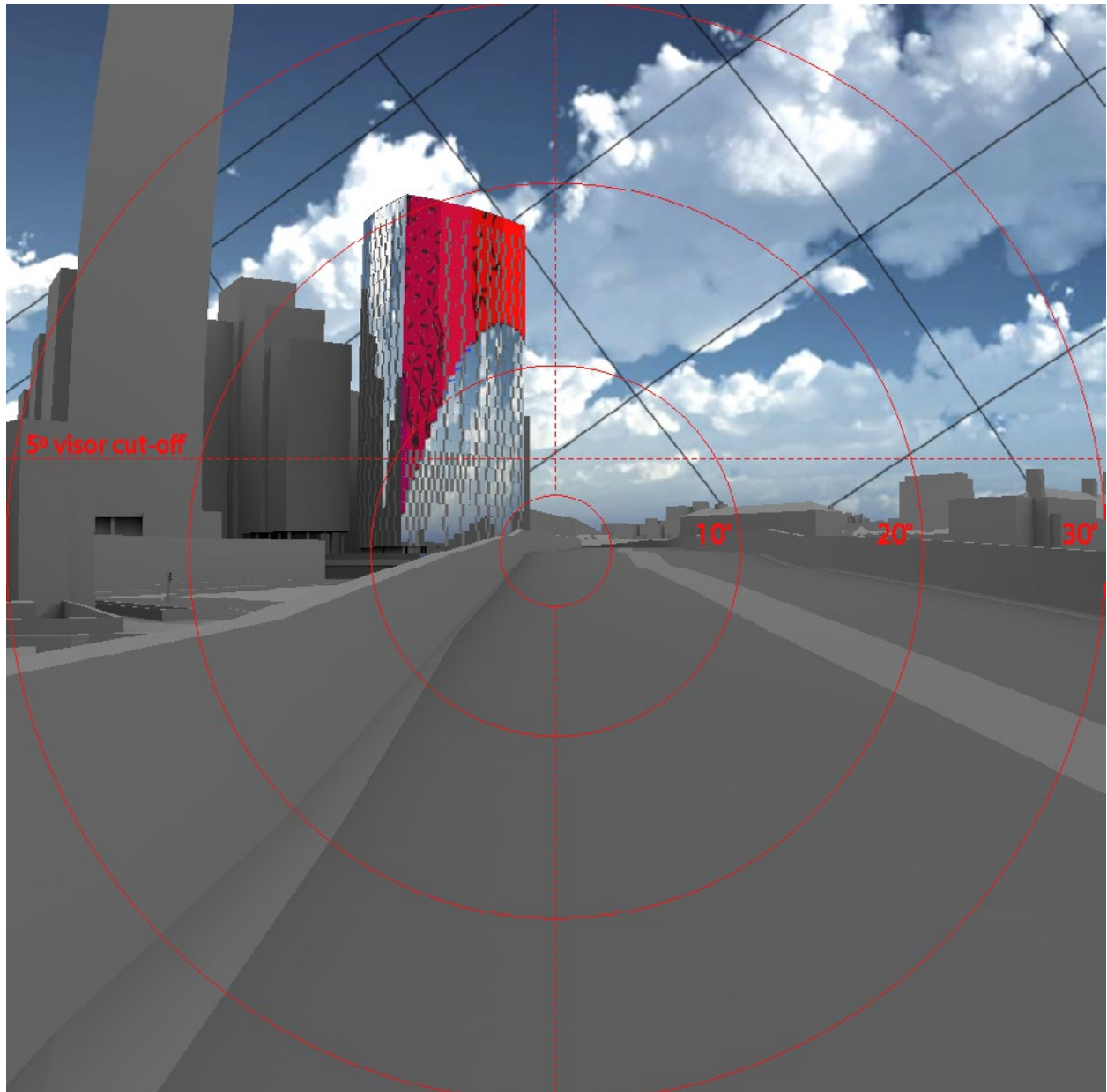
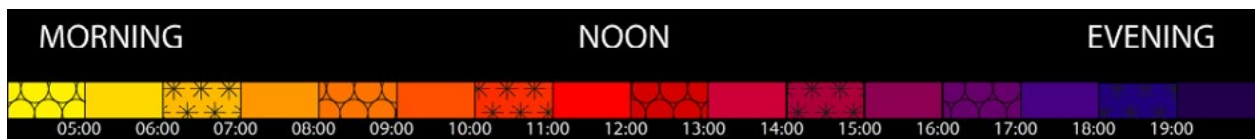


Fig. 31: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT MW4 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

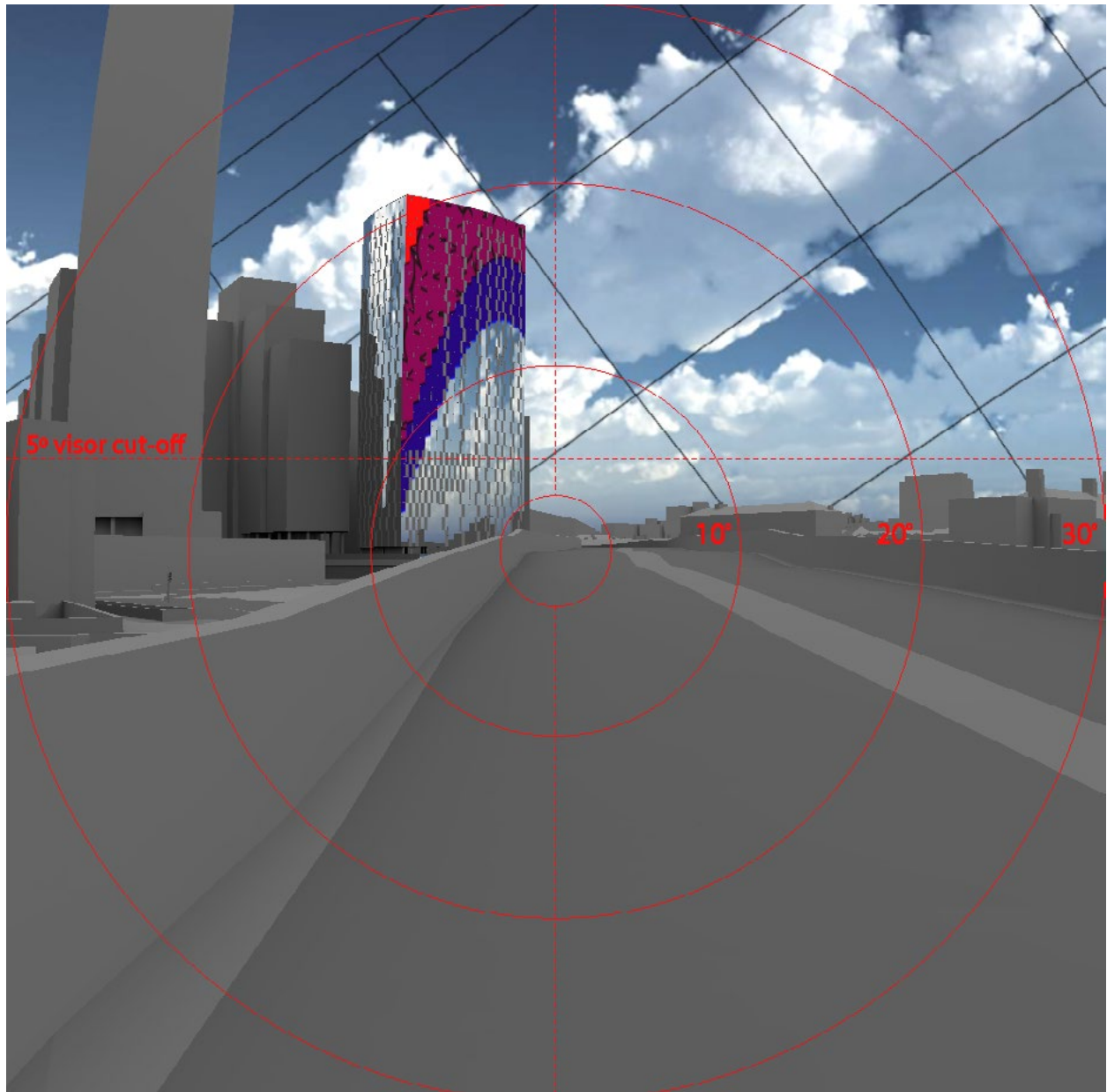


Fig. 32: Solar reflections



6.2 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

PEAK INTENSITY ASSESSMENT

VIEWPOINT MW4 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

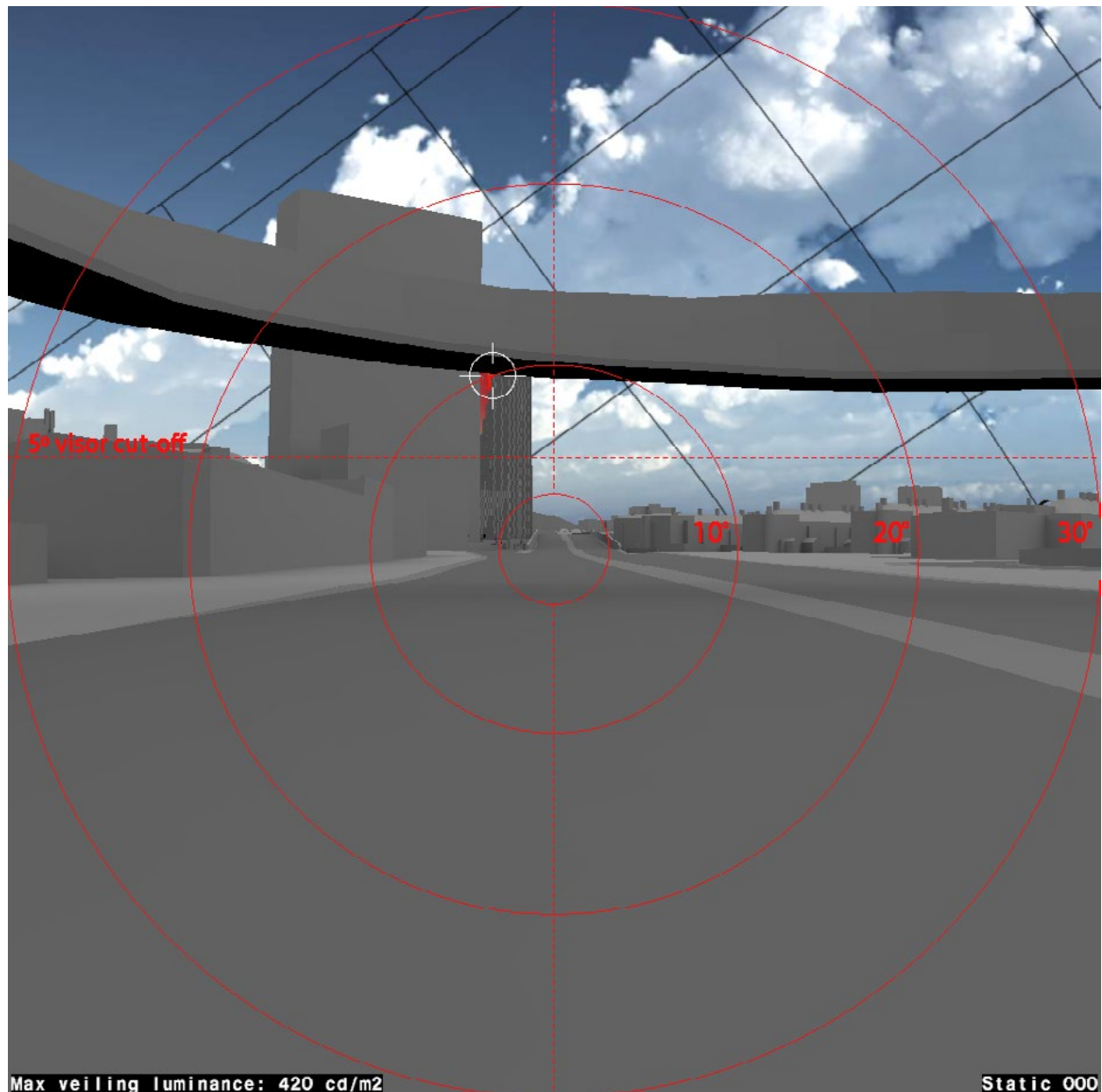
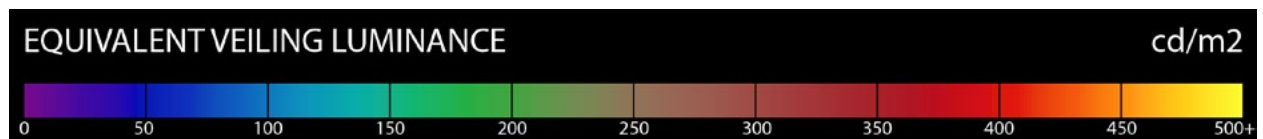


Fig. 33: Peak intensity



PEAK INTENSITY ASSESSMENT
VIEWPOINT MW5 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

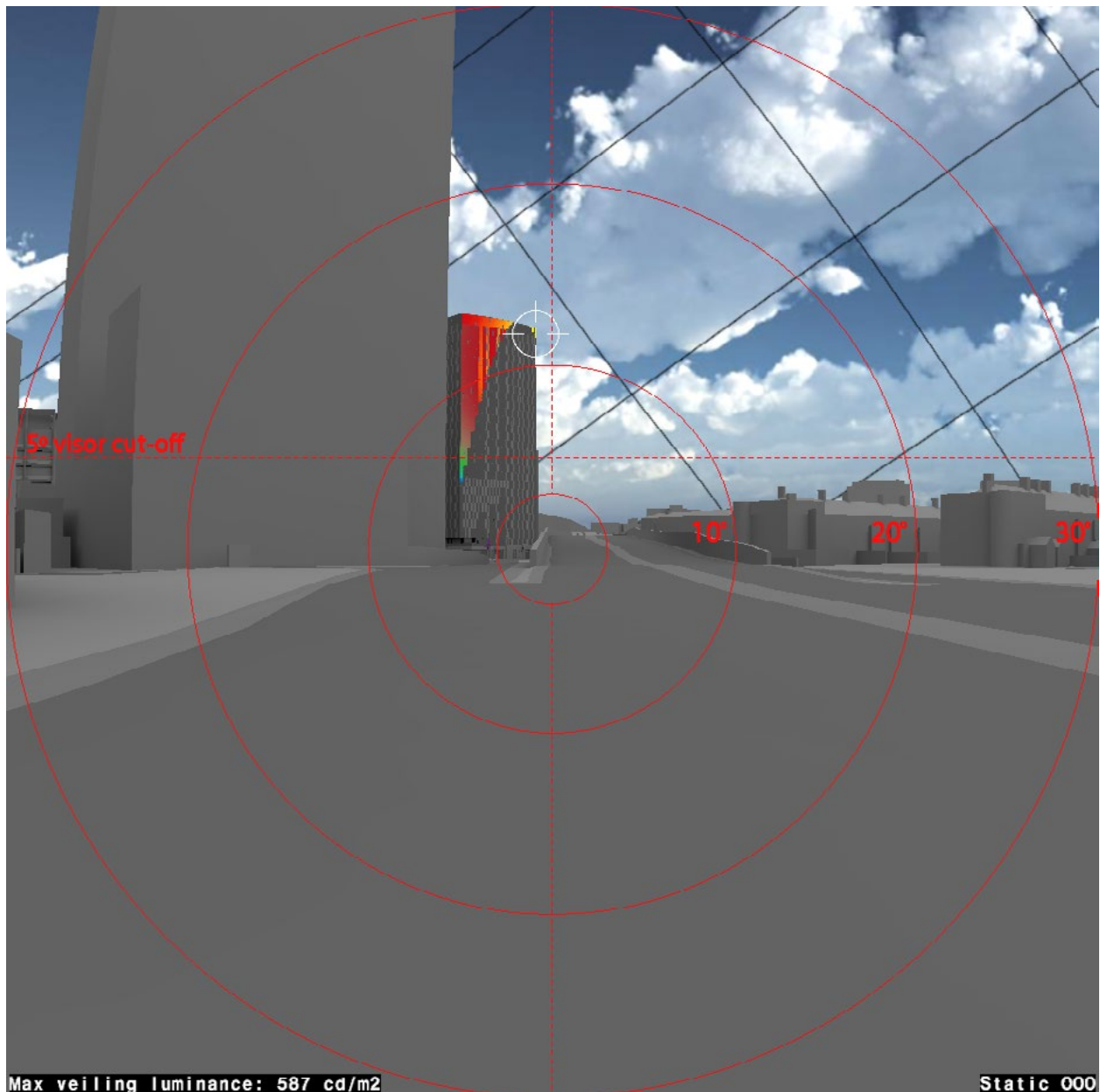
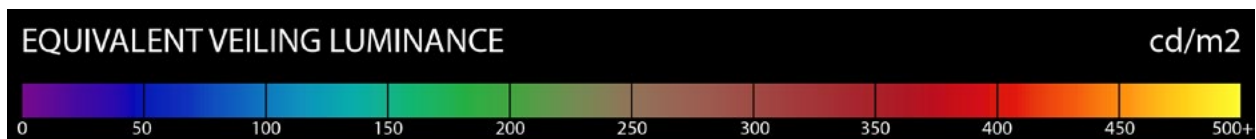


Fig. 34: Peak intensity



PEAK INTENSITY ASSESSMENT
VIEWPOINT MW6 - MANCUNIAN WAY/RING ROAD EASTBOUND
LEFT LANE, LOOKING FORWARD

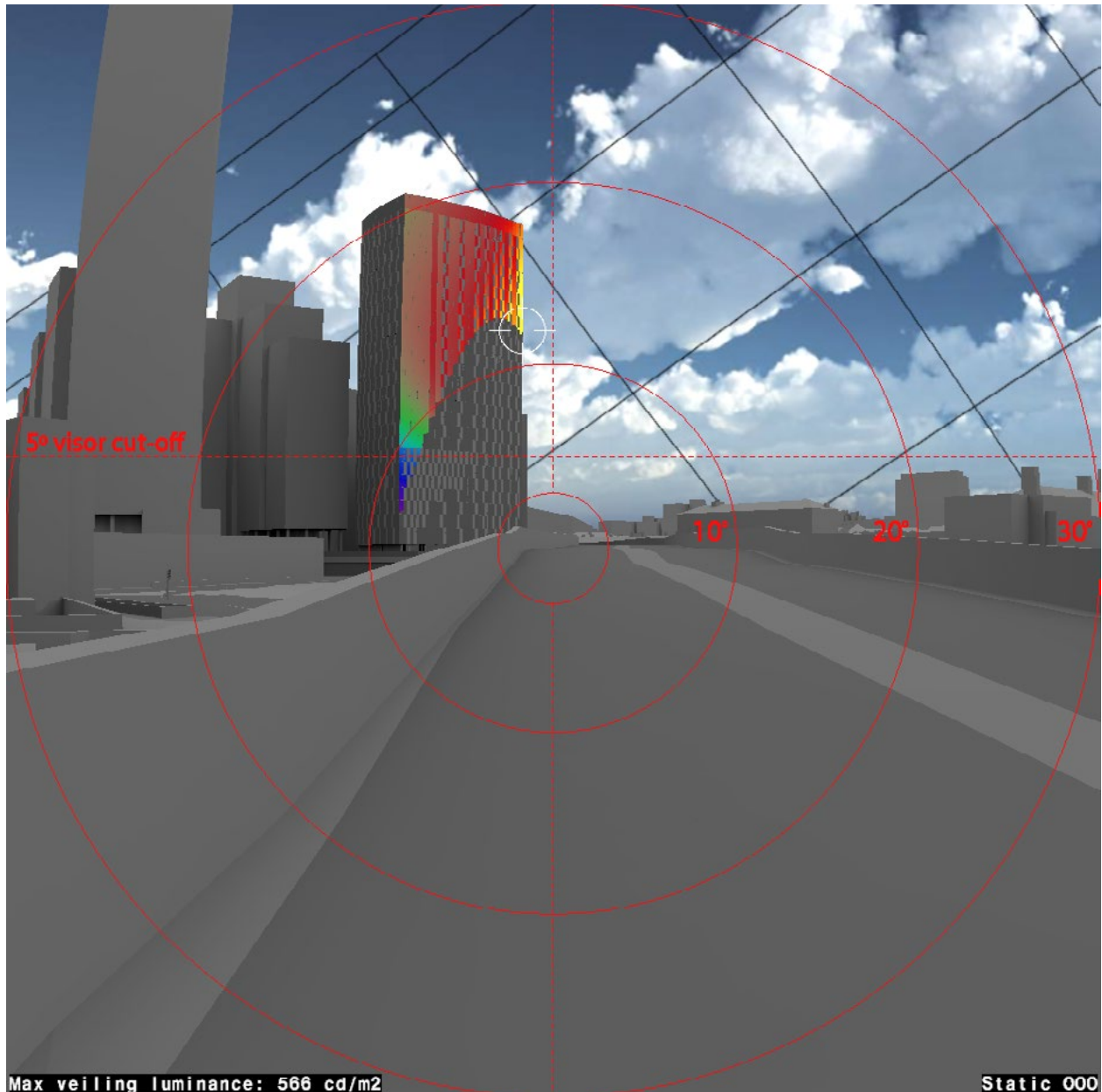
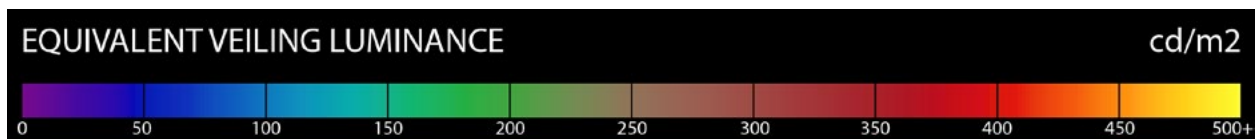


Fig. 35: Peak intensity



7 MANCUNIAN WAY OFF-RAMP WITH MEDLOCK STREET JUNCTION (SLIP1)



Fig. 36: Junction Location

7.1 STAGE 1: STATIC ASSESSMENT

60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT SLIP1A - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING FORWARD

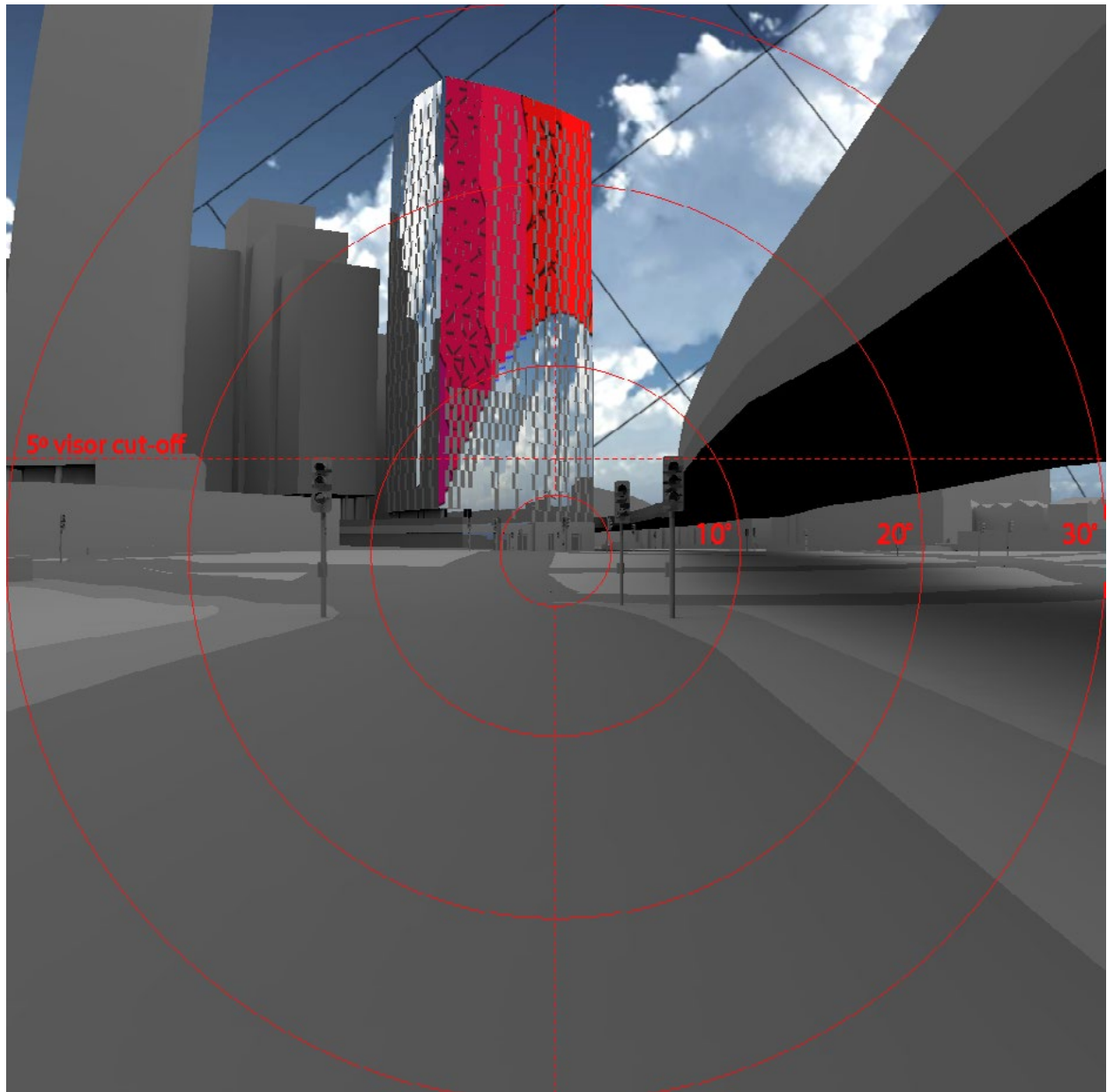
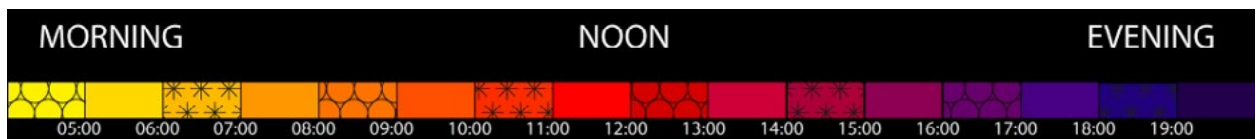


Fig. 38: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT SLIP1A - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING FORWARD

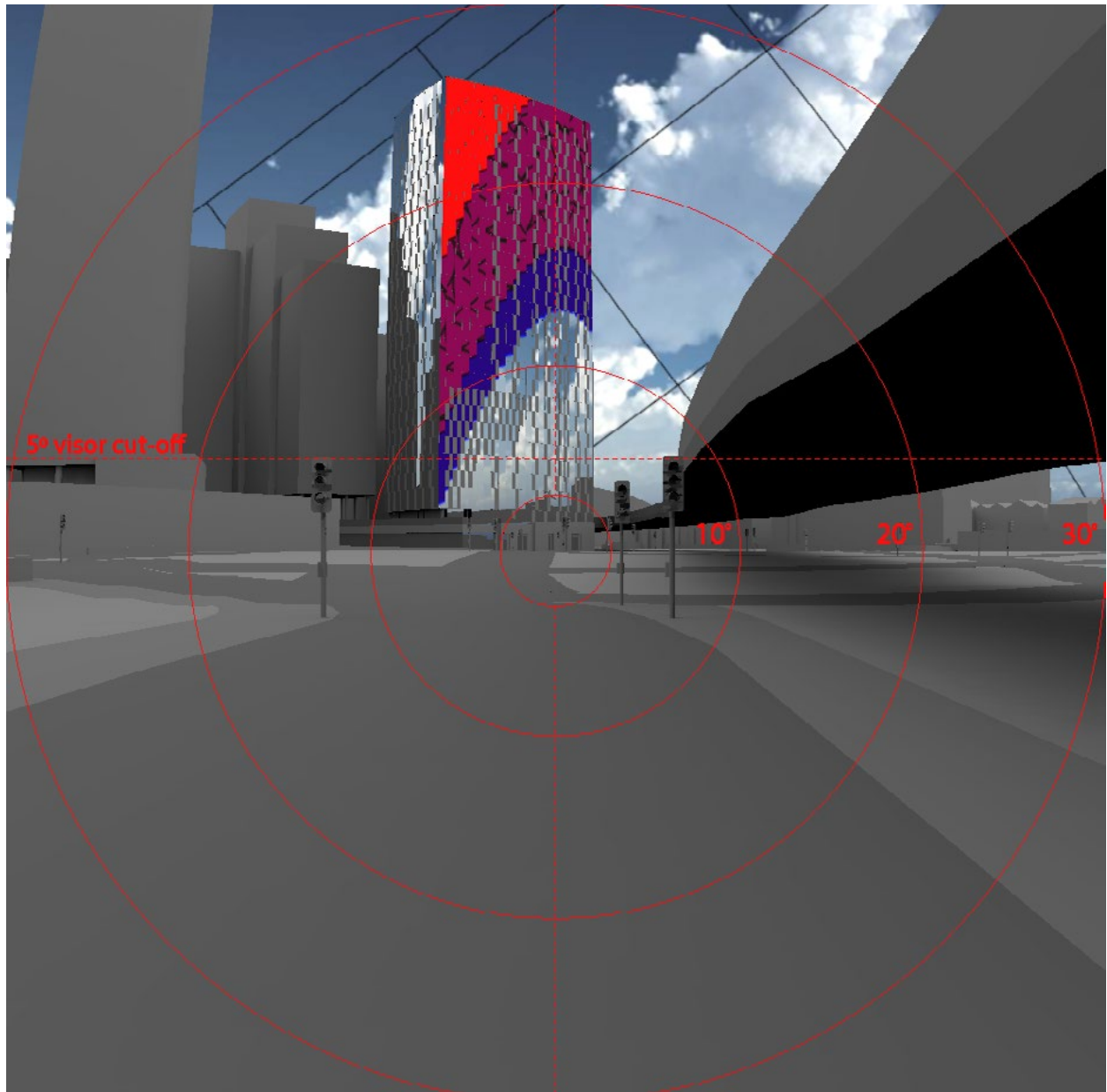


Fig. 39: Solar reflections



60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT SLIP1B - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING AT TRAFFIC LIGHT

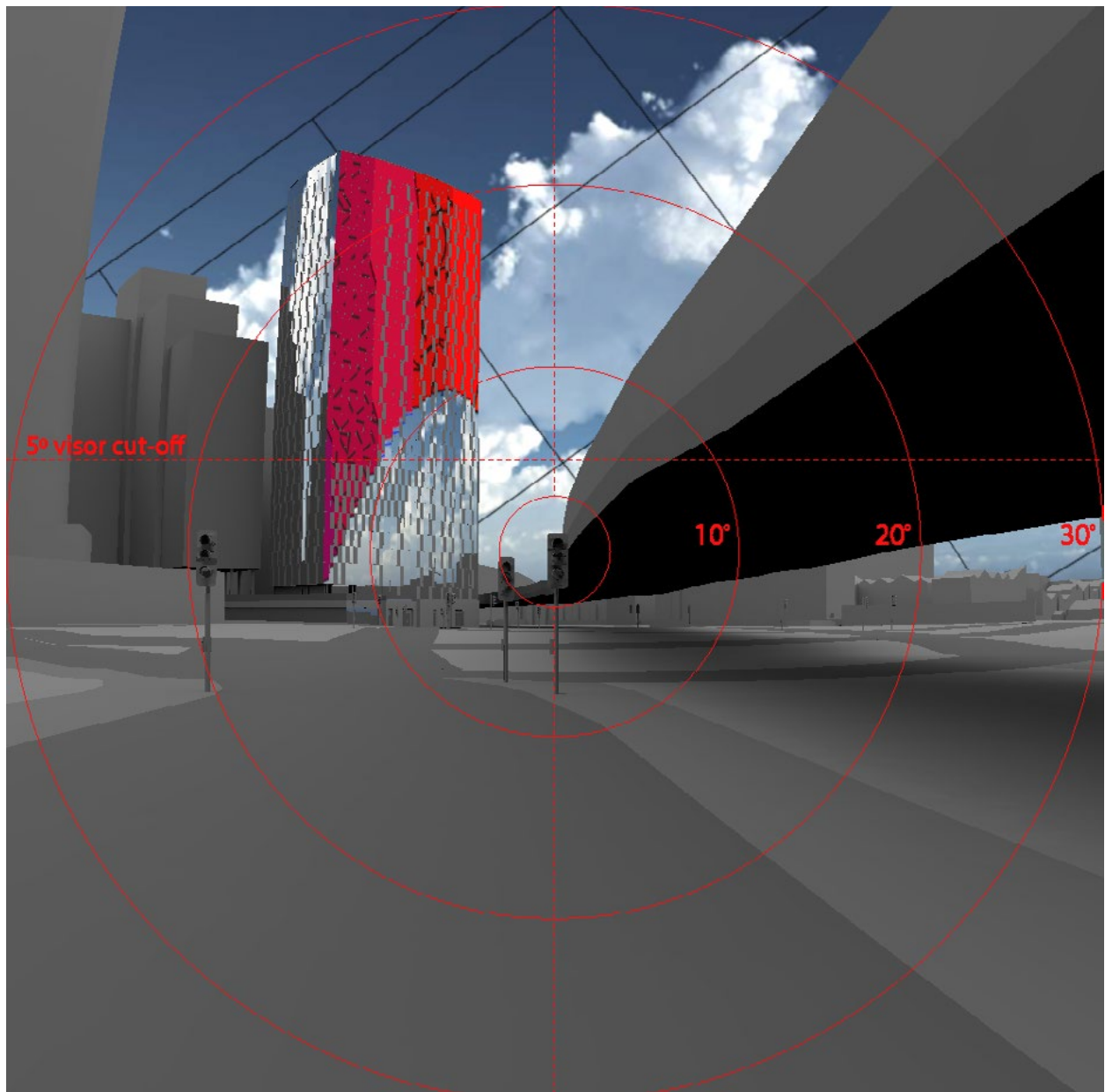
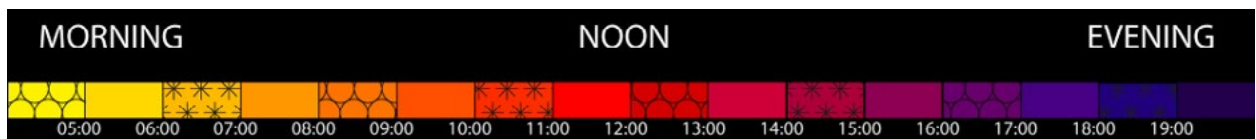


Fig. 40: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT SLIP1B - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING AT TRAFFIC LIGHT

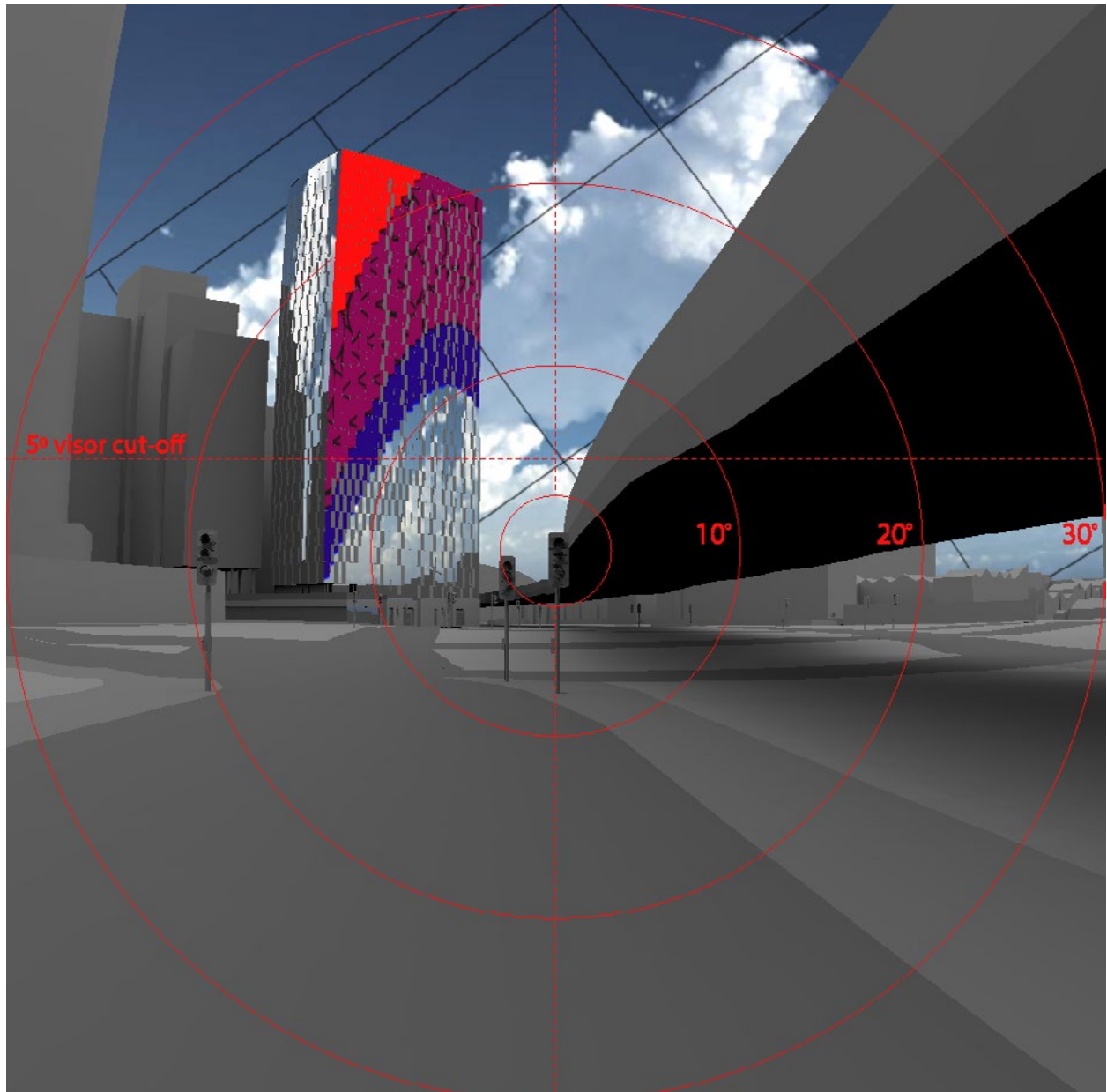


Fig. 41: Solar reflections



7.2 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

PEAK INTENSITY ASSESSMENT

VIEWPOINT SLIP1A - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING FORWARD

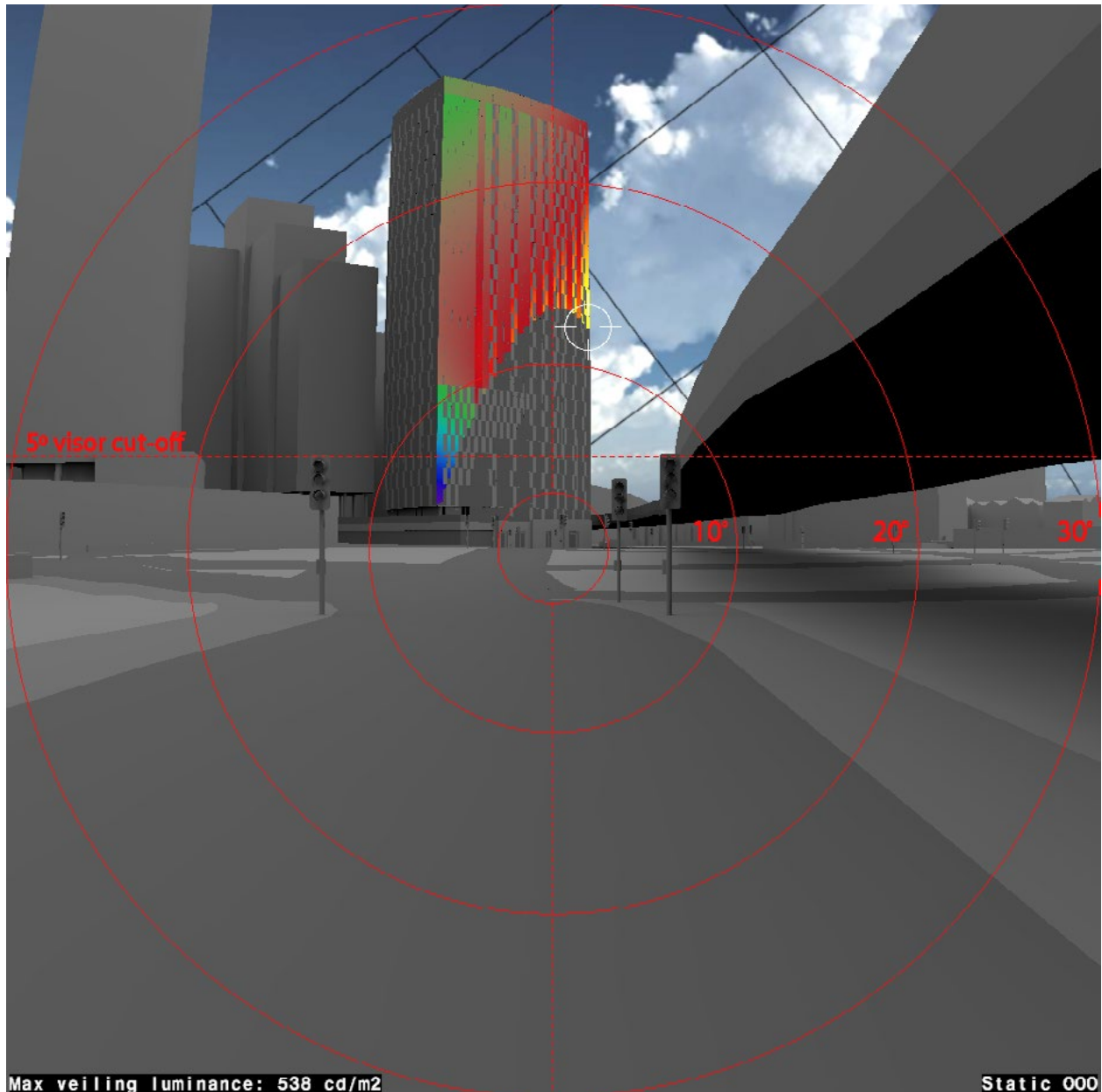
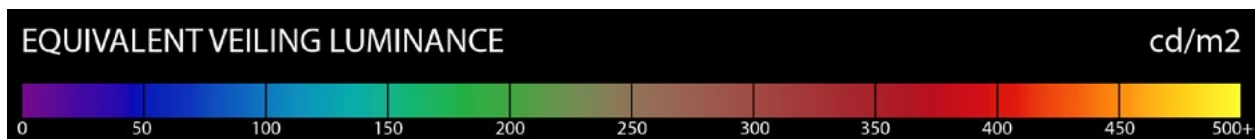


Fig. 42: Peak intensity



PEAK INTENSITY ASSESSMENT
VIEWPOINT SLIP1B - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING AT TRAFFIC LIGHT

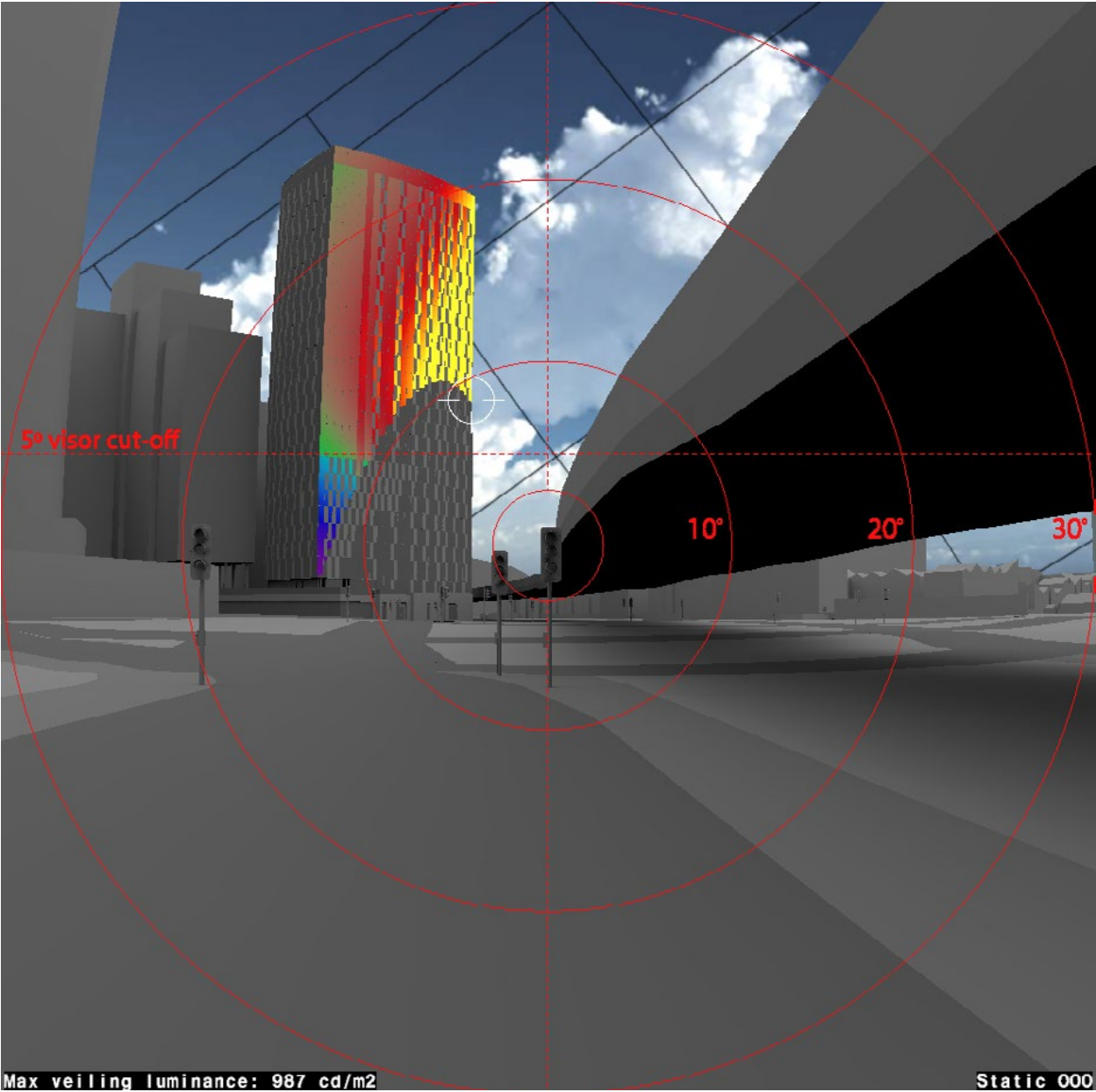
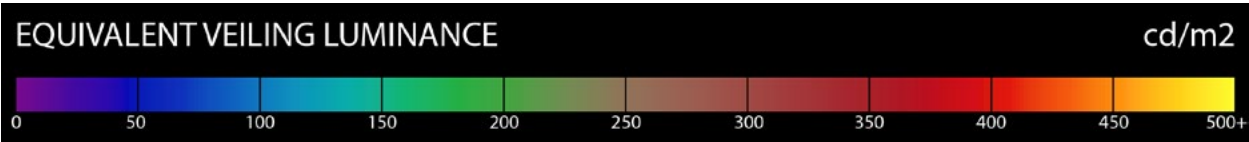


Fig. 43: Peak intensity



7.3 STAGE 3: VISUAL ASSESSMENT

VISUAL APPRAISAL

VIEWPOINT SLIP1A - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING FORWARD

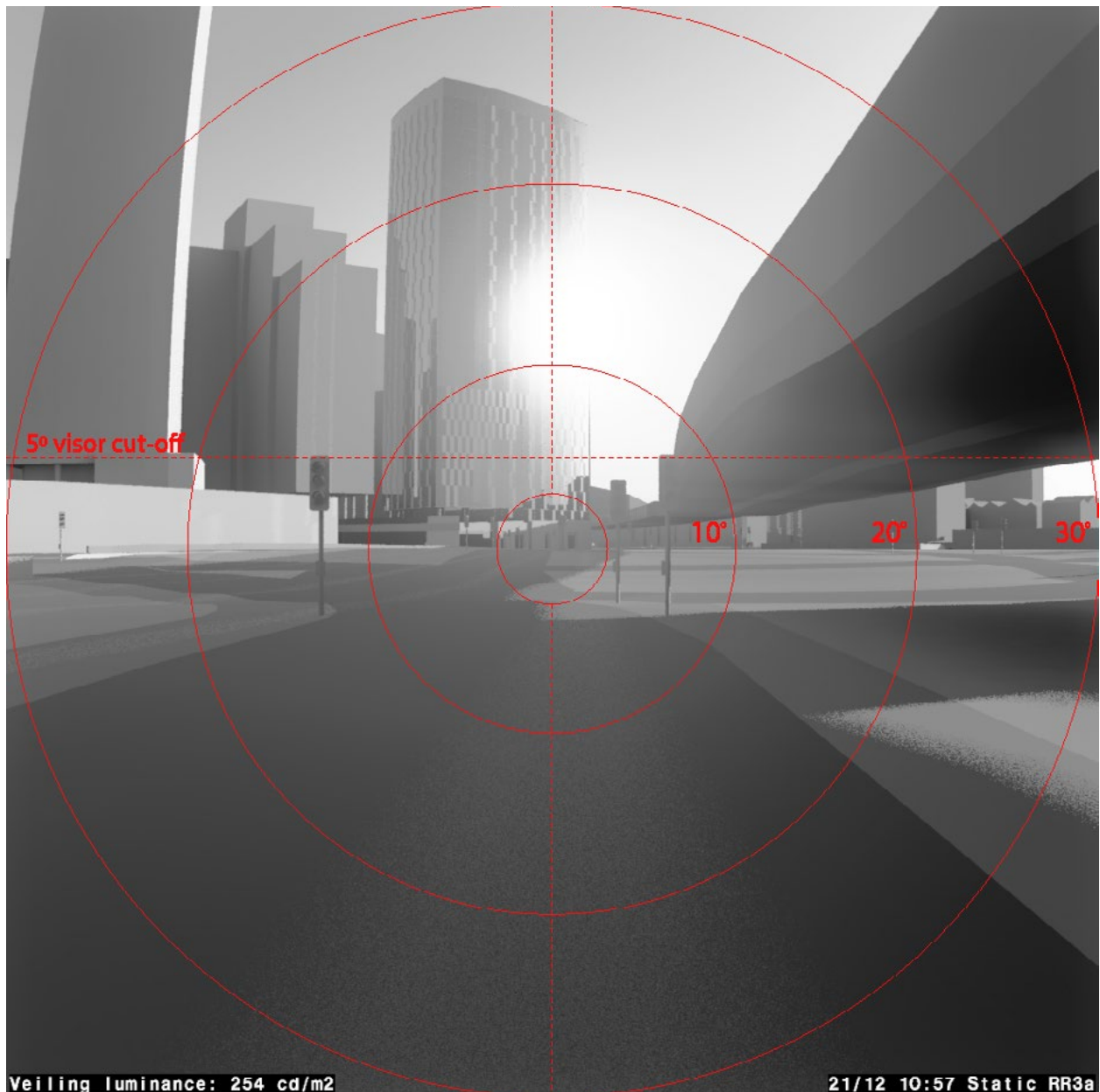


Fig. 44: Visual appraisal

VISUAL APPRAISAL
VIEWPOINT SLIP1B - MANCUNIAN WAY OFF-RAMP
RIGHT LANE, LOOKING AT TRAFFIC LIGHT

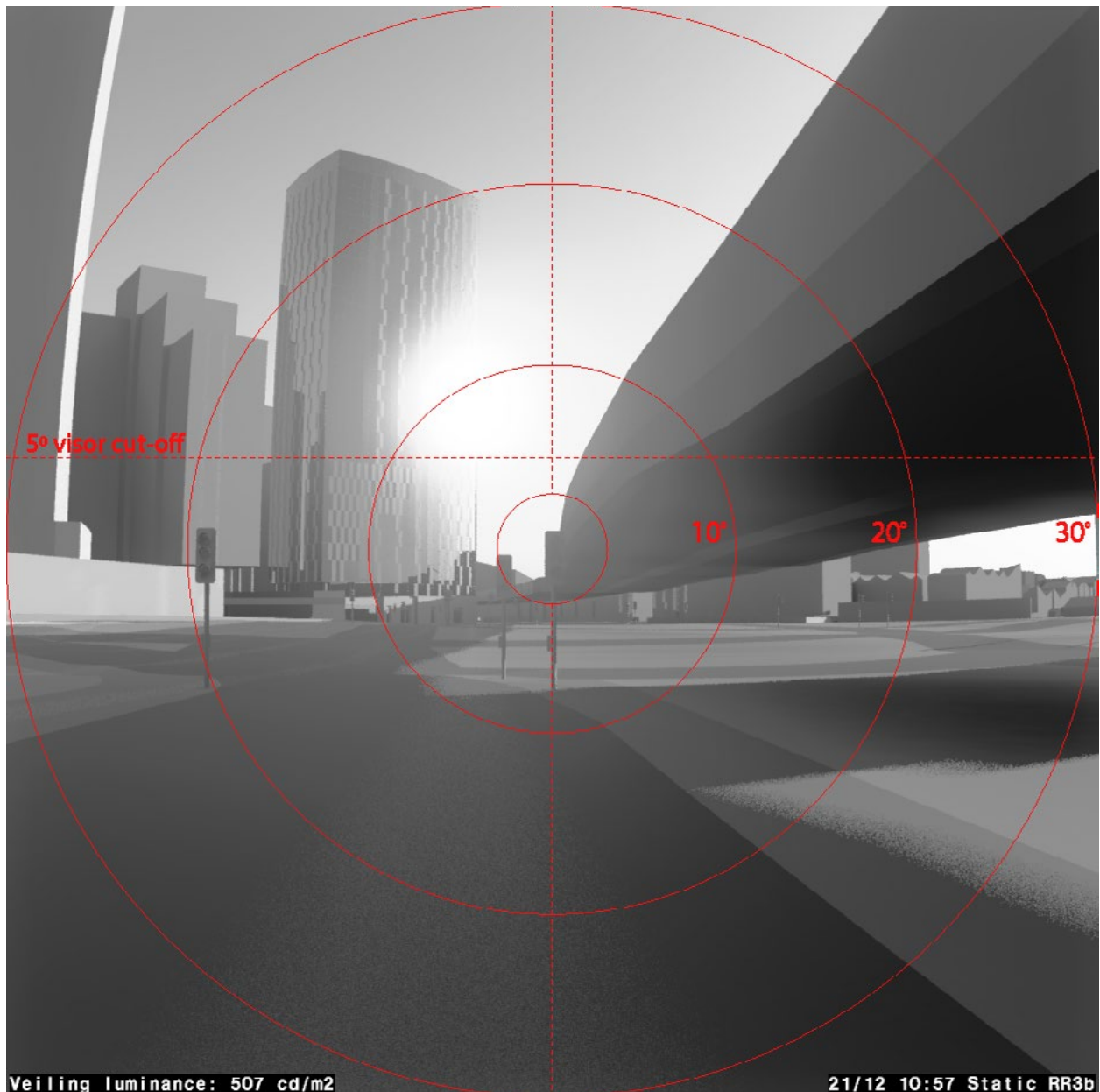


Fig. 45: Visual appraisal

8 MANCUNIAN WAY OFF-RAMP WITHIN MEDLOCK STREET JUNCTION (SLIP2)

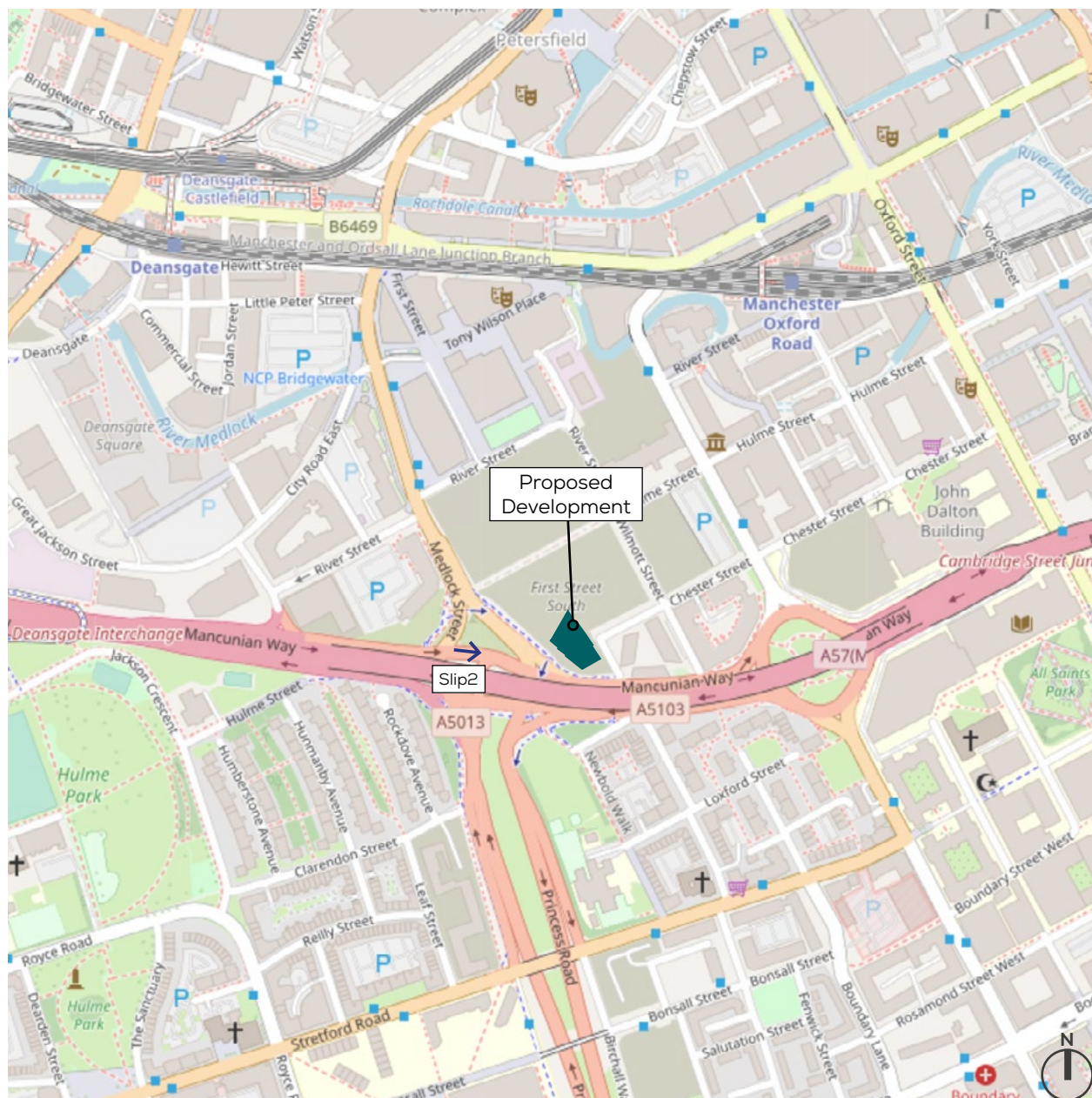


Fig. 46: Junction Location

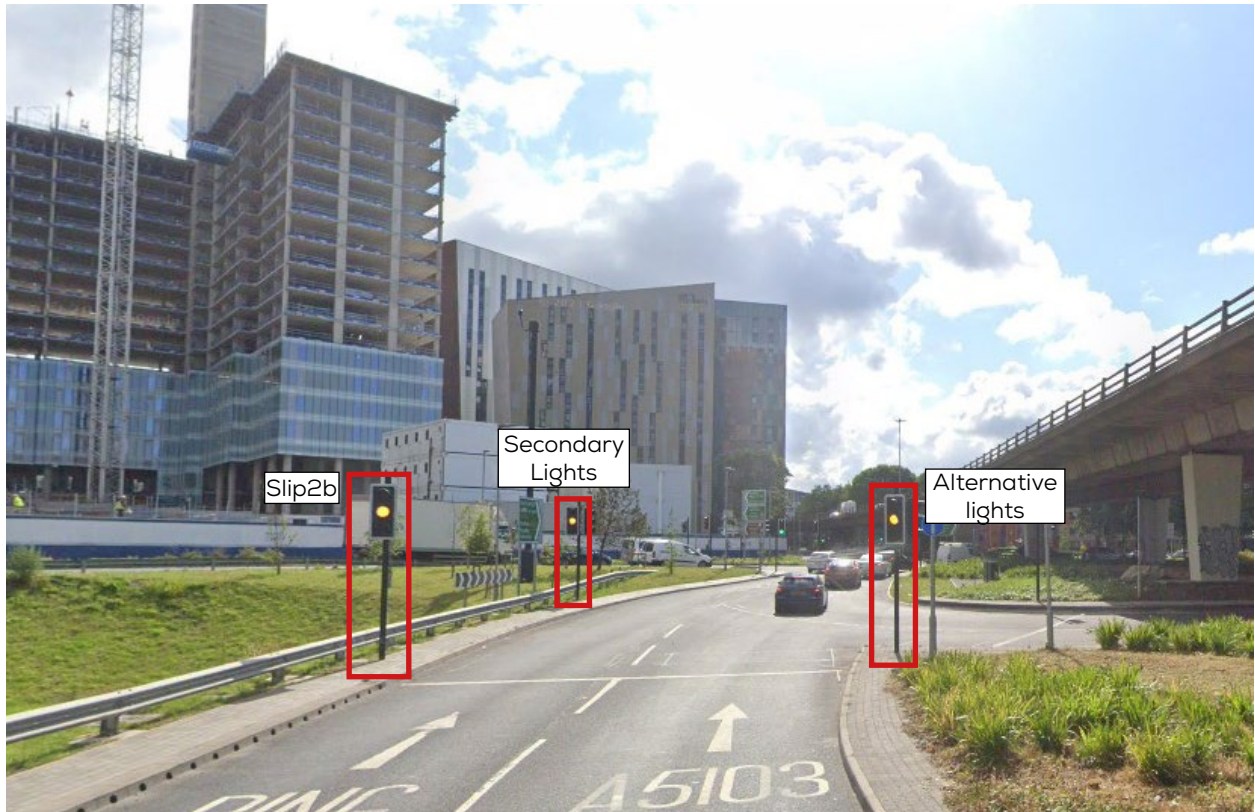


Fig. 47: Traffic Light Location

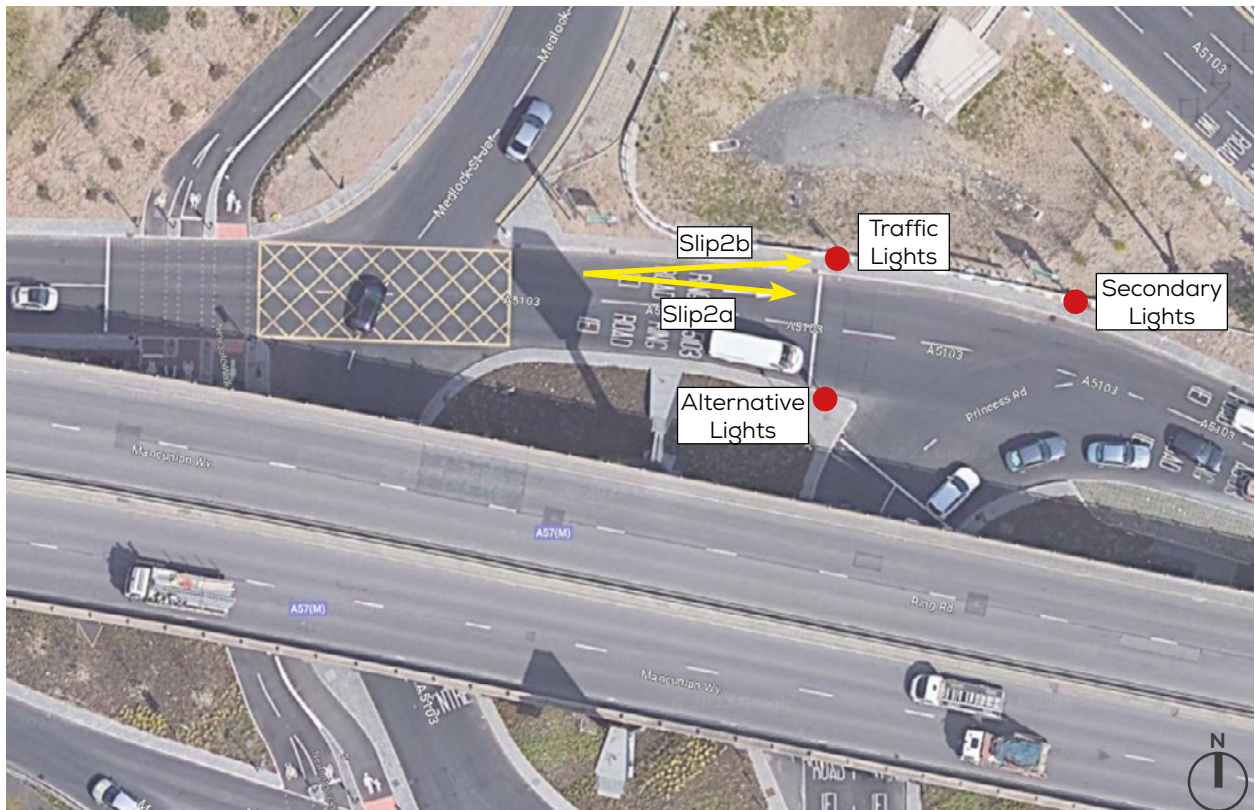


Fig. 48: Viewpoints

8.1 STAGE 1: STATIC ASSESSMENT

60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT SLIP2A - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING FORWARD

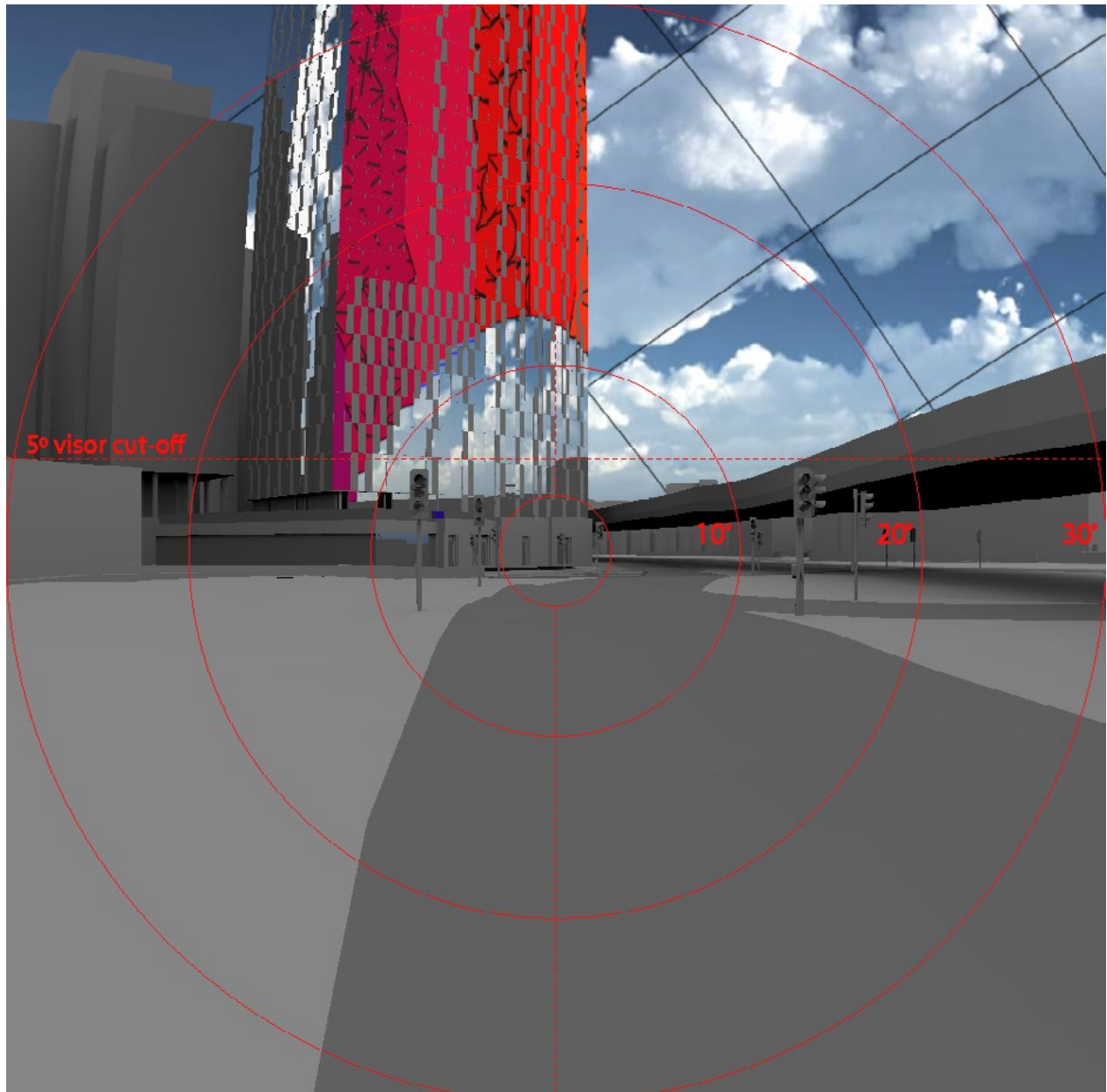
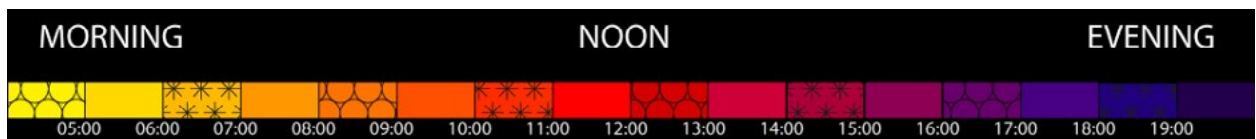


Fig. 49: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT SLIP2A - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING FORWARD

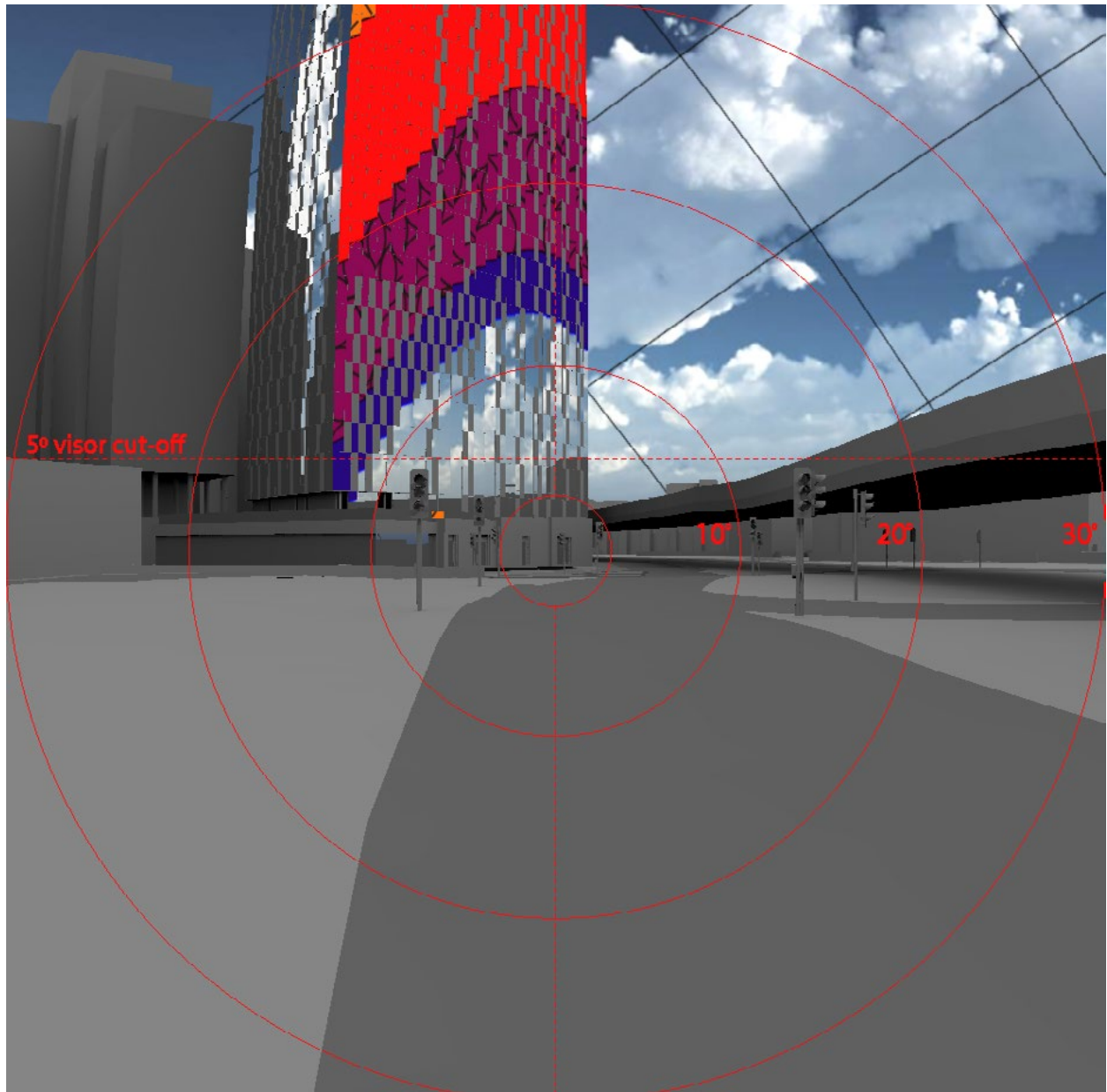


Fig. 50: Solar reflections



60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT SLIP2B - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING AT TRAFFIC LIGHT

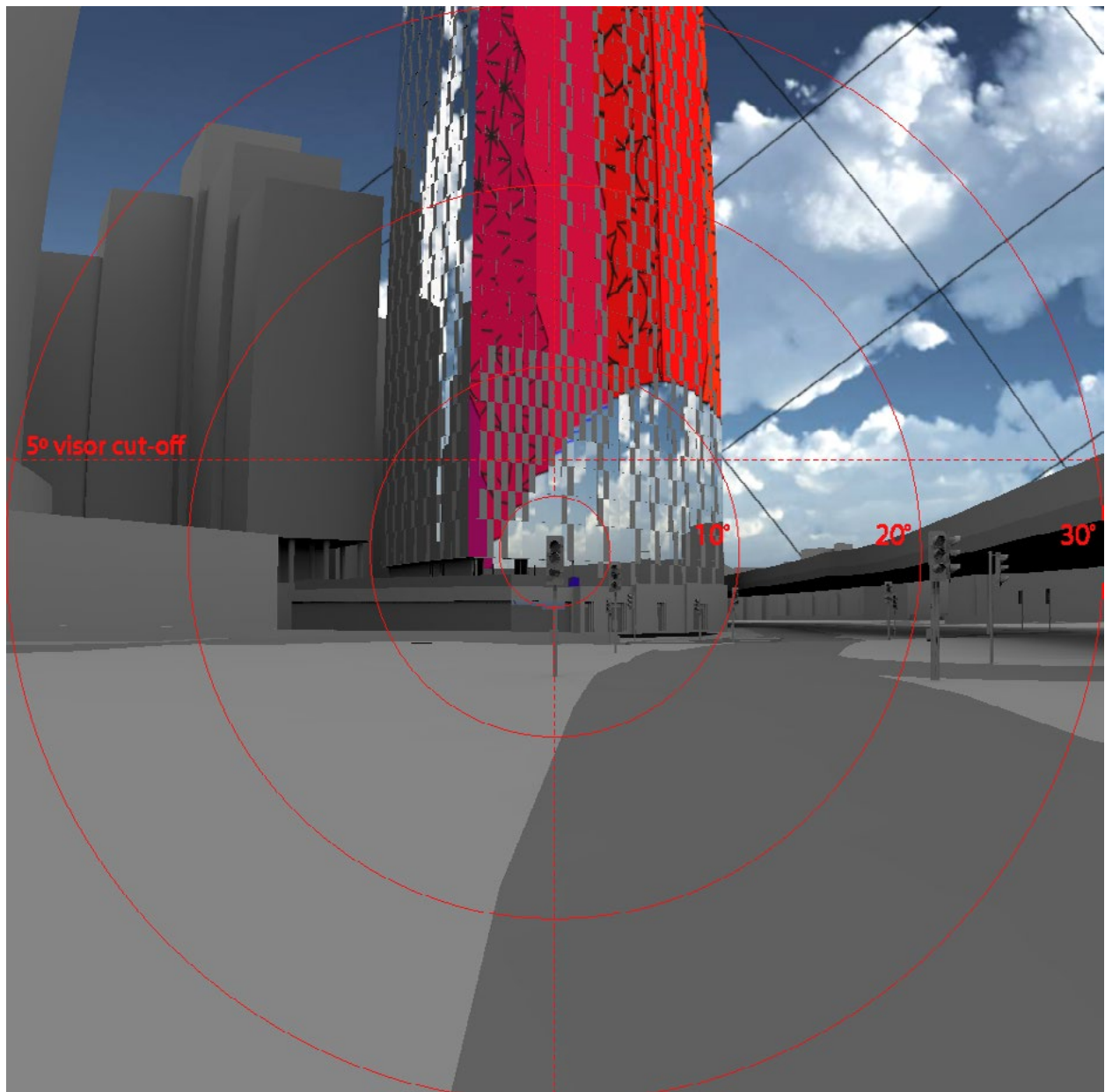
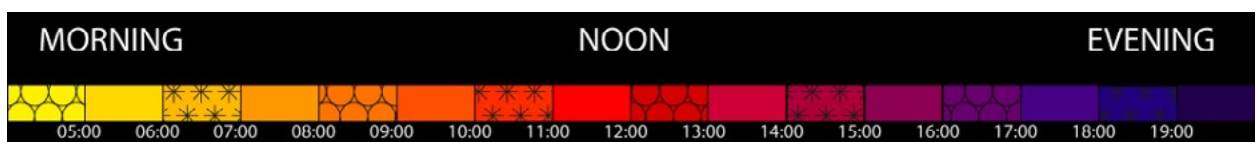


Fig. 51: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT SLIP2B - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING AT TRAFFIC LIGHT

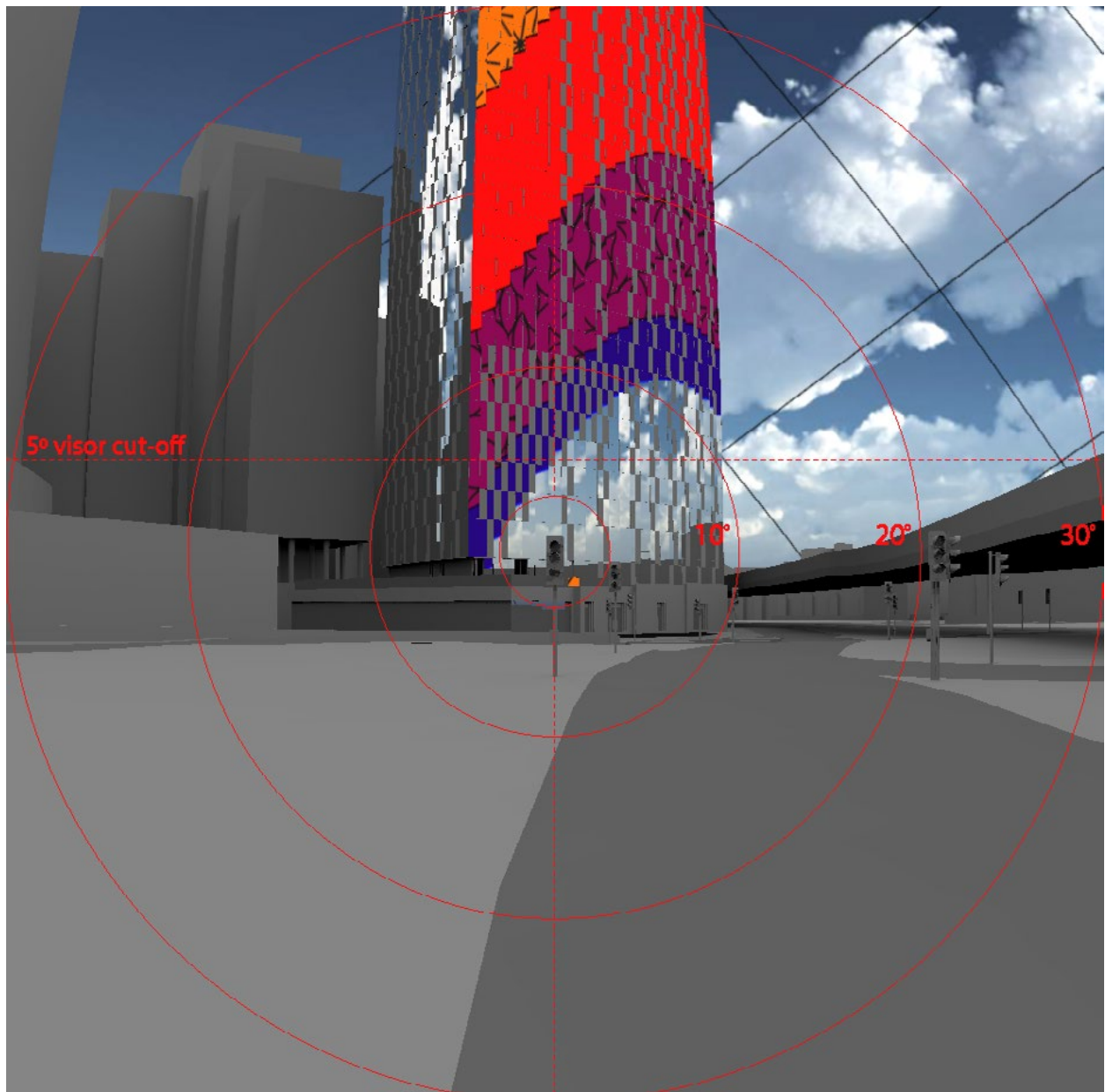


Fig. 52: Solar reflections



8.2 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

PEAK INTENSITY ASSESSMENT VIEWPOINT SLIP2A - MANCUNIAN WAY OFF-RAMP LEFT LANE, LOOKING FORWARD

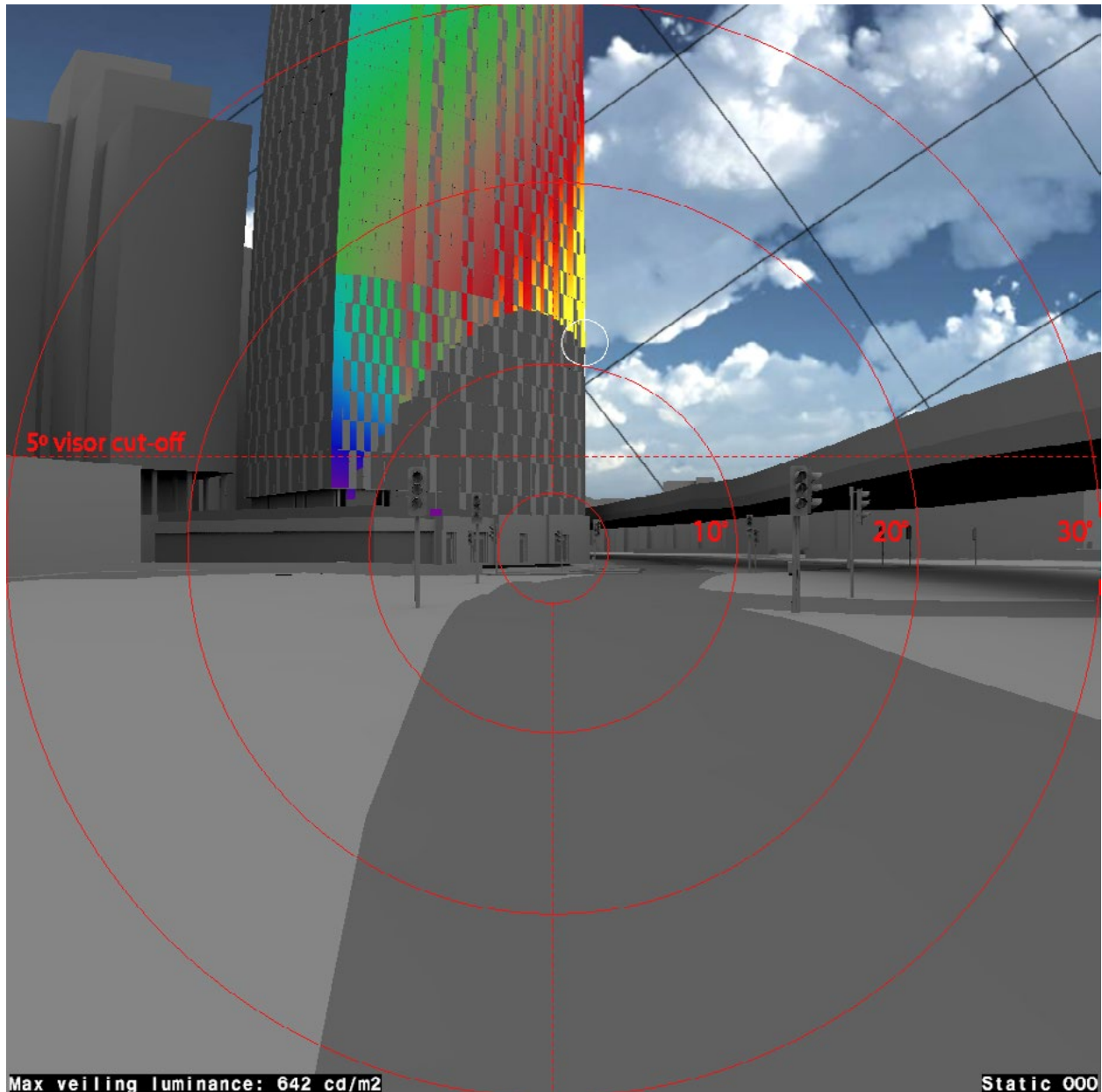
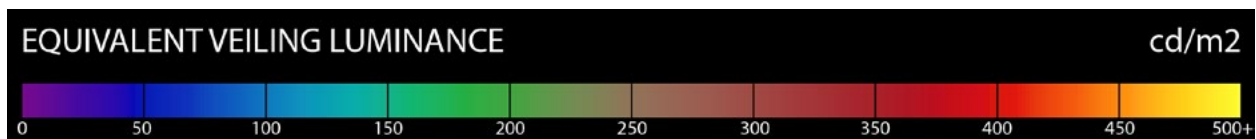


Fig. 53: Peak intensity



PEAK INTENSITY ASSESSMENT
VIEWPOINT SLIP2B - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING AT TRAFFIC LIGHT

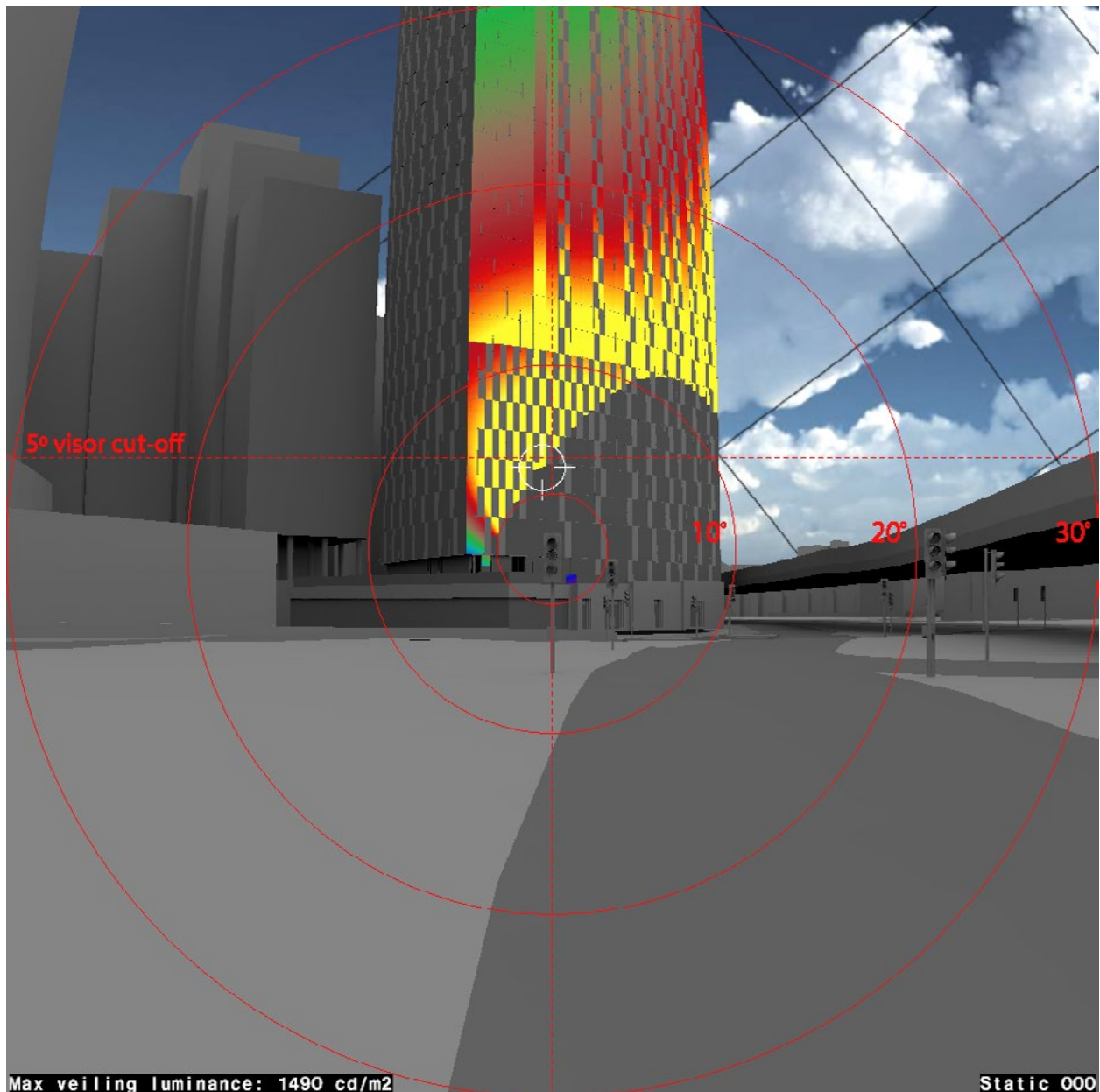
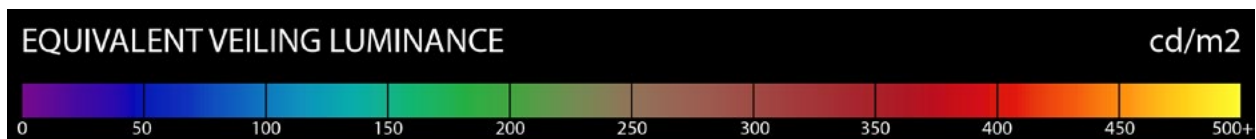


Fig. 54: Peak intensity



8.3 STAGE 3: VISUAL ASSESSMENT

VISUAL APPRAISAL

VIEWPOINT SLIP2A - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING FORWARD

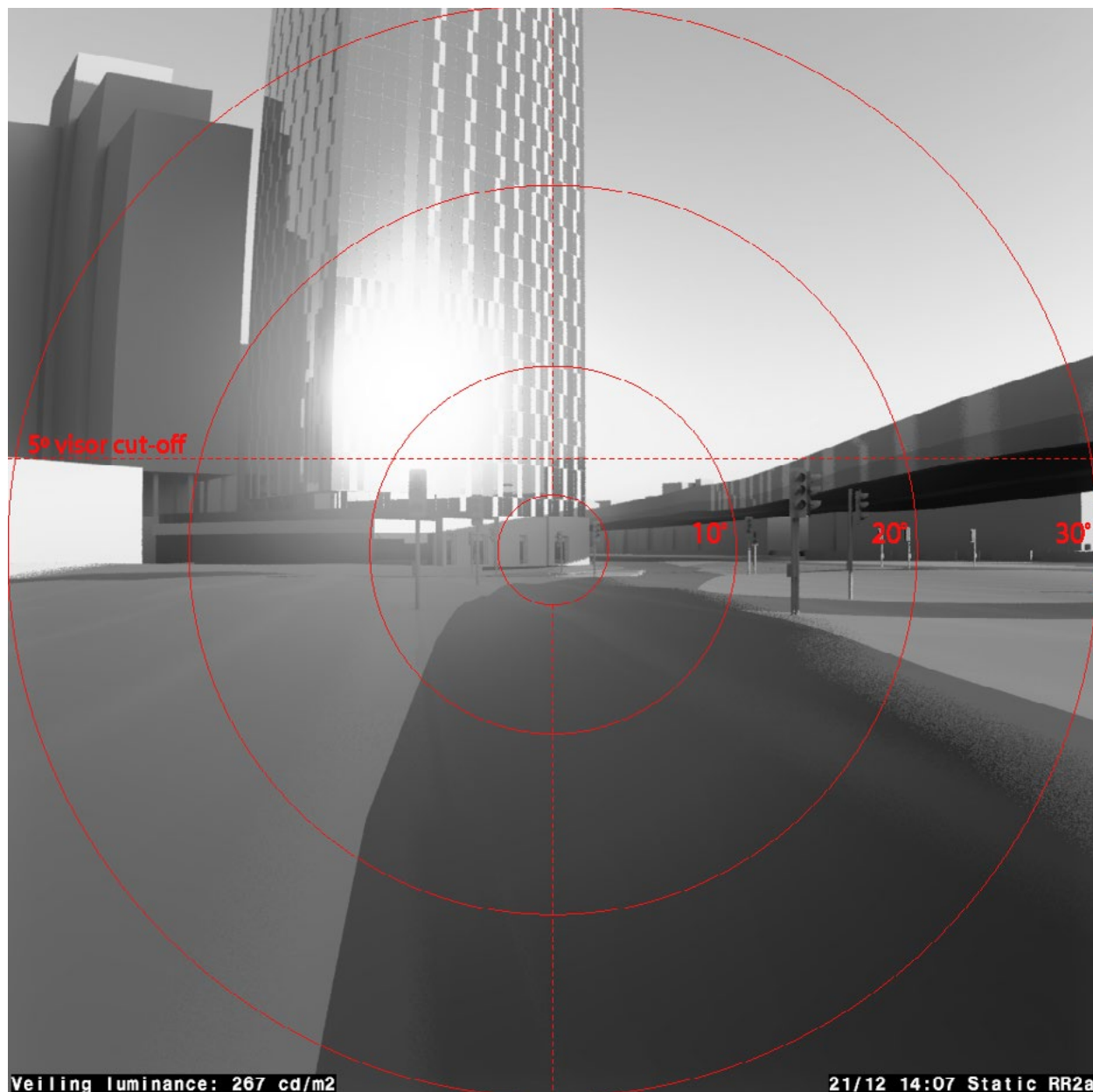


Fig. 55: Visual appraisal

VISUAL APPRAISAL

VIEWPOINT SLIP2B - MANCUNIAN WAY OFF-RAMP
LEFT LANE, LOOKING AT TRAFFIC LIGHT

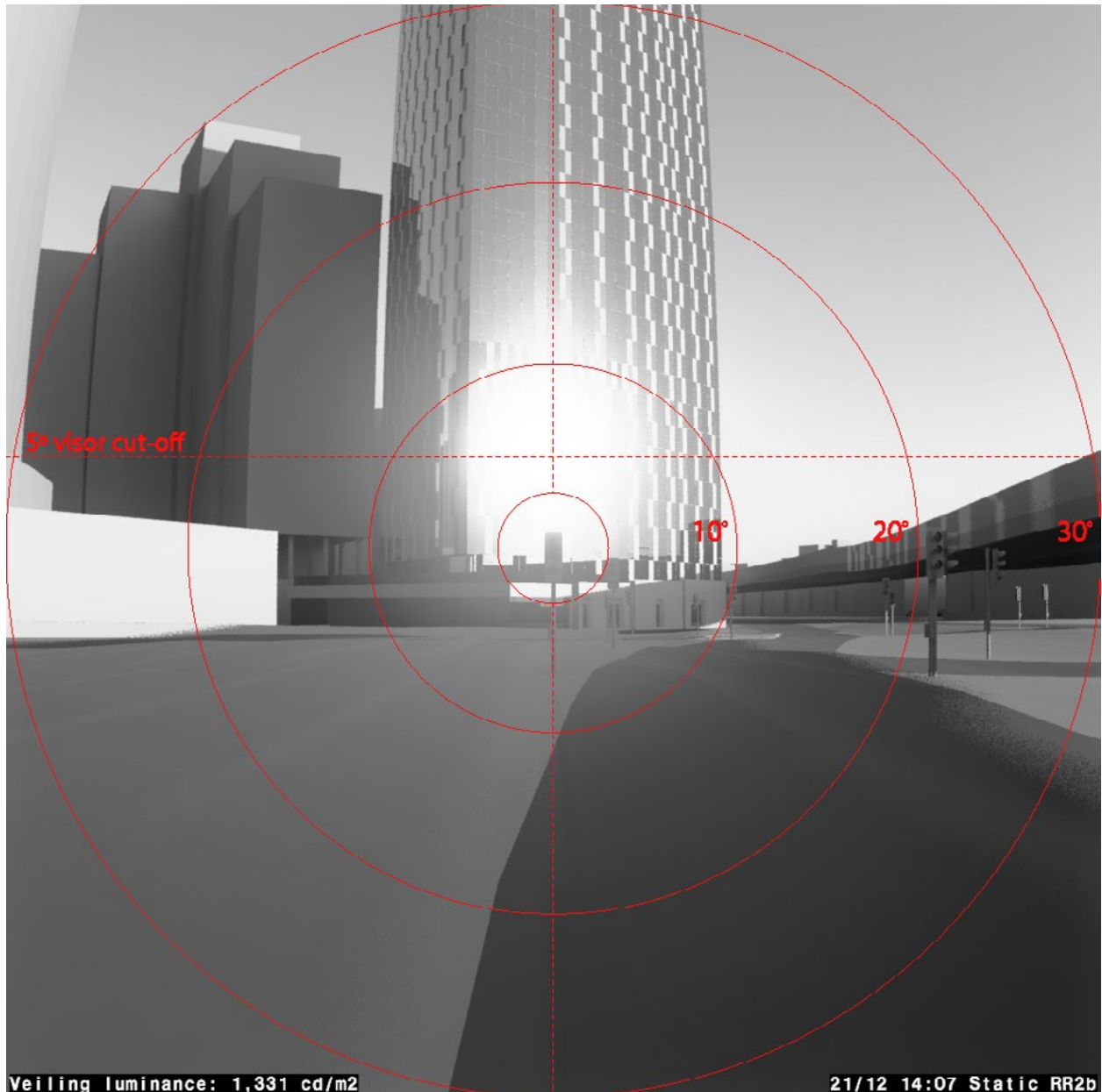


Fig. 56: Visual appraisal

9 MEDLOCK STREET JUNCTION WITH MANCUNIAN WAY ON-RAMP (MS2)



Fig. 57: Viewpoint Location

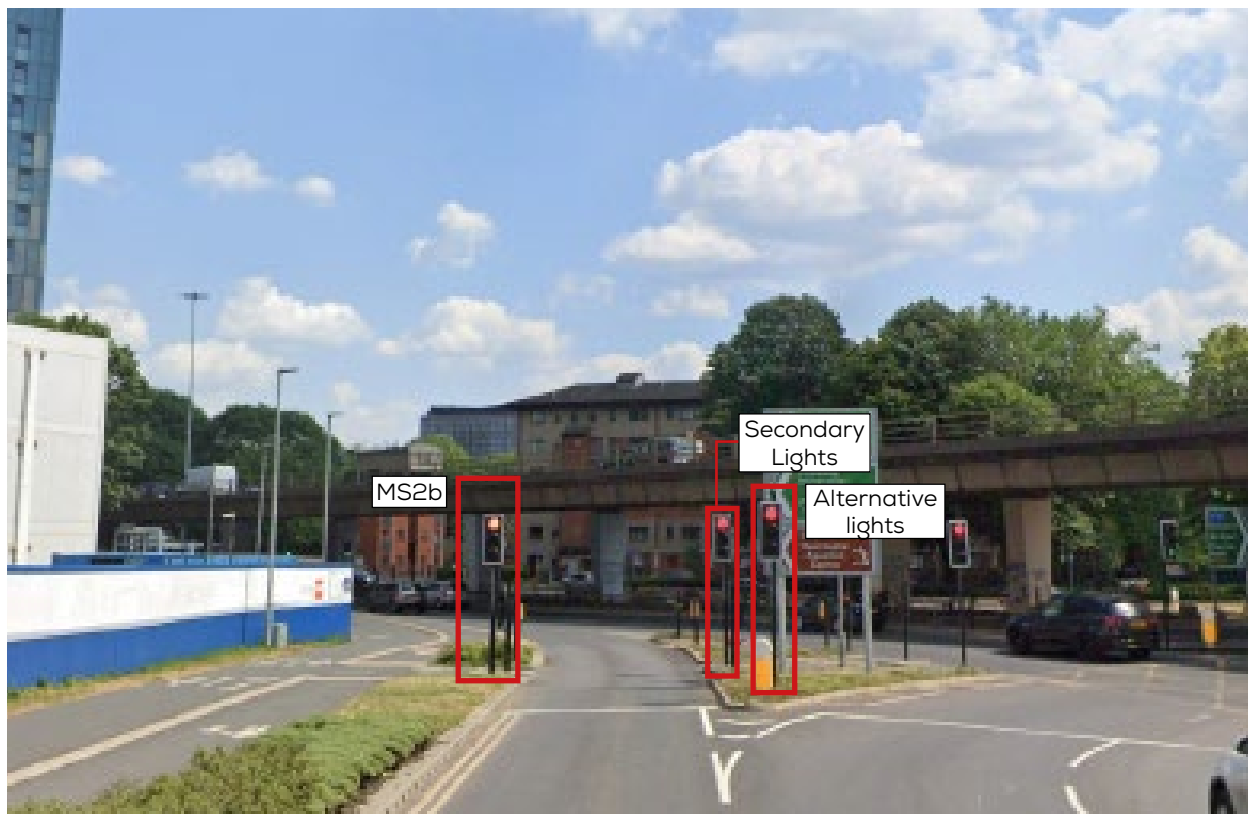


Fig. 58: Traffic Light Location

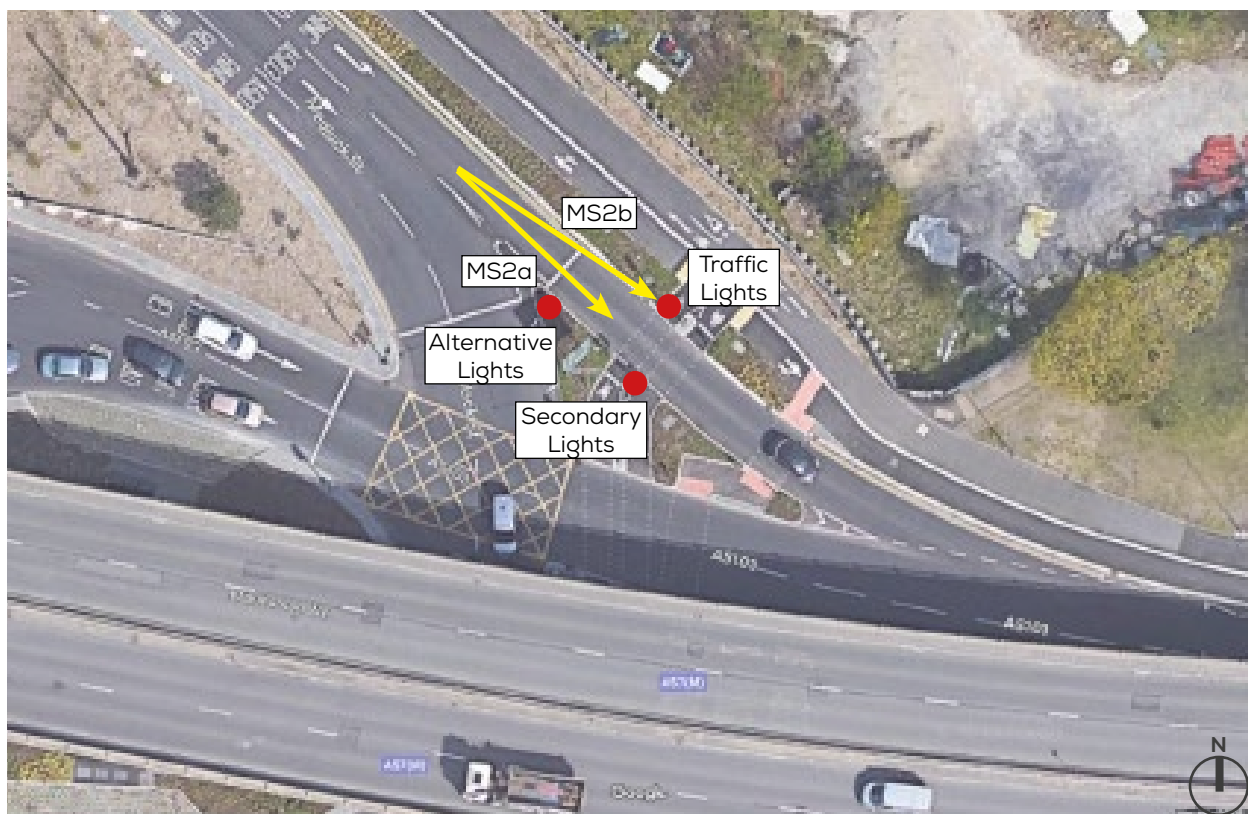


Fig. 59: Viewpoints

9.1 STAGE 1: STATIC ASSESSMENT

60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT MS2A- MEDLOCK STREET
LEFT LANE, LOOKING FORWARD

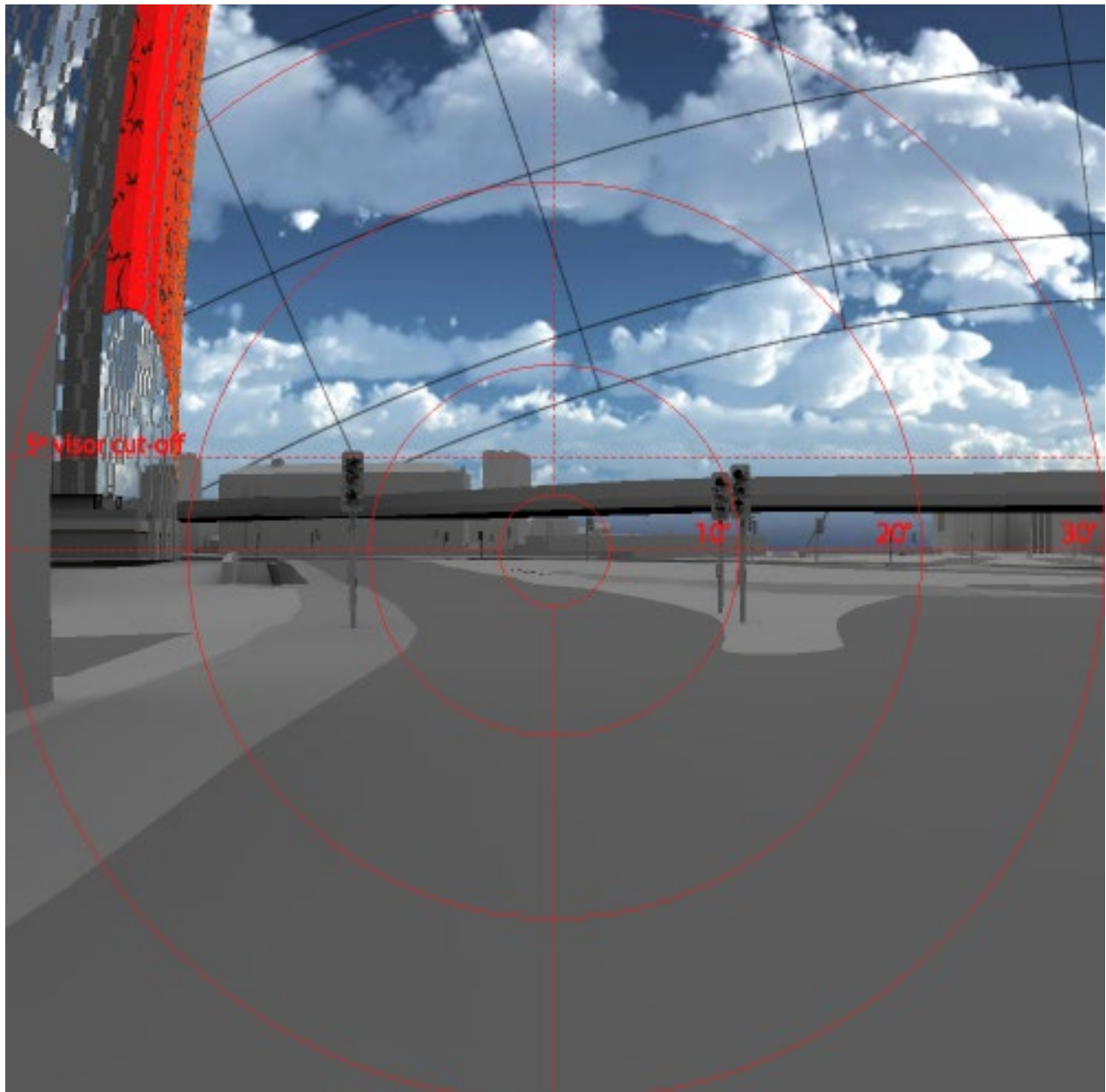
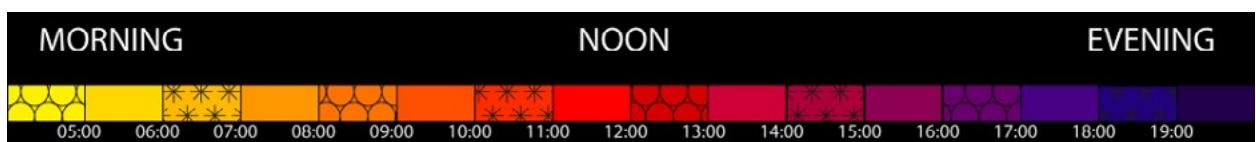


Fig. 60: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT MS2A- MEDLOCK STREET
LEFT LANE, LOOKING FORWARD

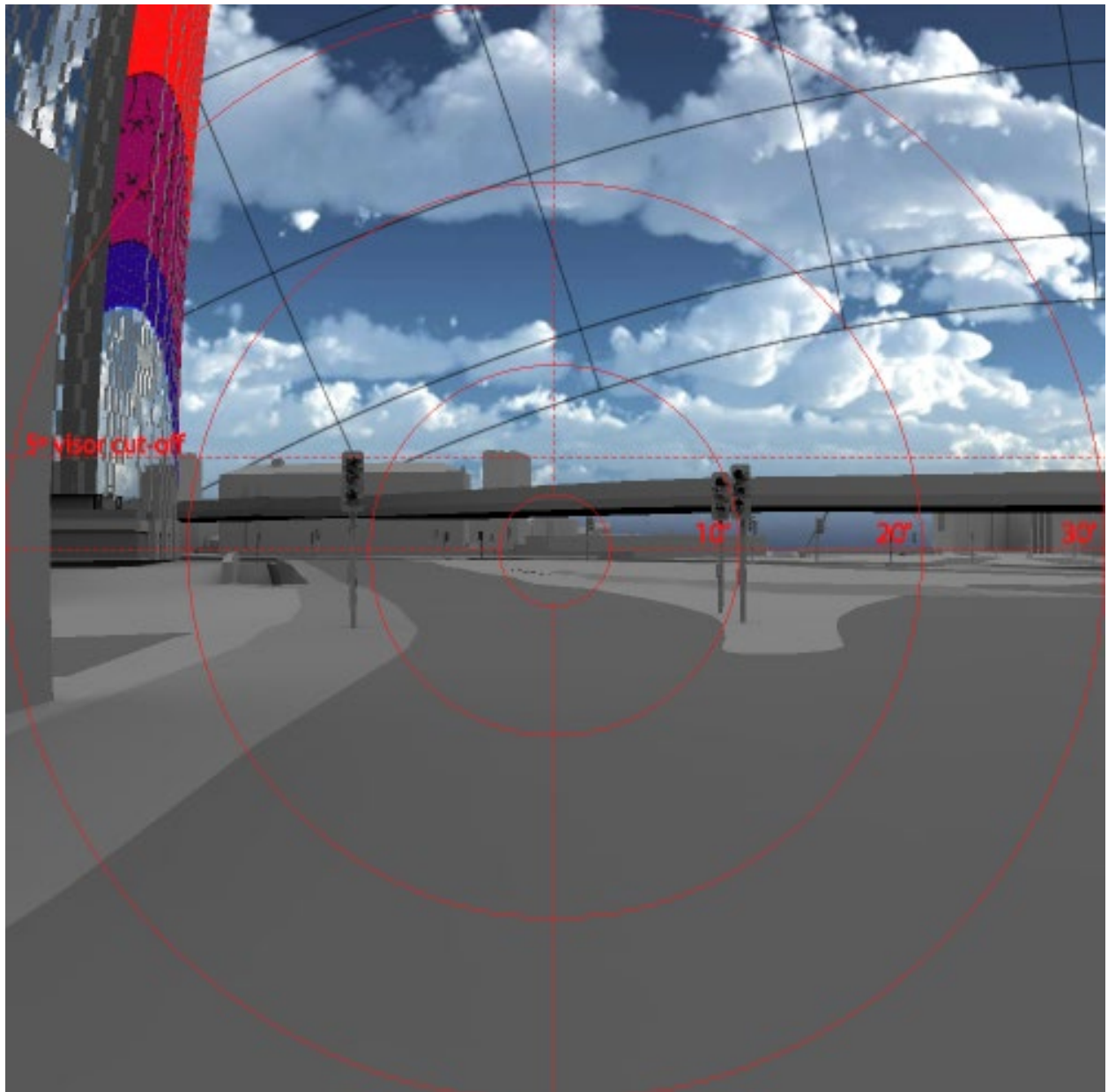


Fig. 61: Solar reflections



60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT MS2B- MEDLOCK STREET
LEFT LANE, LOOKING AT LEFT TRAFFIC LIGHT

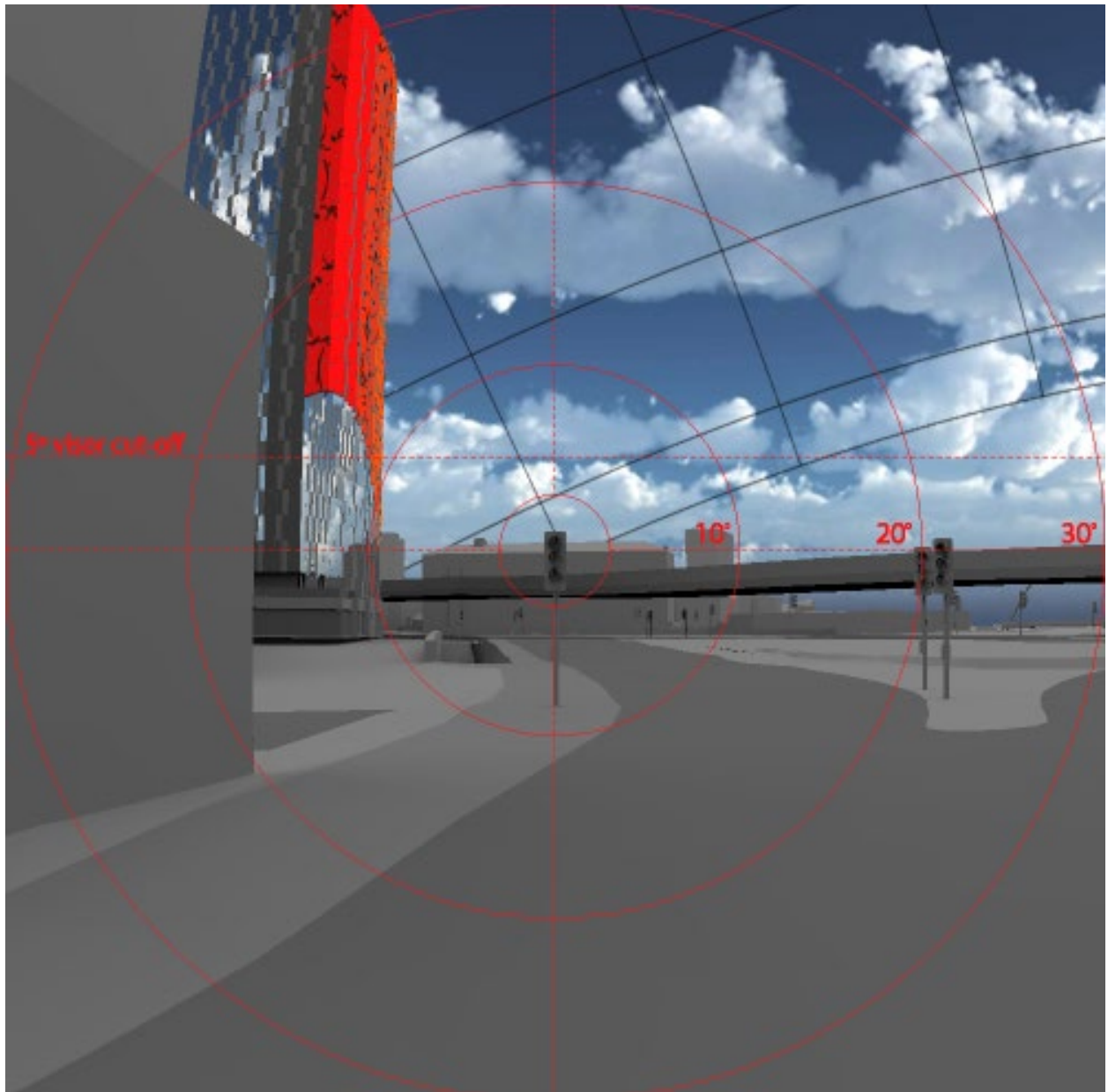
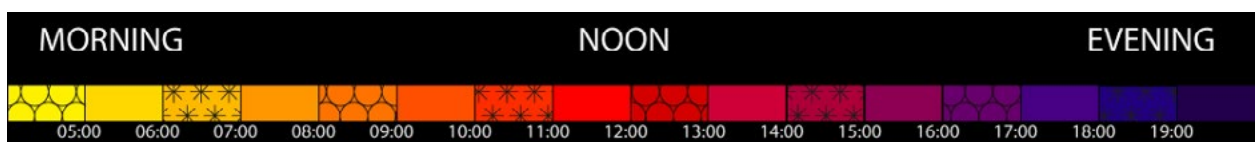


Fig. 62: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT MS2B- MEDLOCK STREET
LEFT LANE, LOOKING AT LEFT TRAFFIC LIGHT

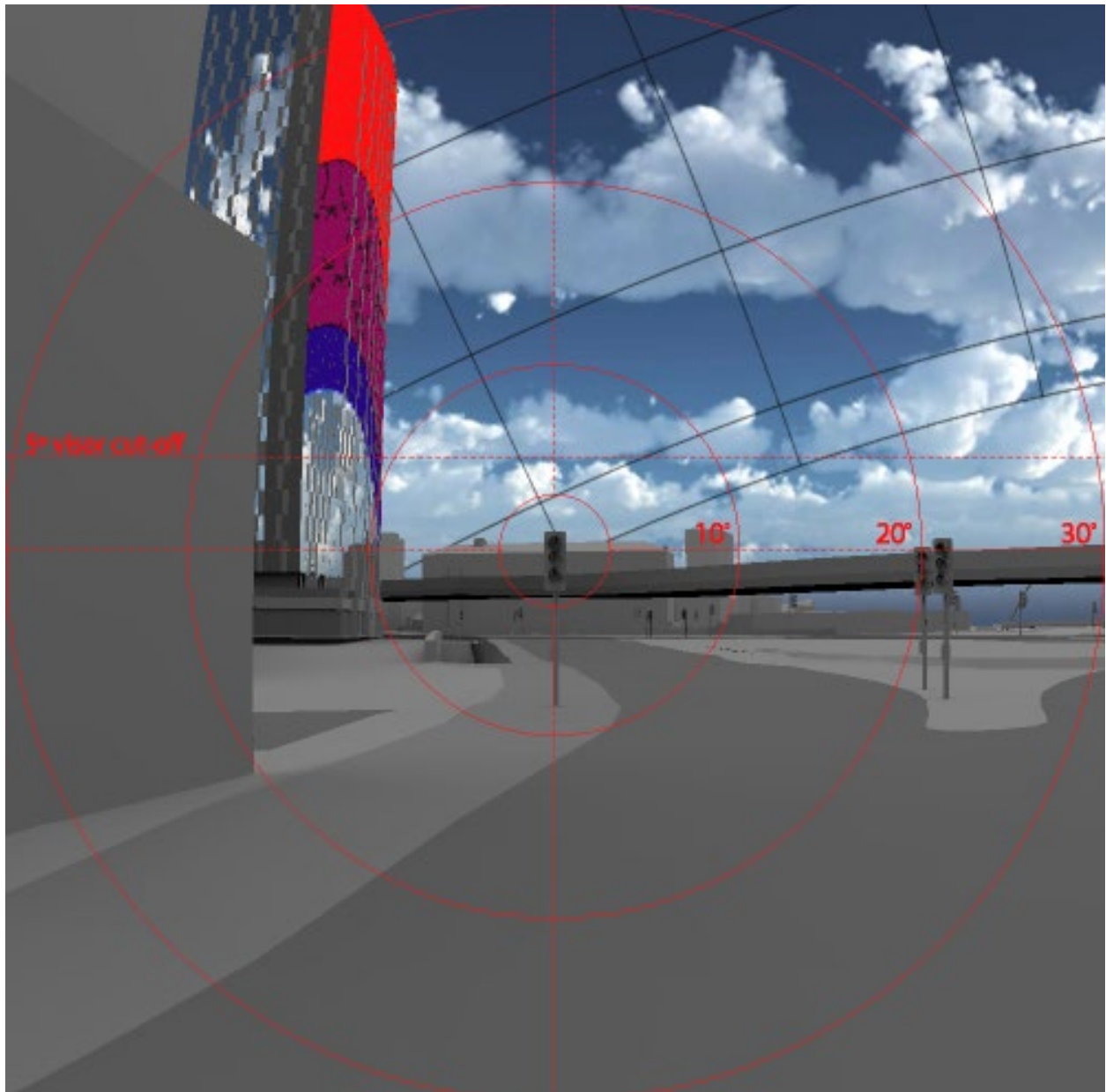


Fig. 63: Solar reflections



9.2 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

PEAK INTENSITY ASSESSMENT VIEWPOINT MS2A- MEDLOCK STREET LEFT LANE, LOOKING FORWARD

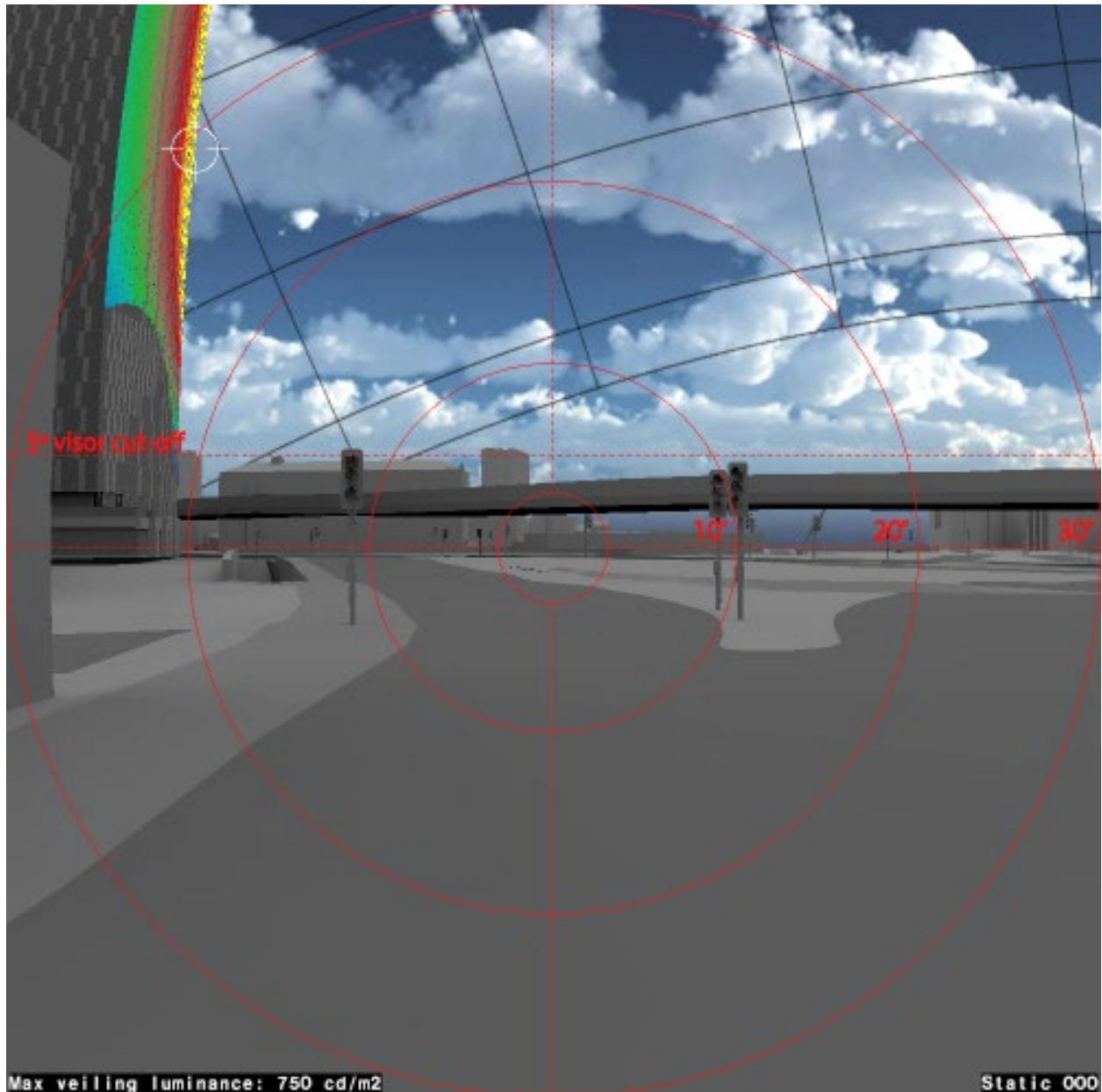
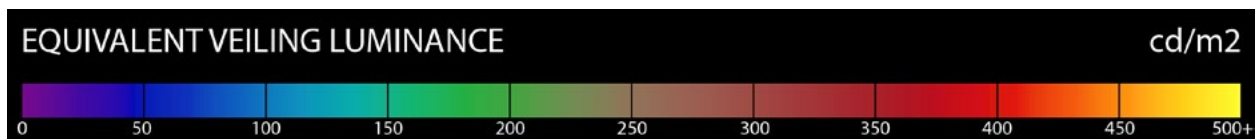


Fig. 64: Peak intensity



PEAK INTENSITY ASSESSMENT
VIEWPOINT MS2B- MEDLOCK STREET
LEFT LANE, LOOKING AT LEFT TRAFFIC LIGHT

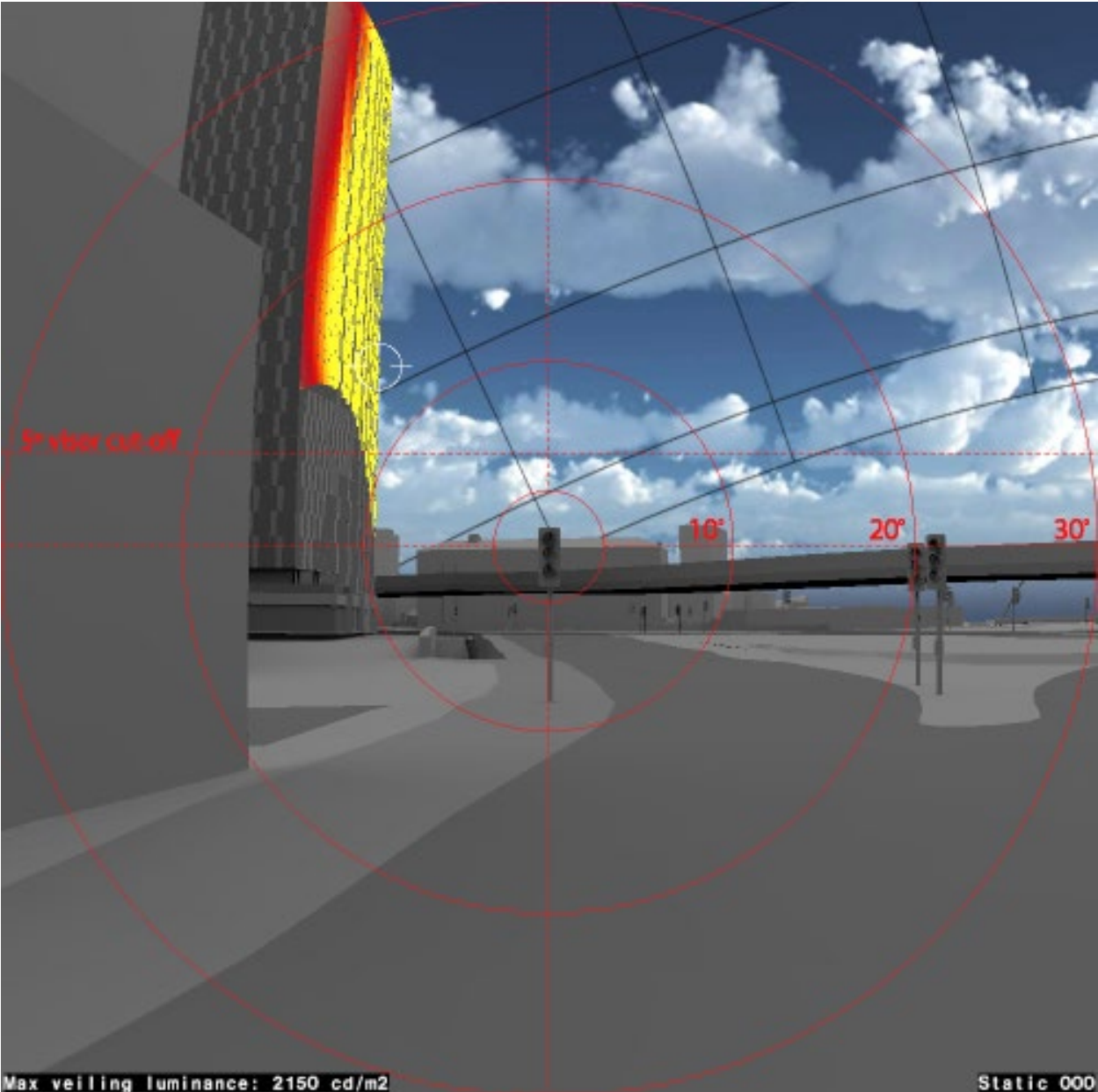
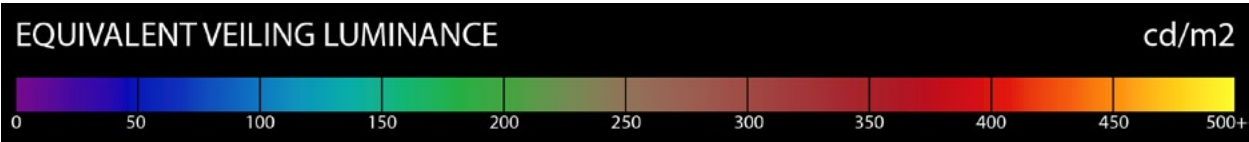


Fig. 65: Peak intensity



9.3 STAGE 3: VISUAL ASSESSMENT

VISUAL APPRAISAL

VIEWPOINT MS2A- MEDLOCK STREET
LEFT LANE, LOOKING FORWARD

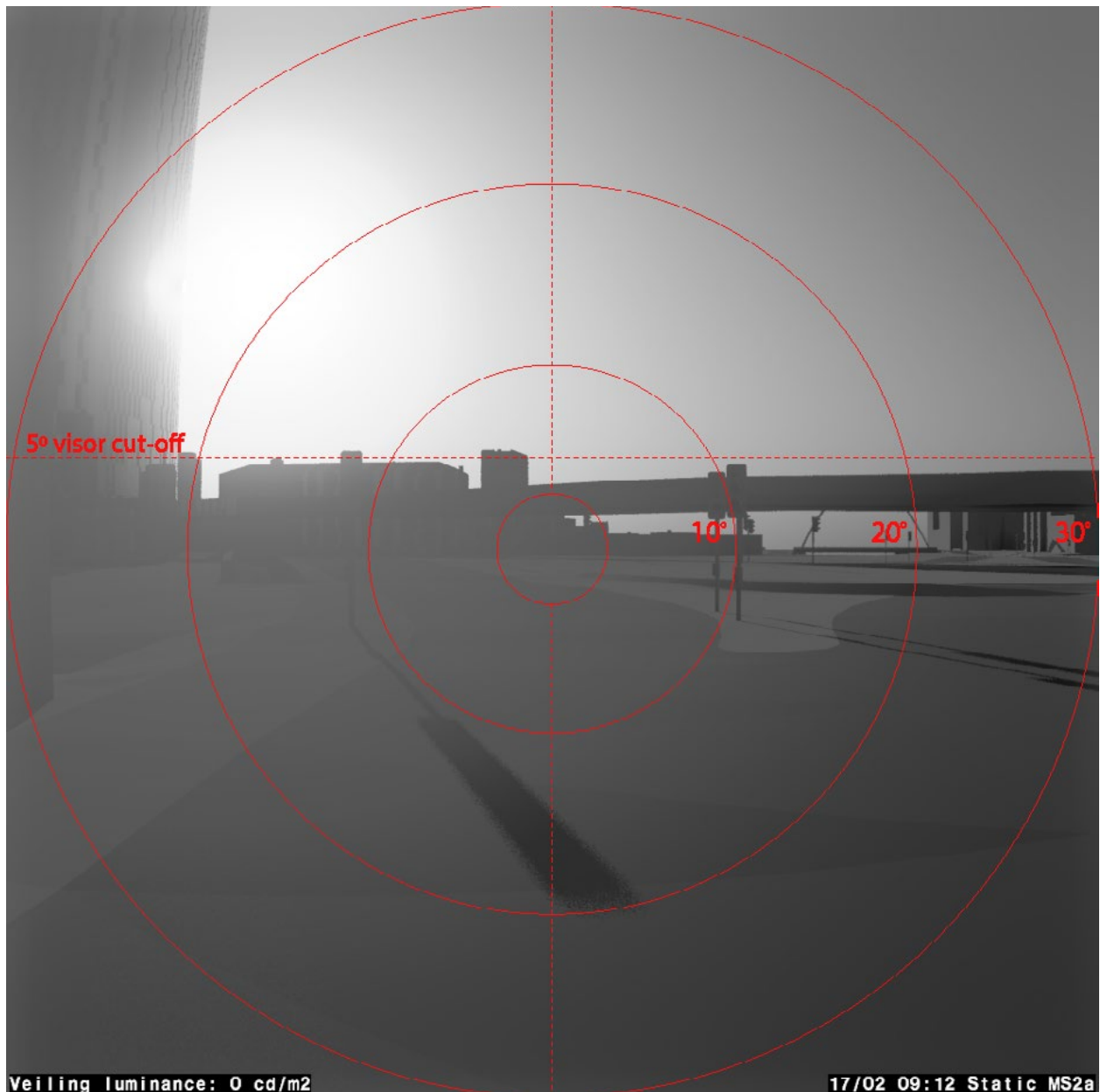


Fig. 66: Visual appraisal

VISUAL APPRAISAL
VIEWPOINT MS2B- MEDLOCK STREET
LEFT LANE, LOOKING AT LEFT TRAFFIC LIGHT

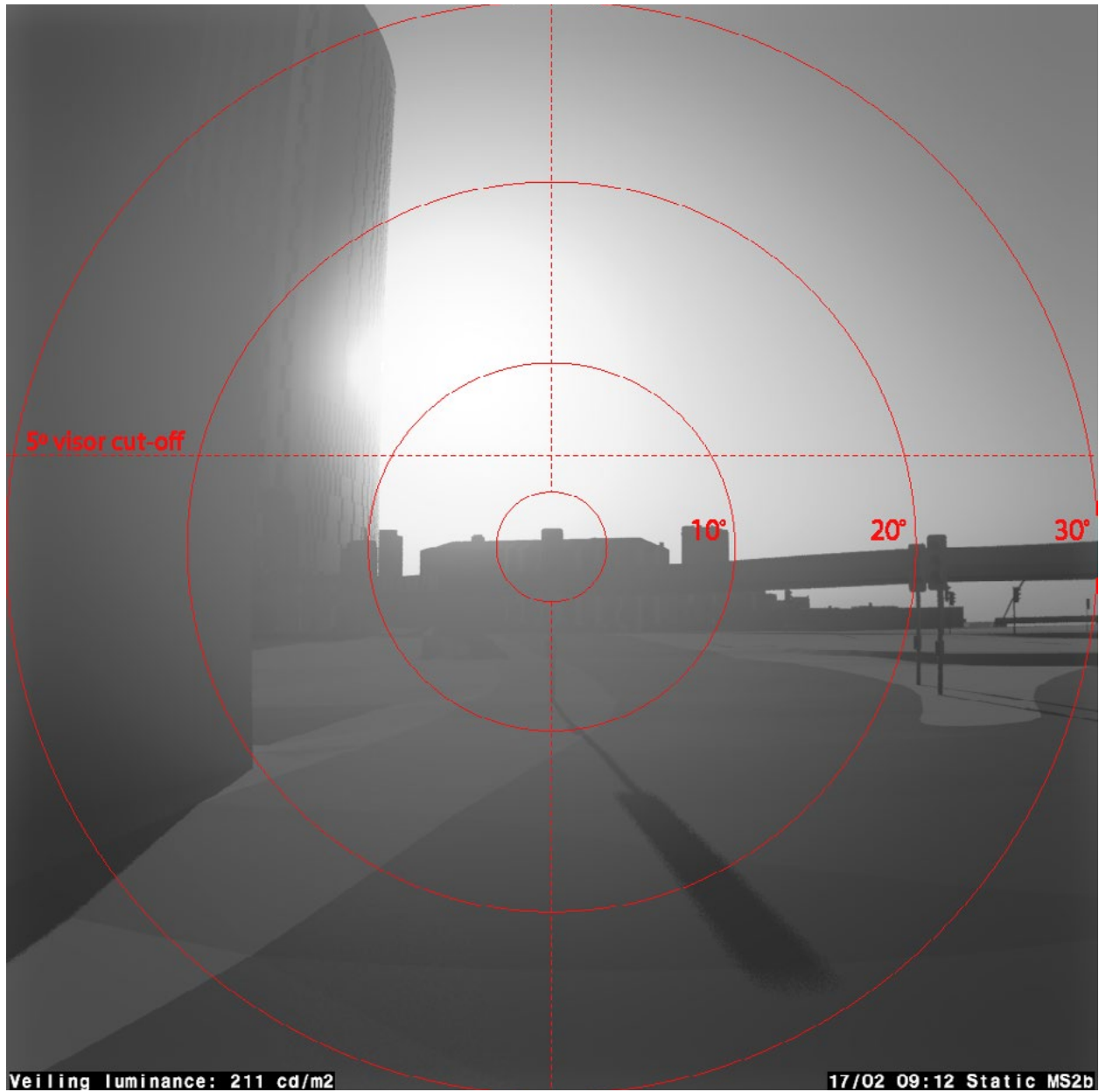


Fig. 67: Visual appraisal

10 CHESTER STREET JUNCTION WITH CAMBRIDGE STREET (CS1)



Fig. 68: Junction Location



Fig. 69: Driver's View



Fig. 70: Viewpoint

10.1 STAGE 1: STATIC ASSESSMENT

60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT CS1 - CHESTER STREET
LOOKING FORWARD

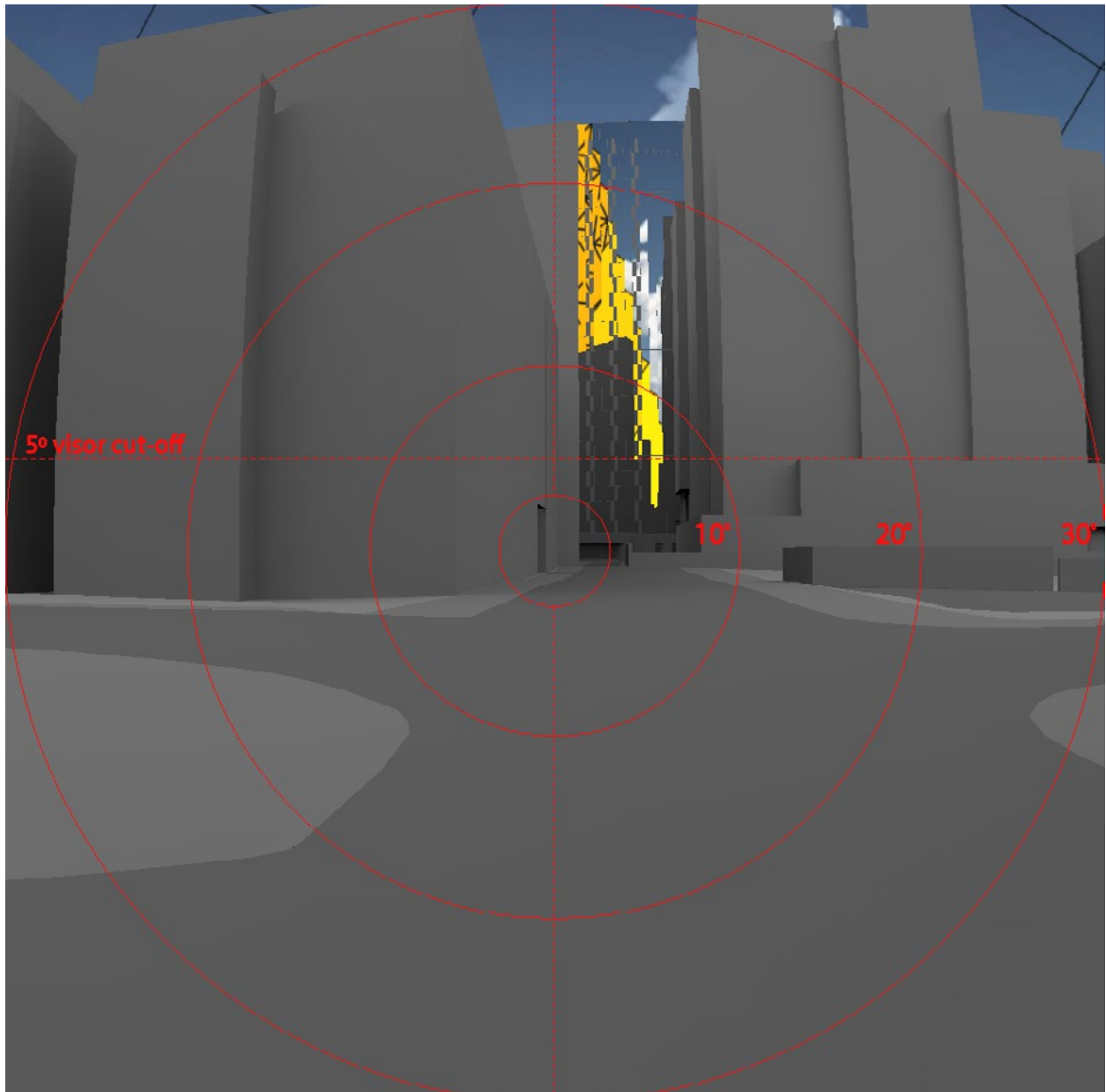
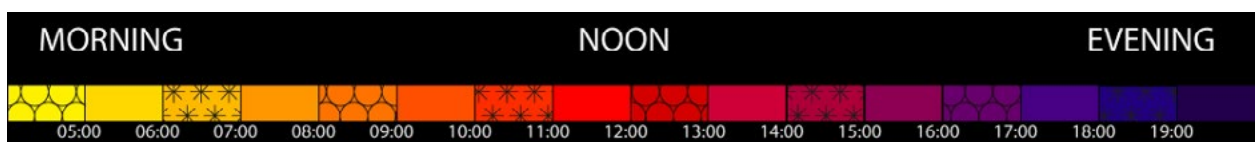


Fig. 71: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT CS1 - CHESTER STREET
LOOKING FORWARD

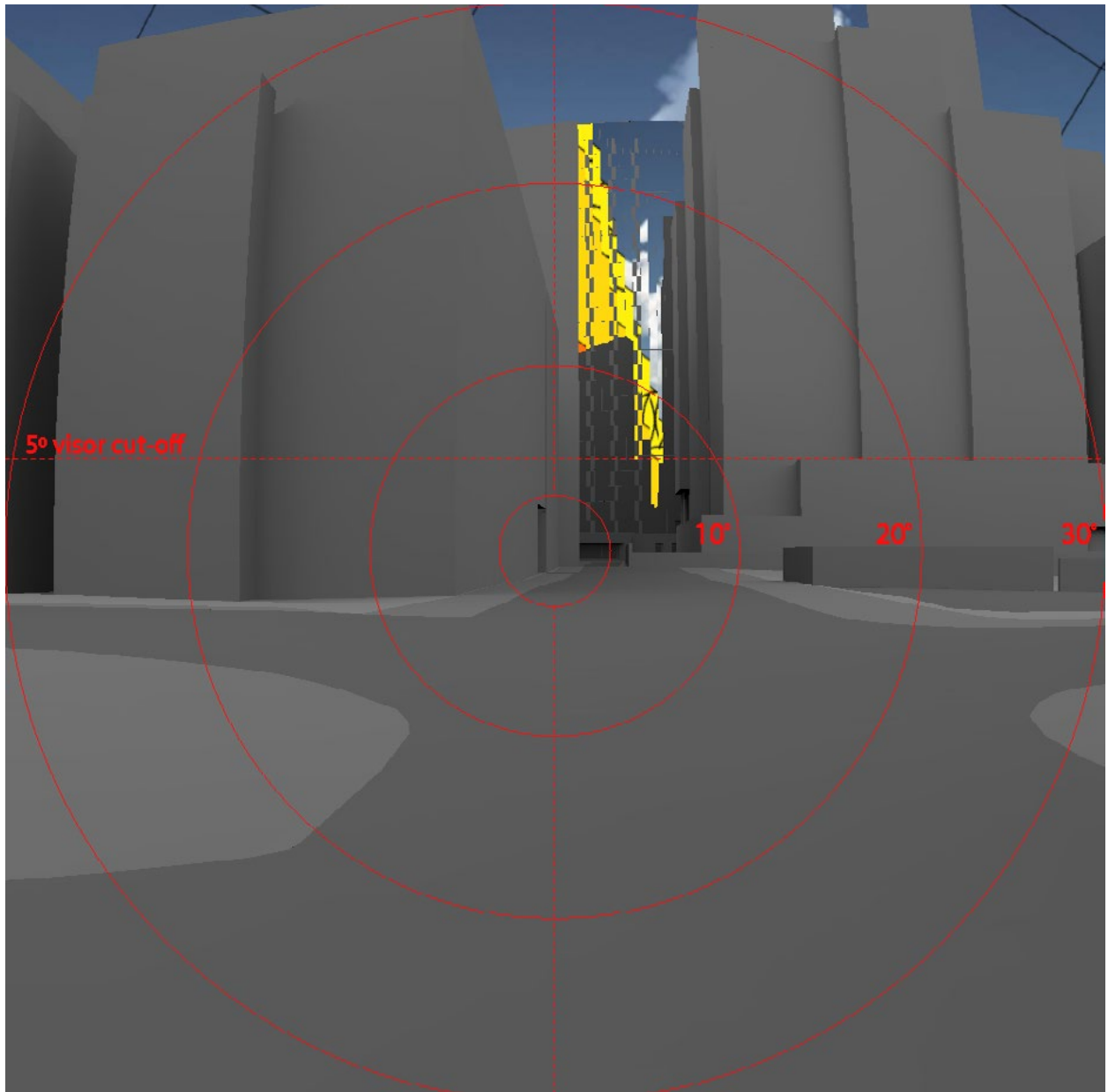


Fig. 72: Solar reflections



10.2 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

PEAK INTENSITY ASSESSMENT VIEWPOINT CS1 - CHESTER STREET LOOKING FORWARD

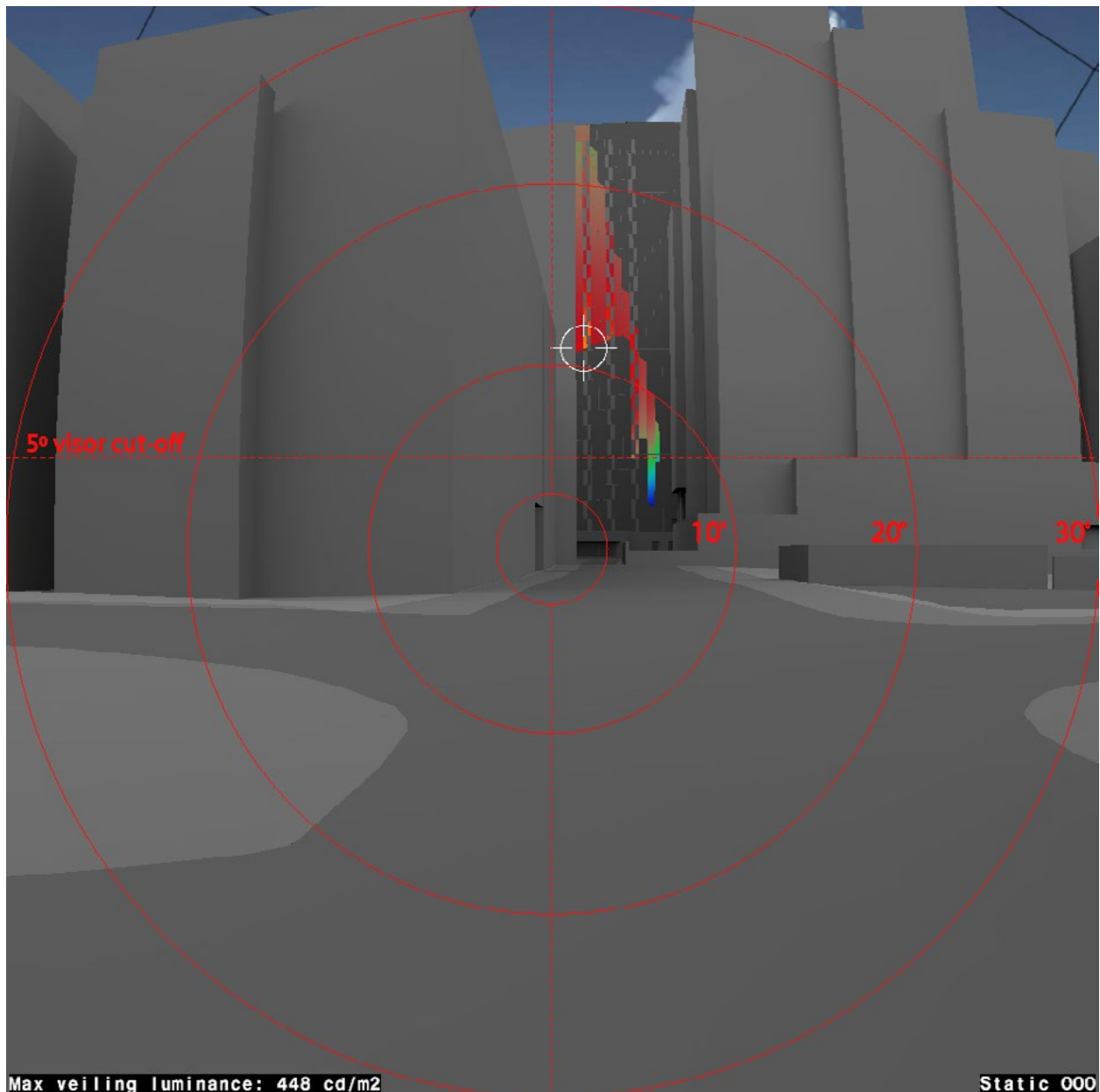
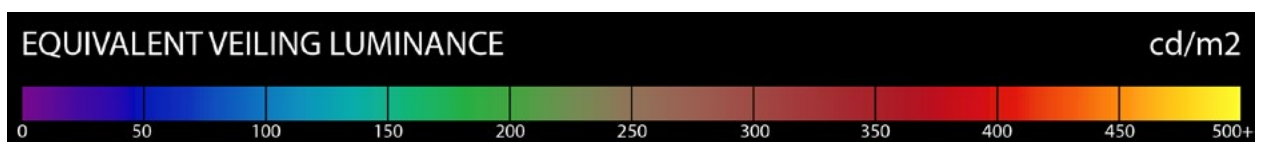


Fig. 73: Peak intensity



11 CHESTER STREET JUNCTION WITH WILMOTT STREET (CS2)



Fig. 74: Junction Location



Fig. 75: Driver's View



Fig. 76: Viewpoint

11.1 **STAGE 1: STATIC ASSESSMENT**

60° FIELD OF VIEW: TIME OF DAY
VIEWPOINT CS2 - CHESTER STREET
LOOKING FORWARD

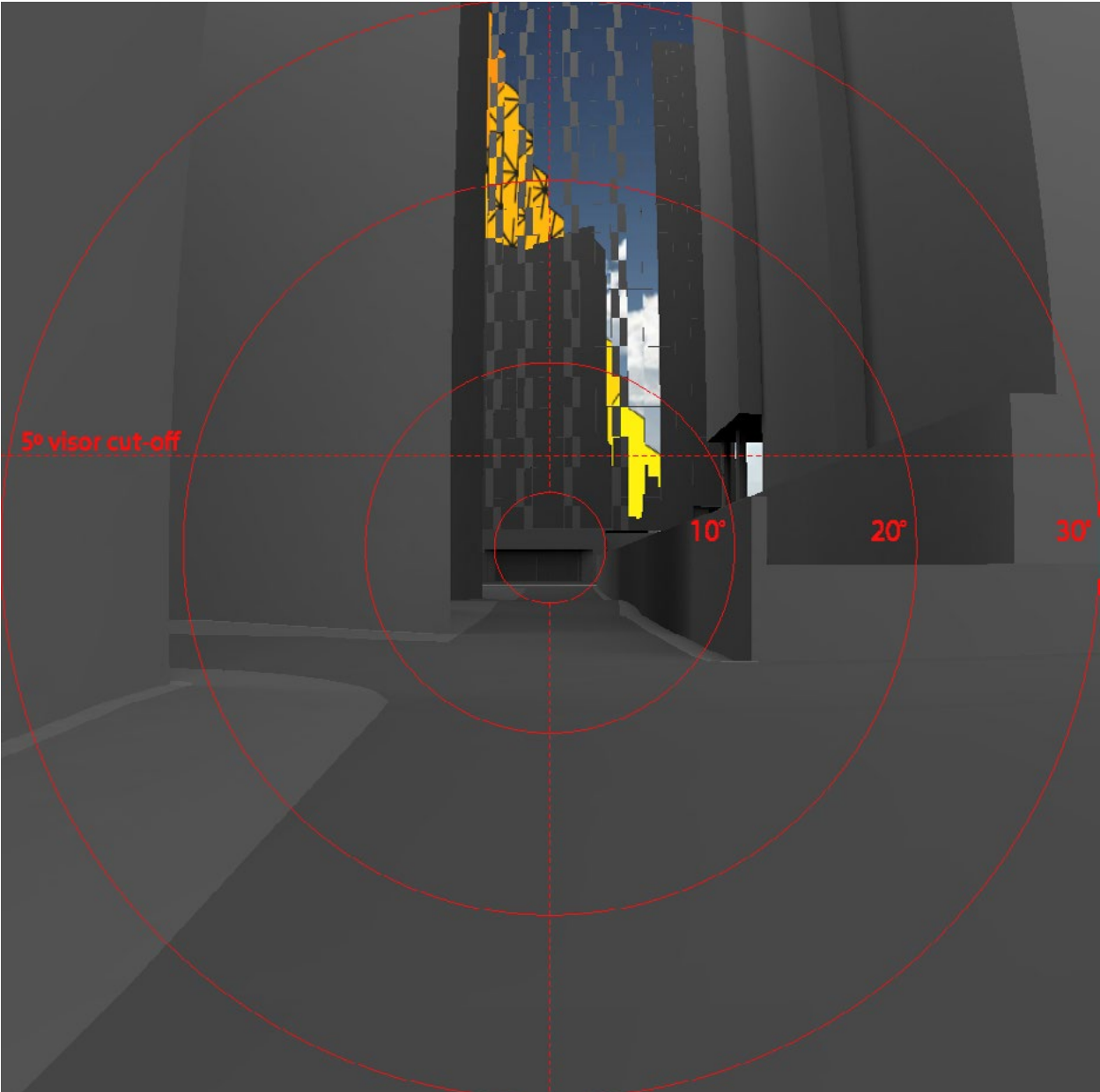
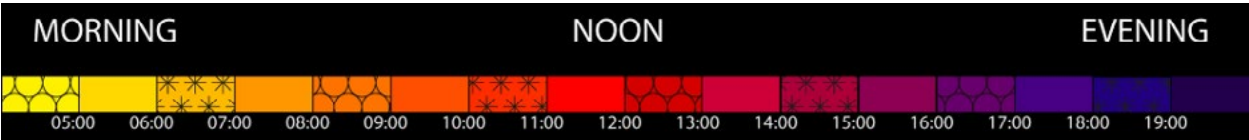


Fig. 77: Solar reflections



60° FIELD OF VIEW: SEASON
VIEWPOINT CS2 - CHESTER STREET
LOOKING FORWARD

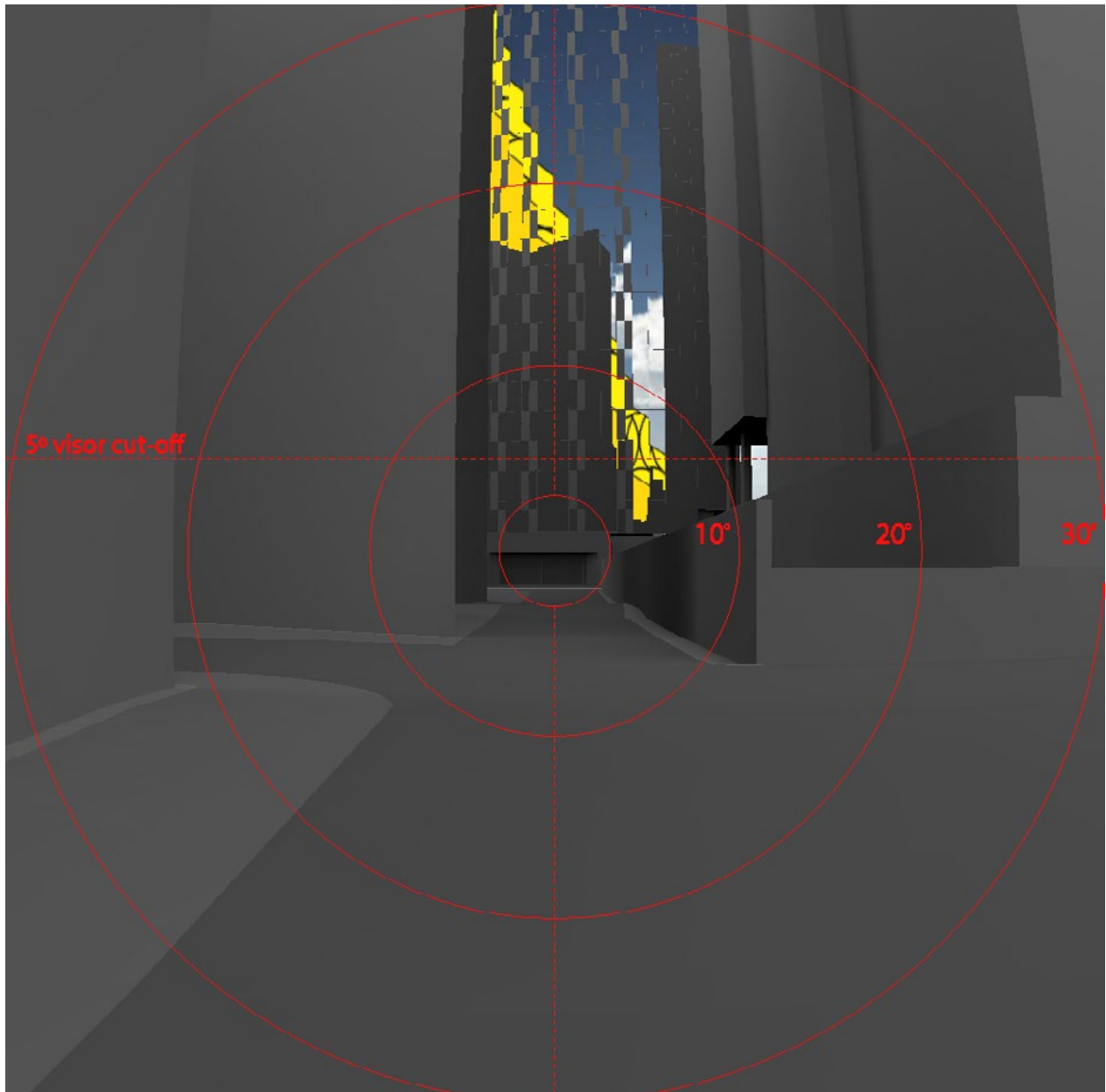


Fig. 78: Solar reflections

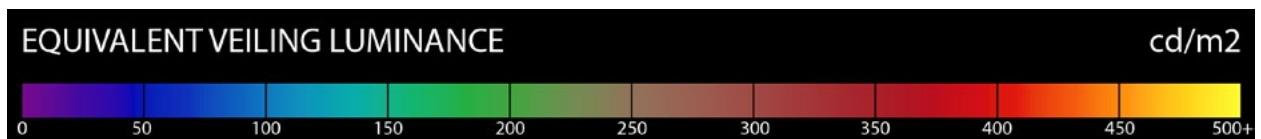


11.2 STAGE 2: POTENTIAL INTENSITY OF REFLECTIONS

PEAK INTENSITY ASSESSMENT VIEWPOINT CS2 - CHESTER STREET LOOKING FORWARD



Fig. 79: Peak intensity





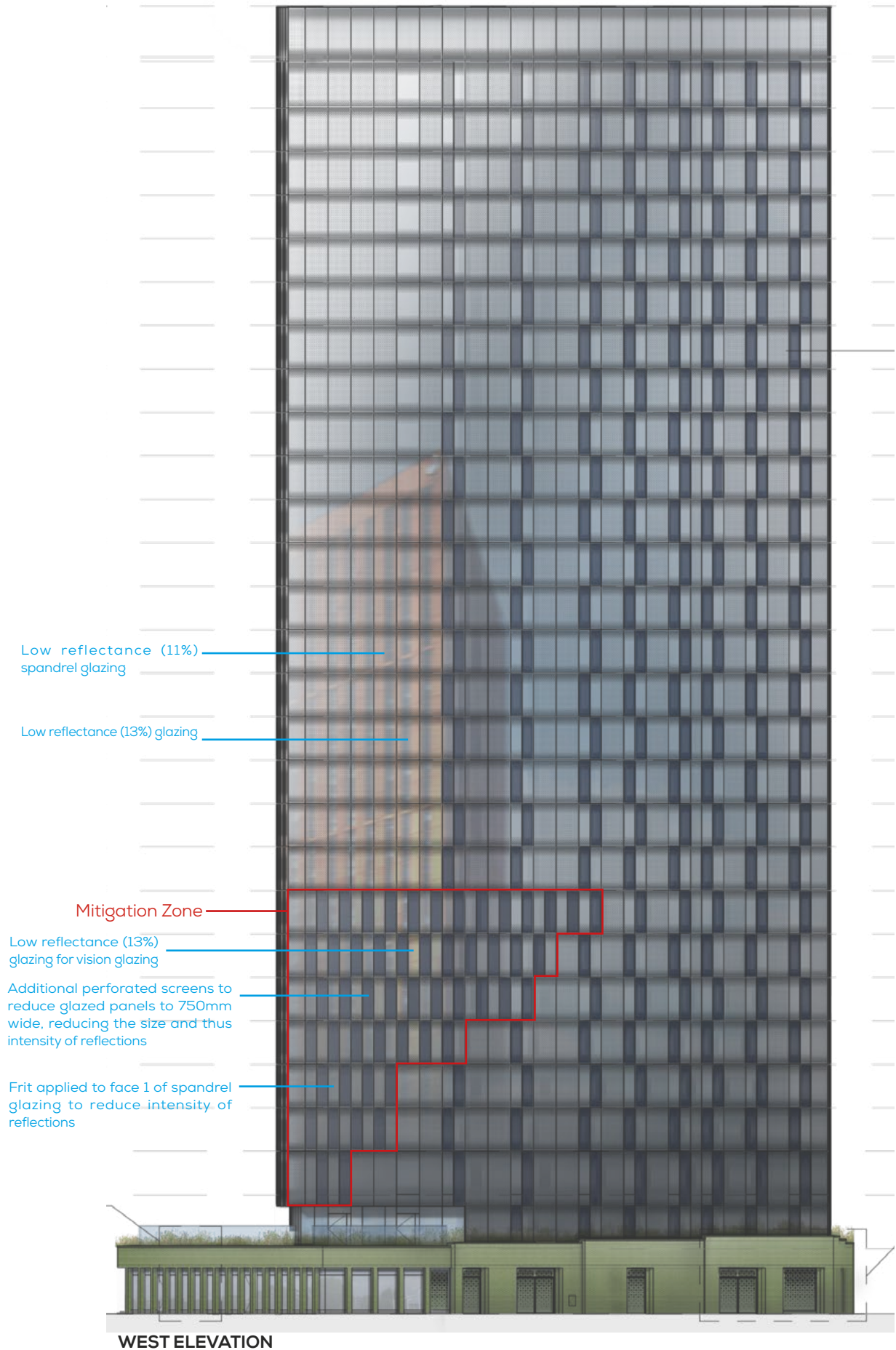
What we do:

Building Surveying
Daylight & Sunlight
Light Obstruction Notices
Measured Surveys
Party Wall & Neighbourly Matters
Rights of Light
Solar PV
Wind Analysis

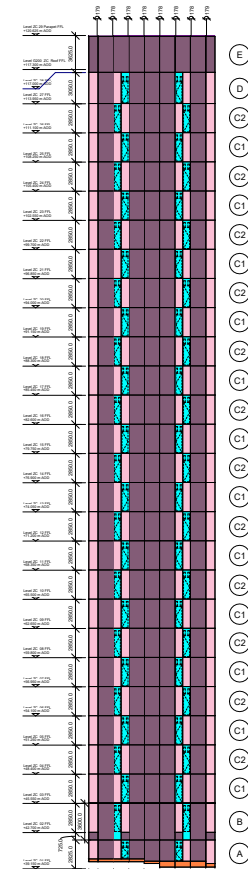
Where we are:

Belfast
Birmingham
Bristol
Dublin
London
Manchester

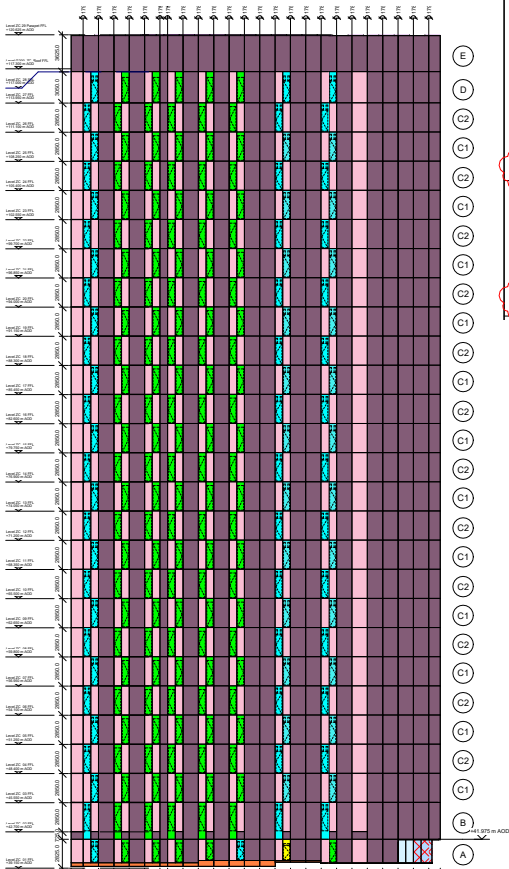
APPENDIX 2 - FACADE MITIGATION



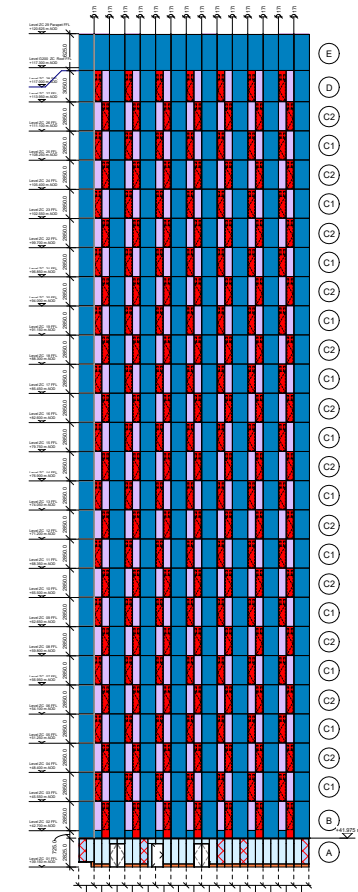
APPENDIX 3 - GLAZING SPECIFICATION



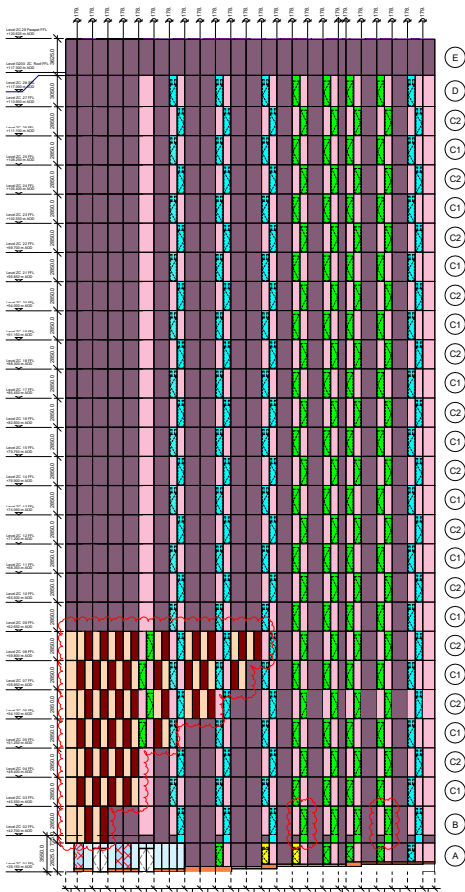
SOUTH ELEVATION



EAST ELEVATION



NORTH ELEVATION



WEST ELEVATION

Glass Laminated Panel (GLP) Types	
	GLP-101 - Vision Glazed Unit - Dark Frit
	GLP-102 - Vision Glazed Unit - Light Frit
	GLP-103 - Opaque Glazed Unit - Dark Frit
	GLP-104 - Opaque Glazed Unit - Light Frit
	GLP-105 - Podium Glazed Unit
	GLP-106 - Podium Opaque Unit
	GLP-107 - Opaque Glazed Unit - Dark Frit Face 01
	GLP-201 - Perforated Rapid Vent Panel - Dark with DRS-104
	GLP-201 - Perforated Rapid Vent Panel - Dark with DRS-105
	GLP-201 - Perforated Rapid Vent Panel - Dark with DRS-106
	GLP-202 - Perforated Rapid Vent Panel - Light with DRS-104
	GLP-203 - Perforated Metal Spandrel Panel - Dark

Project : **First Street South - Block C
Manchester**

Project nr: **260000**

Client : **Bowmer + Kirkland**

Architects: **SimpsonHaugh**

Report : **63088-FCH-ZC-ZZ-RP-O-0006**

Object: **Glass photometric datasheet**

Issued by: **Focchi Technical Department**

Rev.	Issue N°	Date	Written by	N° pages
P01	-	15/04/2026	M.Ugolini	6
P02	-	22/05/2026	M.Ugolini	11

Comments:

All the glass part of this report are the ones showed in the glass type schedule 63088-FCH-ZC-ZZ-SC-O-0001 and 63088-FCH-ZC-ZZ-SC-O-0002.

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info@focchiltd.co.uk www.focchi.it



① 10 mm Artlite on Planibel Clearlite with 30% white silk screen printing pos.2 Heat strengthened ② 20 mm Argon 90% ③ 5 mm iplus 1.1T pos.3 Heat strengthened ④ 18 mm Argon 90% ⑤ Stratobel 55.2 (5 mm iplus 1.0 pos.5 + 0.76 mm PVB Clear + 5 mm Planibel Clearlite) Annealed

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	49
External light reflection : ρ_v [%]	19
Internal light reflection : ρ_{vi} [%]	25
Colour rendering index : R_a [%]	95

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	37
External energy reflection : ρ_e [%]	26
Internal energy reflection : ρ_{ei} [%]	31
Direct energy transmission : τ_e [%]	26
Energy absorption glass 1 : ae_1 [%]	34
Energy absorption glass 2 : ae_2 [%]	7
Energy absorption glass 3 : ae_3 [%]	7
Total energy absorption : ae [%]	48
Shading coefficient : SC	0.43
UV transmission : τ_{uv} [%]	0
Selectivity	1.32

🌱 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO2 eq. /m²] ¹	NPD
---	-----

🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m².K)]	0.5
---	-----

🔊 Acoustic properties

Direct airborne sound reduction - EN 12758 : R_w (C;Ctr) [dB] ²	NPD
--	-----

🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	P2A
Pendulum body impact resistance - EN 12600	NPD / NPD / 1B1
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	63.8
Weight : [kg/m²]	63

¹ This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

² The sound reduction indexes correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3 and are tested in laboratory conditions. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is +/- 1 dB.



Glass Configurator
Calculation software verified by INISMa
EN 410 and EN 673
Report n° 2024B COU 48790



Several AGC products are now available in Low-Carbon Glass version. The Low-Carbon Glass version does not affect the properties of the above glass configuration. For more info about the AGC Low-Carbon Glass range, please visit our YourGlass page.

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① Stratobel Clearlite 66.2 Annealed ② 18 mm Argon 90% ③ 5 mm iplus 1.1T pos.3 Heat strengthened ④ 18 mm Argon 90% ⑤ Stratobel 55.2 (5 mm iplus 1.0 pos.5 + 0.76 mm PVB Clear + 5 mm Planibel Clearlite) Annealed

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	66
External light reflection : ρ_v [%]	17
Internal light reflection : ρ_{vi} [%]	18
Colour rendering index : R_a [%]	94

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	45
External energy reflection : ρ_e [%]	25
Internal energy reflection : ρ_{ei} [%]	28
Direct energy transmission : τ_e [%]	34
Energy absorption glass 1 : ae_1 [%]	26
Energy absorption glass 2 : ae_2 [%]	8
Energy absorption glass 3 : ae_3 [%]	7
Total energy absorption : ae [%]	41
Shading coefficient : SC	0.52
UV transmission : τ_{uv} [%]	0
Selectivity	1.47

🌱 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO ₂ eq. /m ²] ¹	123.1
--	-------

🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m ² .K)]	0.5
--	-----

🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	45 (-1;-3)
--	------------

🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	P2A
Pendulum body impact resistance - EN 12600	1B1 / NPD / 1B1
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	64.5
Weight : [kg/m ²]	69

¹. This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

². The sound reduction indexes are interpolated (no test available). They correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is +/- 2 dB.



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① 10 mm Artlite on Planibel Clearlite with 30% grey silk screen printing pos.2 Heat strengthened ② 20 mm Argon 90%
③ 5 mm iplus 1.1T pos.3 Heat strengthened ④ 18 mm Argon 90% ⑤ Stratobel 55.2 (5 mm iplus 1.0 pos.5 + 0.76 mm PVB Clear + 5 mm Planibel Clearlite) Annealed

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	47
External light reflection : ρ_v [%]	13
Internal light reflection : ρ_{vi} [%]	19
Colour rendering index : R_a [%]	95

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	36
External energy reflection : ρ_e [%]	22
Internal energy reflection : ρ_{ei} [%]	28
Direct energy transmission : τ_e [%]	25
Energy absorption glass 1 : ae_1 [%]	39
Energy absorption glass 2 : ae_2 [%]	7
Energy absorption glass 3 : ae_3 [%]	7
Total energy absorption : ae [%]	53
Shading coefficient : SC	0.41
UV transmission : τ_{uv} [%]	0
Selectivity	1.31

🌱 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO2 eq. /m²] ¹	NPD
---	-----

🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m².K)]	0.5
---	-----

🔊 Acoustic properties

Direct airborne sound reduction - EN 12758 : R_w (C;Ctr) [dB] ²	NPD
--	-----

🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	P2A
Pendulum body impact resistance - EN 12600	NPD / NPD / 1B1
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	63.8
Weight : [kg/m²]	63

¹ This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

² The sound reduction indexes correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3 and are tested in laboratory conditions. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is +/- 1 dB.



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① Stratophone 88.4 (8 mm Planibel Clearlite + 1.52 mm Acoustic PVB clear + 8 mm Artlite on Planibel Clearlite with 30% grey silk screen printing pos.2) Heat strengthened ② 16 mm Argon 90% ③ 5 mm iplus 1.1T pos.3 Heat strengthened ④ 16 mm Argon 90% ⑤ Stratobel 55.2 (5 mm iplus 1.0 pos.5 + 0.76 mm PVB Clear + 5 mm Planibel Clearlite) Annealed

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	46
External light reflection : ρ_v [%]	13
Internal light reflection : ρ_{vi} [%]	19
Colour rendering index : R_a [%]	94

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	32
External energy reflection : ρ_e [%]	16
Internal energy reflection : ρ_{ei} [%]	28
Direct energy transmission : τ_e [%]	24
Energy absorption glass 1 : α_{e1} [%]	50
Energy absorption glass 2 : α_{e2} [%]	5
Energy absorption glass 3 : α_{e3} [%]	5
Total energy absorption : α_e [%]	60
Shading coefficient : SC	0.37
UV transmission : τ_{uv} [%]	0
Selectivity	1.44

🌱 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO2 eq. /m²] ¹	NPD
---	-----

🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m².K)]	0.5
---	-----

🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	48 (-1;-4)
--	------------

🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	P2A
Pendulum body impact resistance - EN 12600	NPD / NPD / 1B1
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	65.3
Weight : [kg/m²]	80

¹. This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

². The sound reduction indexes are interpolated (no test available). They correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is ± 2 dB.



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- ① 10 mm Artlite on Planibel Clearlite with 50% white silk screen printing pos.2 Heat strengthened ② 18 mm Air 100%
 ③ 8 mm Artlite on Planibel Clearlite with 100% grey silk screen printing pos.4 Heat soaked thermally toughened

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	2
External light reflection : ρ_v [%]	21
Internal light reflection : ρ_{vi} [%]	12
Colour rendering index : R_a [%]	84

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	34
External energy reflection : ρ_e [%]	18
Internal energy reflection : ρ_{ei} [%]	13
Direct energy transmission : τ_e [%]	6
Energy absorption glass 1 : ae_1 [%]	39
Energy absorption glass 2 : ae_2 [%]	37
Total energy absorption : ae [%]	76
Shading coefficient : SC	0.39
UV transmission : τ_{uv} [%]	0
Selectivity	0.06

🌿 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO ₂ eq. /m ²] ¹	NPD
--	-----

🔥 Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m ² .K)]	2.7
--	-----

🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	38 (-2;-4)
--	------------

🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	NPD
Pendulum body impact resistance - EN 12600	NPD / 1C2
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	36.0
Weight : [kg/m ²]	45

¹. This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

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 ③ 8 mm Artlite on Planibel Clearlite with 100% grey silk screen printing pos.4 Heat soaked thermally toughened

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	2
External light reflection : ρ_v [%]	11
Internal light reflection : ρ_{vi} [%]	12
Colour rendering index : R_a [%]	84

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	34
External energy reflection : ρ_e [%]	11
Internal energy reflection : ρ_{ei} [%]	13
Direct energy transmission : τ_e [%]	6
Energy absorption glass 1 : ae_1 [%]	47
Energy absorption glass 2 : ae_2 [%]	36
Total energy absorption : ae [%]	83
Shading coefficient : SC	0.39
UV transmission : τ_{uv} [%]	0
Selectivity	0.06

🌿 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO ₂ eq. /m ²] ¹	NPD
--	-----

🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m ² .K)]	2.7
--	-----

🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	38 (-2;-4)
--	------------

🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	NPD
Pendulum body impact resistance - EN 12600	NPD / 1C2
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	36.0
Weight : [kg/m ²]	45

¹ This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

² The sound reduction indexes are interpolated (no test available). They correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is +/- 2 dB.



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 Report n° 2024B COU 48790



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AGC makes no express or implied warranty of any kind with respect to the Glass Configurator. There are no warranties of merchantability, non-infringement or fitness for any particular purpose and no warranty shall be implied by operation of law or otherwise. In no event shall AGC be liable for direct, indirect, consequential or incidental damages of any kind relating to or resulting from the use of the Glass Configurator.

- ① 10 mm Artlite on Planibel Clearlite with 50% grey silk screen printing pos.1 Heat strengthened ② 18 mm Air 100%
 ③ 8 mm Artlite on Planibel Clearlite with 100% grey silk screen printing pos.4 Heat soaked thermally toughened

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	2
External light reflection : ρ_v [%]	12
Internal light reflection : ρ_{vi} [%]	12
Colour rendering index : R_a [%]	84

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	34
External energy reflection : ρ_e [%]	12
Internal energy reflection : ρ_{ei} [%]	13
Direct energy transmission : τ_e [%]	6
Energy absorption glass 1 : ae_1 [%]	47
Energy absorption glass 2 : ae_2 [%]	35
Total energy absorption : ae [%]	82
Shading coefficient : SC	0.39
UV transmission : τ_{uv} [%]	0
Selectivity	0.06

🌿 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO ₂ eq. /m ²] ¹	NPD
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🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m ² .K)]	2.7
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🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	38 (-2;-4)
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🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	NPD
Pendulum body impact resistance - EN 12600	NPD / 1C2
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	36.0
Weight : [kg/m ²]	45

¹. This value represents the global warming potential (GWP) associated with the production of the configured glass product. This value covers the entire production phase (module A1 to A3); no other stage in the product's life cycle is included in this value. This GWP value is calculated according to the modelling principles defined in EN 15804+A2:2019. A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impact on the building, and must consider the entire life cycle (all information modules), which can be obtained via the full EPD.

². The sound reduction indexes are interpolated (no test available). They correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is +/- 2 dB.



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① Stratobel Clearlite 88.2 Heat strengthened ② 14 mm Argon 90% ③ 5 mm iplus 1.0T pos.3 Heat strengthened ④ 16 mm Argon 90% ⑤ Stratobel 66.4 (6 mm iplus 1.0T pos.5 + 1.52 mm PVB Clear + 6 mm Planibel Clearlite) Heat strengthened

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	67
External light reflection : ρ_v [%]	16
Internal light reflection : ρ_{vi} [%]	17
Colour rendering index : R_a [%]	93

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	43
External energy reflection : ρ_e [%]	23
Internal energy reflection : ρ_{ei} [%]	24
Direct energy transmission : τ_e [%]	34
Energy absorption glass 1 : α_{e1} [%]	31
Energy absorption glass 2 : α_{e2} [%]	6
Energy absorption glass 3 : α_{e3} [%]	6
Total energy absorption : α_e [%]	43
Shading coefficient : SC	0.50
UV transmission : τ_{uv} [%]	0
Selectivity	1.56

🌿 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO2 eq. /m²] ¹	...
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🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m².K)]	0.5
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🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	45 (-1;-3)
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🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	P4A
Pendulum body impact resistance - EN 12600	1B1 / NPD / 1B1
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	65.3
Weight : [kg/m²]	85

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² The sound reduction indexes are interpolated (no test available). They correspond to glazing with dimensions 1230 mm by 1480 mm according to EN ISO 10140-3. In-situ performances may vary according to the effective glazing dimensions, supporting system, installation, environment, noise sources etc. The accuracy of the given indexes is ± 2 dB.



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① 10 mm Planibel Clearlite Thermally toughened ② 10 mm Air 100% ③ 8 mm Artlite on Planibel Clearlite with 100% grey silk screen printing pos.4 Thermally toughened

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	4
External light reflection : ρ_v [%]	16
Internal light reflection : ρ_{vi} [%]	12
Colour rendering index : R_a [%]	85

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	50
External energy reflection : ρ_e [%]	14
Internal energy reflection : ρ_{ei} [%]	13
Direct energy transmission : τ_e [%]	9
Energy absorption glass 1 : ae_1 [%]	14
Energy absorption glass 2 : ae_2 [%]	63
Total energy absorption : ae [%]	77
Shading coefficient : SC	0.58
UV transmission : τ_{uv} [%]	1
Selectivity	0.08

🌿 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO ₂ eq. /m ²] ¹	NPD
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🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m ² .K)]	2.9
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🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	36 (-1;-3)
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🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	NPD
Pendulum body impact resistance - EN 12600	1C1 / 1C2
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	28.0
Weight : [kg/m ²]	45

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① Stratobel Clearlite 66.4 Annealed ② 16 mm Argon 90% ③ Stratobel 66.4 (6 mm iplus 1.0T pos.3 + 1.52 mm PVB Clear + 6 mm Planibel Clearlite) Heat strengthened

Glass performance data simulation

☀️ Light properties - EN 410

Light transmittance : τ_v [%]	76
External light reflection : ρ_v [%]	12
Internal light reflection : ρ_{vi} [%]	13
Colour rendering index : R_a [%]	95

🔥 Energy properties - EN 410

Total solar energy transmittance : g [%]	53
External energy reflection : ρ_e [%]	20
Internal energy reflection : ρ_{ei} [%]	20
Direct energy transmission : τ_e [%]	44
Energy absorption glass 1 : α_{e1} [%]	27
Energy absorption glass 2 : α_{e2} [%]	9
Total energy absorption : α_e [%]	36
Shading coefficient : SC	0.61
UV transmission : τ_{uv} [%]	0
Selectivity	1.43

🌱 Environmental properties

Cradle to Gate – Global warming potential: Module A1-A3 : [kg CO2 eq. /m²] ¹	128.5
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🌡️ Thermal properties - EN 673

Thermal transmittance (vertical glazing) : U value [W/(m².K)]	1.0
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🔊 Acoustic properties

Direct airborne sound reduction - Interpolated : R_w (C;Ctr) [dB] ²	42 (-1;-6)
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🛡️ Safety properties

Resistance to fire - EN 13501-2	NPD
Reaction to fire - EN 13501-1	NPD
Bullet resistance - EN 1063	NPD
Burglar resistance - EN 356	P4A
Pendulum body impact resistance - EN 12600	1B1 / 1B1
Explosion resistance - EN 13541	NPD

📏 Thickness and weight

Nominal thickness : [mm]	43.0
Weight : [kg/m²]	63

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