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**DAYLIGHT & SUNLIGHT**  
SOLAR GLARE ASSESSMENT

**Lever Street, Manchester**

**08 November 2024**

GIA No: **19922**

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# 1 EXECUTIVE SUMMARY

The purpose of this report is to ascertain whether the Proposed Development will give rise to significant effects in terms of solar glare to drivers at surrounding road junctions. This report has been prepared to support the planning application for the NXQ Lever Street scheme. Contained within this report are the final solar glare assessments undertaken for the proposed and retained façades.

A total of 13 road junctions surrounding the site have been considered sensitive to potential reflections from the Proposed Development, as shown in Figure 14. At each of the 13 junctions, all relevant viewpoints have been assessed and are discussed within this report.

The following five junctions would be unaffected in terms of solar glare with no reflections visible within 30° or would experience non-significant effects as all reflections occur outside 10° of a drivers' direct line of sight:

- Junction LS3 - Lever Street junction with Great Ancoats Street;
- Junction LLS - Little Lever Street junction with Hilton Street;
- Junction BS1 - Brewer Street junction with Tarriff Street;
- Junction BS2 - Brewer Street junction with Port Street; and
- Junction HS2 - Houldworth Street junction with Lever Street.

The remaining eight sensitive locations would see occurrences of reflections within 10° of a driver's direct line of sight to varying degrees, however for one or more of the following reasons, the reflections are not considered sufficient to give rise to a significant instance of solar glare that may affect visibility of signals or a drivers' safe manoeuvring at a junction:

- Potential reflections occur above the drivers' visor cut-off line which would mitigate potential reflections when deployed;
- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each glazed panels and are less likely to result in the full sun's intensity being reflected;
- Reflections are generated by curved corners where the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time;

- Alternative traffic lights can be relied upon to break safely when reflections would occur;
- The reflections occur outside peak traffic times;
- The probability of the sun shining at the times when reflections could occur is low;
- The solar intensity is low at the times of the day and year when reflections could occur, therefore reflections generated would be low intensity;
- The sun's path sits within the direct line of sight, therefore reflections that occur from the proposed development would be significantly less intense than the intensity of the direct view of the sun that is currently visible at the location; and
- In some locations there are no signals where visibility can be affected by reflections from the Proposed Development.

Owing to the reflections occurring within 10° at some locations, it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

We therefore conclude that the facade design of the Proposed Lever Street scheme would not give rise to significant effects in terms of solar glare to drivers at surrounding road junctions.

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## 2 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 ( and ). 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 and 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.

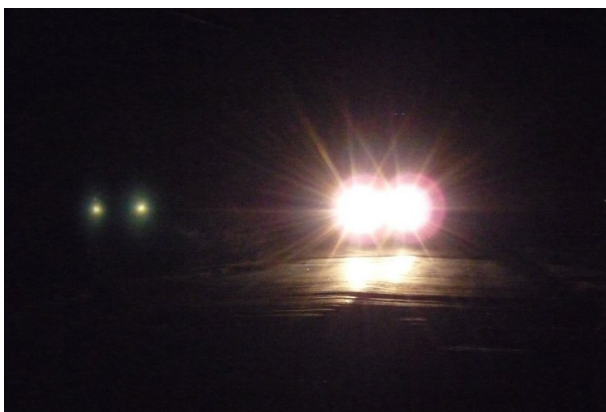


Fig. 01: Headlights at night



Fig. 02: Headlights during day

### 3 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.

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 disability 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."*

## 4 GIA'S APPROACH AND METHODOLOGY

Following the guidance documents referenced above, GIA have developed specialised computer software to undertake reflected glare assessments.

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 (Para. 3.4); and
- ImageanalysisoftheStaticAssessment(Paragraph 3.5)
- The limitations of this approach and methodology are set out in Paragraph 3.8.

### 4.1 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. 03, Fig. 04 and Fig. 05.

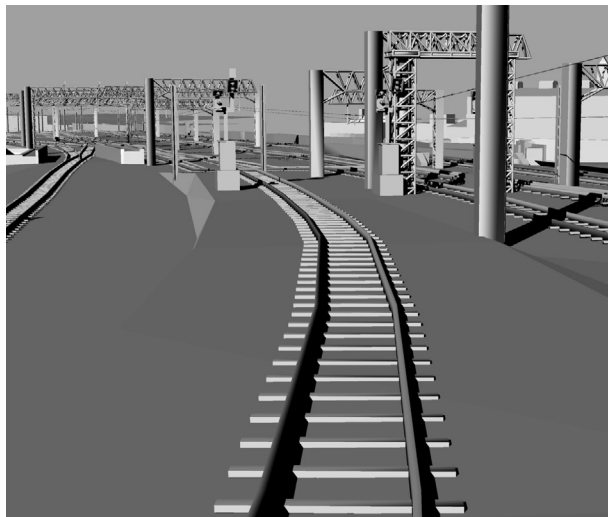


Fig. 03: Computer model of train tracks & signals from photogrammetry

### 4.2 REFLECTIVE SURFACE PROPERTIES

The 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.

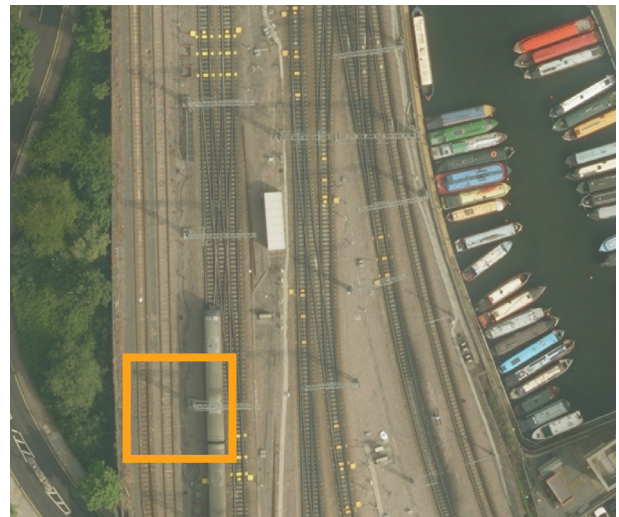


Fig. 04: High-resolution aerial photograph



Fig. 05: High-resolution aerial photograph (close-up)

### 4.3 RENDERING OF STILLS

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

For road drivers, sensitive viewpoints around the site are selected in locations where reflected solar glare may cause adverse impacts to those travelling towards the Proposed Development. The viewpoints are generally located at the minimum stopping distance and at the driver’s eye height. The focal point is a relevant traffic element, such as signals or incoming traffic.

The stopping distance is calculated as the combination of thinking and breaking distances  $D_{total} = D_{thinking} + D_{breaking} = V \cdot T + \frac{V^2}{(2\mu \cdot g)}$ , where each component is:

V = Relevant vehicle speed, typically the road speed limit.

T = Thinking time (0.67 sec)

μ = Breaking effort (considered 0.65 for cars, 0.5 for buses and 0.031 for trains)

g = Gravity acceleration.

The height of the viewpoint is considered to be 1.5 m for cars, 2.0 m for buses and 2.75 m for trains.

I.e. A viewpoint for car driving at 30 mph would be placed at 23m from a traffic light and at 1.5 m above the ground (see ).

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. 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.

### Typical Stopping Distances



Fig. 06: Typical car stopping distances for various speed limits

#### 4.4 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. 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.

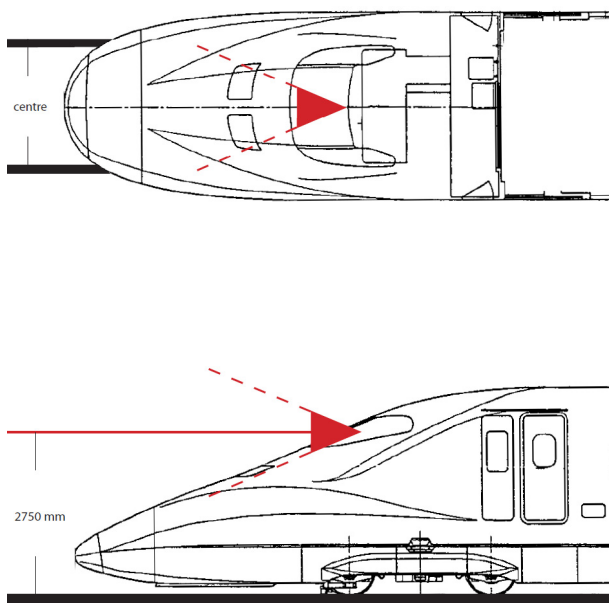


Fig. 07: Driver Viewpoint

#### 4.5 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.

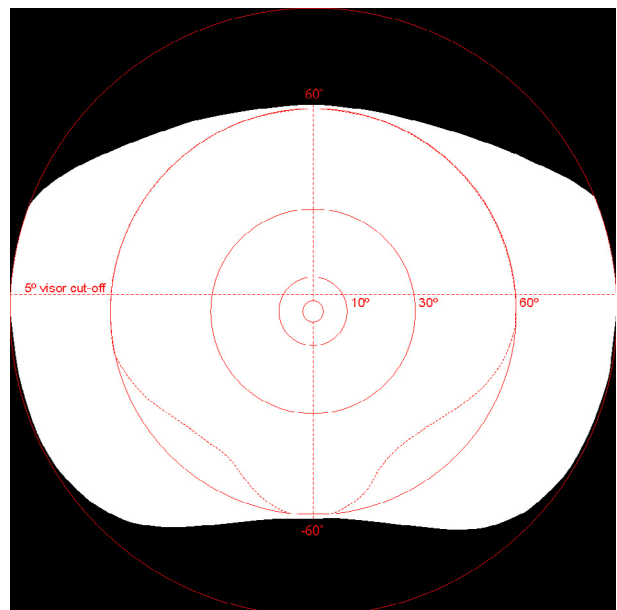


Fig. 08: Typical human field of view

Fig. 09 shows the colour coded sunpaths projected onto the sky dome to visualise the time of day and season during which solar reflections occur.

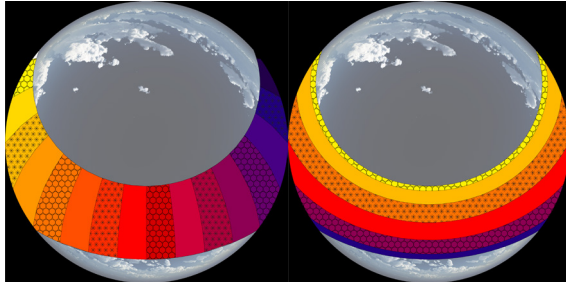


Fig. 09: Stage 1 - Colour coded sunpath for time of day and seasons

Two identical viewpoints are rendered as shown in and : 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;

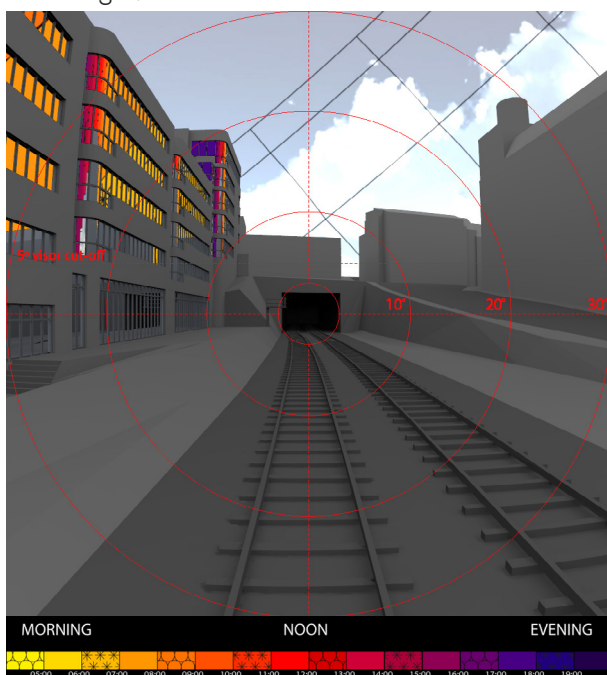


Fig. 10: Stage 1 Example - Hours

## 4.6 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.

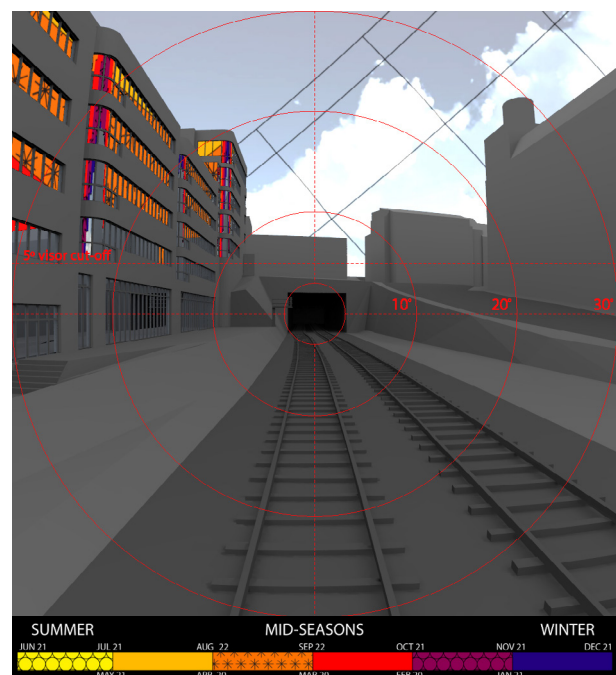


Fig. 11: Stage 1 Example - Months

## 5 DISCUSSION & CONCLUSIONS

To study the likely occurrence of sunlight being reflected towards drivers on roads surrounding the Site, solar glare assessments have been undertaken at all sensitive locations where the proposal would be visible within 30° of a drivers' direct line of sight. Where a junction is served by multiple signals and lanes, multiple relevant viewpoints may have been assessed, as well as all directions of travel where the proposal can be seen. The location of the relevant sensitive locations is shown on Page 22.

Our glare studies at the relevant sensitive locations are presented within pages 24-63 of this report and a detailed discussion provided for all sensitive locations where reflections from the Proposed Development occur within 10° of a driver's direct line of sight and thus have the potential to result in instances of solar glare.

The following junctions are considered to have no impact in terms of solar glare owing to no reflections being given off the façades of the Proposed Development within the driver's 60° field of view:

- Junction LS3 - Lever Street junction with Great Ancoats Street.

The proposed development is visible within the field of view at the following junctions, however reflections occur outside 10° of the driver's line of sight and are not considered to be not significant:

- Junction LLS - Little Lever Street junction with Hilton Street;
- Junction BS1 - Brewer Street junction with Tarriff Street;
- Junction BS2 - Brewer Street junction with Port Street; and
- Junction HS2 - Houldworth Street junction with Lever Street.

The remaining junctions are discussed in more detail within the following pages.

### Junction LS1 – Lever Street junction with Dale Street

Two viewpoints have been assessed at this junction, LS1a and LS1b. Viewpoint LS1a shows the view of drivers in the right lane looking forward whilst viewpoint LS1b shows drivers in the right lane looking at the right side traffic lights. There is a second traffic light on the opposite side of the junction primarily for use by stationary vehicles and an alternative traffic lights on the left side of the road.

All reflections within viewpoint LS1a occur outside 10° of a driver’s line of sight so are considered to be not significant.

At this junction, for both viewpoints assessed:

- The view of drivers looking straight ahead is not significantly effected;
- For the reflections generated by the curved corners within 10° when drivers are looking at the right side traffic lights, the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time;
- The reflections occur outside the most sensitive 5° field;
- Multiple traffic lights can be relied upon to break safely when reflections would occur, where drivers

have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;

- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun’s intensity being reflected for a significant duration;
- The reflections mostly occur in the afternoon during the winter months when the solar intensity is low, therefore any reflections generated would be low intensity;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers’ line of sight is 10-50%. Reflections from the main facade would only have a probability of 10-30%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver’s direct line of sight, the times when reflections would occur (as identified in Table 01) and the factors outlined above, solar glare at the Lever Street junction with Dale Street is considered unlikely to cause significant concern for drivers.

Table 01: Summary of reflections at Junction LS1 within 10°

| VIEWPOINT | FACADE                | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR                                  | LOCATION WITHIN 30° OF DRIVER’S LINE OF SIGHT |
|-----------|-----------------------|-----------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------|
| LS1b      | South-Western (main)  | 14:00 to 15:00 GMT                      | Mid-seasons (Mid-January to mid-February and mid-October to mid-November) | Reflections are visible from 5° to 7°         |
|           | Western Curved Corner | 15:00 to 19:00 GMT                      | Throughout the year (Mid-January to mid-November)                         | Very thin strips, visible between 6° to 8°    |

### Junction LS2 - Lever Street pedestrian crossing

Two viewpoints have been assessed at this junction, LS2a and LS2b. Viewpoint LS2a shows the view of drivers in the right lane looking forward, whilst viewpoint LS2b shows drivers in the right lane looking at the right traffic lights. There is a second traffic light on the opposite side of the junction primarily for use by stationary vehicles and an alternative traffic lights on the left side of the road.

All reflections within viewpoint LS2a occur outside 10° of a driver's line of sight so are considered to be not significant.

At this junction, for both viewpoints assessed:

- The view of drivers looking straight ahead is not significantly effected;
- The reflections within 10° when drivers are looking at the right side traffic lights occur from curved corner glazing where the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time and they are predominantly located above the drivers visor line, where drivers could deploy their visor to mitigate most reflections;
- The reflections only just fall within the 10° field;
- Multiple traffic lights can be relied upon to break safely when reflections would occur, where drivers have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;

- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun's intensity being reflected for a significant duration;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers' line of sight is 10-50%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver's direct line of sight, the times when reflections would occur (as identified in Table 02) and the factors outlined above, solar glare at the Lever Street pedestrian crossing is considered unlikely to cause significant concern for drivers.

Table 02: Summary of reflections at Junction LS2 within 10°

| VIEWPOINT | FACADE                | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR          | LOCATION WITHIN 30° OF DRIVER'S LINE OF SIGHT |
|-----------|-----------------------|-----------------------------------------|---------------------------------------------------|-----------------------------------------------|
| LS2b      | Western Curved Corner | 15:00 to 19:00 GMT                      | Throughout the year (Mid-January to mid-November) | Very thin strips, visible between 9° to 10°   |

**Junction HS1 - Houldworth Street  
junction with Newton Street**

One viewpoint has been assessed at this junction. There is just one lane of traffic, and this is not a controlled junction, therefore the viewpoint assessed (HS1) shows the perspective of drivers look forward as they approach the junction.

At this junction:

- There are no signals where visibility can be affected by reflections from the Proposed Development;
- The reflections within 10° occur from curved corner glazing where the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time and they are located above the drivers visor line, where drivers could deploy their visor to mitigate all reflections;
- The reflections occur outside the most sensitive 5° field;
- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun’s intensity being reflected for a significant duration;
- The reflections mostly occur in the evening during the mid-seasons when the solar intensity is low, therefore any reflections generated would be low intensity;

- The probability of the sun shining at the times when reflections could occur within 10° of a drivers’ line of sight is 10-40%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver’s direct line of sight, the times when reflections would occur (as identified in Table 03) and the factors outlined above, solar glare at the junction of Houldworth Street junction with Newton Street is considered unlikely to cause significant concern for drivers.

Table 03: Summary of reflections at Junction HS1 within 10°

| VIEWPOINT | FACADE                 | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR         | LOCATION WITHIN 30° OF DRIVER’S LINE OF SIGHT |
|-----------|------------------------|-----------------------------------------|--------------------------------------------------|-----------------------------------------------|
| HS1       | Southern Curved Corner | 17:00 to 19:00 GMT                      | Throughout the year (Mid-March to mid-September) | Very thin strips, visible between 6° to 10°   |

### Junction GA1 -Great Ancoats Street junction with Laystall Street

Two viewpoints have been assessed at this junction, GA1a and GA1b. Viewpoint GA1a shows the view of drivers in the left lane looking forward, whilst viewpoint GA1b shows drivers in the left lane looking at the left traffic lights. There is a second traffic light on the opposite side of the junction on the right side of the road primarily for use by stationary vehicles and an alternative traffic lights on the right side of the road.

All reflections within viewpoint GA1b occur outside 10° of a driver’s line of sight so are considered to be not significant.

At this junction, for both viewpoints assessed:

- The view of drivers looking at the traffic lights is not significantly effected;
- The reflections within 10° when drivers are looking straight ahead occur from curved corner glazing where the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time and they are predominantly located above the drivers visor line, where drivers could deploy their visor to mitigate most reflections;
- The reflections only just fall within the 10° field;

- Multiple traffic lights can be relied upon to break safely when reflections would occur, where drivers have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;
- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun’s intensity being reflected for a significant duration;
- The reflections mostly occur in the early mornings during the mid-seasons when the solar intensity is low, therefore any reflections generated would be low intensity;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers’ line of sight is 10-50%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver’s direct line of sight, the times when reflections would occur (as identified in Table 04) and the factors outlined above, solar glare at the junction of Great Ancoats Street with Laystall Street is considered unlikely to cause significant concern for drivers.

Table 04: Summary of reflections at Junction GA1 within 10°

| VIEWPOINT | FACADE                | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR                          | LOCATION WITHIN 30° OF DRIVER’S LINE OF SIGHT |
|-----------|-----------------------|-----------------------------------------|-------------------------------------------------------------------|-----------------------------------------------|
| GA1a      | Eastern Curved Corner | Sunrise to 10:00 GMT                    | Mid-Seasons (Mid-January to mid-May and mid-July to mid-November) | Very thin strips, visible between 9° to 10°   |

## Junction GA2 - Great Ancoats

### Street pedestrian crossing

Two viewpoints have been assessed at this junction, GA2a and GA2b. Viewpoint GA2a shows the view of drivers in the left lane looking forward, whilst viewpoint GA2b shows drivers in the left lane looking at the left traffic lights. There is a second traffic light on the opposite side of the crossing primarily for use by stationary vehicles and an alternative traffic lights on the right side of the road.

At this junction, for both viewpoints assessed:

- The reflections within 10° within the both viewpoints occur from curved corner glazing where the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time and they are predominantly located above the drivers visor line, where drivers could deploy their visor to mitigate most reflections;
- Alternative traffic lights can be relied upon to break safely when reflections would occur behind the left side traffic lights, where drivers have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;
- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun's intensity being reflected for a significant duration;

- The reflections mostly occur in the early mornings during the mid-seasons when the solar intensity is low, therefore any reflections generated would be low intensity;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers' line of sight is 10-50%. Those closest to the direct line of sight would have a probability of 10-40%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver's direct line of sight, the times when reflections would occur (as identified in Table 05) and the factors outlined above, solar glare at the Great Ancoats Street pedestrian crossing is considered unlikely to cause significant concern for drivers.

Table 05: Summary of reflections at GA2 within 10°

| VIEWPOINT | FACADE                | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR          | LOCATION WITHIN 30° OF DRIVER'S LINE OF SIGHT |
|-----------|-----------------------|-----------------------------------------|---------------------------------------------------|-----------------------------------------------|
| GA2a      | Eastern Curved Corner | Sunrise to 10:00 GMT                    | Throughout the year (Mid-February to mid-October) | Very thin strips, visible between 3° to 10°   |
| GA2b      |                       |                                         | Throughout the year (Mid-January to mid-November) | Very thin strips, visible between 2° to 7°    |

### Junction GA3 - Great Ancoats Street pedestrian crossing

Two viewpoints have been assessed at this junction, GA3a and GA3b. Viewpoint GA3a shows the view of drivers in the left lane looking forward, whilst viewpoint GA3b shows drivers in the left lane looking at the left traffic lights. There is a second traffic light on the opposite side of the crossing primarily for use by stationary vehicles and an alternative traffic lights on the right side of the road.

At this junction, for both viewpoints assessed:

- The reflections within 10° within the both viewpoints occur from either a thin strip of the main facade or from curved corner glazing where the angle changes with each thin strip. Therefore reflections would occur from only a sliver within the field of view at any one time and they are predominantly located above the drivers visor line, where drivers could deploy their visor to mitigate most reflections;
- Alternative traffic lights can be relied upon to break safely when reflections would occur behind the left side traffic lights, where drivers have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;

- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun's intensity being reflected for a significant duration;
- The reflections mostly occur in the early mornings during the mid-seasons when the solar intensity is low, therefore any reflections generated would be low intensity;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers' line of sight is 10-50%. Those closest to the direct line of sight would have a probability of 20-40%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver's direct line of sight, the times when reflections would occur (as identified in Table 06) and the factors outlined above, solar glare at the Great Ancoats Street pedestrian crossing is considered unlikely to cause significant concern for drivers.

Table 06: Summary of reflections at Junction GA3 within 10°

| VIEWPOINT | FACADE                | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR                                  | LOCATION WITHIN 30° OF DRIVER'S LINE OF SIGHT                          |
|-----------|-----------------------|-----------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------|
| GA3a      | South-Eastern (main)  | 08:00 to 09:00 GMT                      | Mid-seasons (Mid-January to mid-February and mid-October to mid-November) | Very thin strips and small areas of reflections visible from 5° to 10° |
|           | Eastern Curved Corner | Sunrise to 08:00 GMT                    | Throughout the year (Mid-February to mid-October)                         | Very thin strips, visible between 5° to 10°                            |
| GA3b      | South-Eastern (main)  | 08:00 to 09:00 GMT                      | Mid-seasons (Mid-January to mid-February and mid-October to mid-November) | Very thin strips and small areas of reflections visible from 2° to 10° |
|           | Eastern Curved Corner | Sunrise to 08:00 GMT                    | Throughout the year (Mid-February to mid-October)                         | Very thin strips, visible between 2° to 10°                            |

### Junction GA4 - Great Ancoats Street junction with Newton Street

Two viewpoints have been assessed at this junction, GA4a and GA4b. Viewpoint GA4a shows the view of drivers in the left lane looking forward, whilst viewpoint GA4b shows drivers in the left lane looking at the left traffic lights. There is a second traffic light on the opposite side of the junction primarily for use by stationary vehicles and an alternative traffic lights on the right side of the road.

At this junction, for both viewpoints assessed:

- For the view of drivers looking straight ahead, the reflections within 10° occur from glazing on just one window panel so comprise of a very small area within the field of view and only just fall within the 10° field;
- The reflections within 10° within the other viewpoint occur from curved corner glazing where the angle changes with each thin strip and so reflections would occur from only a sliver within the field of view at any one time and are predominantly located above the drivers visor line, where drivers could deploy their visor to mitigate most reflections;
- Alternative traffic lights can be relied upon to break safely when reflections would occur behind the left side traffic lights, where drivers have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;

- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun's intensity being reflected for a significant duration;
- The reflections mostly occur in the early mornings during the mid-seasons when the solar intensity is low, therefore any reflections generated would be low intensity;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers' line of sight is 10-50%. Those closest to the direct line of sight would have a probability of 20-40%.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver's direct line of sight, the times when reflections would occur (as identified in Table 07) and the factors outlined above, solar glare at the junction of Great Ancoats Street with Newton Street is considered unlikely to cause significant concern for drivers.

Table 07: Summary of reflections at Junction GA4 within 10°

| VIEWPOINT | FACADE                | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR                                 | LOCATION WITHIN 30° OF DRIVER'S LINE OF SIGHT |
|-----------|-----------------------|-----------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------|
| GA4a      | Eastern Curved Corner | 07:00 to 08:00 GMT                      | Mid-Seasons (Mid-February to mid-March and mid-September to mid-October) | One single window panel, visible at 9-10°     |
| GA4b      |                       | 05:00 to 09:00 GMT                      | Throughout the year (Mid-January to mid-November)                        | Very thin strips, visible between 2° to 9°    |

### Junction GA5 - Great Ancoats Street junction with Lever Street

Two viewpoints have been assessed at this junction, GA5a and GA5b. Viewpoint GA5a shows the view of drivers in the right lane looking forward, whilst viewpoint GA5b shows drivers in the right lane looking at the right traffic lights. There is a second traffic light on the opposite side of the junction primarily for use by stationary vehicles and an alternative traffic lights on the left side of the road.

All reflections within viewpoint GA5a occur outside 10° of a driver's line of sight so are considered to be not significant.

At this junction, for both viewpoints assessed:

- The view of drivers looking straight ahead is not significantly effected;
- Alternative traffic lights can be relied upon to break safely when reflections would occur behind the right side traffic lights, where drivers have a choice of using either the left or right traffic lights, or those on the opposite side of the junction;
- The reflections within 10° occur from glazing on just two floors so comprise of a very small area within the field of view and only just fall within the 10° field;

- The reflections are broken up by solid facade elements and horizontal shading, thus the reflections would only occur for a short period of time from each window and are less likely to result in the full sun's intensity being reflected for a significant duration;
- The reflections occur outside peak traffic times;
- The reflections occur in the early mornings during the mid-seasons when the solar intensity is low, therefore any reflections generated would be low intensity;
- The probability of the sun shining at the times when reflections could occur within 10° of a drivers' line of sight is 10-30%; and
- The sun's path would also be visible at this junction, as such, any reflections visible would be significantly less intense than the direct view of the sun that would occur at this location.

Owing to the reflections occurring within 10° it is recommended that a low reflectance glazing is used for the facades where reflections occur. No further mitigation is considered necessary.

Therefore, based on the location of reflections related to the driver's direct line of sight, the times when reflections would occur (as identified in Table 08) and the factors outlined above, solar glare at the junction of Great Ancoats Street with Lever Street is considered unlikely to cause significant concern for drivers.

Table 08: Summary of reflections at Junction GA5 within 10°

| VIEWPOINT | FACADE               | TIMES OF THE DAY THAT REFLECTIONS OCCUR | TIMES OF THE YEAR THAT REFLECTIONS OCCUR                                 | LOCATION WITHIN 30° OF DRIVER'S LINE OF SIGHT           |
|-----------|----------------------|-----------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------|
| GA5b      | North-Eastern (main) | 07:00 to 08:00 GMT                      | Mid-seasons (Mid-February to mid-March and mid-September to mid-October) | Reflections are visible from a small area between 9-10° |

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## 6 SCENARIO OVERVIEW

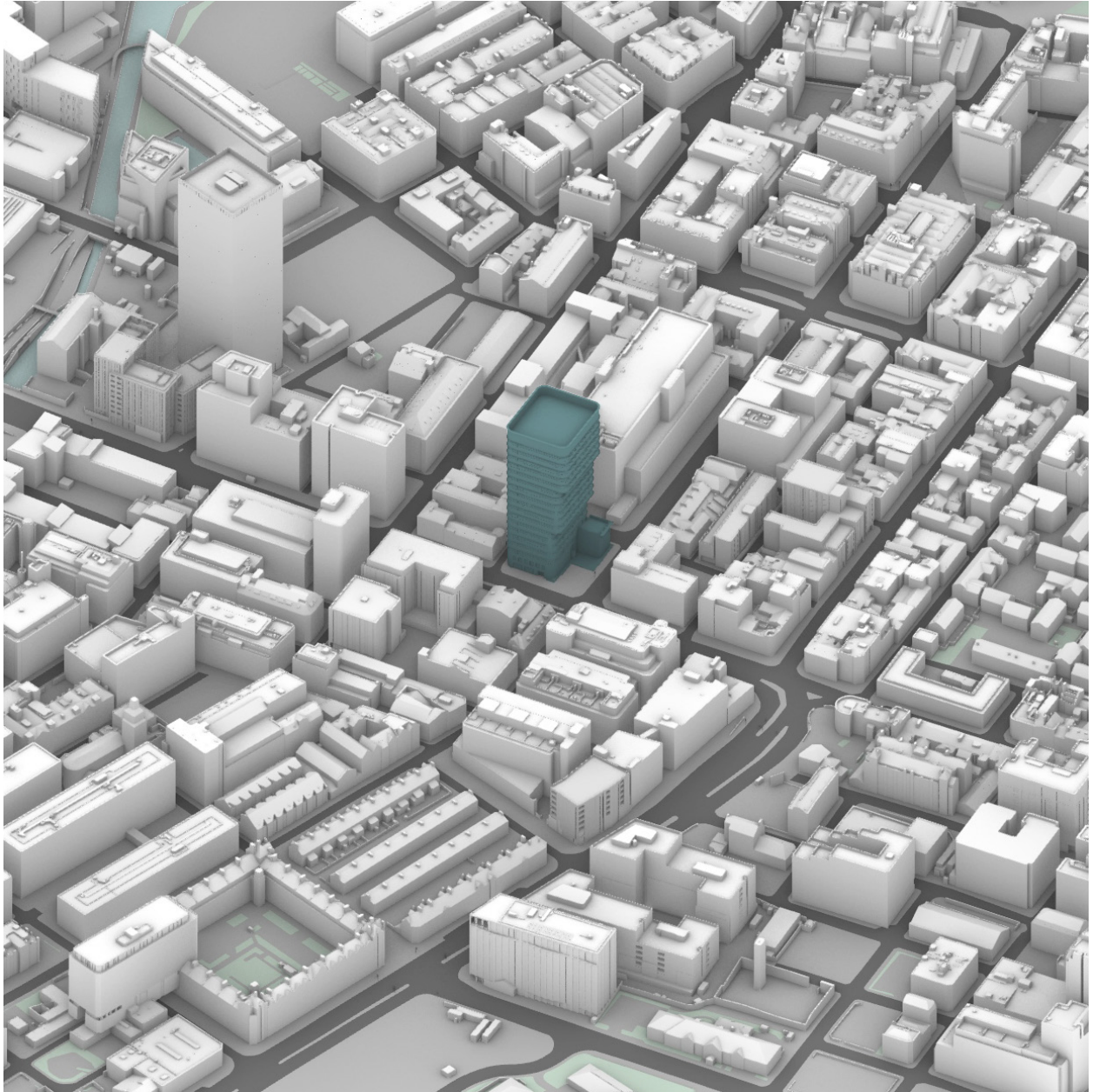


Fig. 12: Site Overview Perspective



Fig. 13: Site Plan - Viewpoints

# 7 LOCATION OF SENSITIVE JUNCTIONS

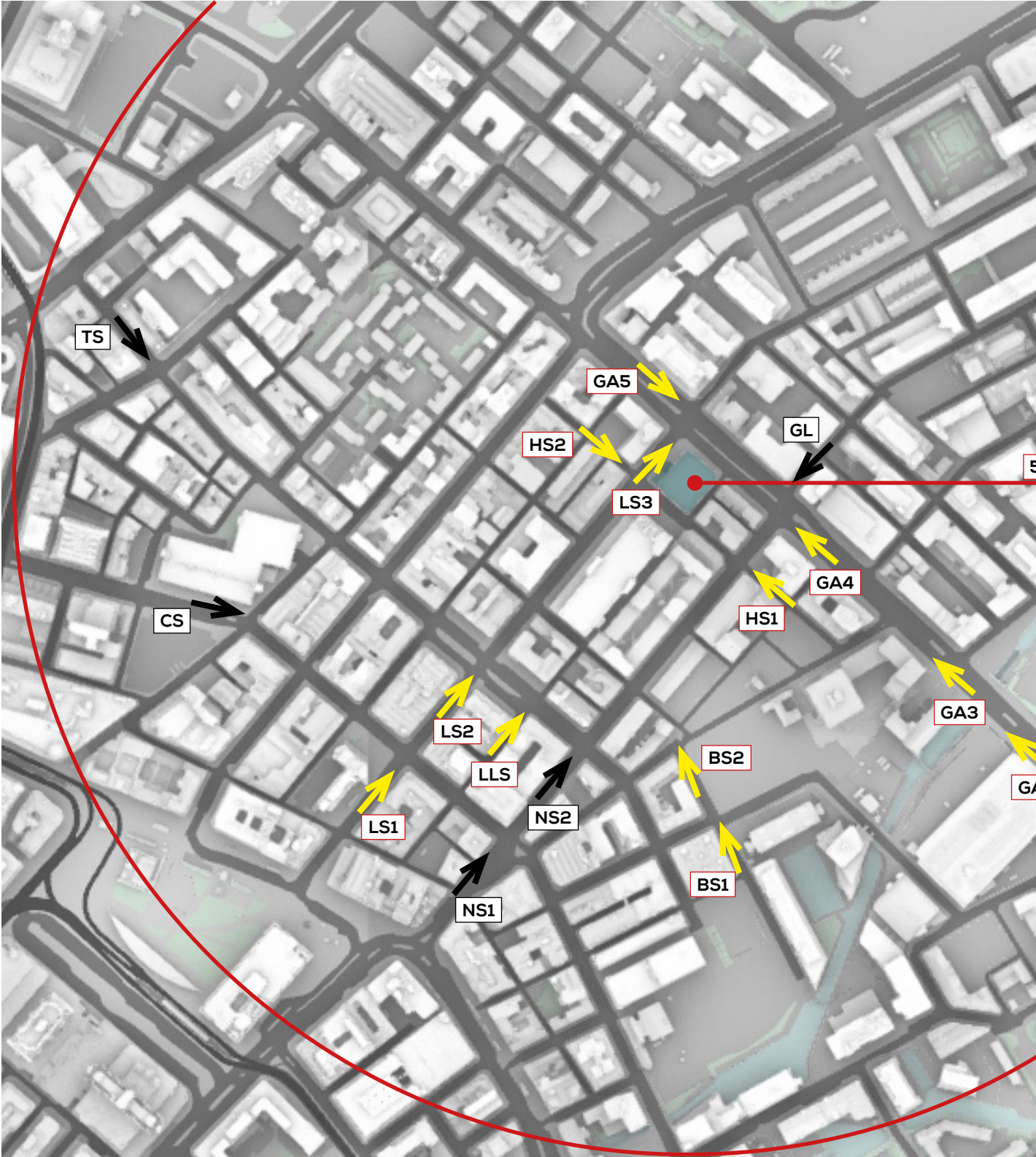


Fig. 14: Site Overview Perspective



- ➔ Scheme not visible
- ➔ Scheme visible
- Proposed

## Viewpoint Key

- TS** - Thomas Street junction with High Street (not assessed)
- CS** - Church Street junction with Tib Street (not assessed)
- LS1** - Lever Street junction with Dale Street (page 24-27)
- LS2** - Lever Street pedestrian crossing (page 28-31)
- LS3** - Lever Street junction with Great Ancoats Street (page 32-33)
- LLS** - Little Lever Street junction with Hilton Street (page 34-35)
- NS1** - Newton Street junction with Dale Street (not assessed)
- NS2** - Newton Street junction with Hilton Street (not assessed)
- BS1** - Brewer Street junction with Tarriff Street (page 36-37)
- BS2** - Brewer Street junction with Port Street (page 38-39)
- HS1** - Houldworth Street junction with Newton Street (page 40-41)
- HS2** - Houldworth Street junction with Lever Street (page 42-43)
- GA1** - Great Ancoats Street junction with Laystall Street (page 44-47)
- GA2** - Great Ancoats Street pedestrian crossing (page 48-51)
- GA3** - Great Ancoats Street pedestrian crossing (page 52-55)
- GA4** - Great Ancoats Street junction with Newton Street (page 56-59)
- GA5** - Great Ancoats Street junction with Lever Street (page 60-63)
- GL** - George Leigh Street junction with Great Ancoats Street (not assessed)

## 8 SOLAR GLARE ASSESSMENT

60° FIELD OF VIEW: TIME OF DAY  
VIEWPOINT LS1a - RIGHT LANE, LOOKING FORWARD

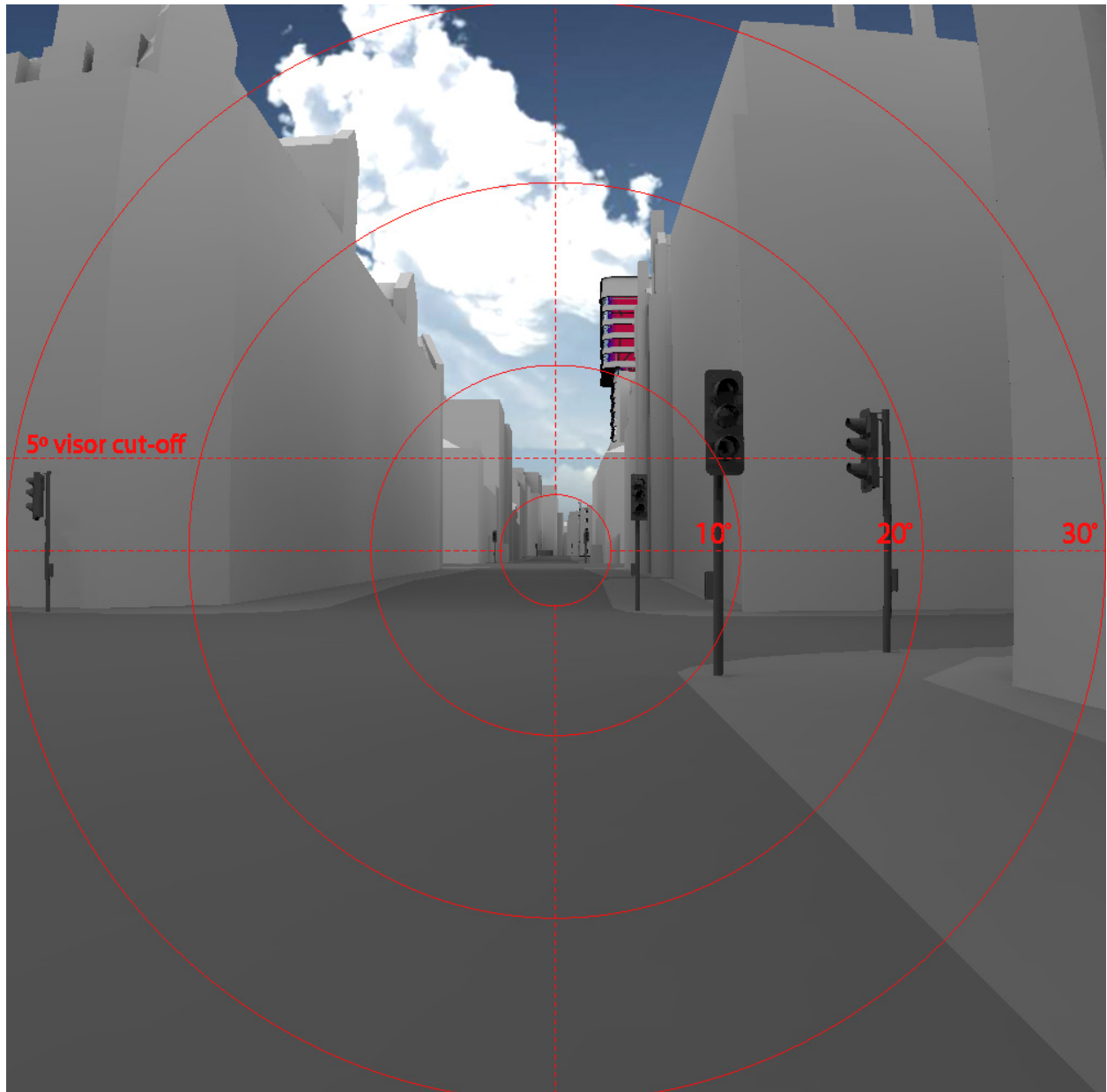
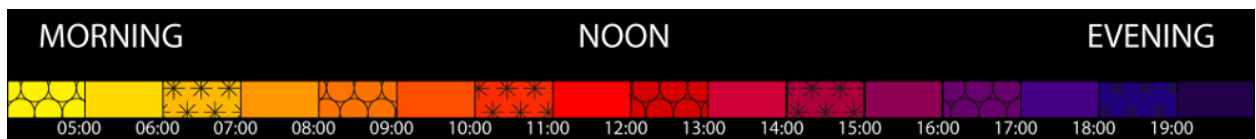


Fig. 15: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT LS1a - RIGHT LANE, LOOKING FORWARD

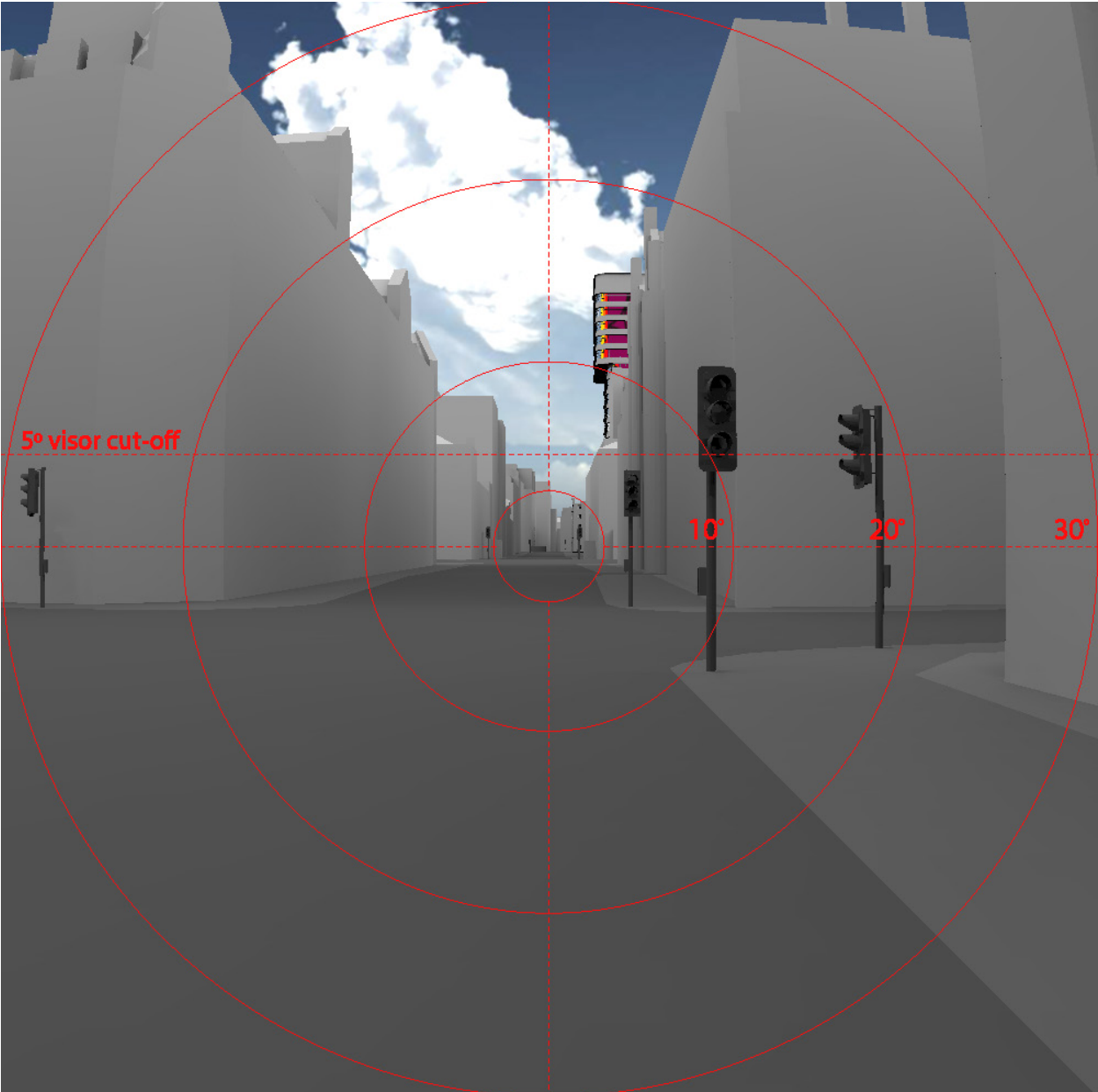


Fig. 16: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT LS1b - RIGHT LANE, LOOKING AT TRAFFIC LIGHTS**

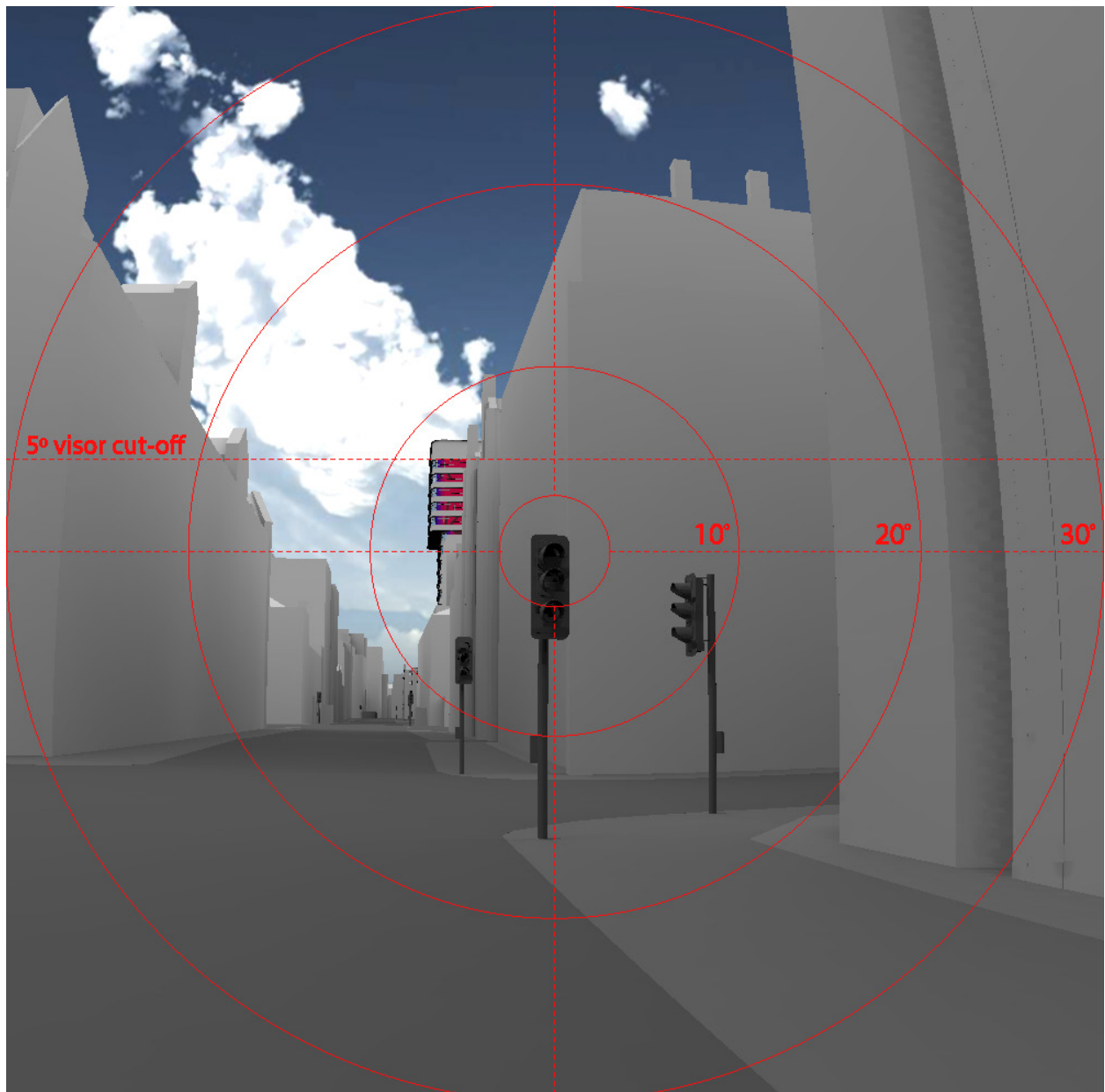
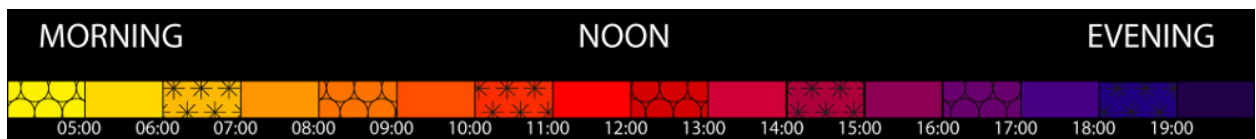


Fig. 17: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT LS1b - RIGHT LANE, LOOKING AT TRAFFIC LIGHTS

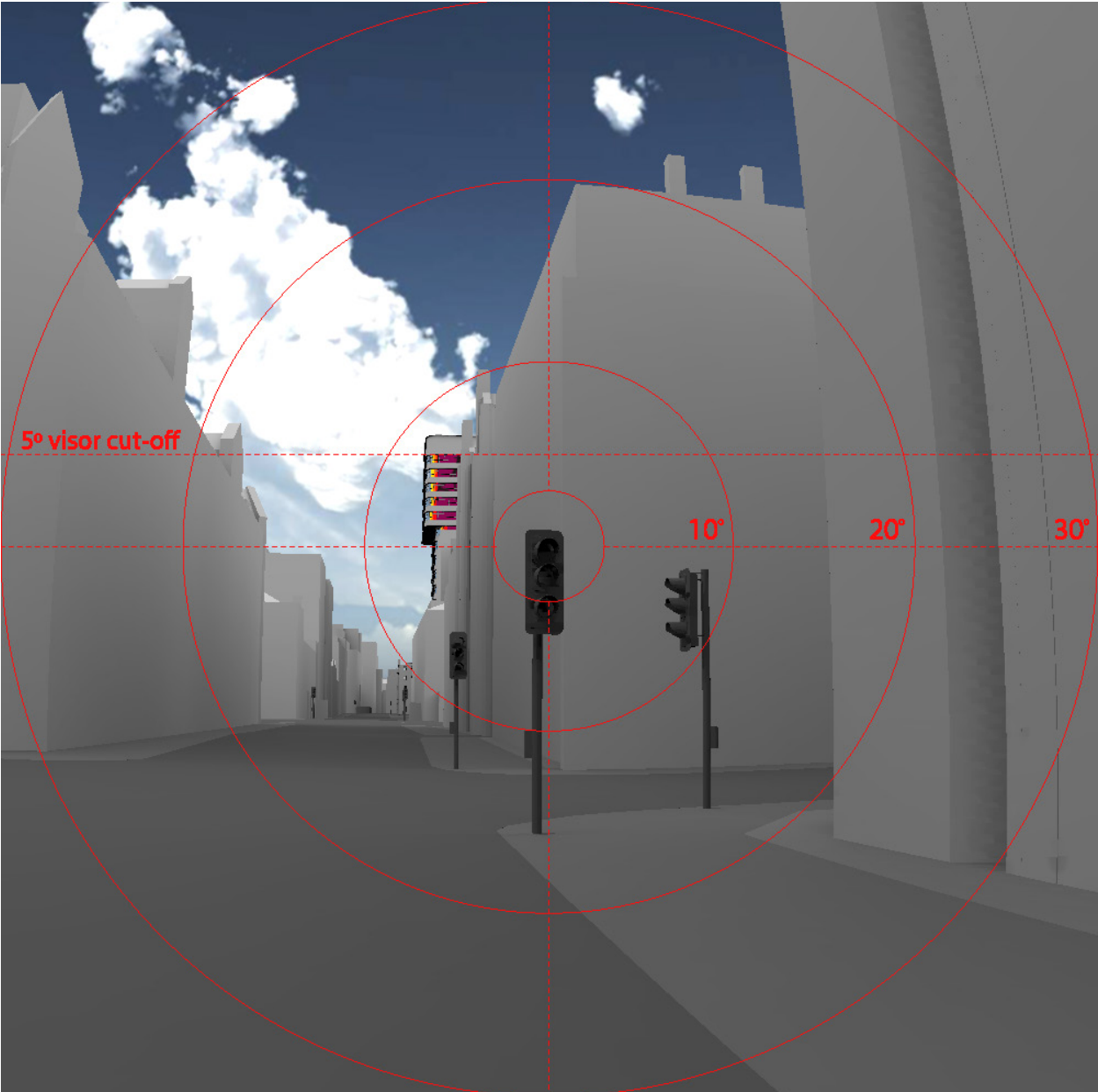


Fig. 18: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT LS2a - RIGHT LANE, LOOKING FORWARD**

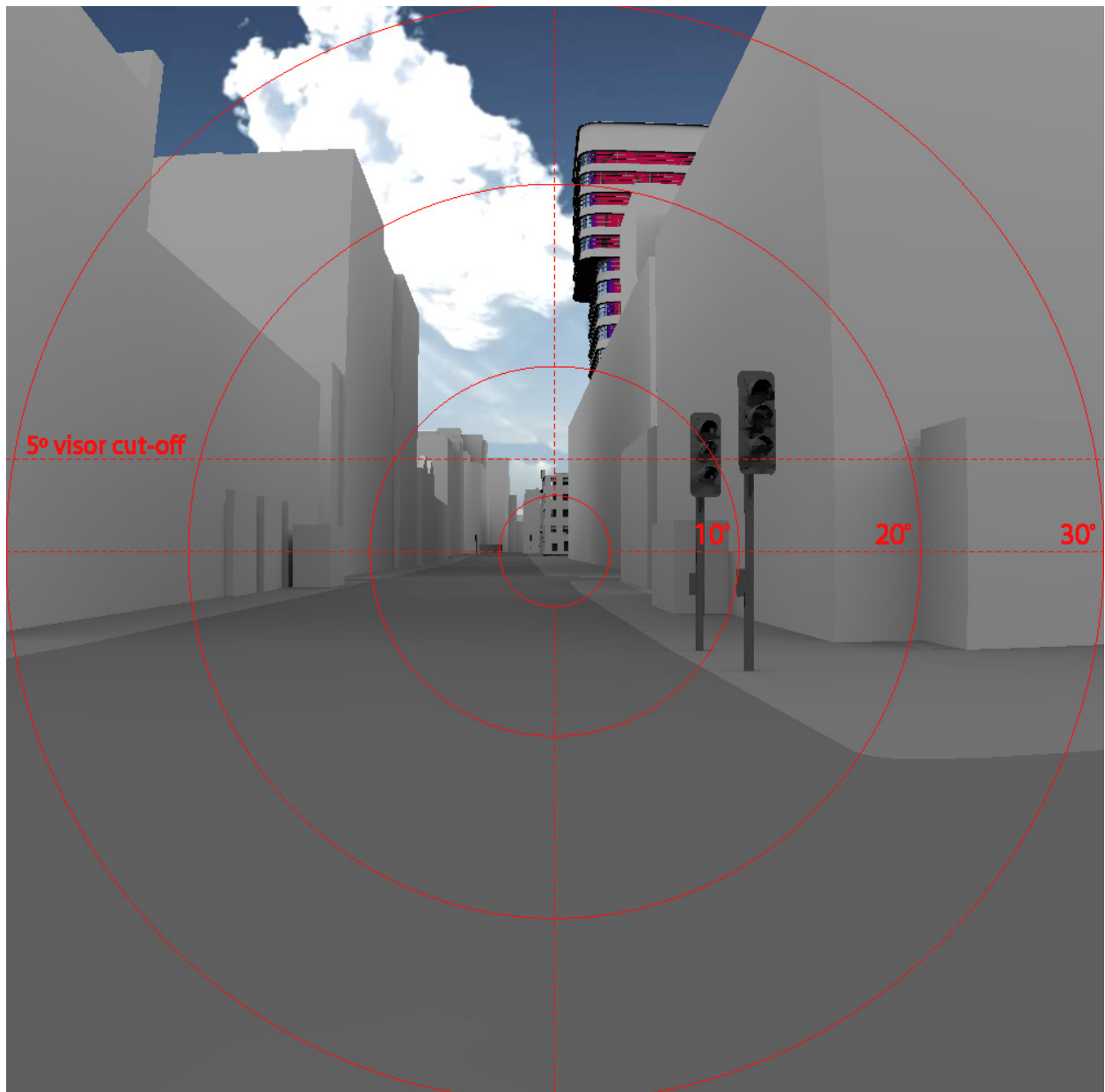
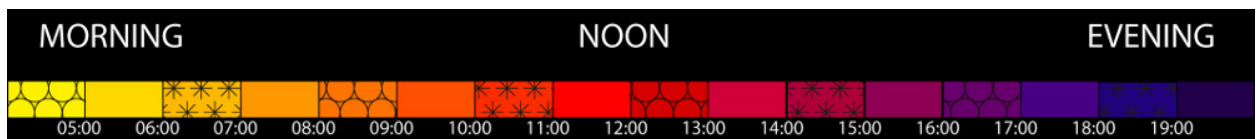


Fig. 19: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT LS2a - RIGHT LANE, LOOKING FORWARD

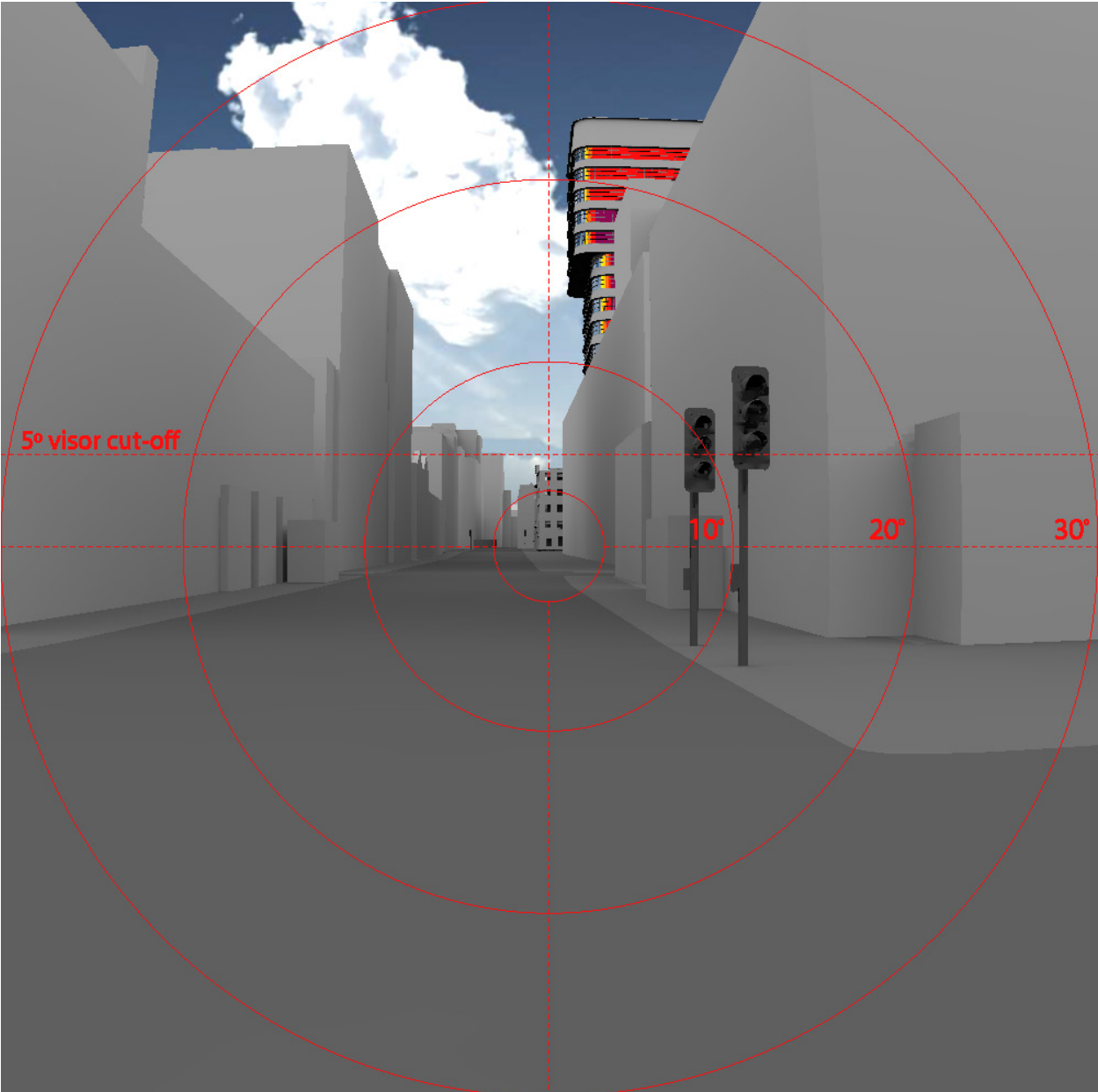


Fig. 20: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT LS2b - RIGHT LANE, LOOKING AT TRAFFIC LIGHTS**

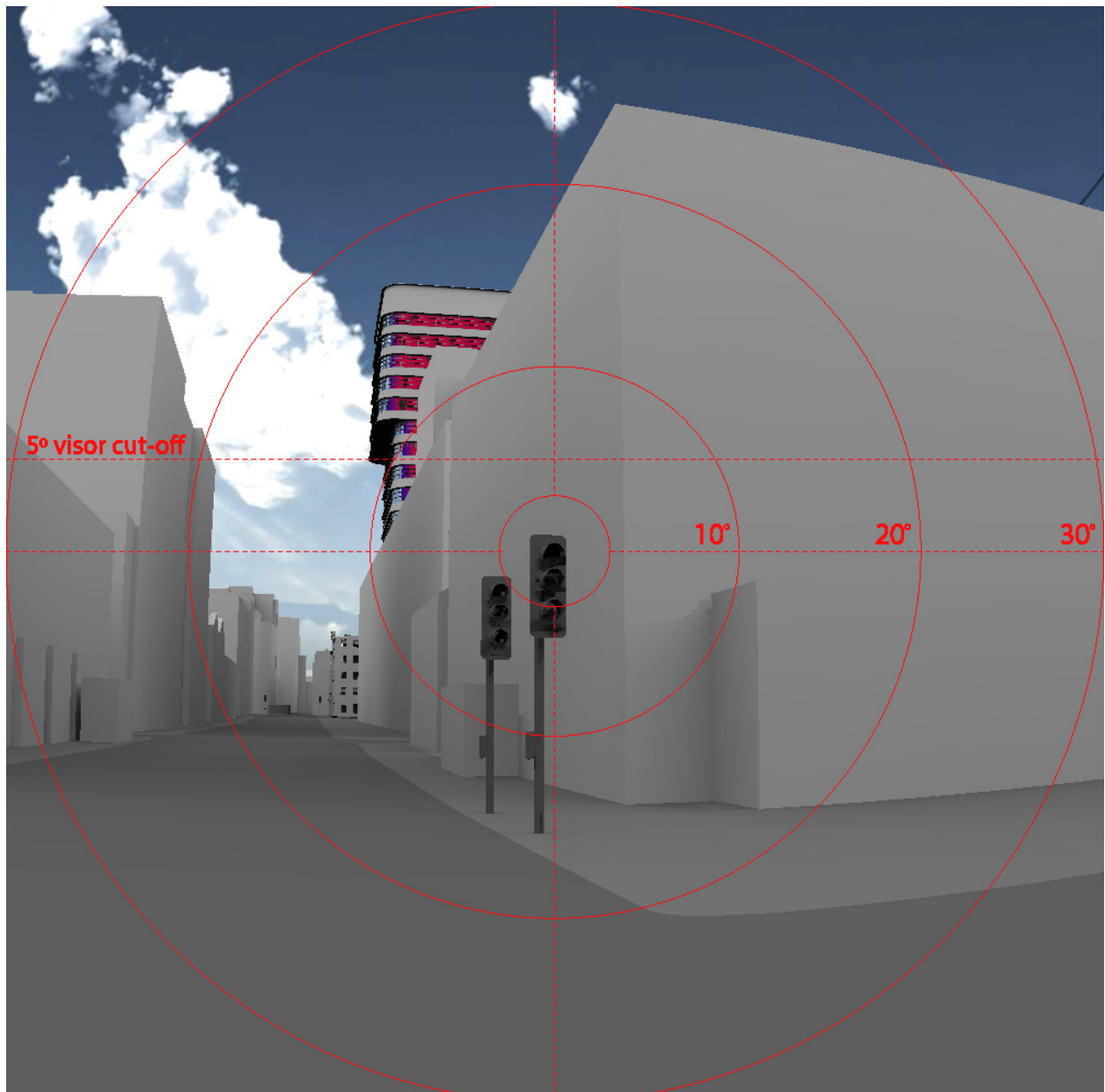
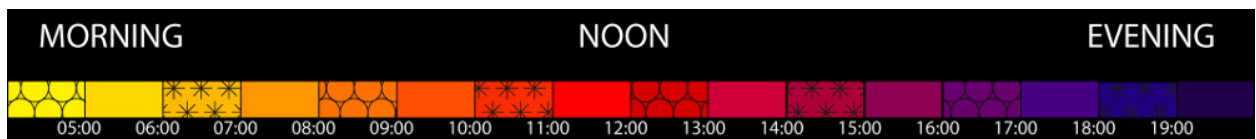


Fig. 21: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT LS2b - RIGHT LANE, LOOKING AT TRAFFIC LIGHTS

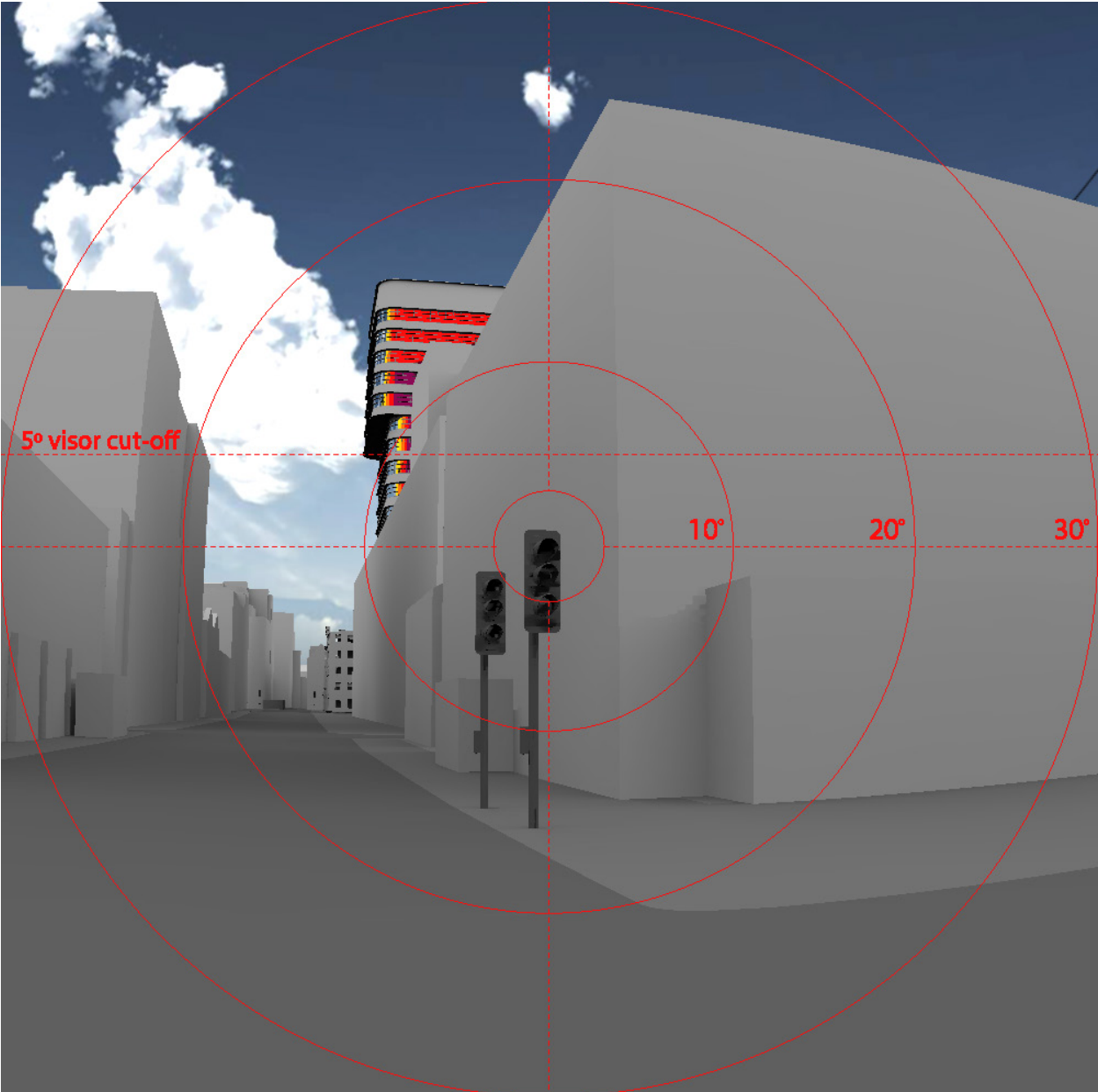


Fig. 22: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT LS3 - MIDDLE LANE, LOOKING AT TRAFFIC LIGHTS**

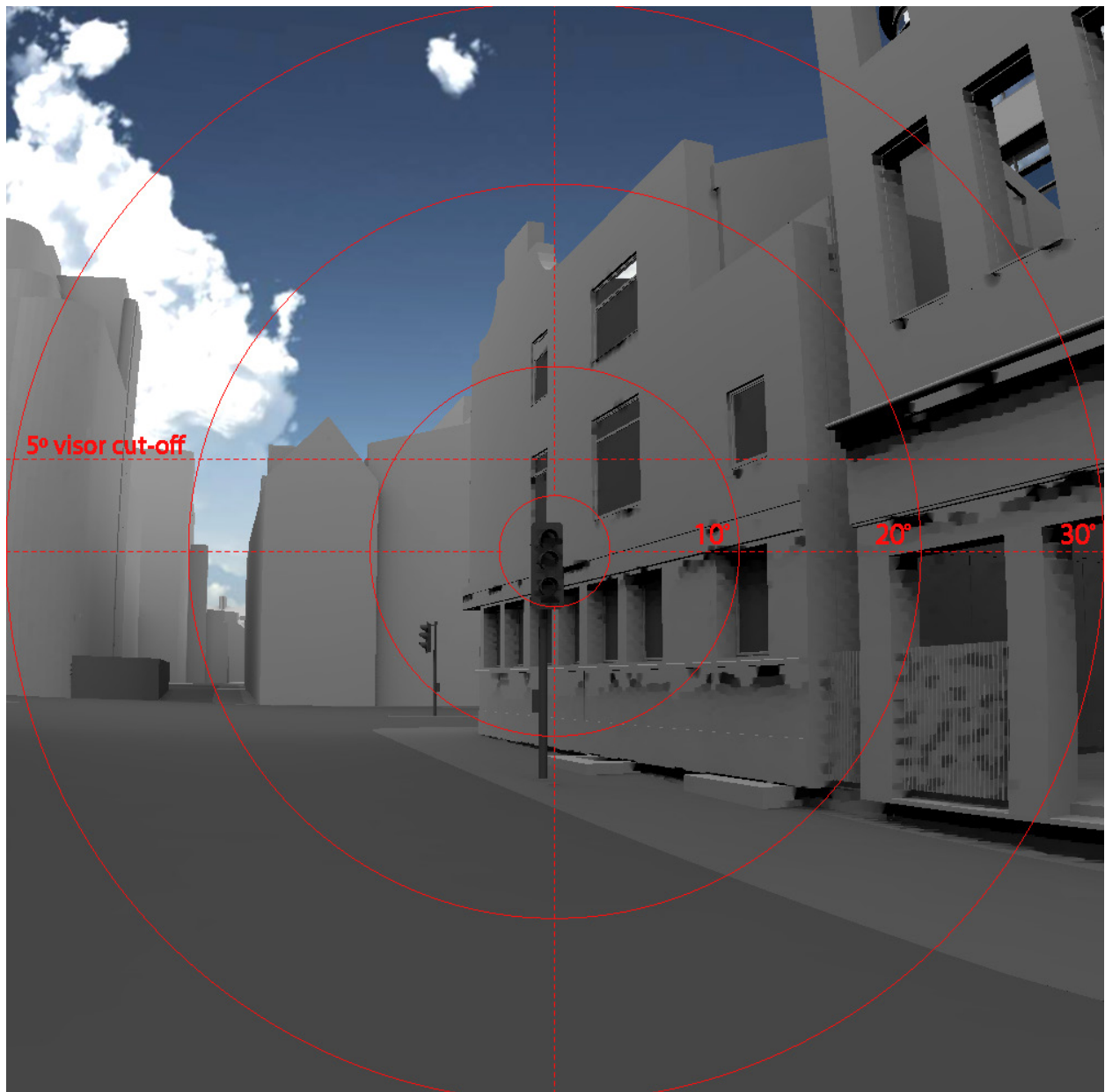
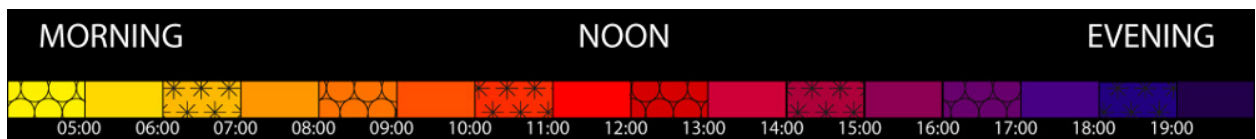


Fig. 23: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT LS3 - MIDDLE LANE, LOOKING AT TRAFFIC LIGHTS

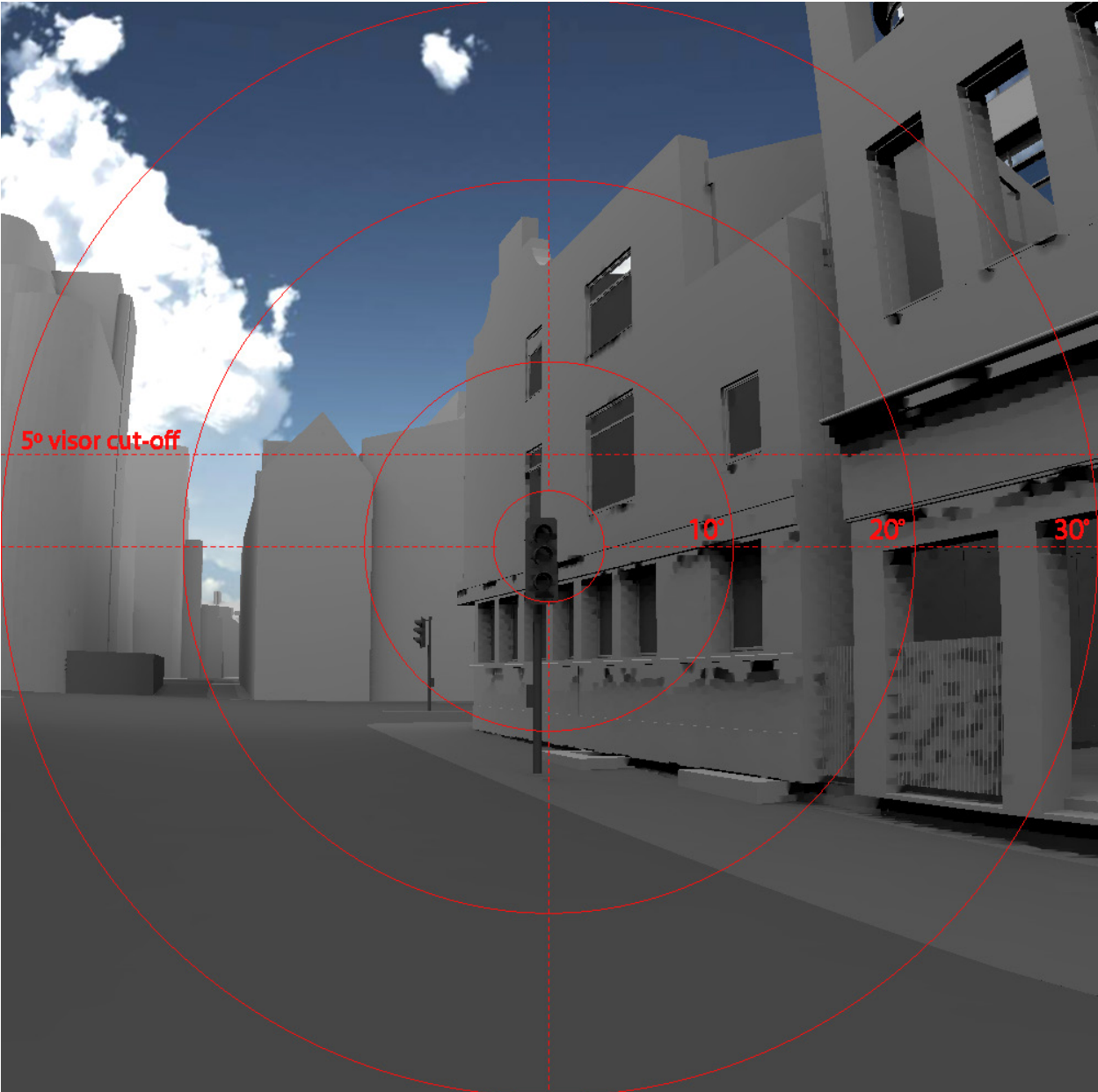


Fig. 24: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT LLS - LOOKING FORWARD**

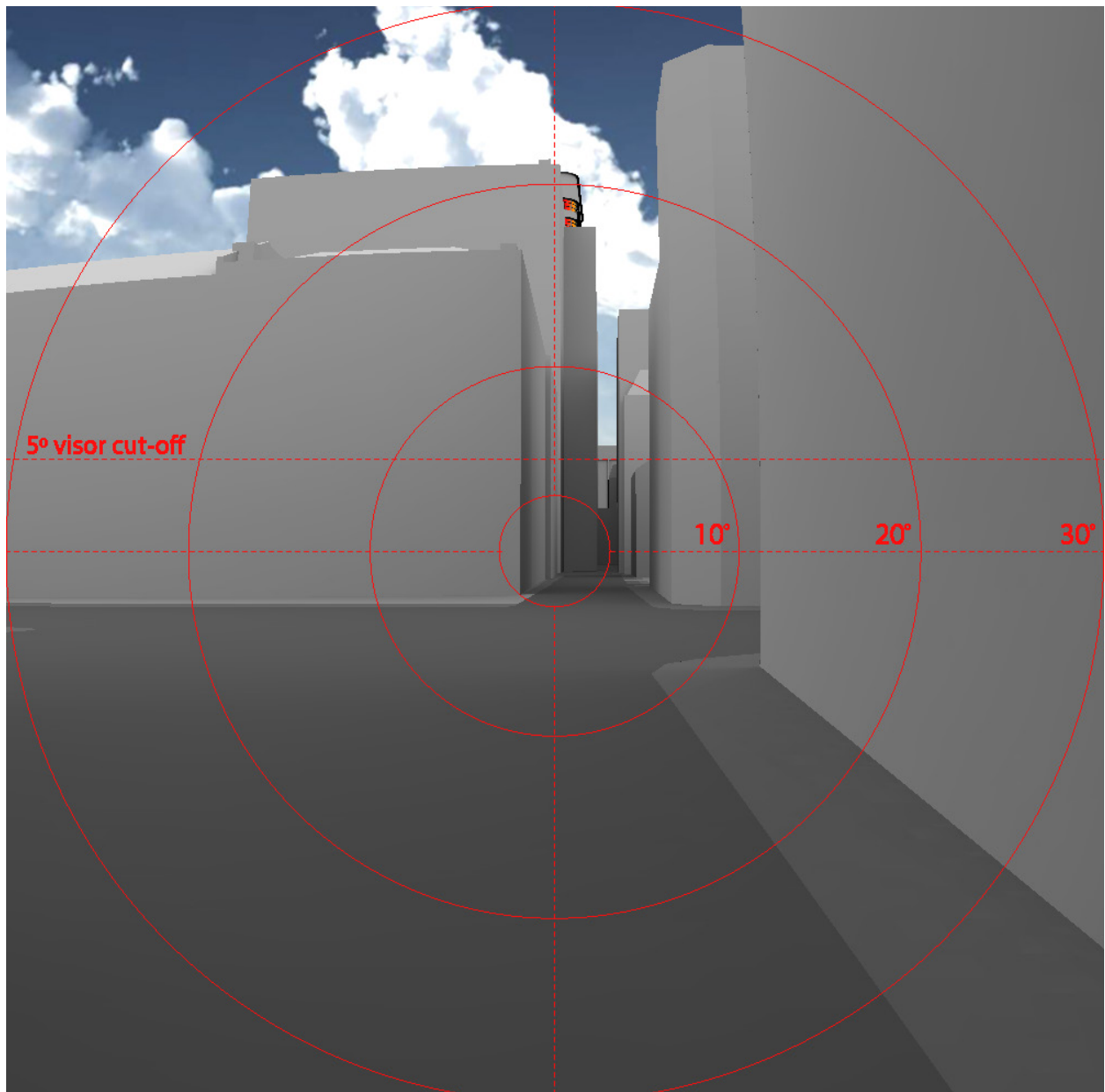
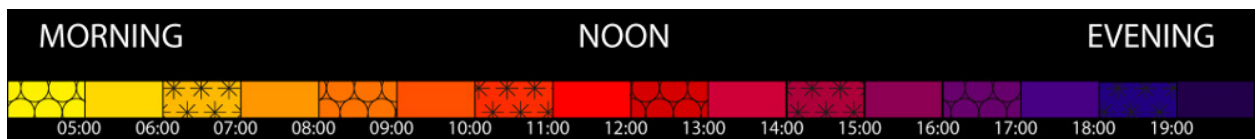


Fig. 25: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT LLS - LOOKING FORWARD

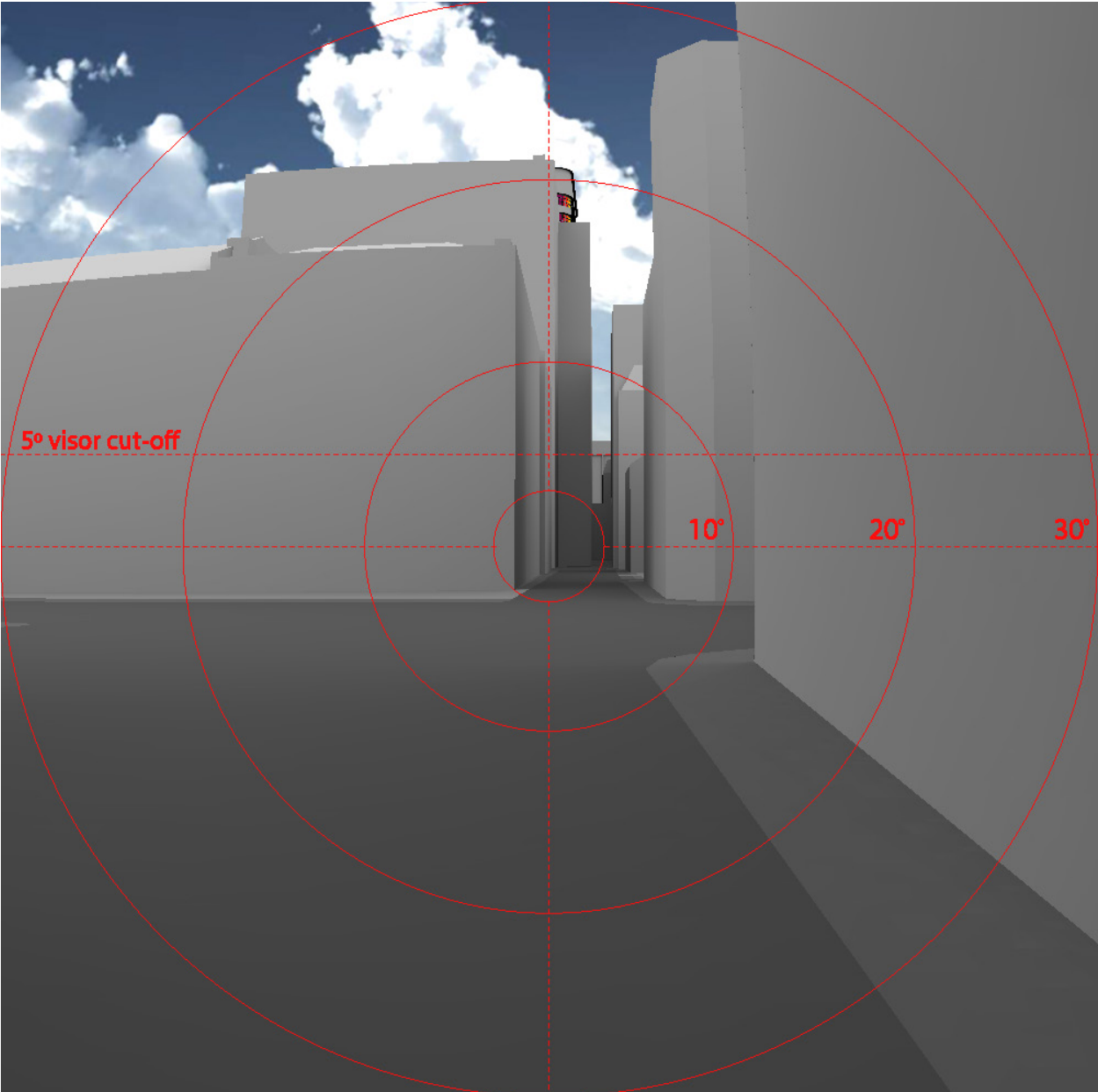


Fig. 26: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT BS1 - LOOKING FORWARD**

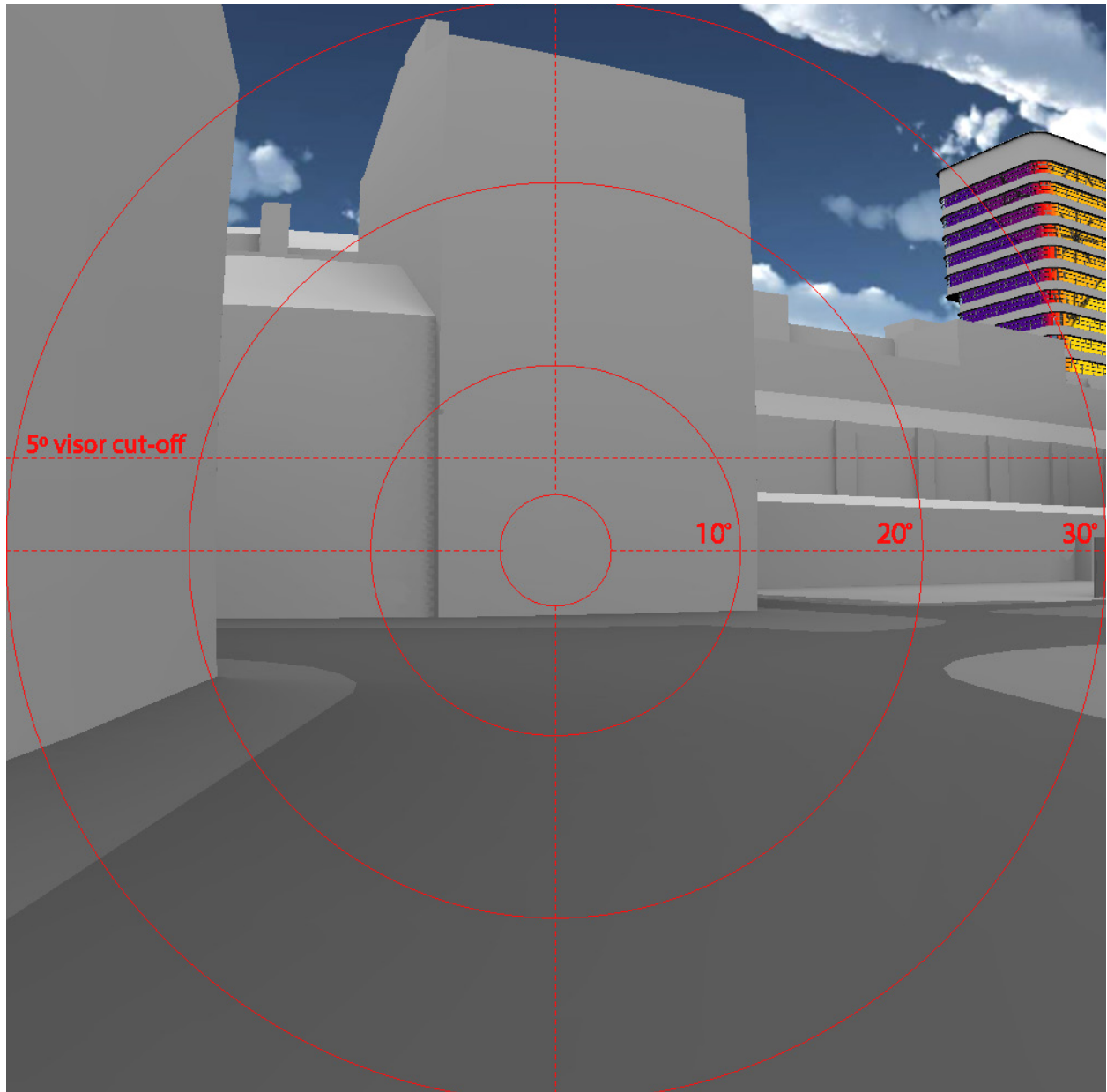
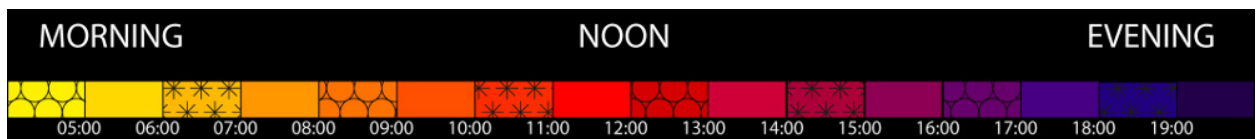


Fig. 27: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT BS1 - LOOKING FORWARD

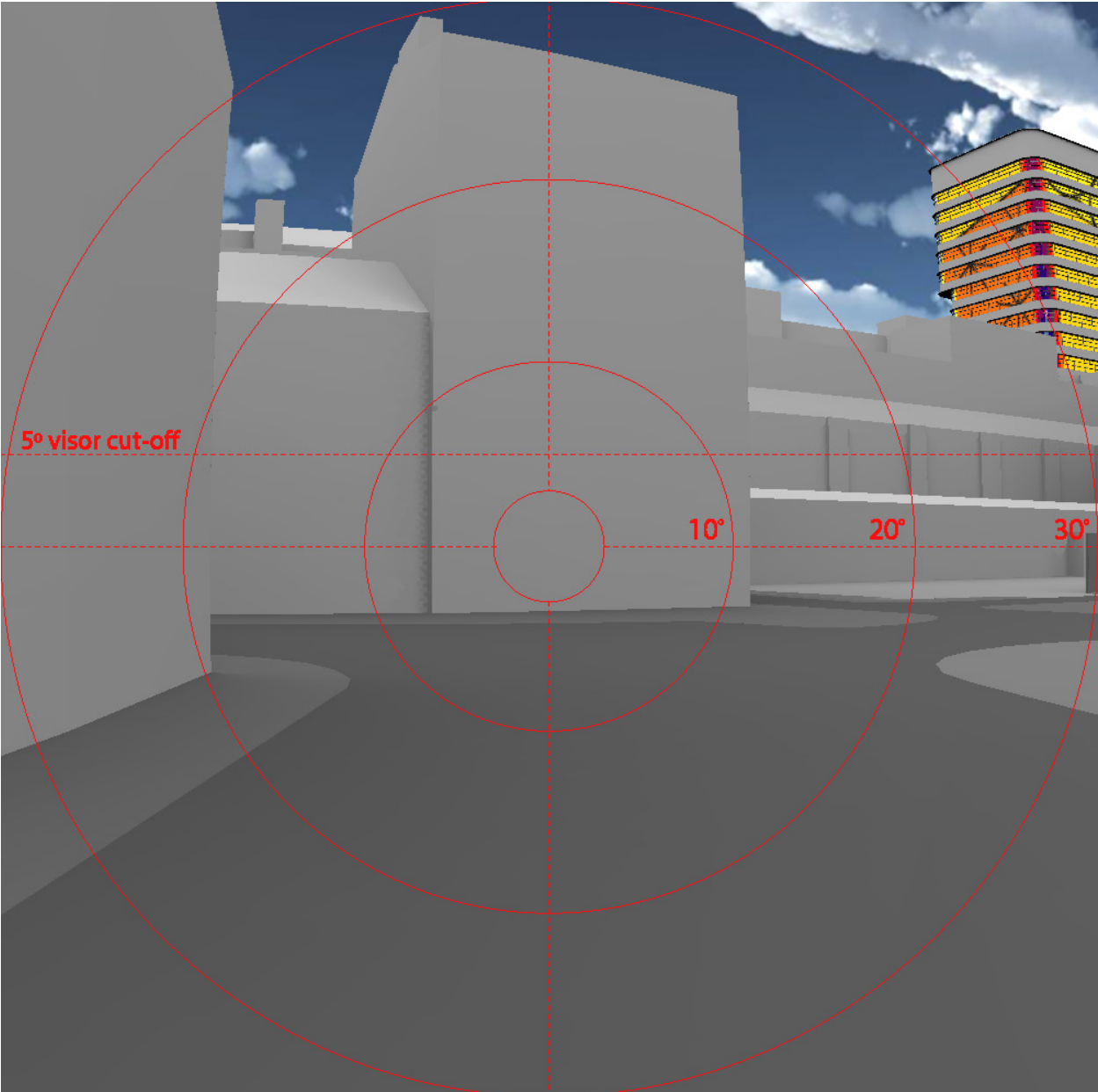


Fig. 28: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT BS2 - LOOKING FORWARD**

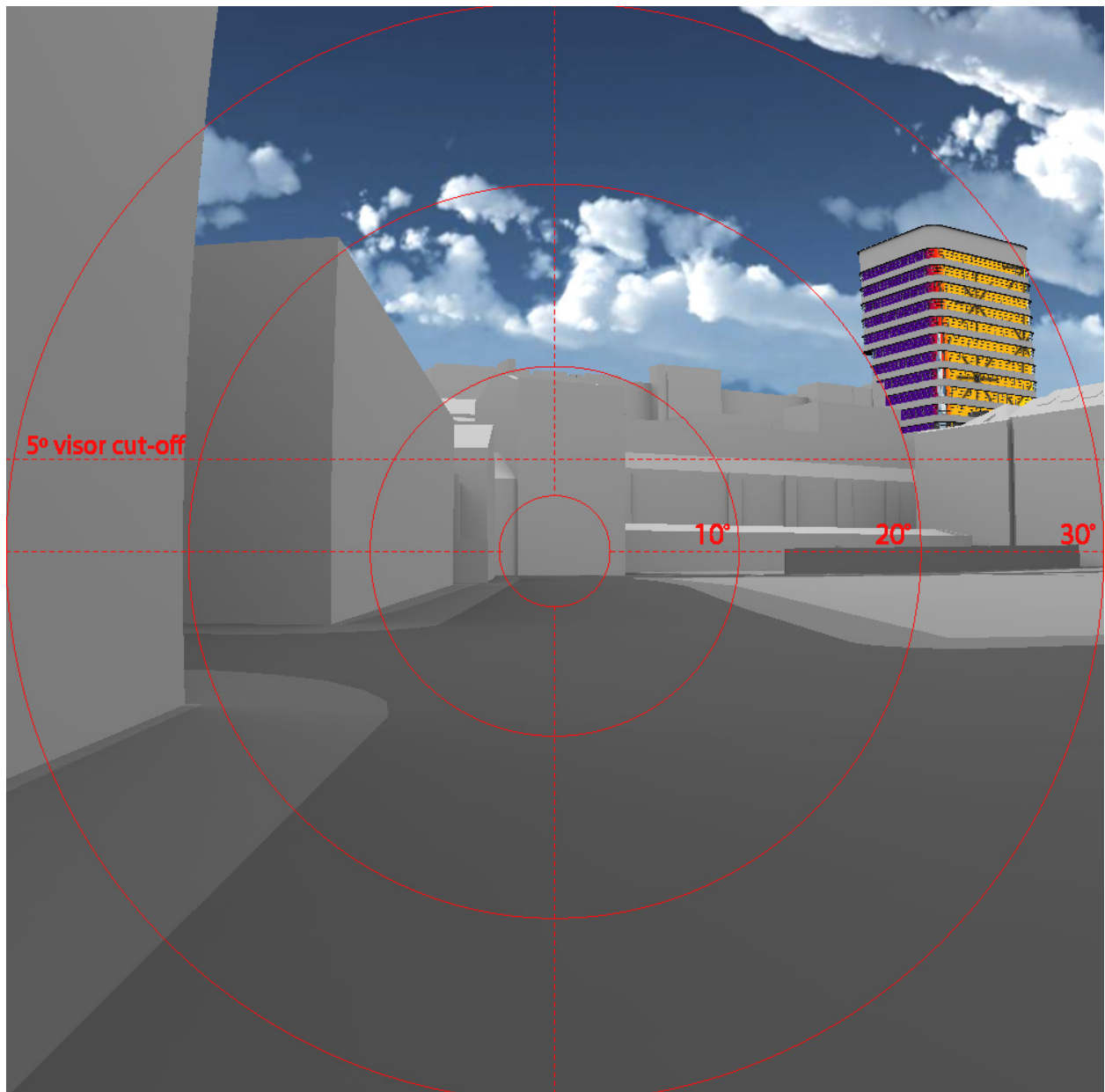
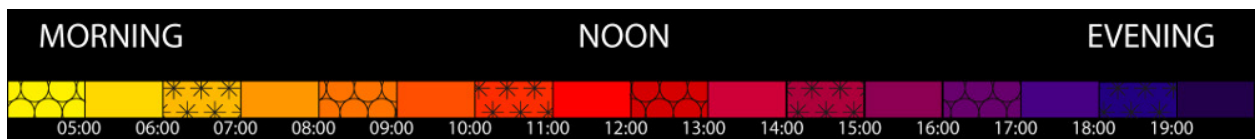


Fig. 29: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT BS2 - LOOKING FORWARD

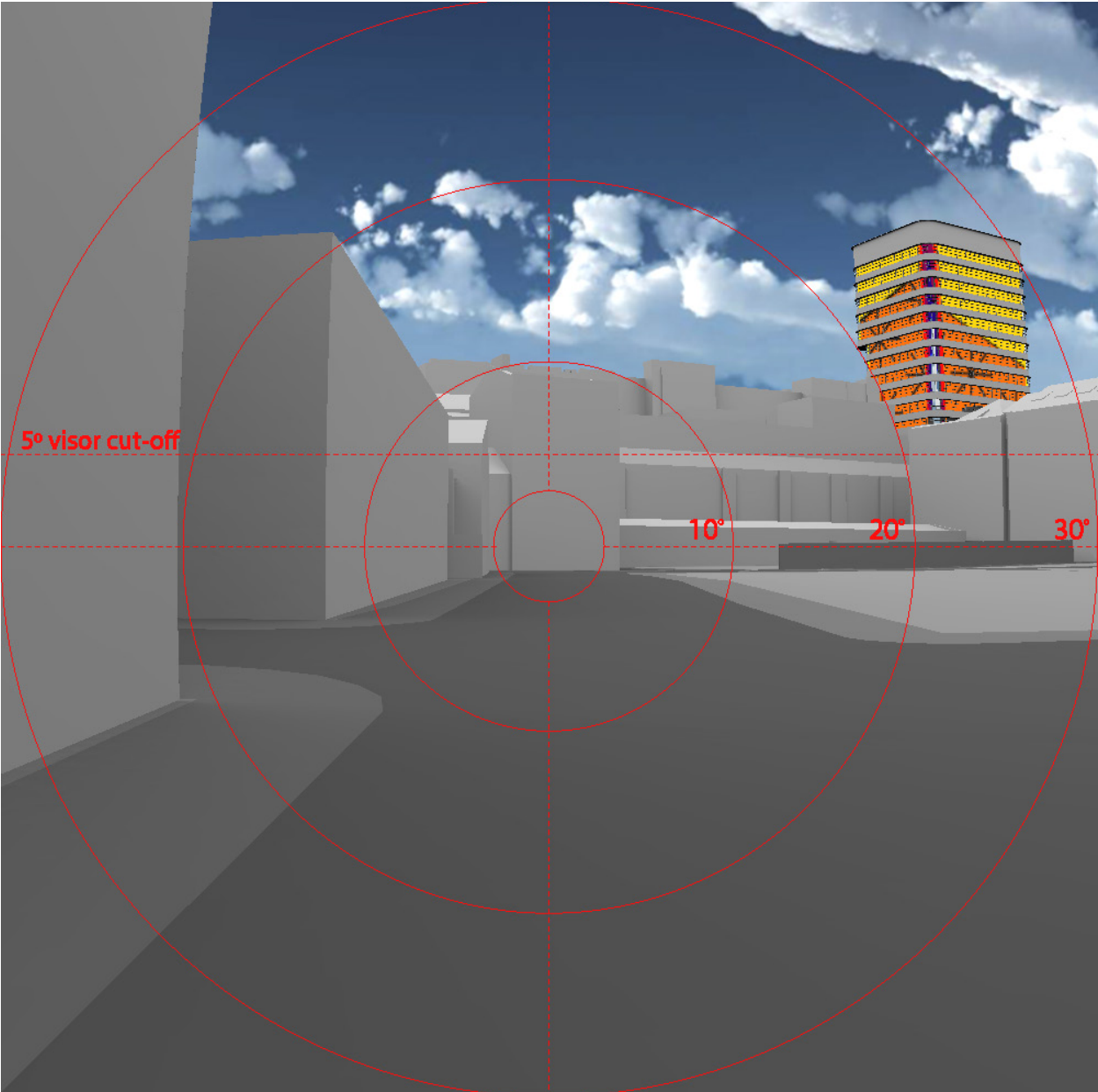


Fig. 30: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT HS1 - LOOKING FORWARD**

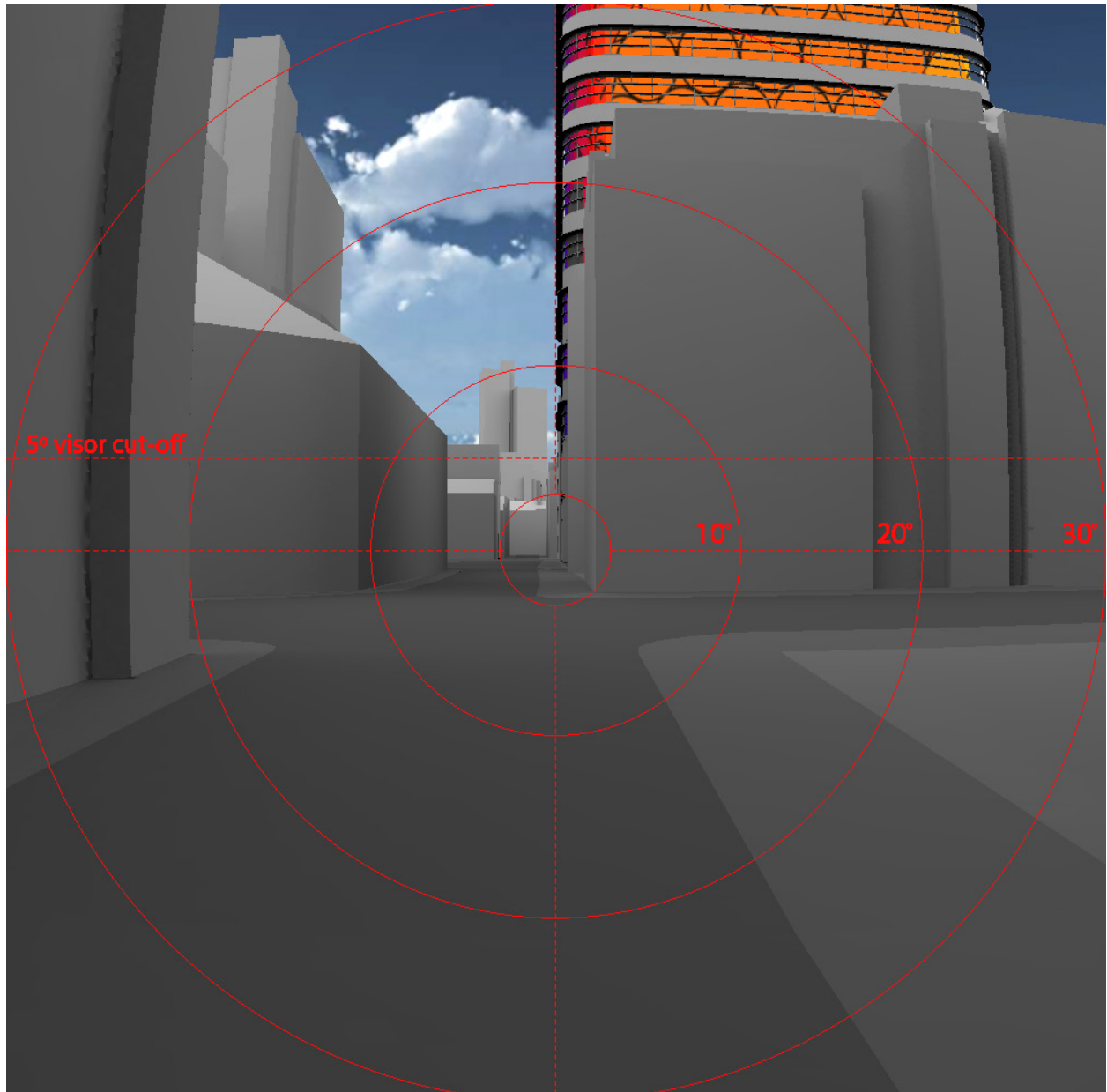
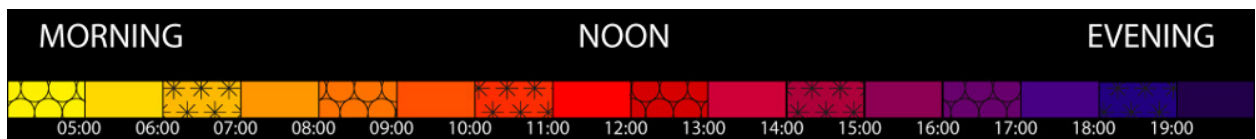


Fig. 31: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT HS1 - LOOKING FORWARD

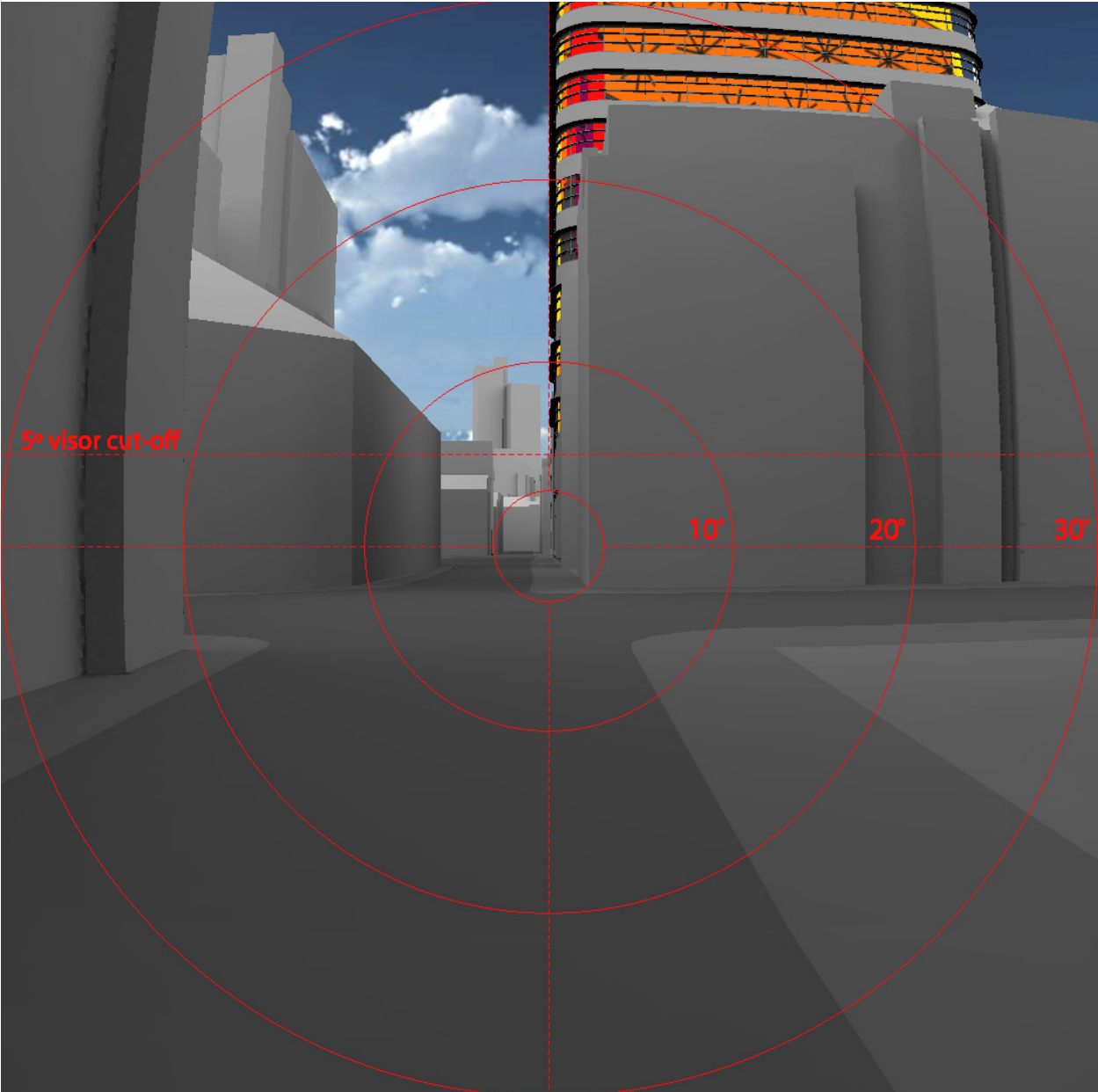


Fig. 32: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT HS2 - LOOKING FORWARD**

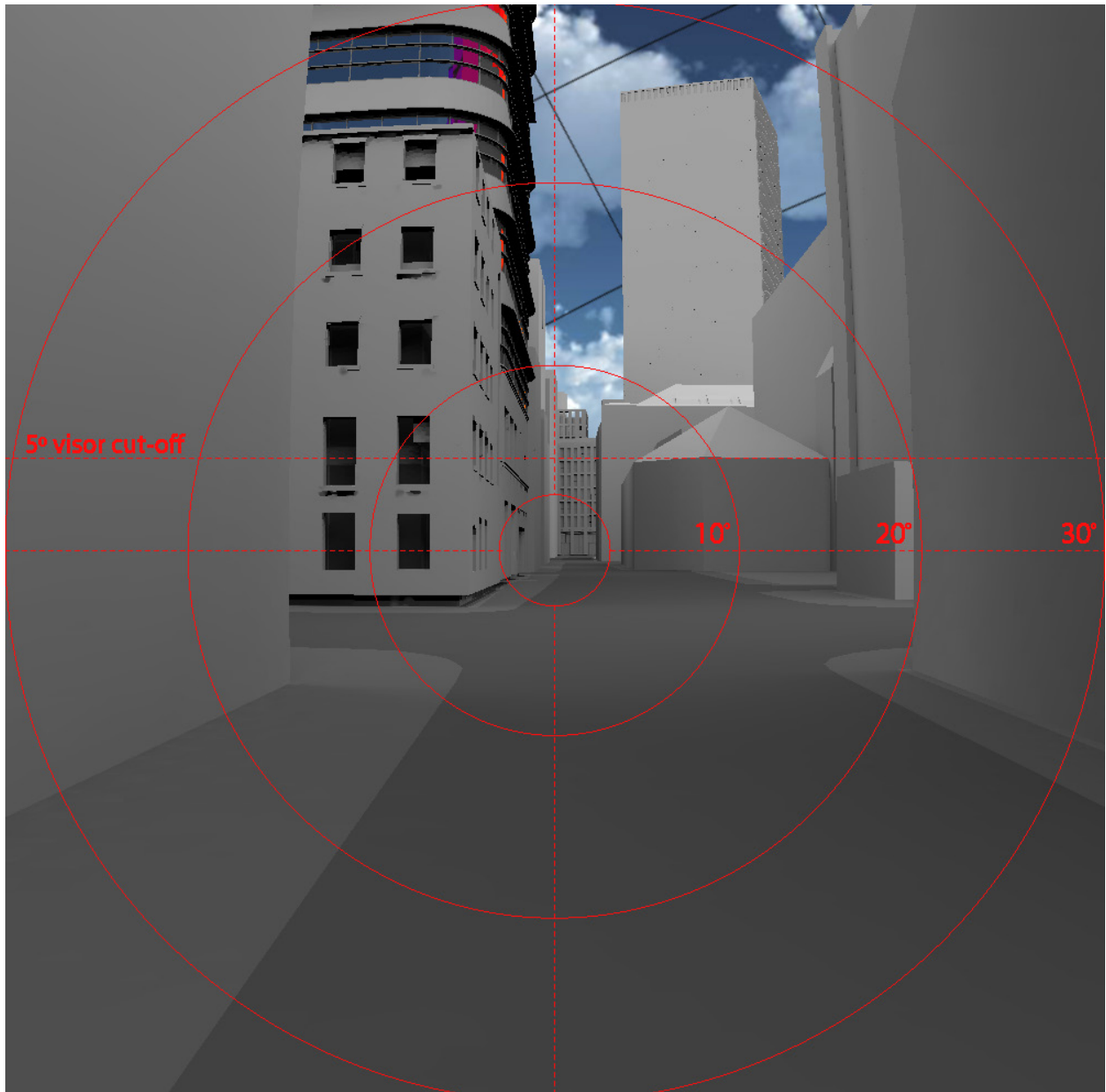
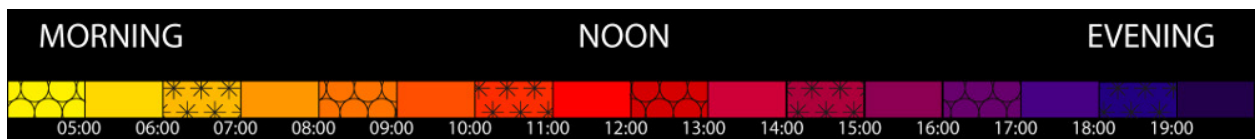


Fig. 33: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT HS2 - LOOKING FORWARD

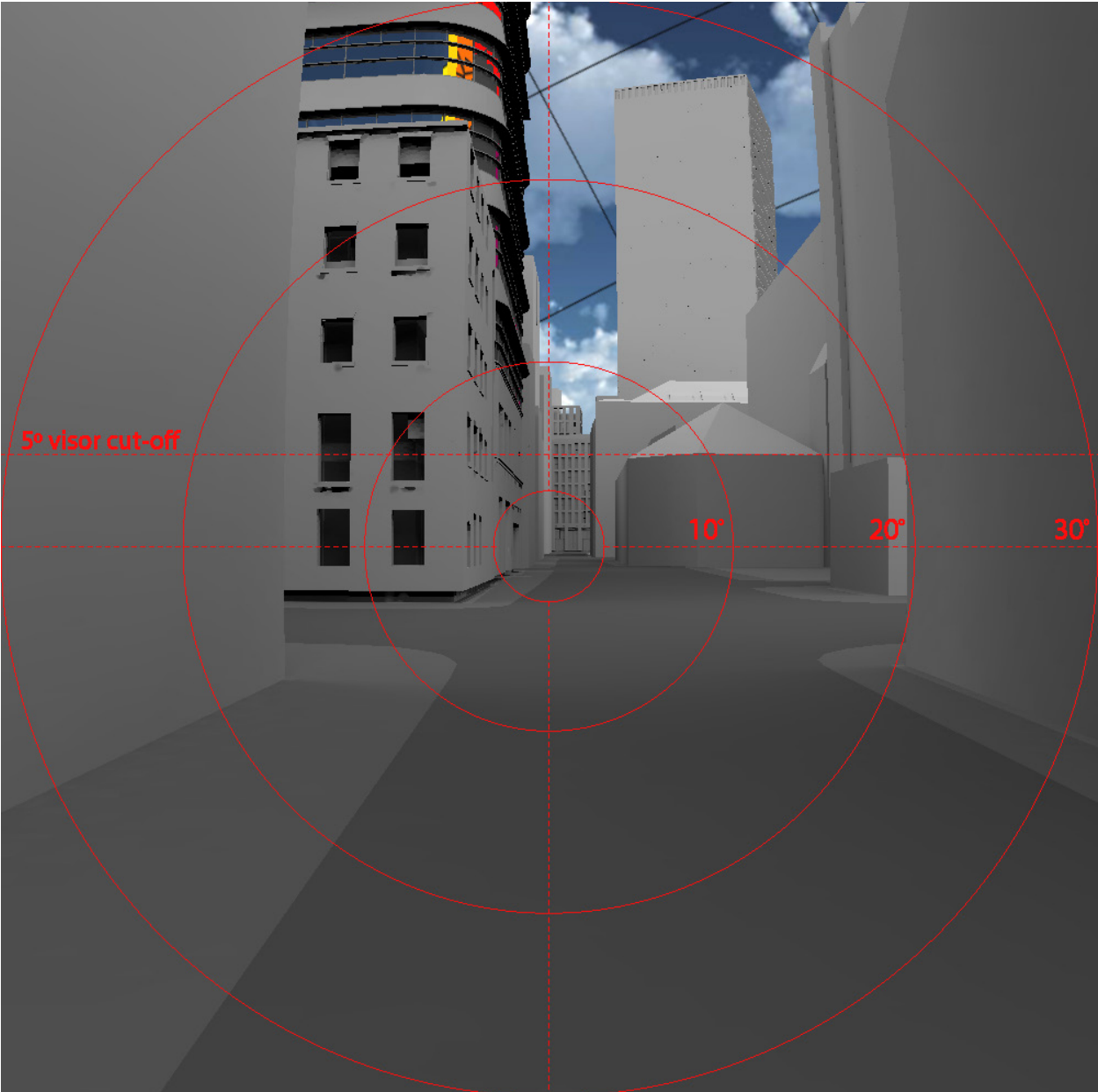


Fig. 34: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA1a - LEFT LANE, LOOKING FORWARD**

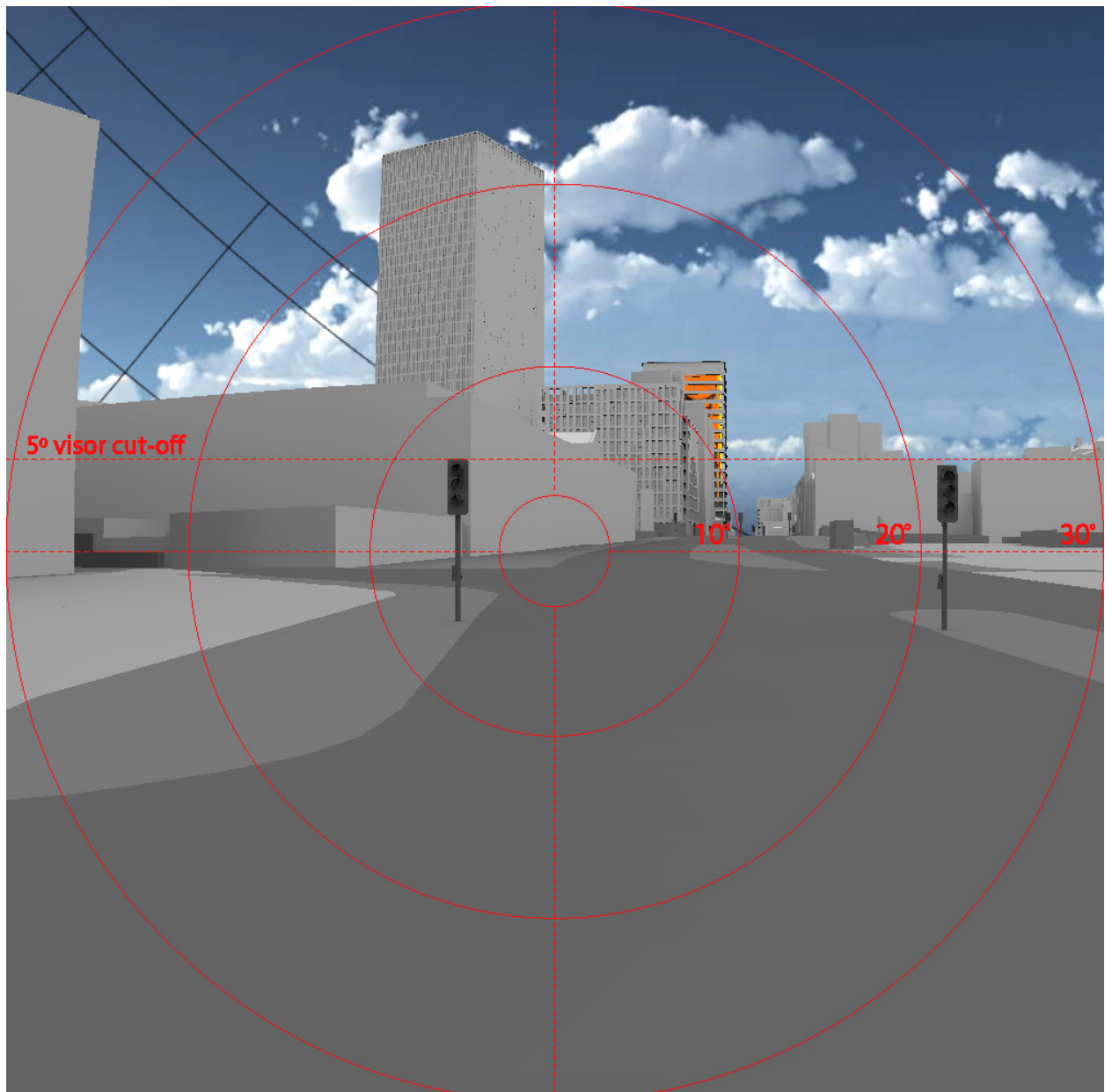
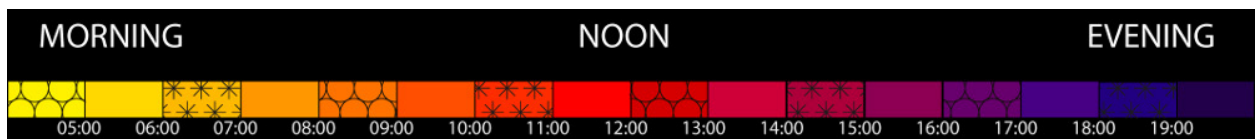


Fig. 35: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA1a - LEFT LANE, LOOKING FORWARD

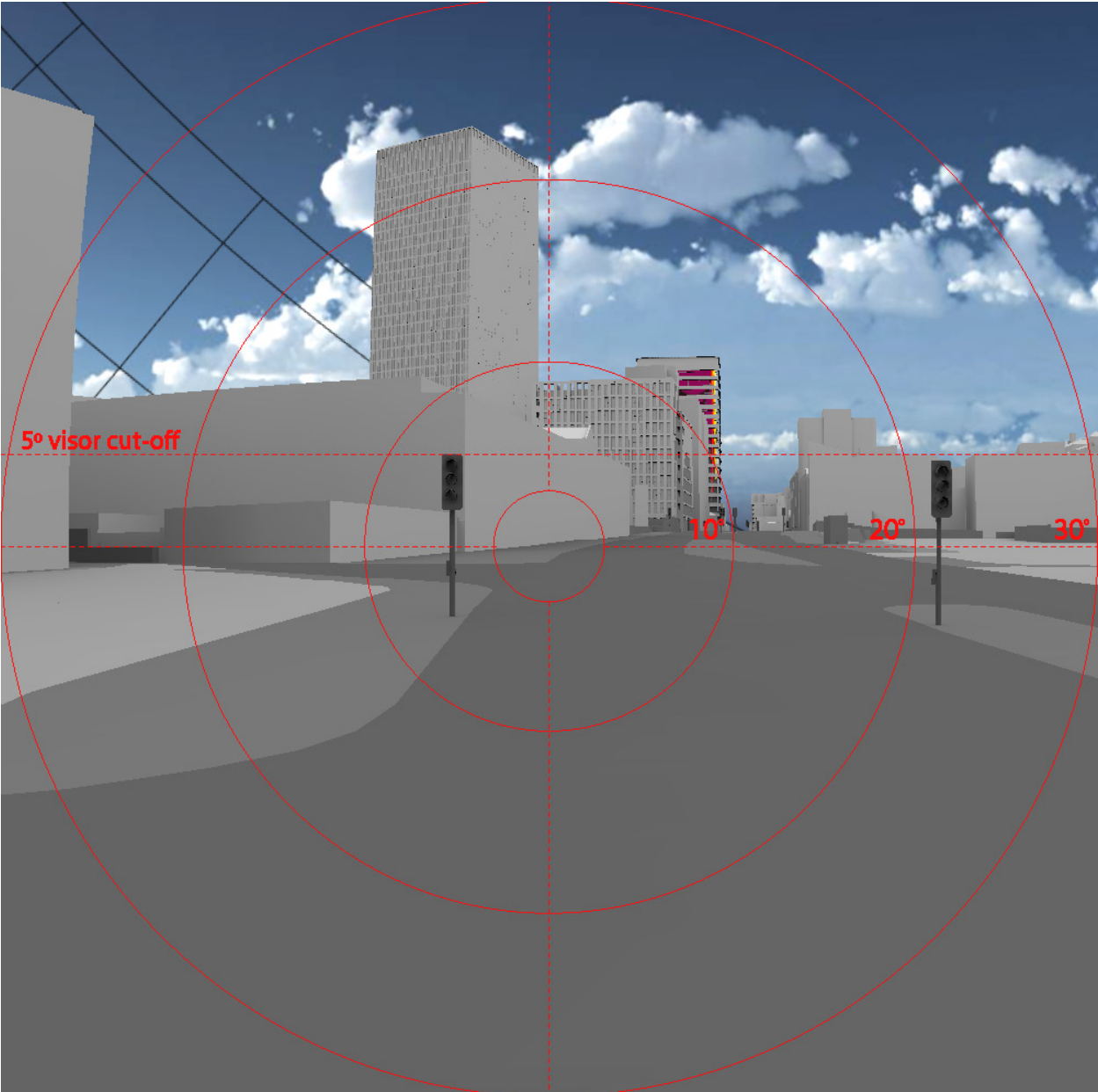


Fig. 36: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA1b - LEFT LANE, LOOKING AT TRAFFIC LIGHT**

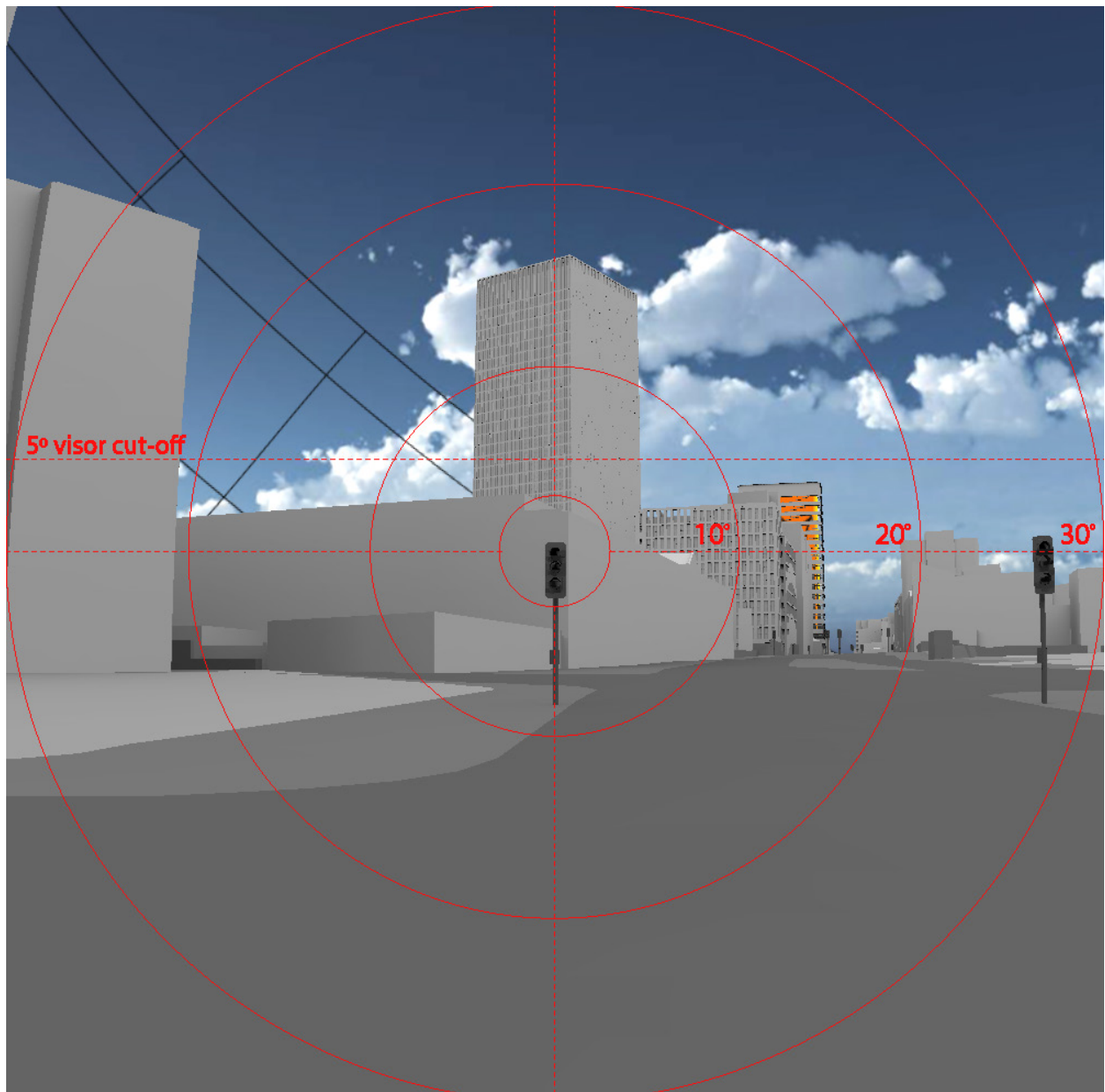
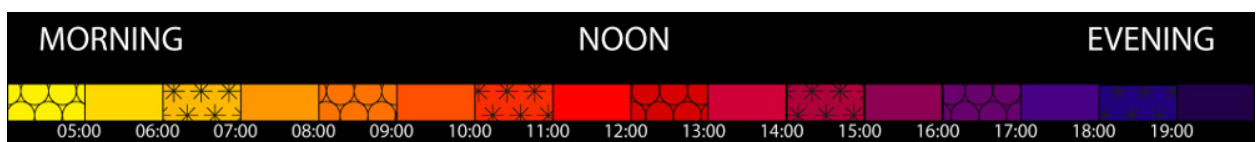


Fig. 37: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA1b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS

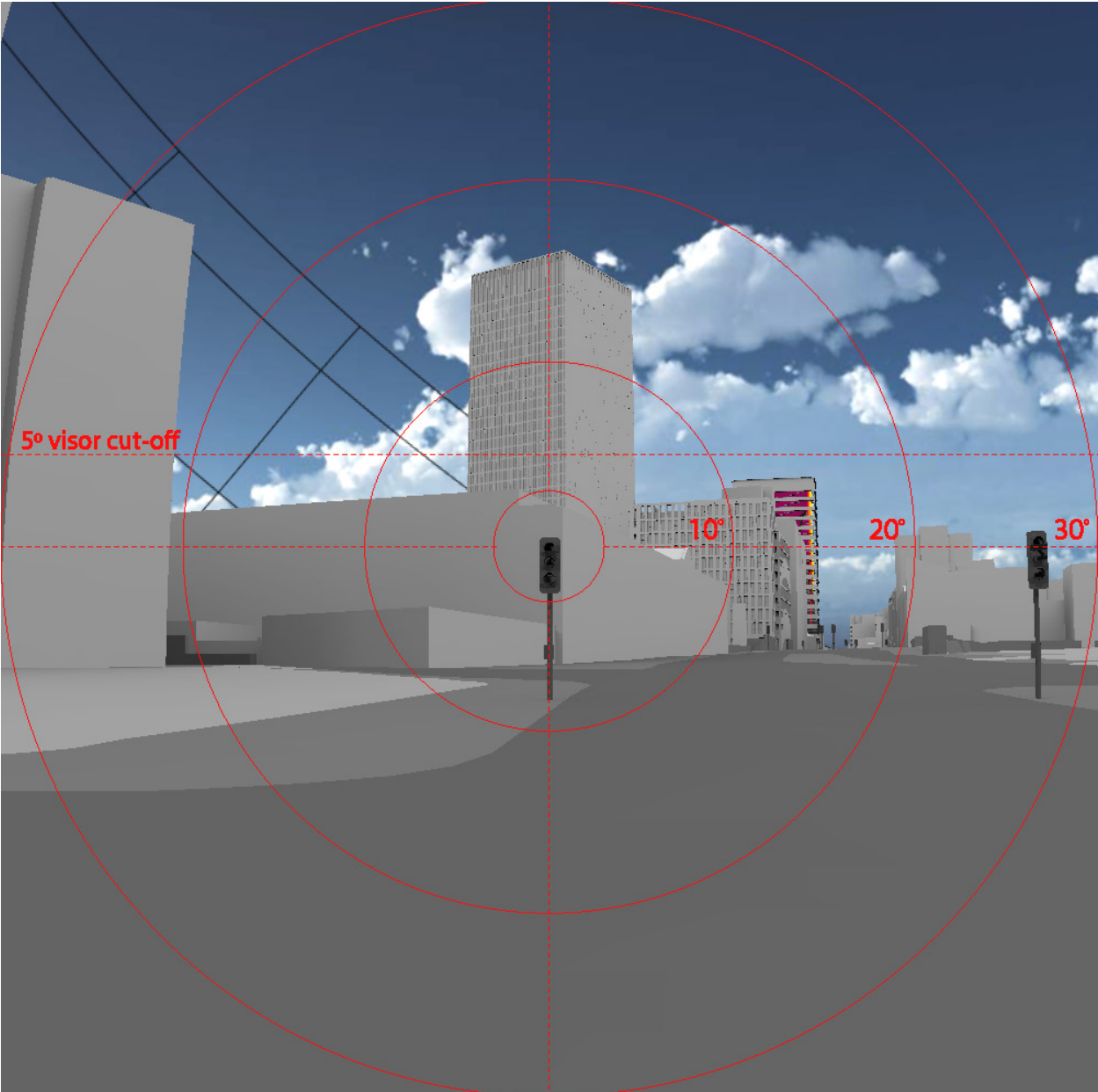


Fig. 38: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA2a - LEFT LANE, LOOKING FORWARD**

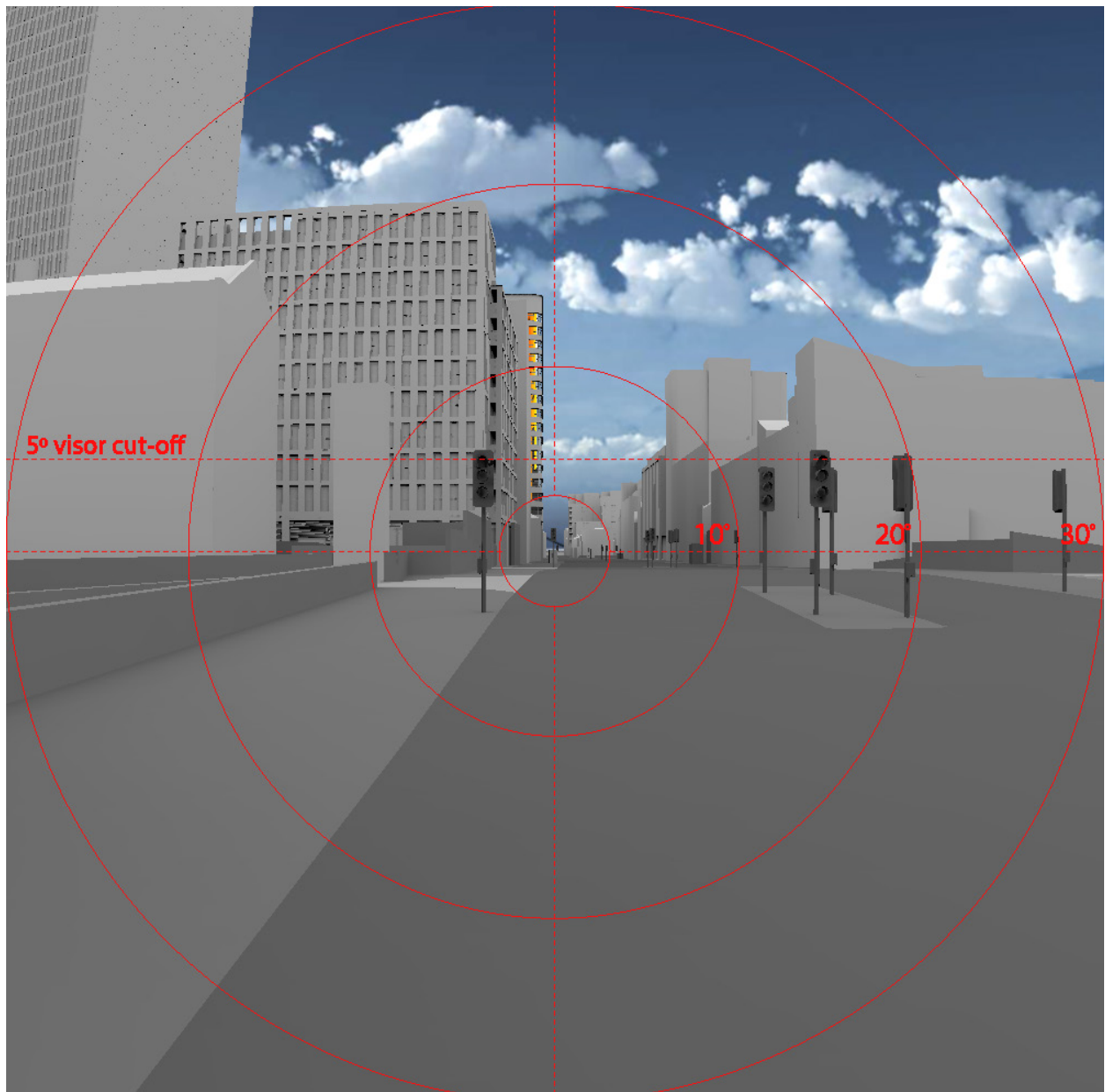
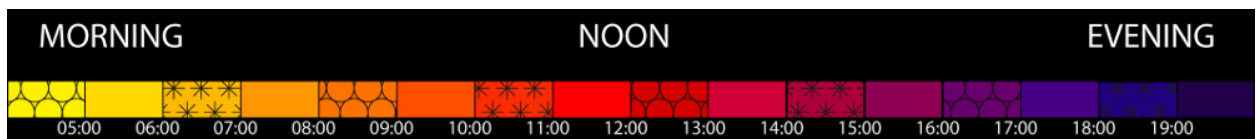


Fig. 39: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA2a - LEFT LANE, LOOKING FORWARD

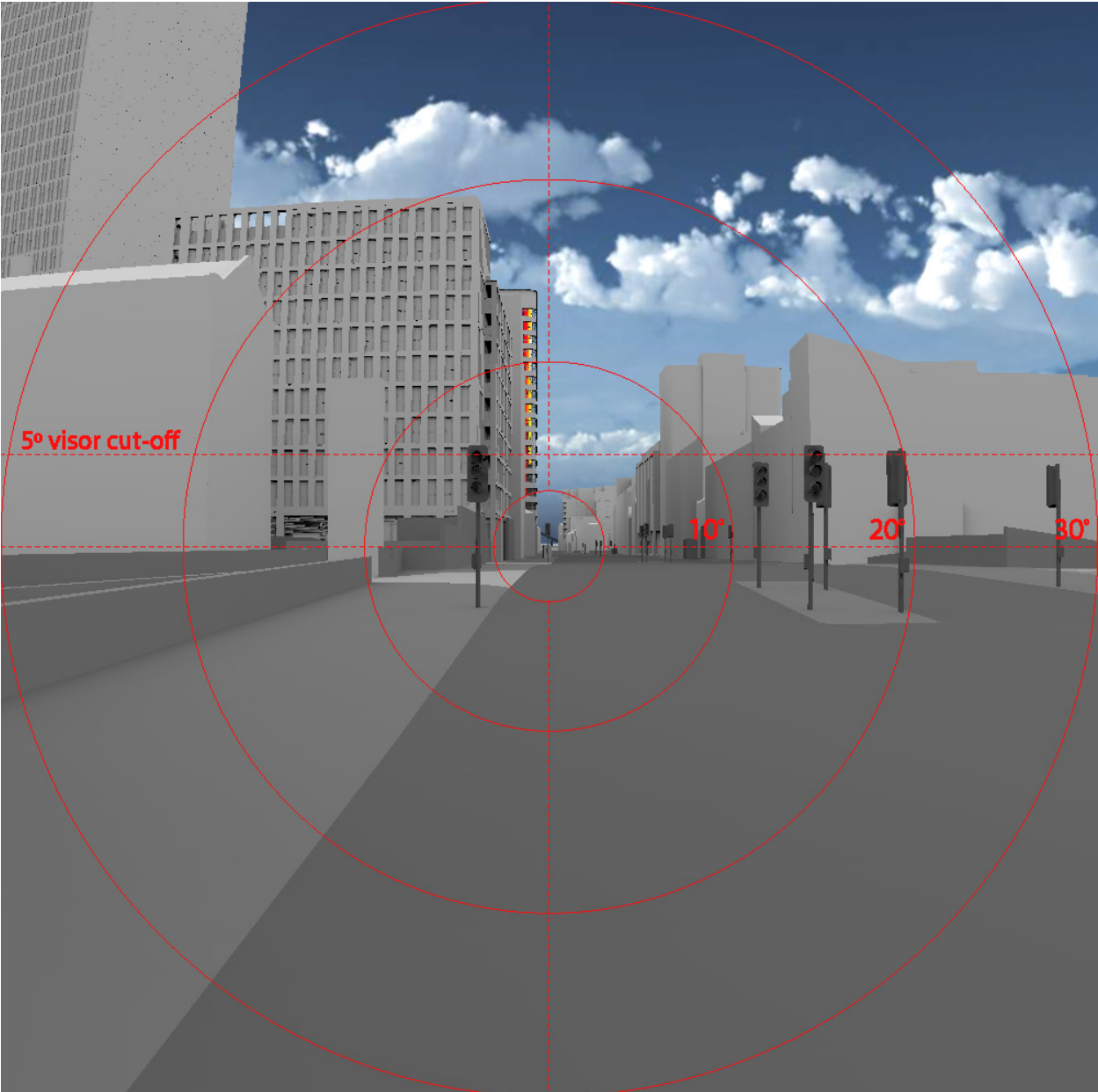


Fig. 40: Solar reflections



60° FIELD OF VIEW: TIME OF DAY  
VIEWPOINT GA2b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS

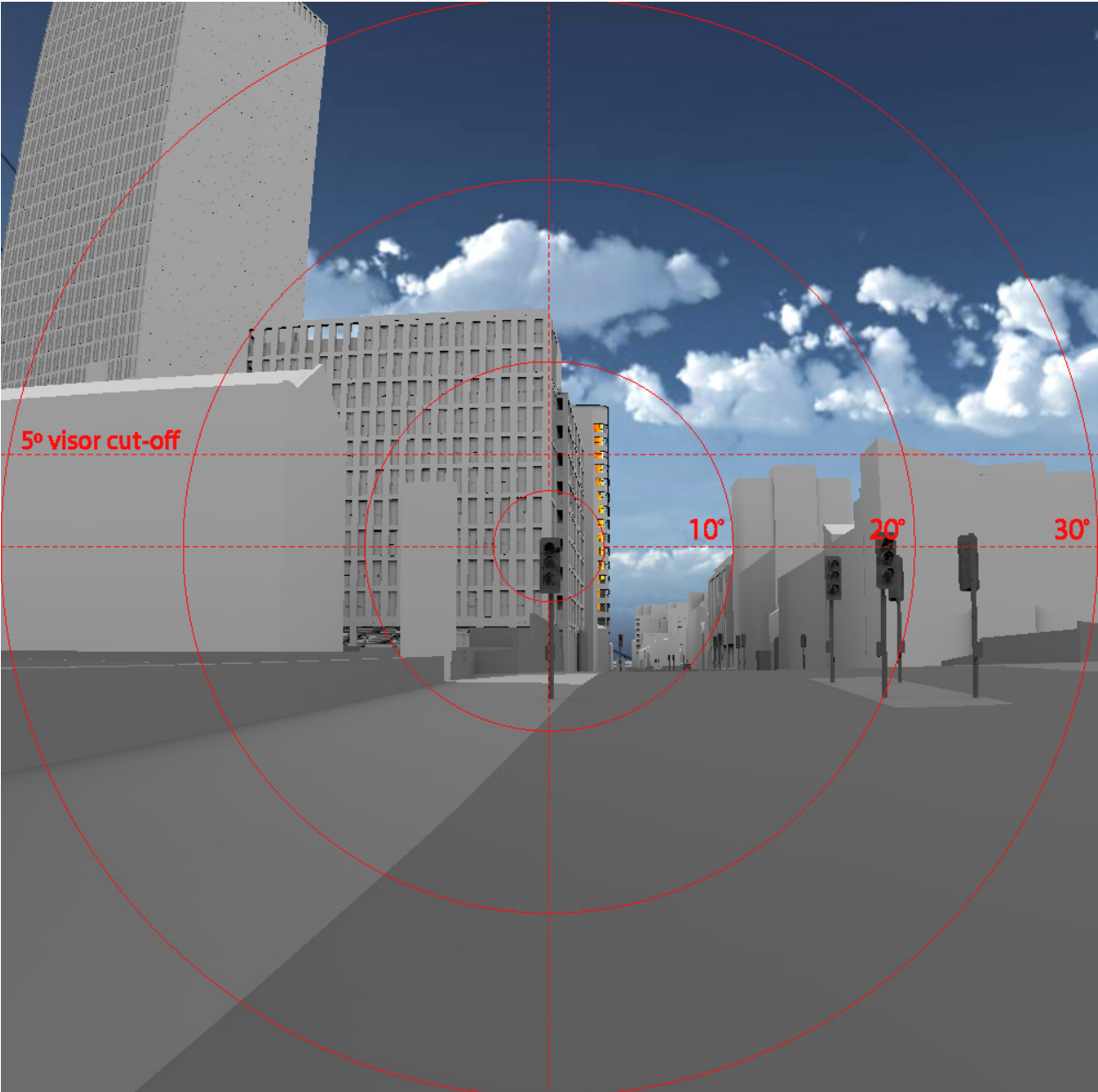
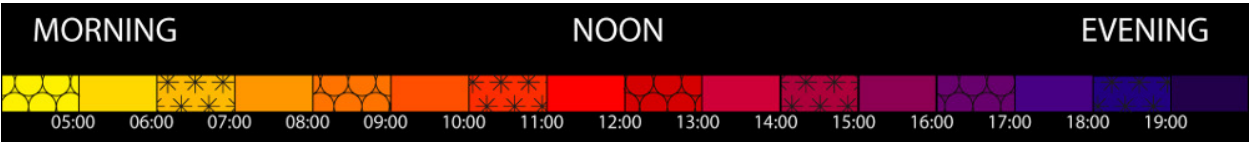


Fig. 41: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA2b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS

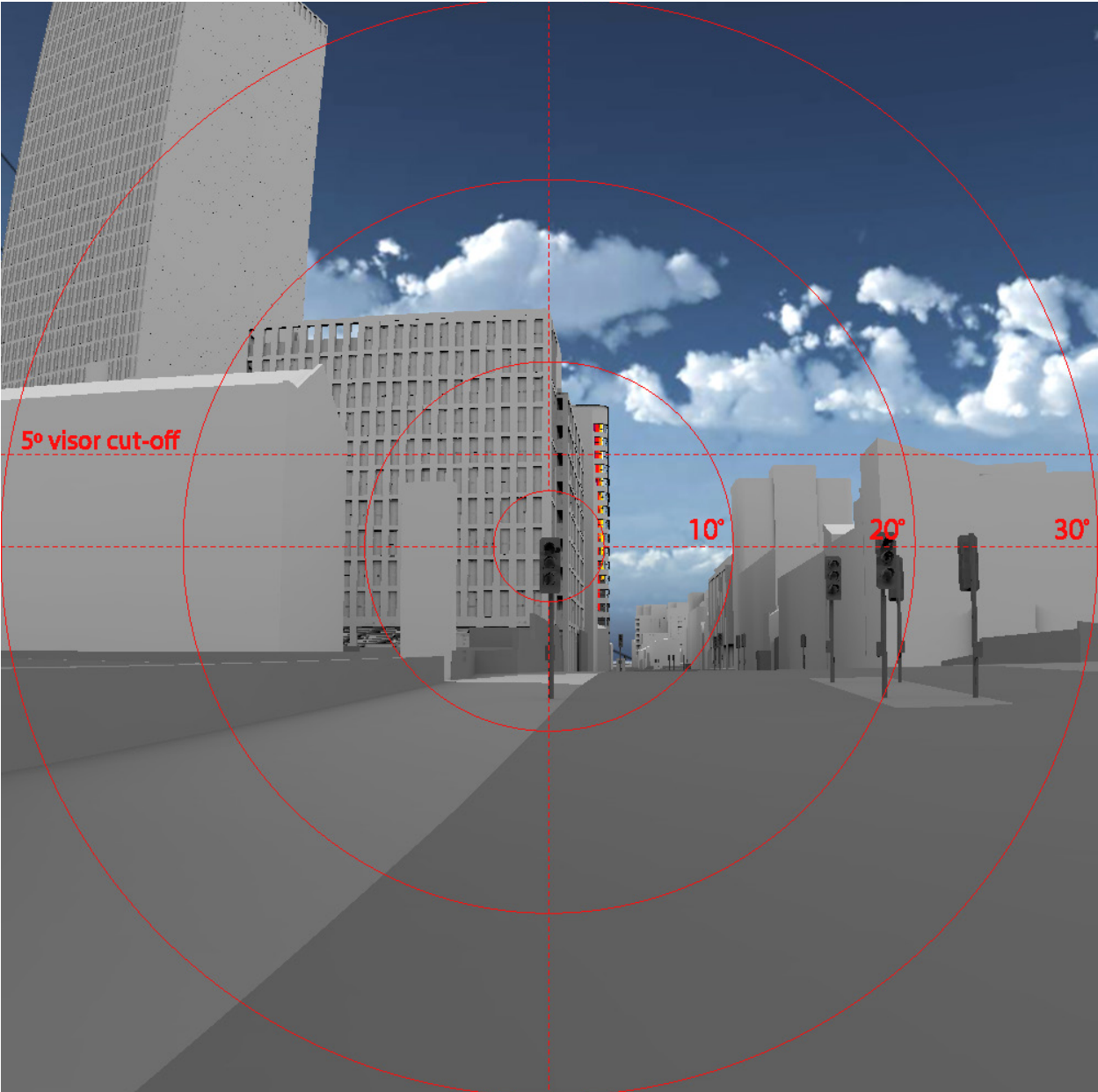


Fig. 42: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA3a - LEFT LANE, LOOKING FORWARD**

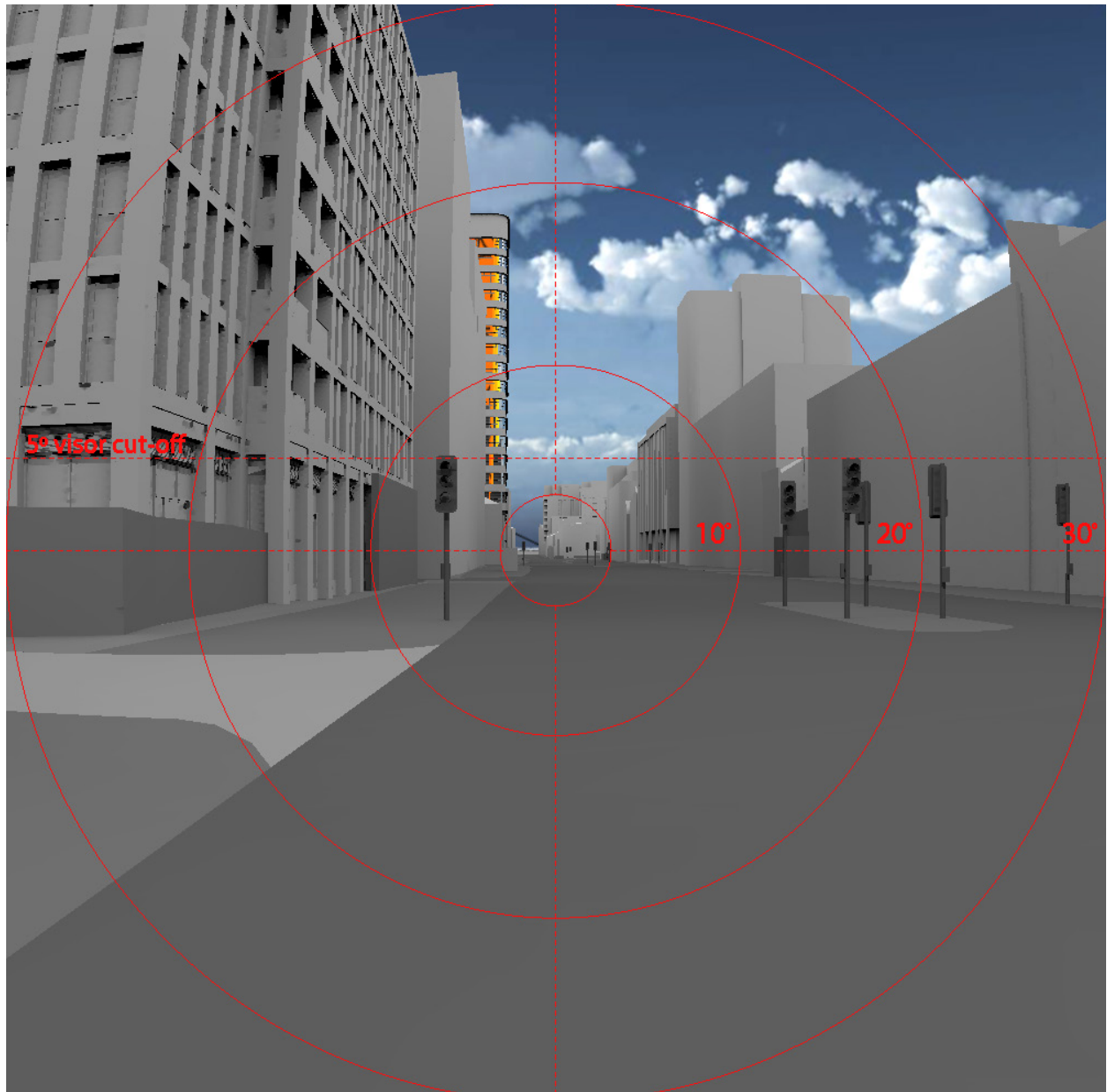
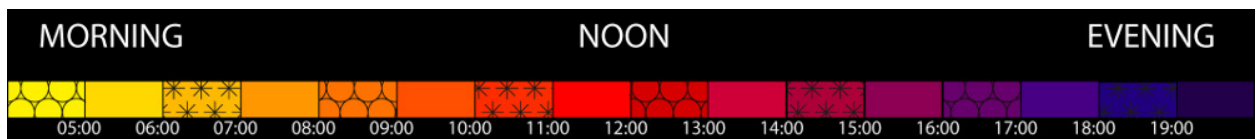


Fig. 43: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA3a - LEFT LANE, LOOKING FORWARD

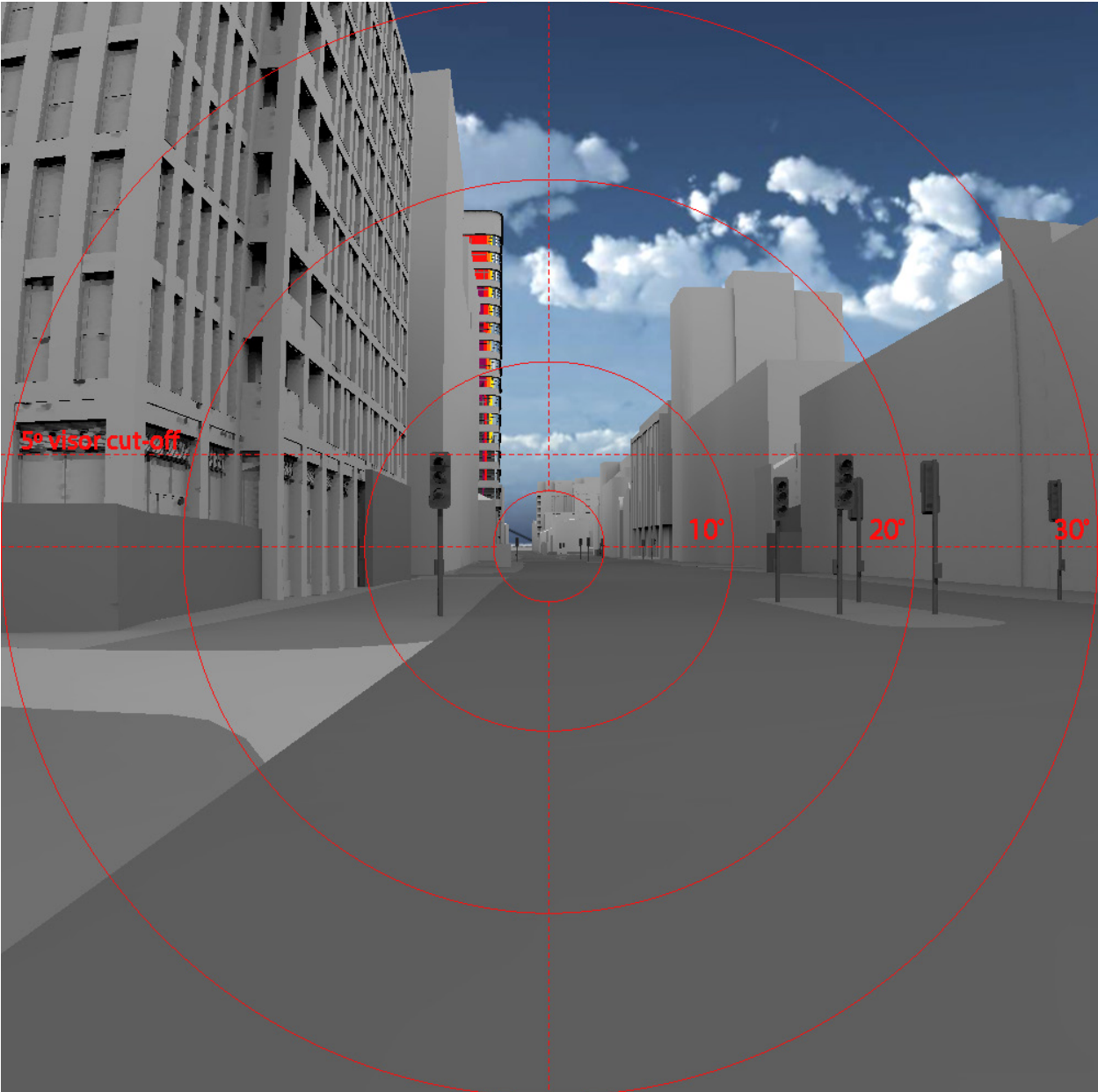


Fig. 44: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA3b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS**

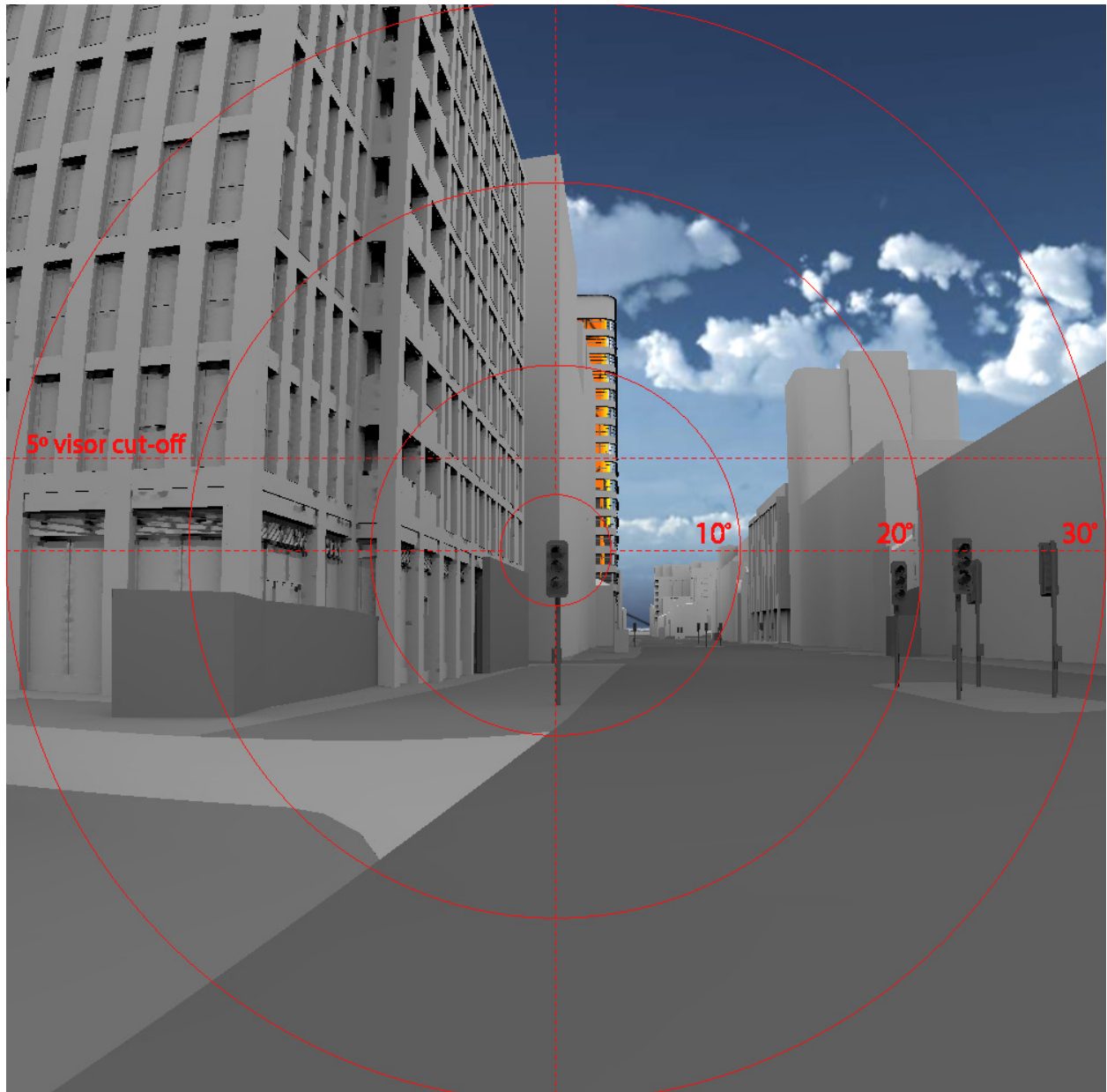
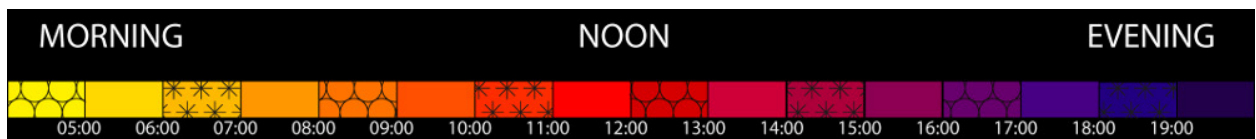


Fig. 45: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA3b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS

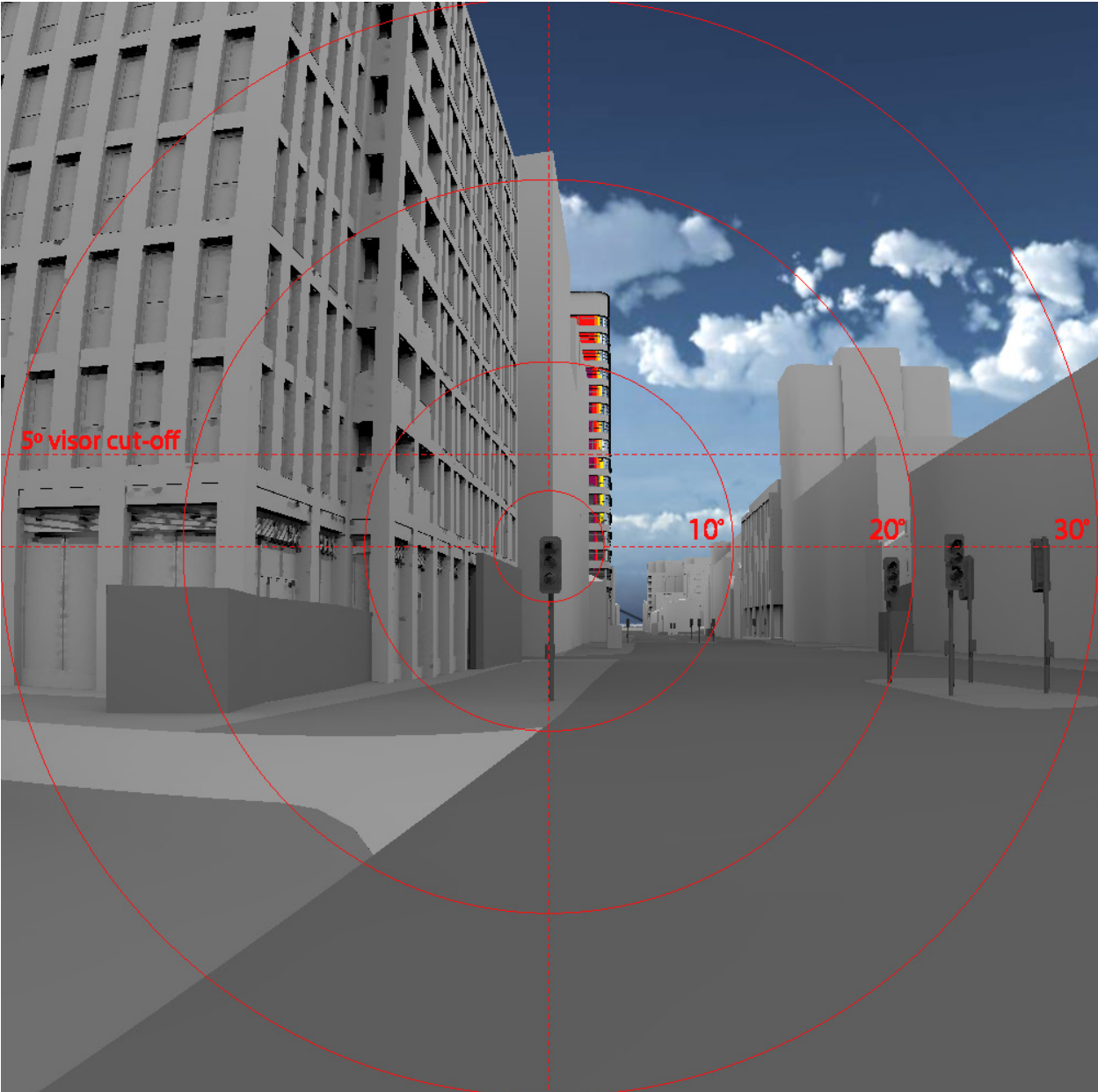


Fig. 46: Solar reflections



60° FIELD OF VIEW: TIME OF DAY  
VIEWPOINT GA4a - LEFT LANE, LOOKING FORWARD

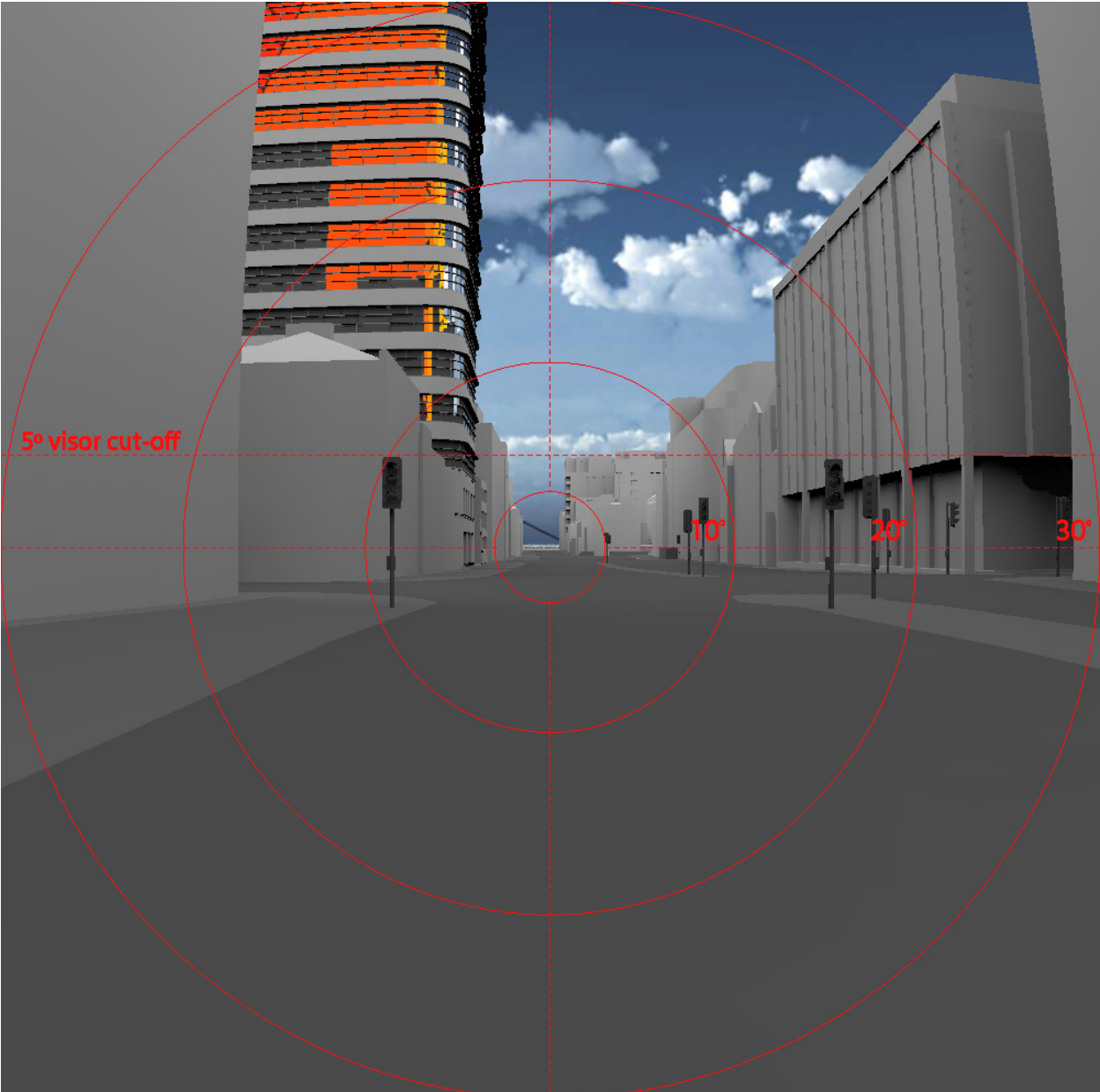
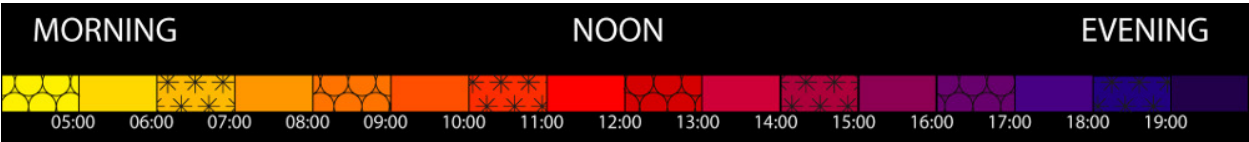


Fig. 47: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA4a - LEFT LANE, LOOKING FORWARD

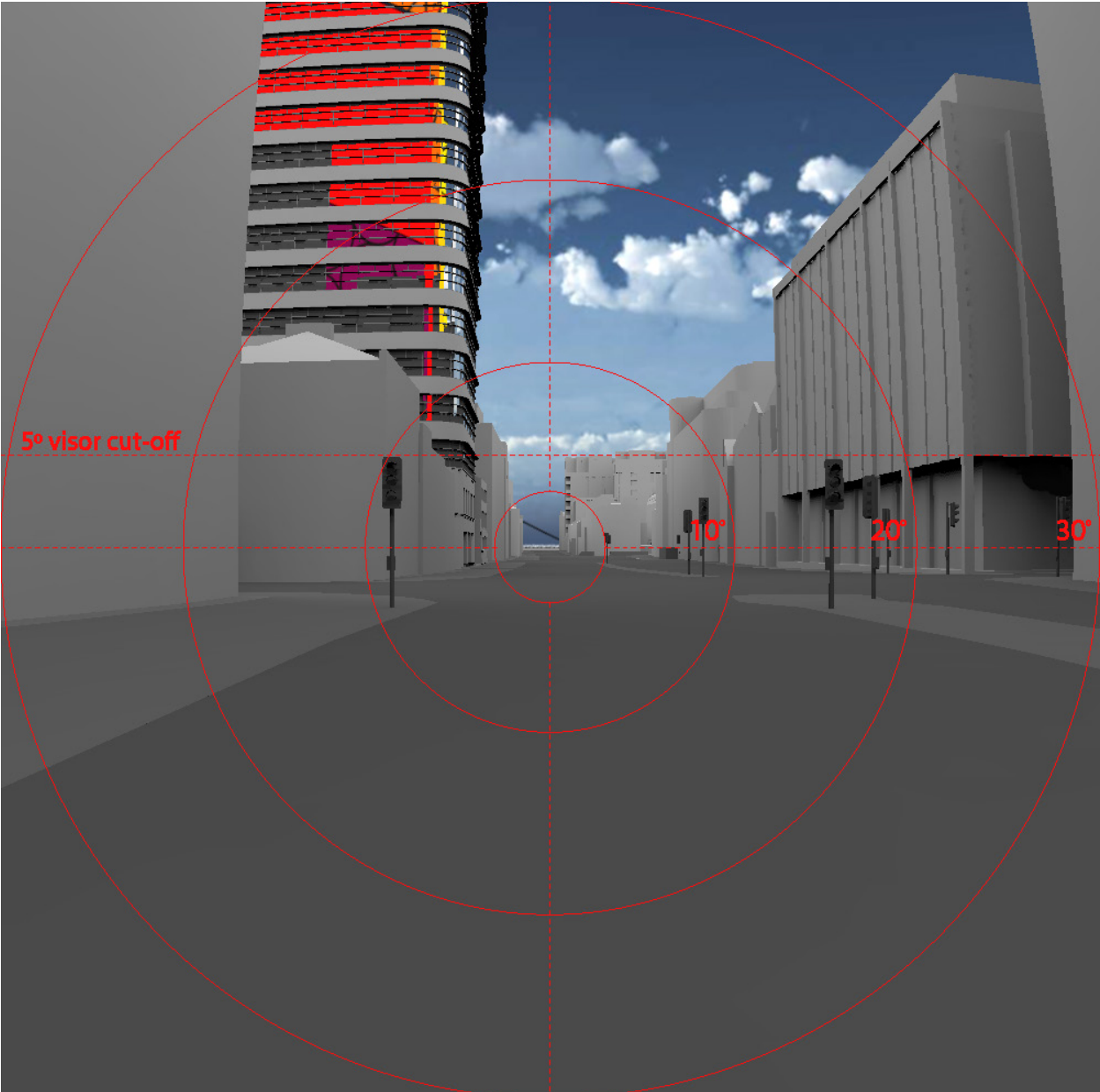


Fig. 48: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA4b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS**

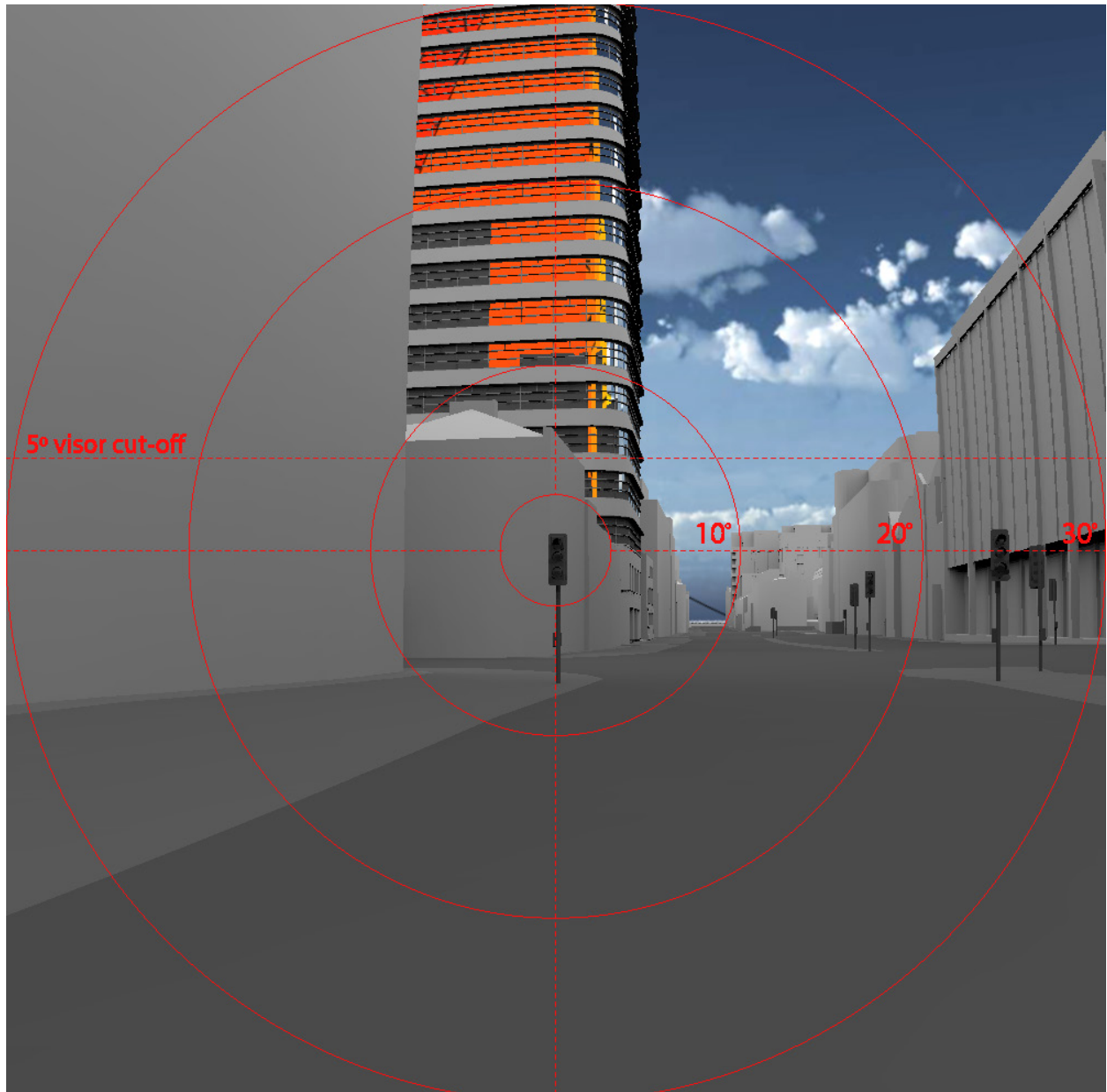
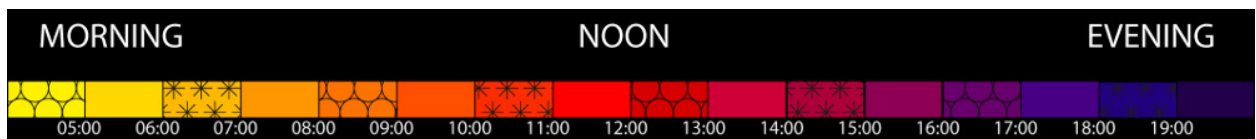


Fig. 49: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA4b - LEFT LANE, LOOKING AT TRAFFIC LIGHTS

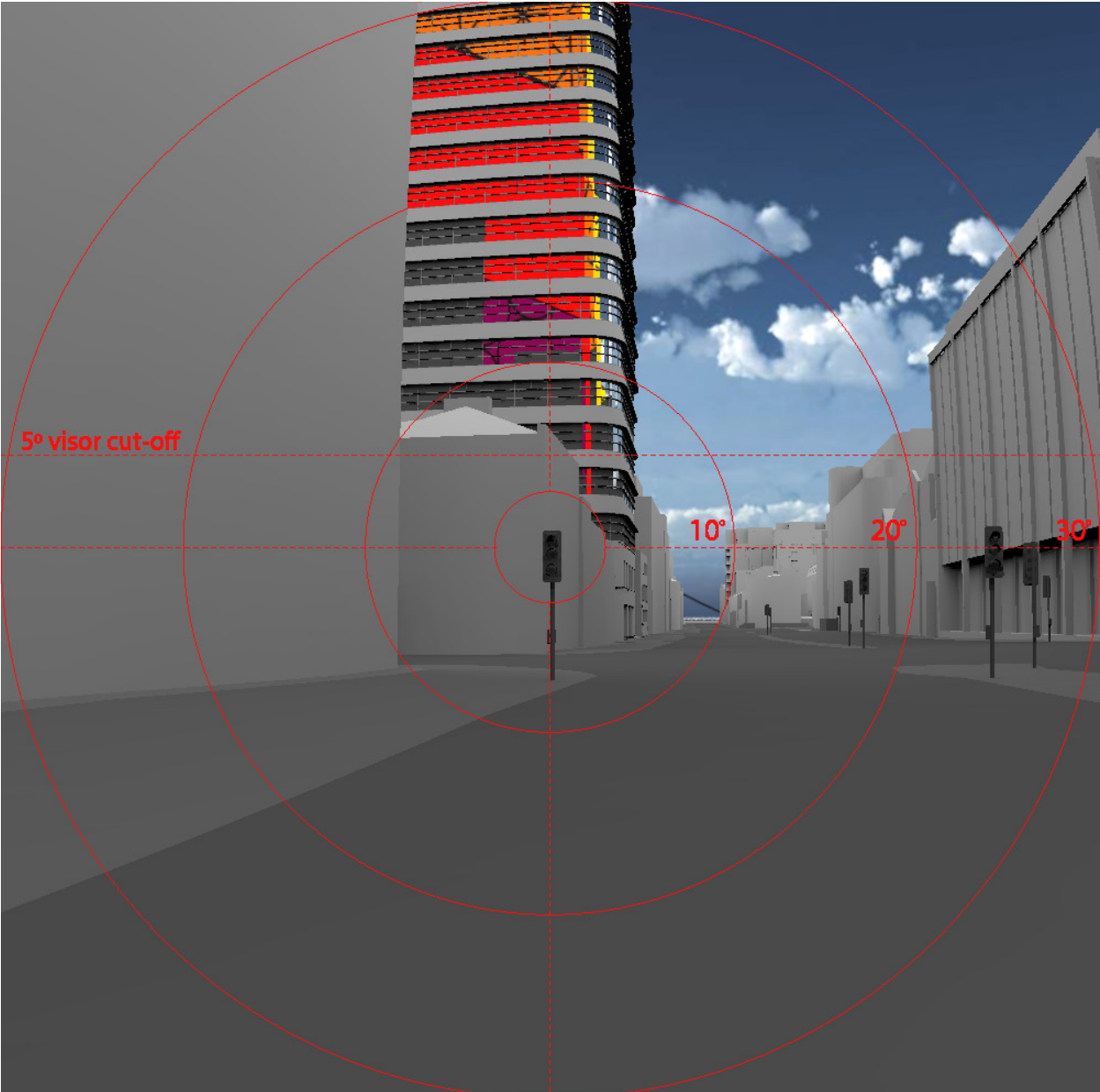


Fig. 50: Solar reflections



**60° FIELD OF VIEW: TIME OF DAY**  
**VIEWPOINT GA5a - RIGHT LANE, LOOKING FORWARD**

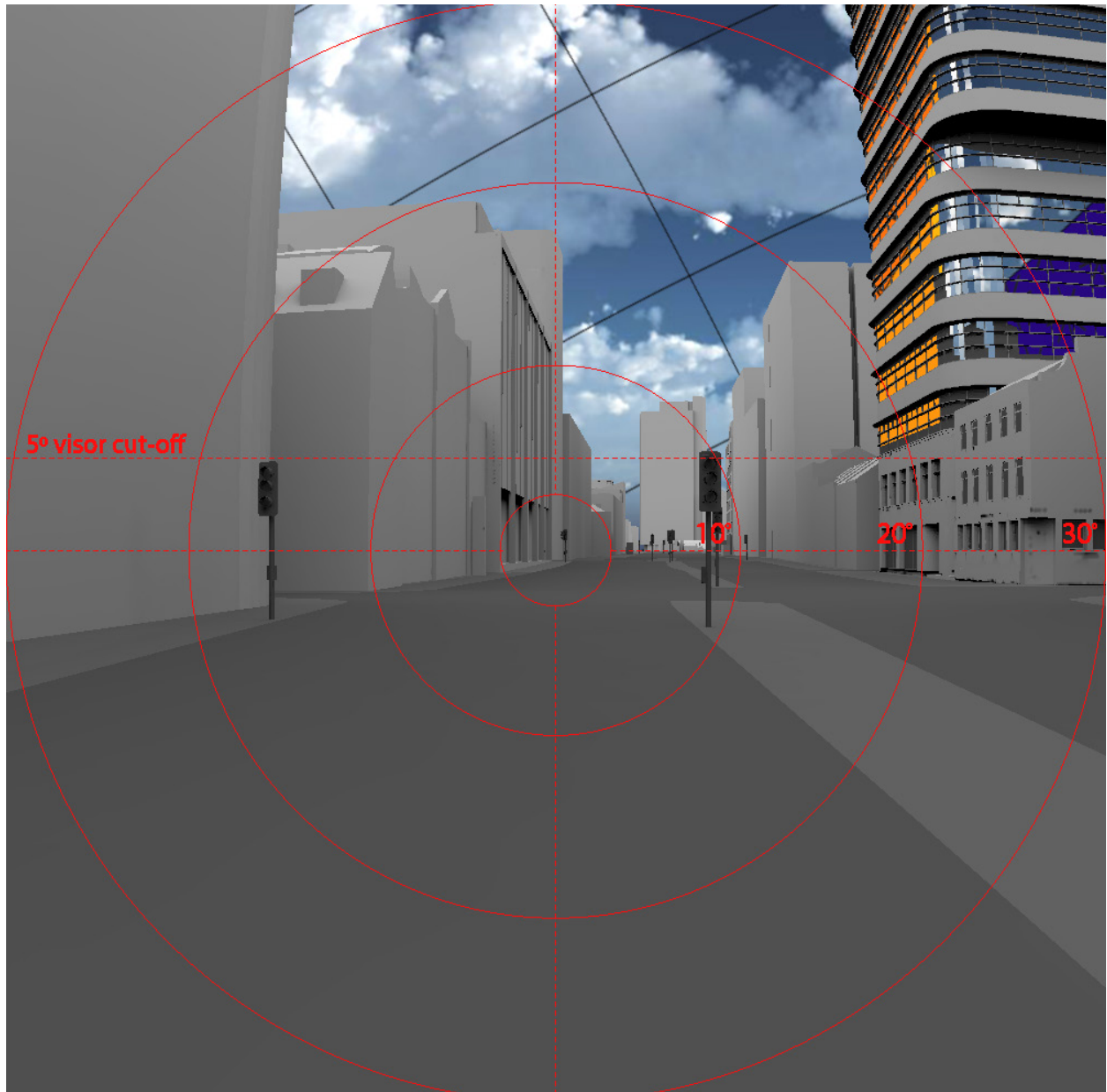
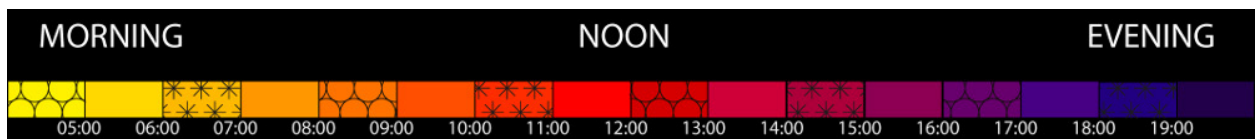


Fig. 51: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA5a - RIGHT LANE, LOOKING FORWARD

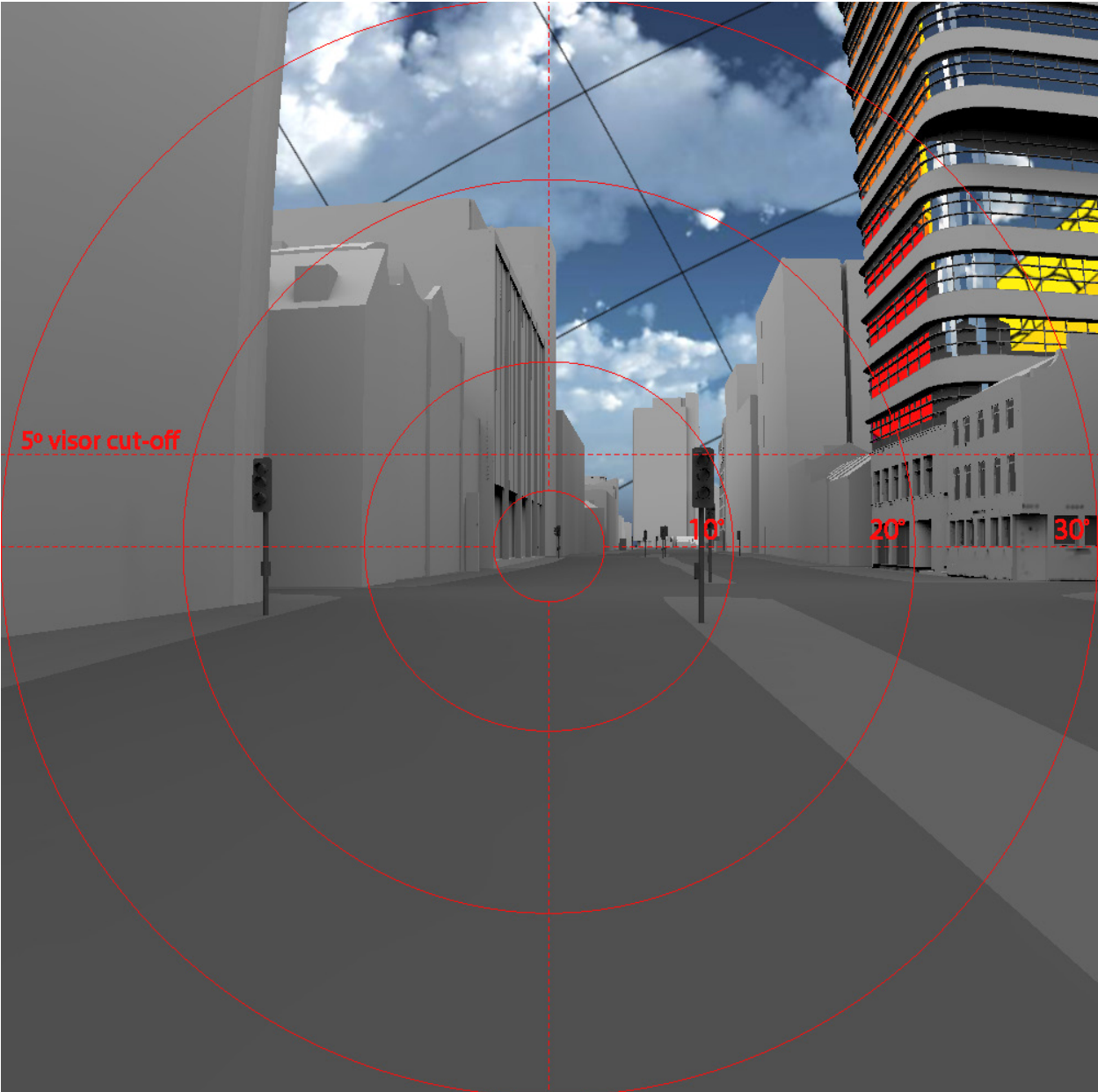


Fig. 52: Solar reflections



60° FIELD OF VIEW: TIME OF DAY  
VIEWPOINT GA5b - RIGHT LANE, LOOKING AT TRAFFIC LIGHTS

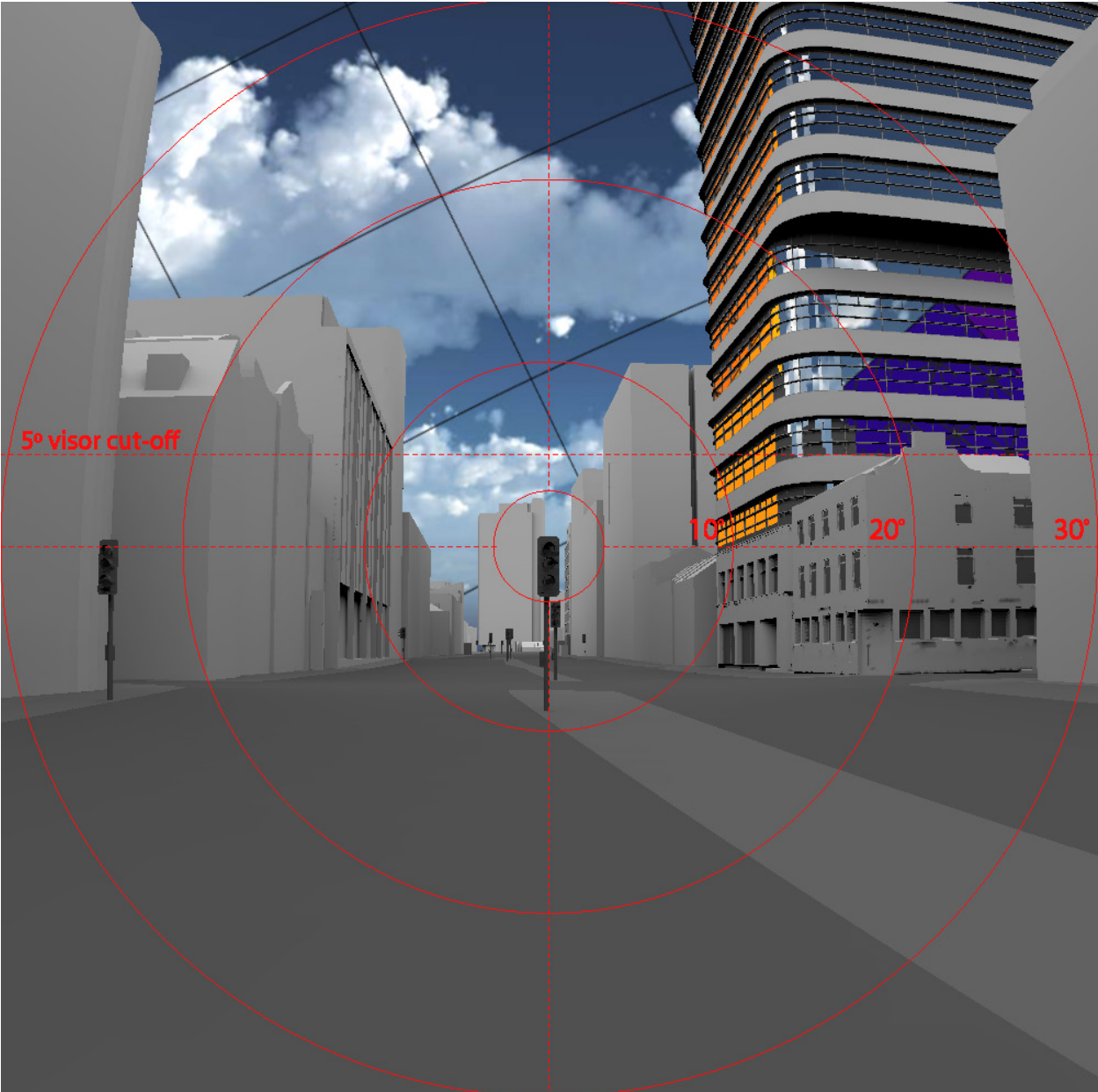
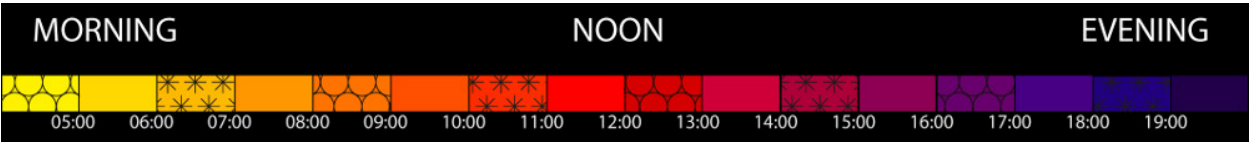


Fig. 53: Solar reflections



60° FIELD OF VIEW: SEASON  
VIEWPOINT GA5b - RIGHT LANE, LOOKING AT TRAFFIC LIGHTS

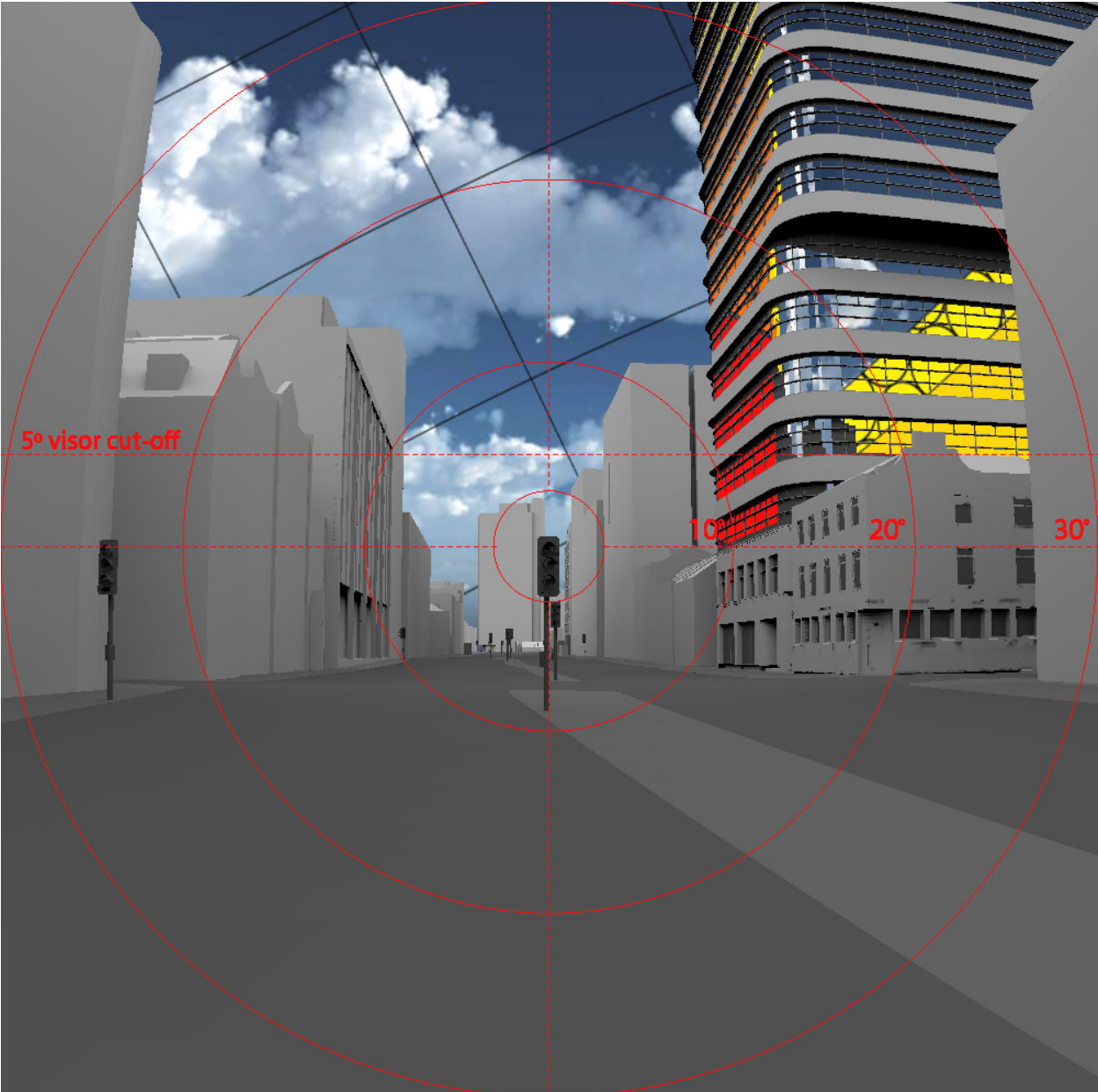


Fig. 54: Solar reflections





## 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