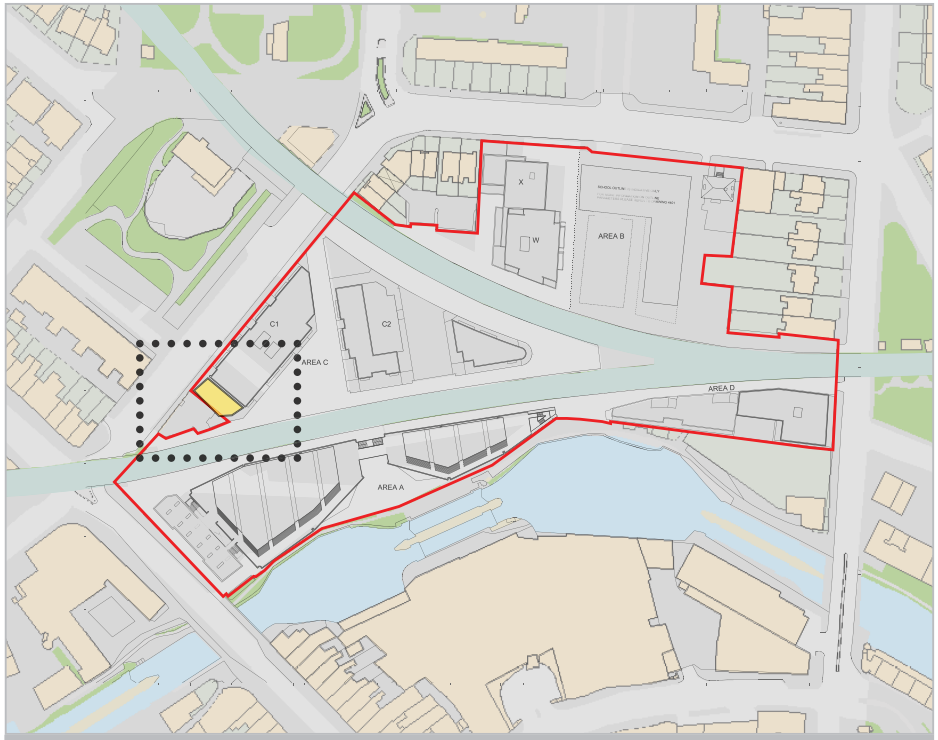


Figure 39: Assessed area

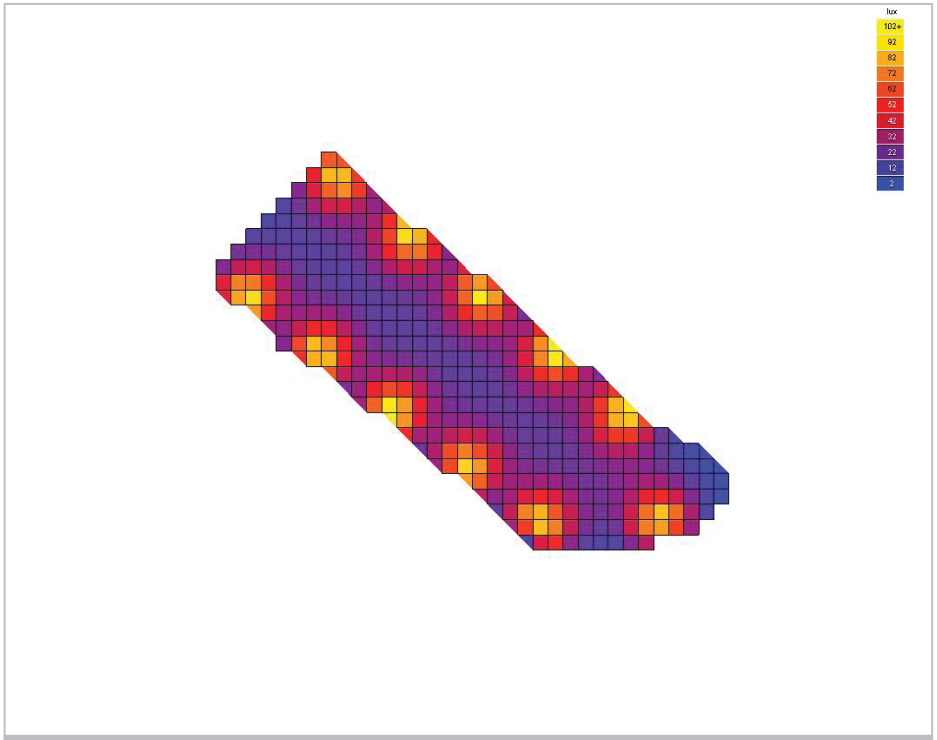


Figure 40: Falsecolour view

Recommended minimum Lux levels per area type:

Public/private terraces - 5 avg. | 1 min.

Achieved Lux levels:

Public/private terraces -34 avg. | 2 min.

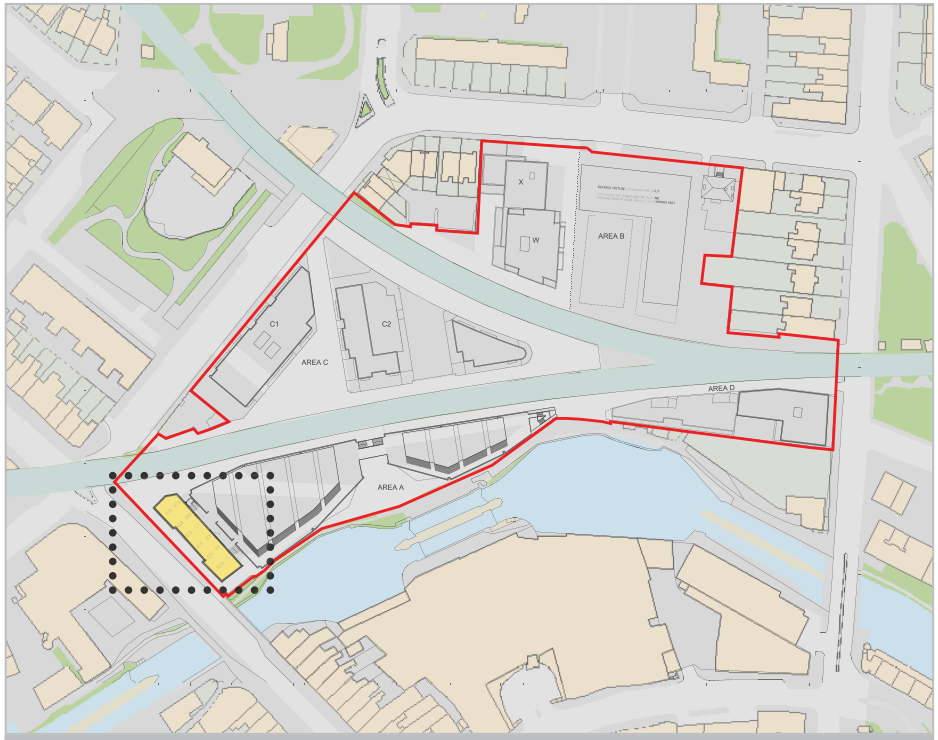


Figure 41: Assessed area

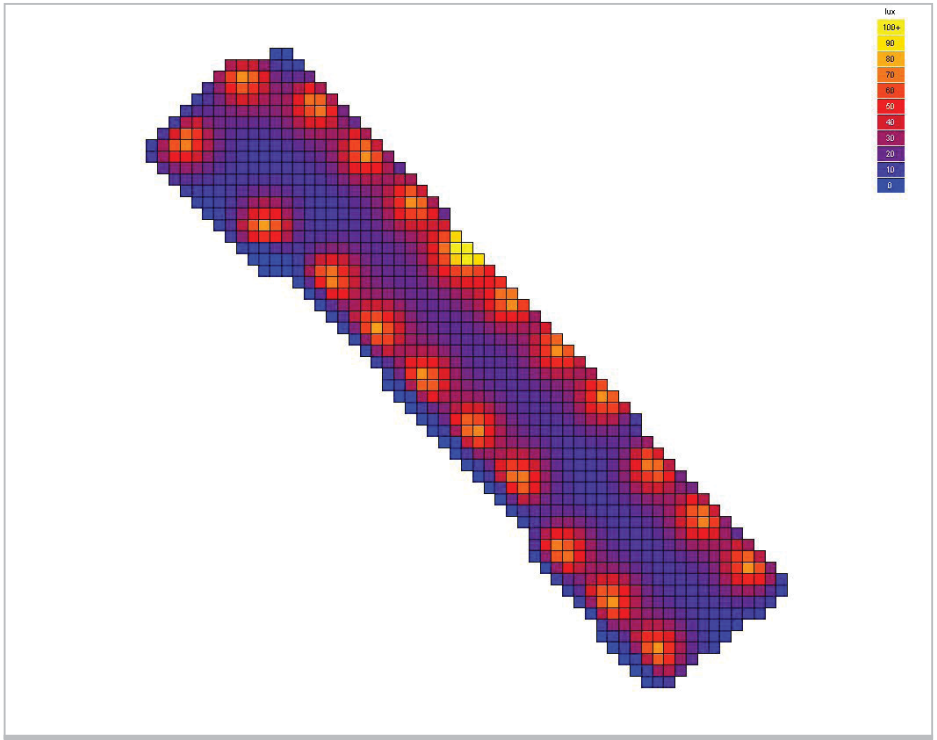


Figure 42: Falsecolour view

Recommended minimum Lux levels per area type:

Public/private terraces - 5 avg. | 1 min.

Achieved Lux levels:

Public/private terraces - 26.6 avg. | 1 min.

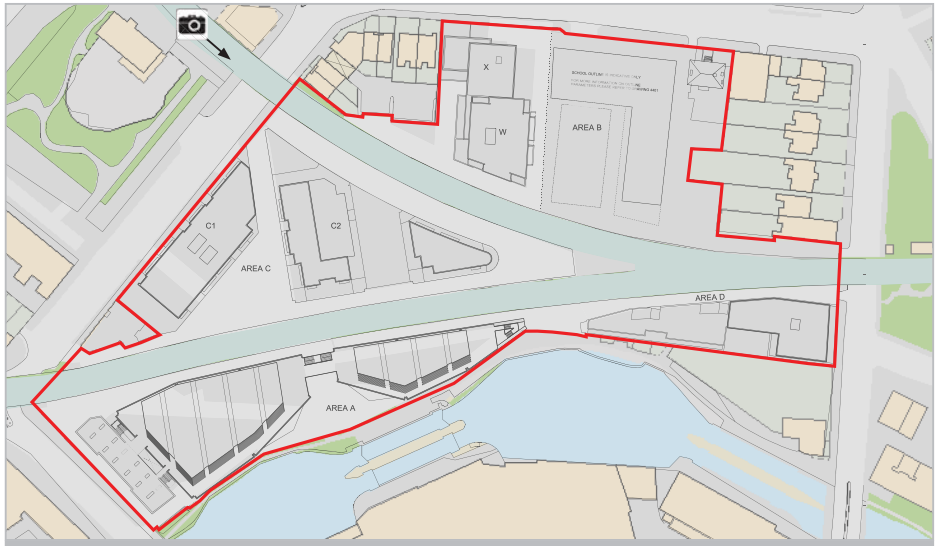


Figure 43: View position on plan

Figure 44: View from train

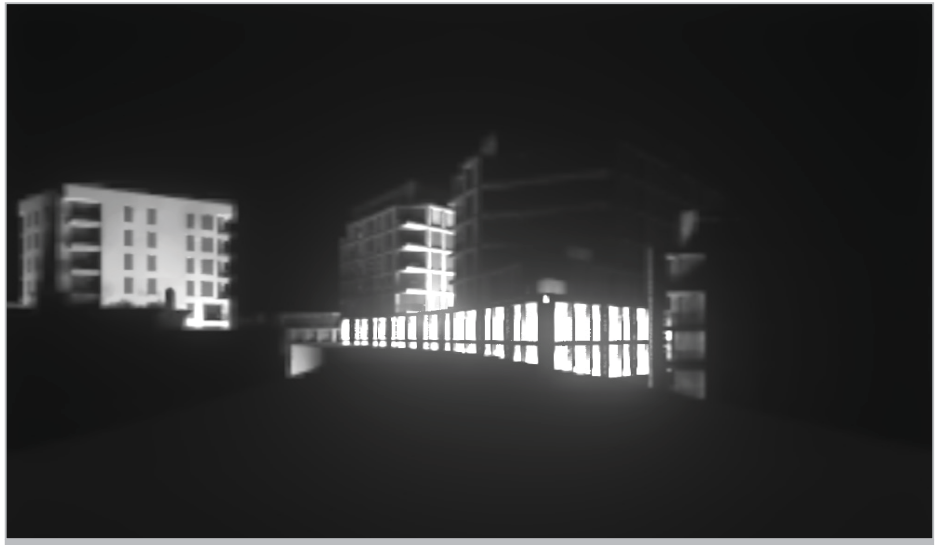


Figure 45: Night-time render

Figure 46: Falsecolour image (candelas)

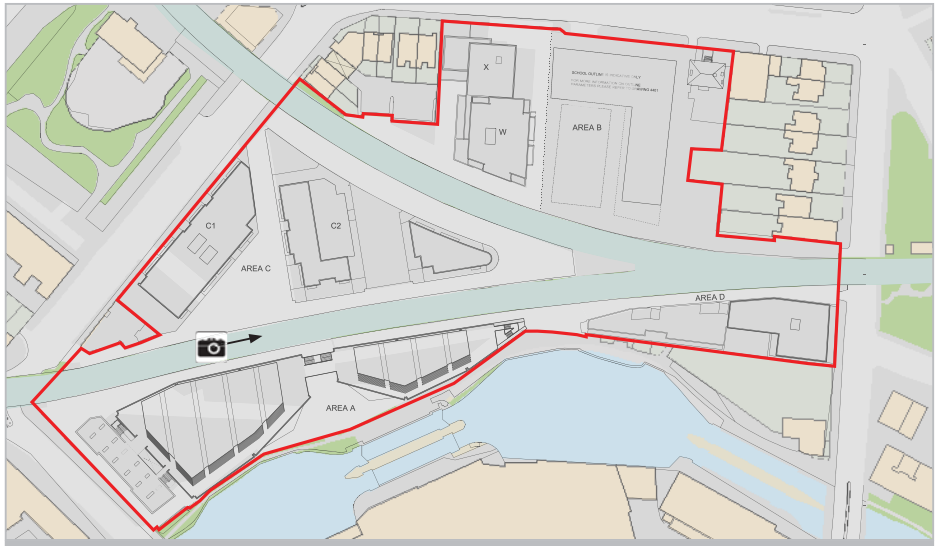


Figure 47: View position on plan

Figure 48: View from train

Figure 49: Night-time render

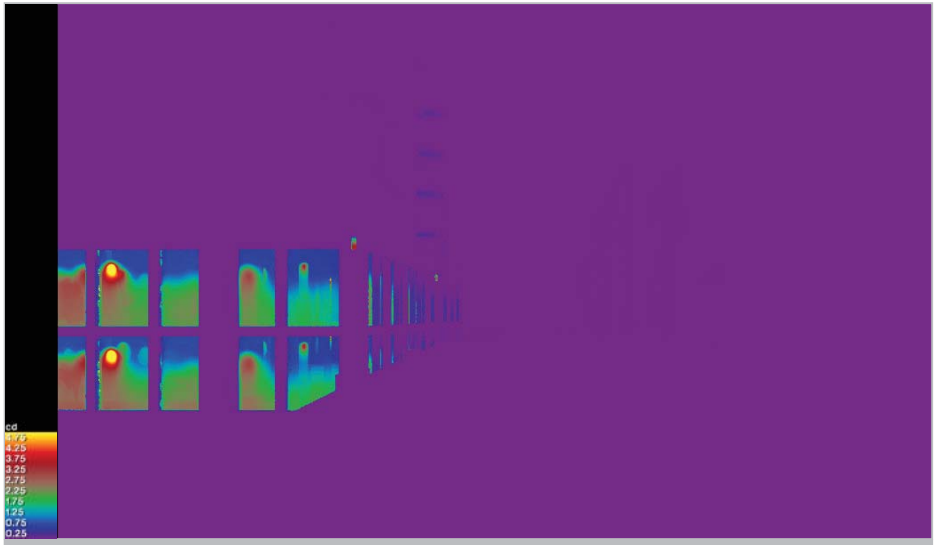


Figure 50: Falsecolour image (candelas)

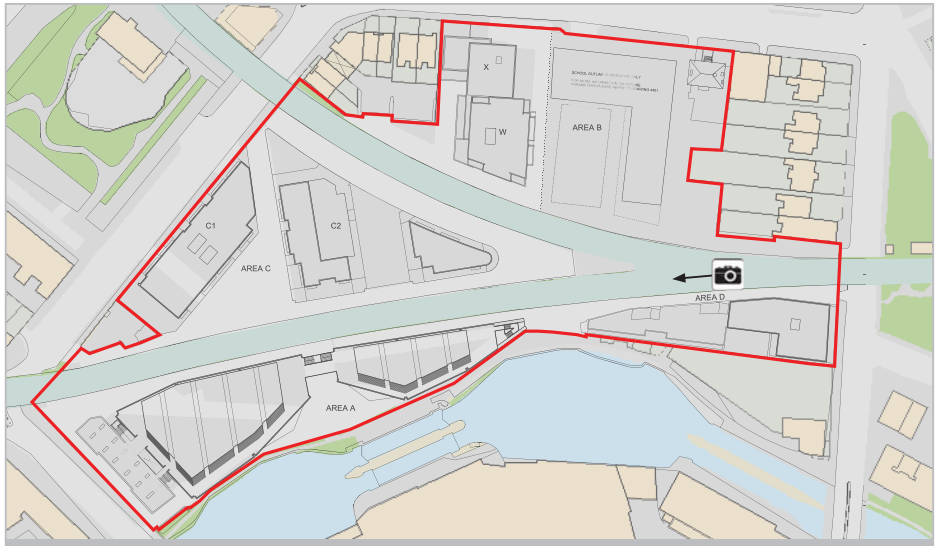


Figure 51: View position on plan

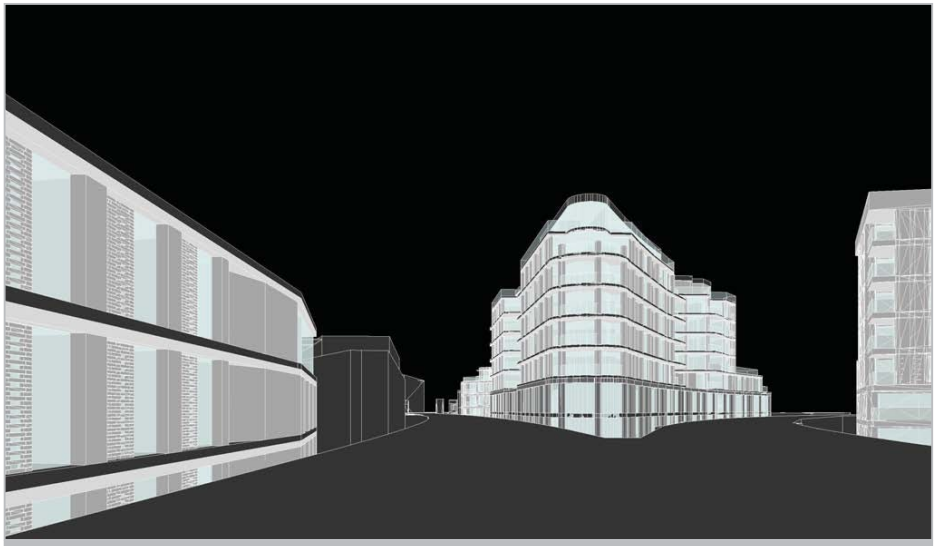


Figure 52: View from train

Figure 53: Night-time render

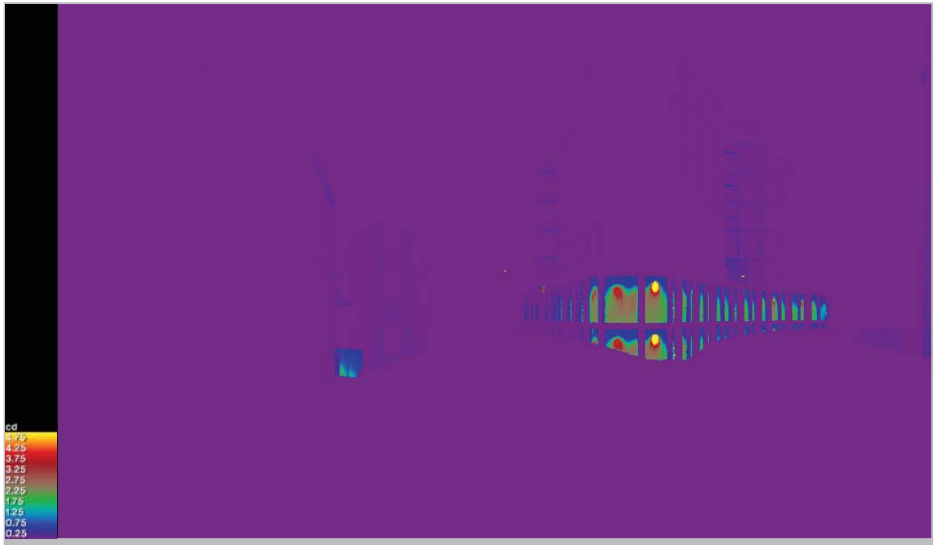


Figure 54: Falsecolour image (candelas)

Appendix 17.8

Solar Glare Results

Reflected Solar Glare Report
Western Parameter

Camden Lock Village
Project No: 2801

December 31, 2011

DAYLIGHT+SOLAR DESIGN

gia

Client	Stanley Sidings Ltd
Architect	AHMM & MAKE
Project Title	Camden Lock Village
Project Number	2801
Report Title	Reflected Solar Glare Report - Western Parameter
Dated	December 31, 2011

Written by	Alex Buckley
Checked by	SP
Type	Planning

Revisions		Date:	Notes:	Signed:
	A	09/11/11	Update View 4	AB
	B	21/12/11	Update to represent new scheme	AB

1. Executive Summary

The assessment has shown no instances of glare to occur in two of the four points assessed. Whilst glare is visible to varying degrees from the other two assessment points, it is either very minor (point 2) or very similar to that which will occur in the existing scenario (point 4).

We therefore consider the proposed development to be acceptable in terms of reflected solar glare.

2. Introduction and Objective

GIA has been instructed to provide a report upon the potential impact of Reflected Solar Glare which may be caused by the proposed scheme prepared by MAKE & AHMM Architects. The assessment will consider the possible impact upon sensitive transport arteries surrounding and facing the proposal. These may include: signalled road intersections, pedestrian crossings, non signalled road junctions and railway signals.

GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon 3D models provided by MAKE & AHMM Architects.
- Carry out a solar glare assessment using the methodologies set out in section 4 of this report.
- Prepare a report setting out the analysis and our findings and recommendations.

3. Guidelines

The CIE 146:2002 Collection on glare states:

> *"Disability glare is glare that impairs vision (CIE, 1987). It is caused by scattering if 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."*
>
> *"The magnitude of the veiling luminance depends on the intensity and distance of the glare source which together determine the relevant parameter E_{glare}, the illuminance at the eye caused by the glare source, and the angle between the glare source and the line of sight Q."*
>
> *"Many investigators (see Vos, 1984) have determined L_{veil} / E_{glare} as a function of Q in various parts of the angular domain, using photometric techniques."*

Glare instances are exacerbated with the effects of age and eye pigmentation which can now be accounted for with more complex formulae. These extremes bear also a strong dependency from the angle determined by the instance of glare in respects of the viewer line of sight.

This is accounted for, amongst age dependency and eye pigmentation, in three separate formulae each valid within their angular domain. These, based upon empirical photometric studies, describe the influence of the angular function with the use of the power of the angle Q, respectively

- Q^3 for angles between 0.1° and 1°,
- Q^2 for angles between 1° and 30° and
- Q for angles beyond 30°.

We can therefore state that the closer the instance of glare to the line of sight of the viewer the worse the veiling effect becomes.

The Building Research Establishment (BRE) have set out in their handbook '*Site Layout Planning for Daylight and Sunlight a Guide to Good Practice*' (1991) and their Information Paper *IP 387*, a methodology for the measurement of the occurrence and duration of Reflected Disability Glare, which might be caused by proposed buildings. IP 387 states:

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

This document also suggests that highly reflective glass coating can increase the risk of reflected solar dazzle, especially in combination with sloping facades.

Unfortunately this document does not provide detailed advice on how to determine the severity of a potential instance of glare based on its duration and it will be the planners responsibility to deduce the level of risk related to the particular instance assessed.

1. Methodology

The methodology described below is not aimed at addressing the intensity of an instance of reflected solar glare, but its 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 the purpose of our assessment the facades of the proposed development are modelled with surfaces onto which we apply the specular properties of a specific glass.

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

Potentially sensitive viewpoints around the site are selected. These viewpoints represent locations where reflected solar glare may cause adverse impacts to those travelling towards the development, such as road users or train drivers. 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 $D_{total} = D_{thinking} + D_{breaking} = V*T + V^2/(2\mu*g)$, 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 1.5m for cars, 2.0m for busses and 2.5m for trains.

I.e. A viewpoint for car driving at 30mph would be placed at 23m (see fig.1) from a traffic light and at 2.5m above the ground.

Figure 1: Typical car stopping distances for various speed limits

1.1. Field of view

"The field of view (also field of vision) is the angular extent of the observable world that is seen at any given moment."

"Different animals have different fields of view, depending on the placement of the eyes. Humans have an almost 180-degree forward-facing field of view[...]."

(http://en.wikipedia.org/wiki/Field_of_view)

"The normal human visual field extends to approximately 60 degrees nasally (toward the nose, or inward) in each eye, to 100 degrees temporally (away from the nose, or outwards), and approximately 60 degrees above and 75 below the horizontal meridian. In the United Kingdom, the minimum field requirement for driving is 60 degrees either side of the vertical meridian, and 20 degrees above and below horizontal. The macula corresponds to the central 13 degrees of the visual field; the fovea to the central 3 degrees."

(http://en.wikipedia.org/wiki/Visual_field)

"The fovea centralis, also generally known as the fovea, is a part of the eye, located in the center of the macula region of the retina. The fovea is responsible for sharp central vision (also called foveal vision), which is necessary in humans for reading, watching television or movies, driving, and any activity where visual detail is of primary importance."

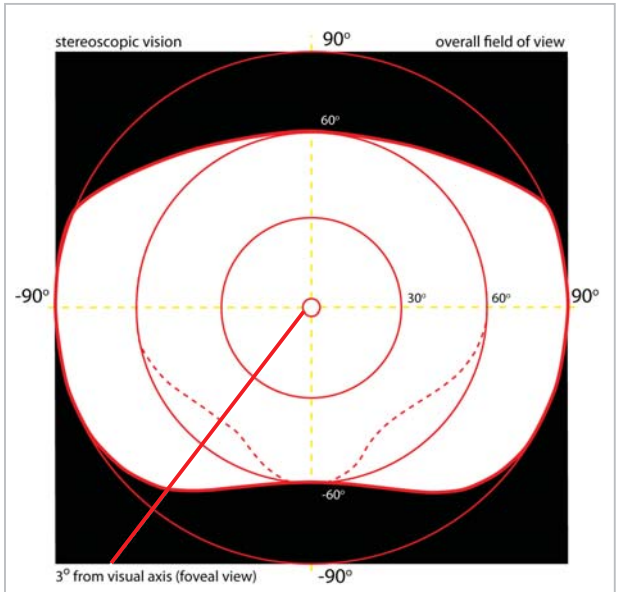


Figure 2: Modified typical human field of view

(http://en.wikipedia.org/wiki/Fovea_centralis_in_macula)

1.2. Image Analysis

The assessment shows the path of the sun for the entire year around the development. Two computer generated angular images are produced for each selected viewpoint, indicating the area which sees the reflection of the sun-path at any point during the year. A modified diagram portraying a standardised extent of human vision (figure 2) is then overlaid onto the image.

The diagram highlights the degrees of vision corresponding to the foveal view with a red circle of 3° of angle in order to identify the area most sensitive to reflected solar glare.

Another red circle represents the incidence of the 30° radius of our typical field of view in order to identify a secondary area of sensitivity to potential reflected glare instances.

As stated in the 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.

1.3. Limitations

It should be noted that as well as reflected glare off the proposed development's facades, this assessment will highlight direct sunlight. As this direct sunlight is not subject to assessment, areas of coloured reflection that do not fall on the proposed buildings facades can be discounted.

The methodology described above is not suitable to quantify the intensity of reflected solar glare. Wherever the potential for reflected solar glare is identified it should be assumed that its intensity is sufficient to cause nuisance and thus mitigating measures ought to be investigated.

Although great care is taken in identifying typical viewpoints around a the new development this does not guarantee that there are no further sensitive locations where reflected solar glare could present a particular risk. This assessment is based on the assumption that in an urban environment moving traffic represents the biggest risk factor and so viewpoints and focus points are selected accordingly.

For practical reasons the area of the assessment is limited to the vicinity of a new development. The occurrence of reflected solar glare at greater distances is not subject of this assessment.

IMPORTANT: The hours shown in the diagrams and described in the text reflect solar time and therefore do not take Daylight Saving Hours into account.

2. Conclusion

2.1. Conclusions on Reflected Solar Glare

Solar Glare assessments have been undertaken at four locations around the site. These locations are identified in figure 3 and have been selected as road junctions where the driver is within sight of the proposed development.

For the purposes of this assessment all commercial areas, including the school, have been assumed to be fully glazed/reflective in order to present a 'worst-case' scenario.

View Position 1

The assessment has shown no instances of glare from view position 1

View Position 2

Minor instances of solar reflection are visible on pages 10 & 11. These occur briefly in the winter evenings and the summer mornings at approximately the following times:
0500-0600 - 20th March until 1st May
0500-0600 - 12th August until 25th September
1500-1600 - 9th February until 23rd February
1500-1600 - 19th October until 3rd November
0400-0600 - 20th May until 23rd July
1600-1800 - 5th March until 2nd April
1600-1800 - 10th September until 6th October

The proposed design presents a typical percentage of glazing versus opaque facade and thus we consider the instances of reflected sunlight to be non material.

View Position 3

The assessment has shown no instances of glare from view position 3

View Position 4

Instances of reflected sunlight from the proposed development are visible from view position 4 (pages 14 & 15). The assessment has shown these to occur during mid-season and summer mornings (approximately between 5am and 7am from 20th March to 23rd September). The occurrences depicted in the diagrams could potentially result in instances of glare.

It should be noted here that the glazed facade of the proposed Block D is very similar to the existing building, shown in figure 4 on page 16, and therefore the instances visible in the assessment would also occur in the existing scenario. For this reason, we do not consider the proposed development to materially increase the potential for reflected glare.

We would recommend to minimise the reflection of sunlight through the use of low-reflective glazing on the facade in question.

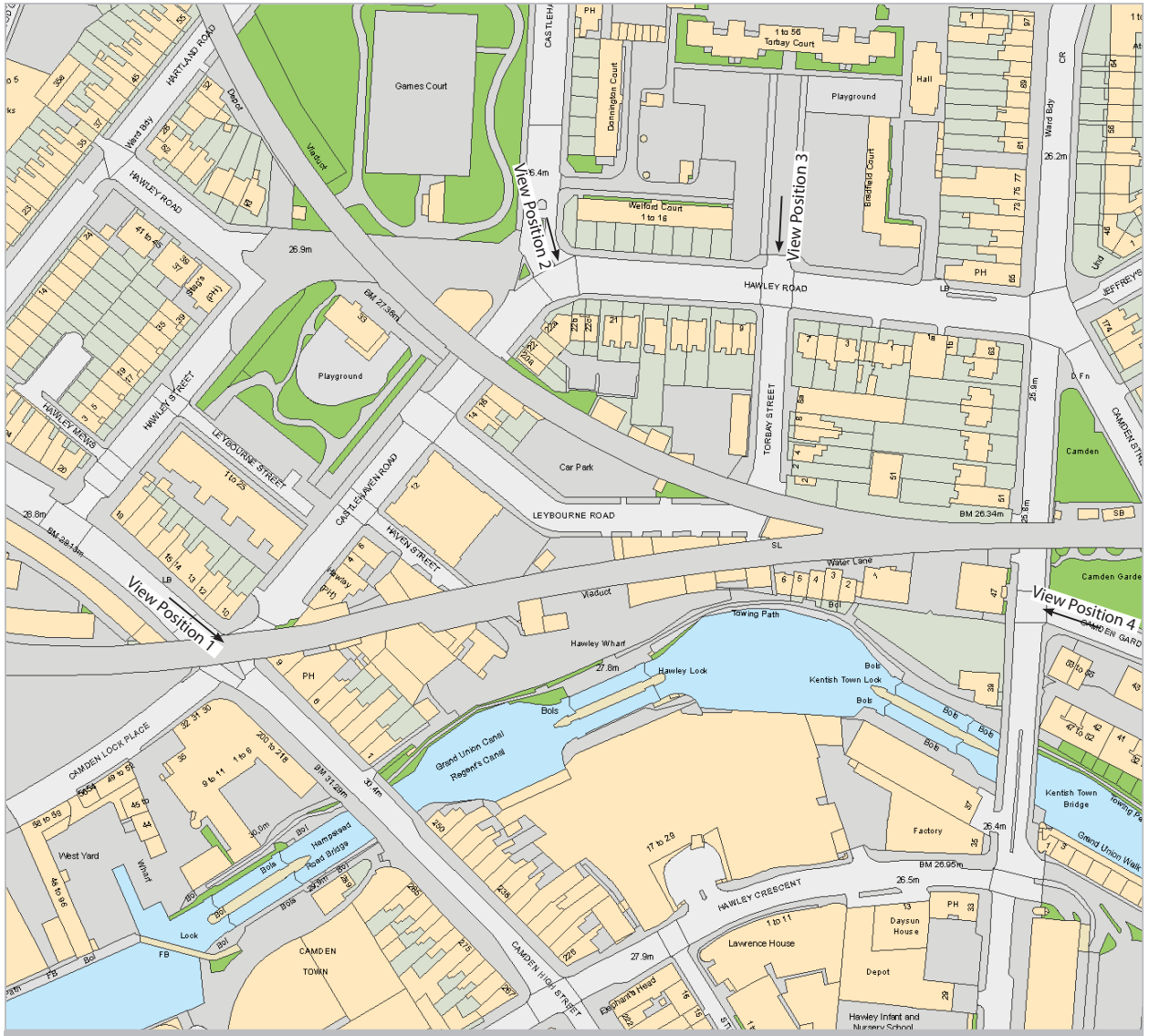
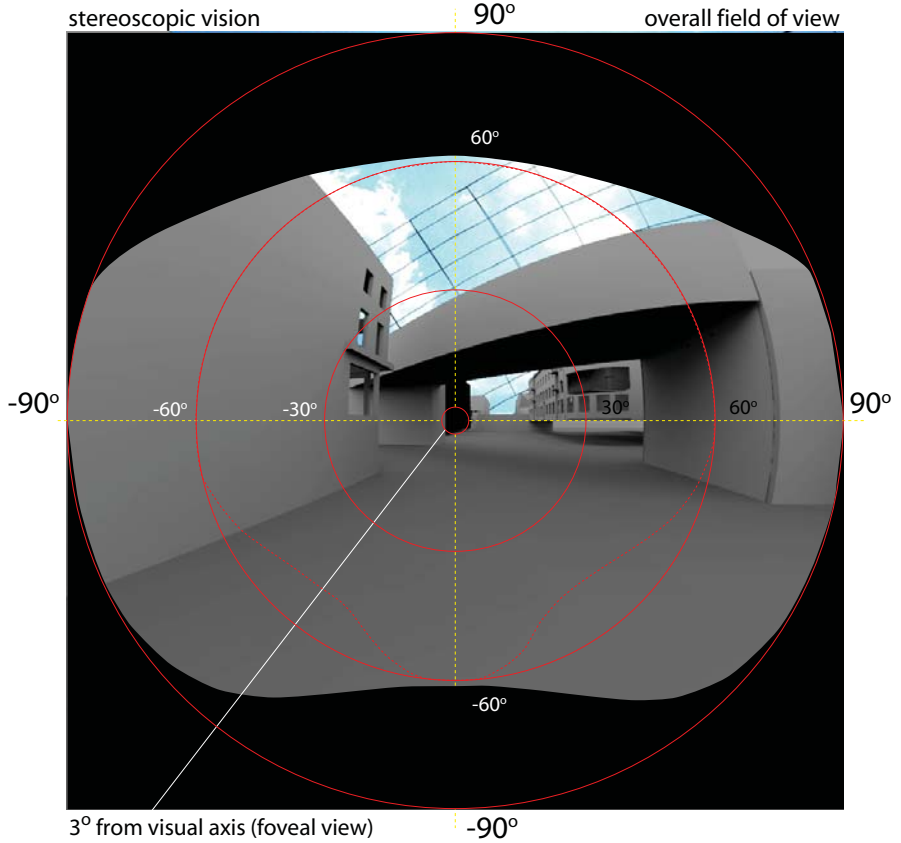


Figure 3: Site Plan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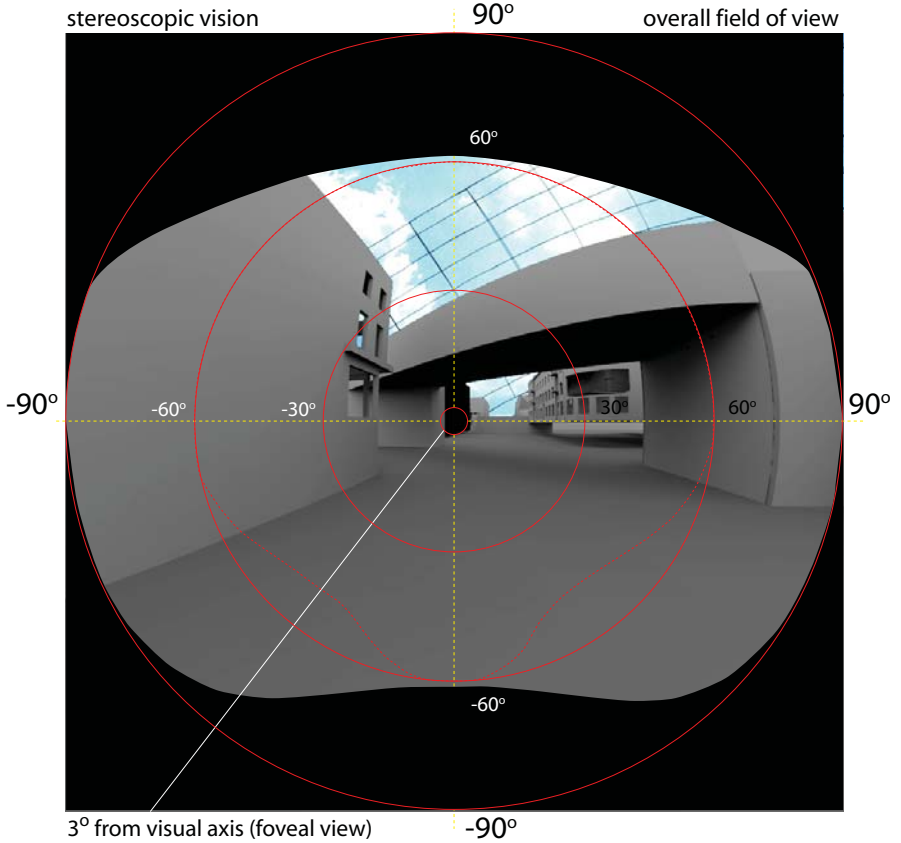
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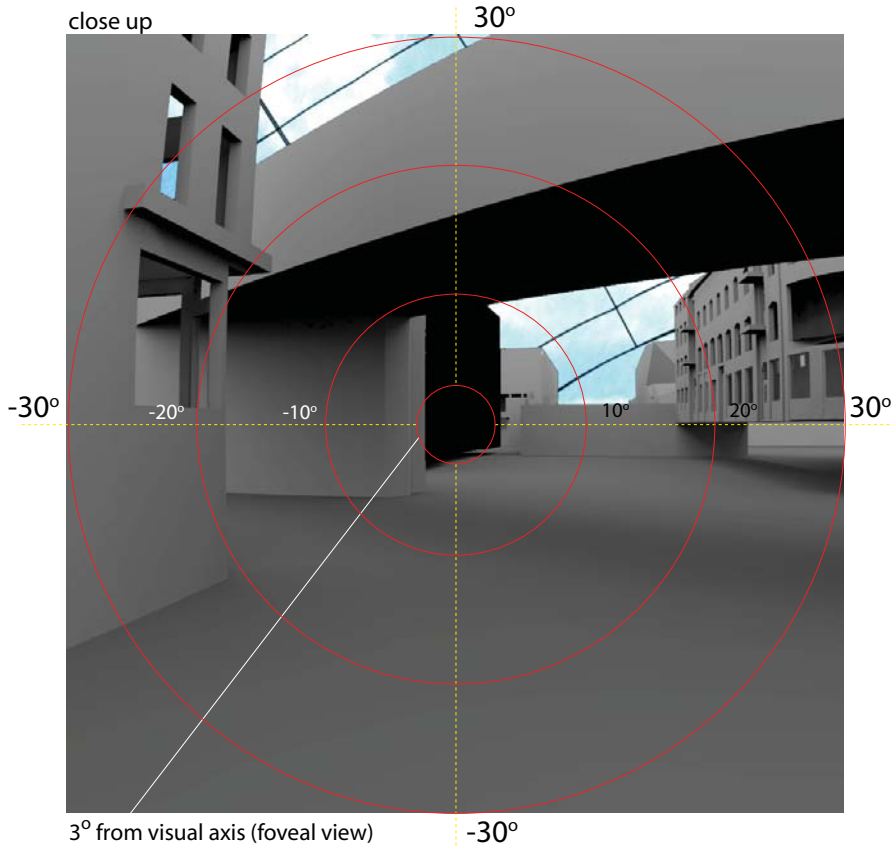
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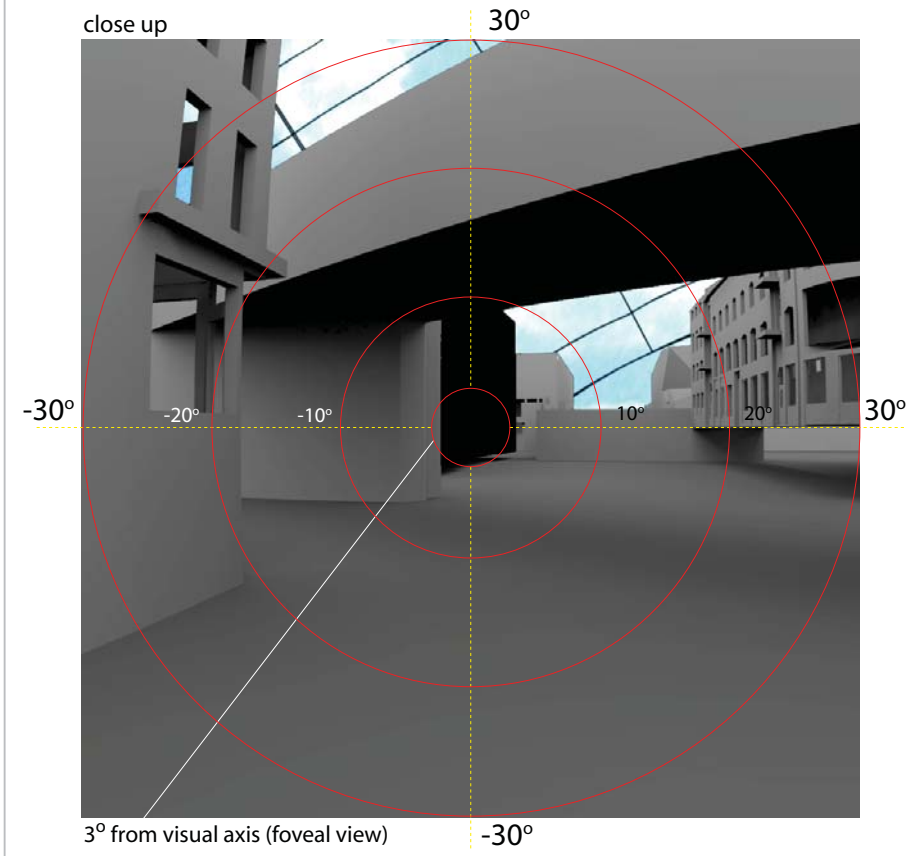
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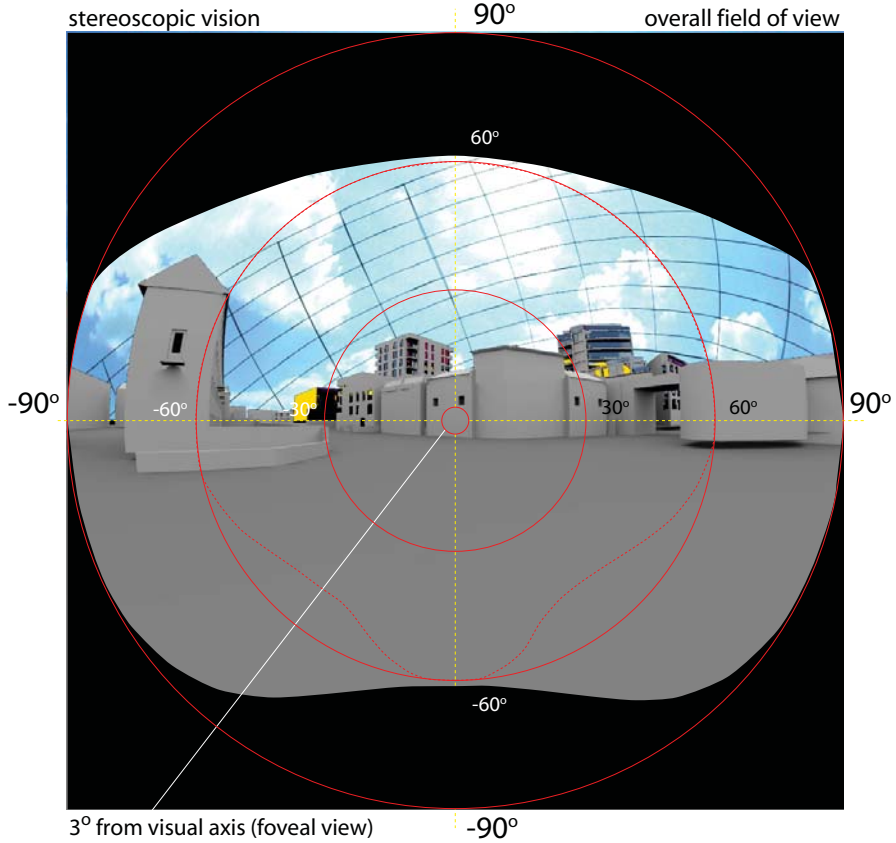
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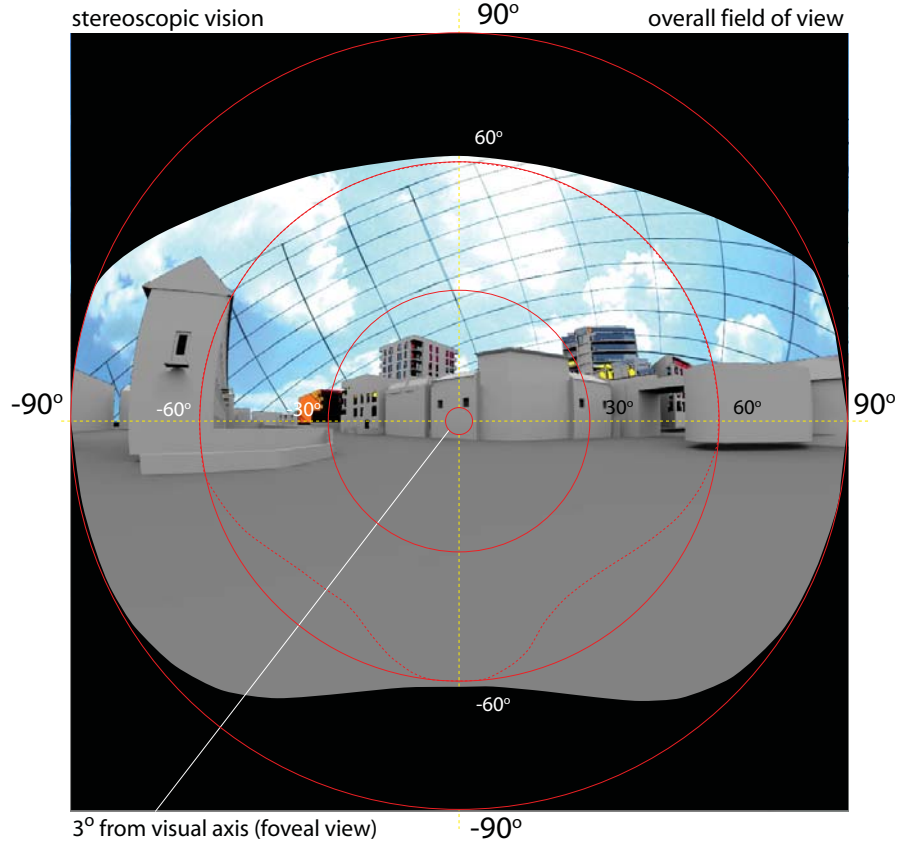
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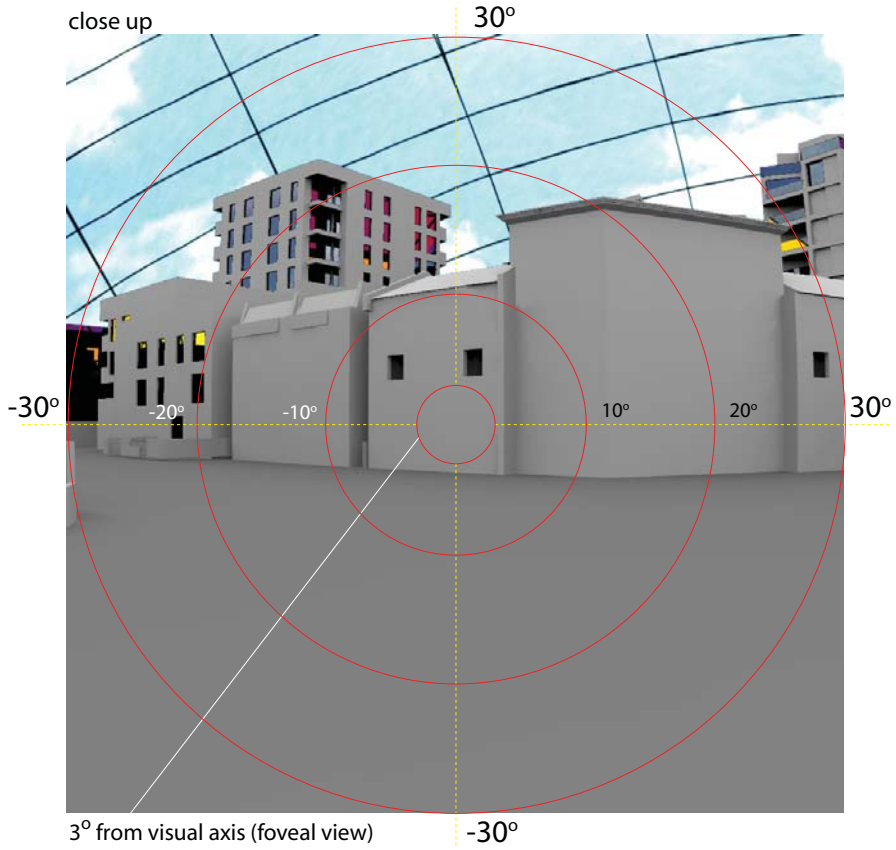
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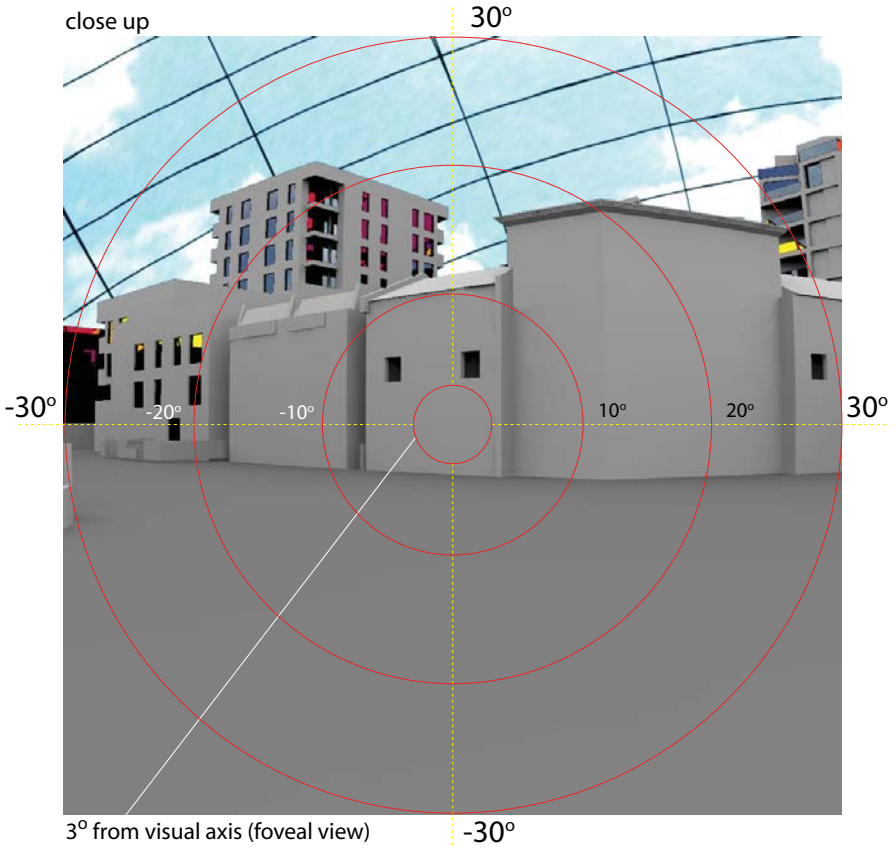
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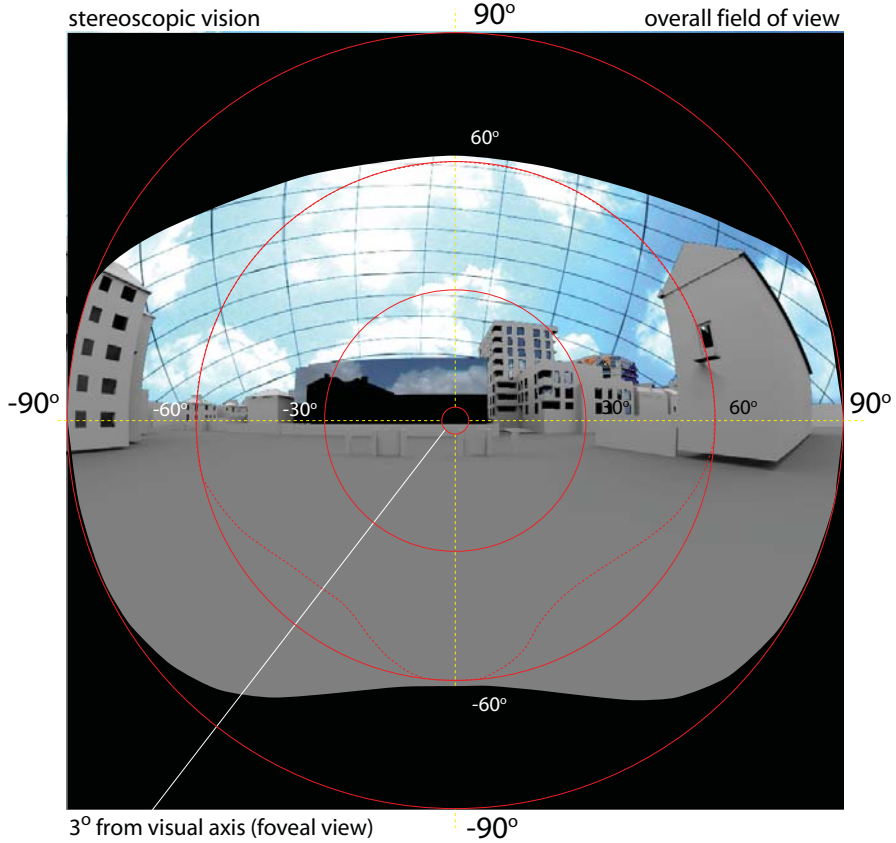
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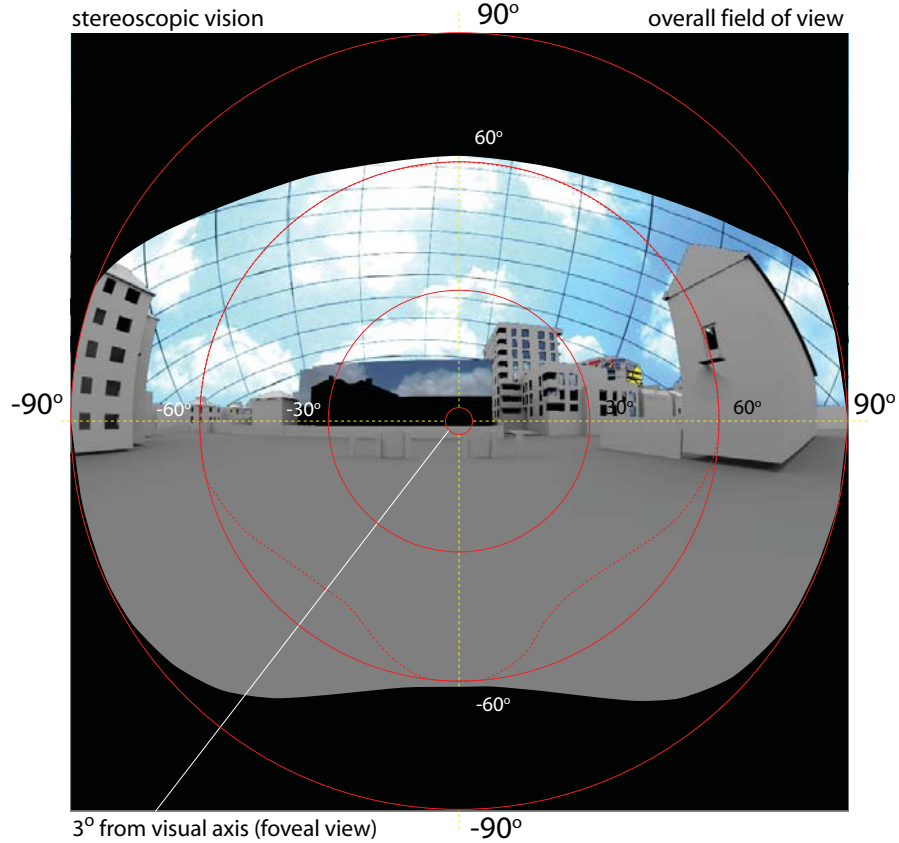
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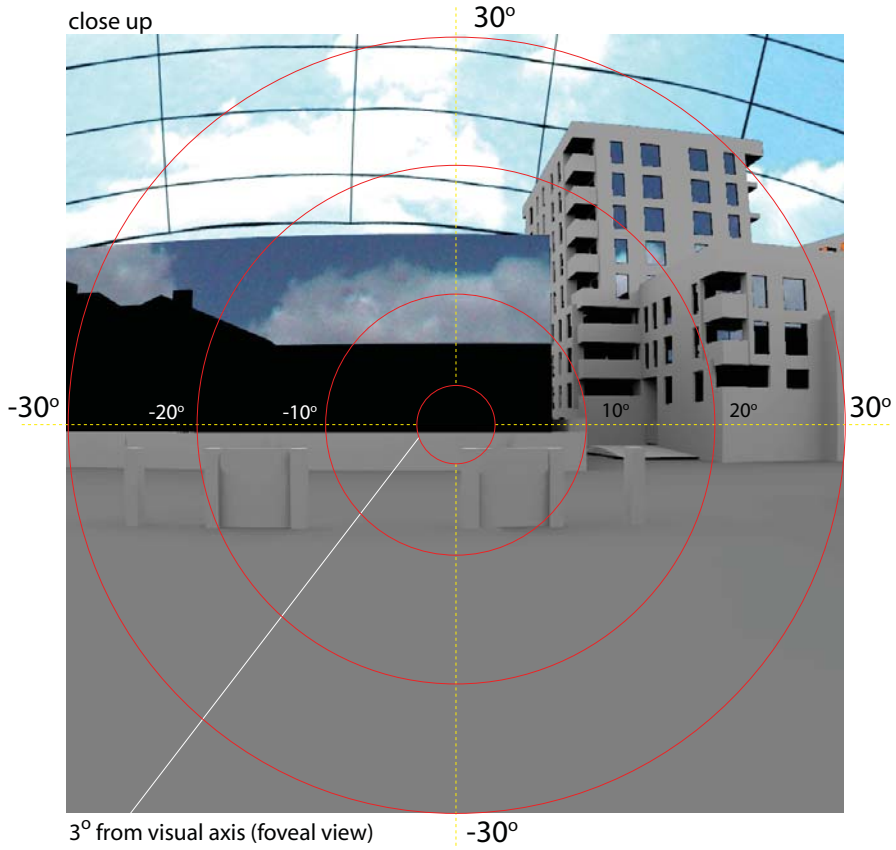
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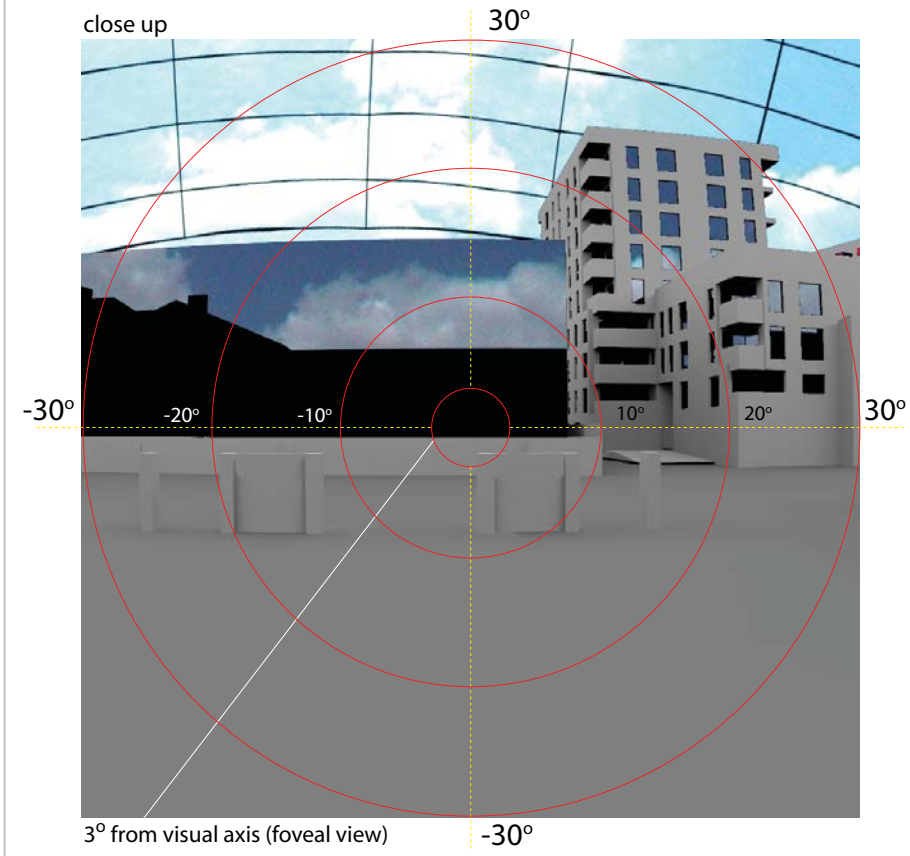
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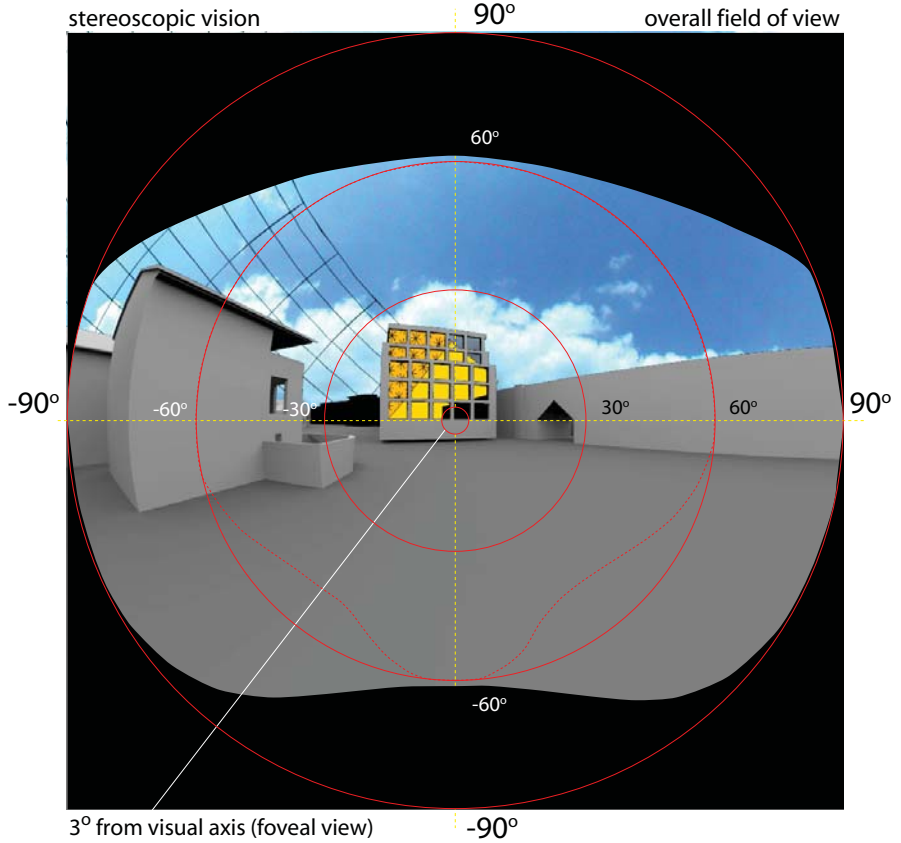
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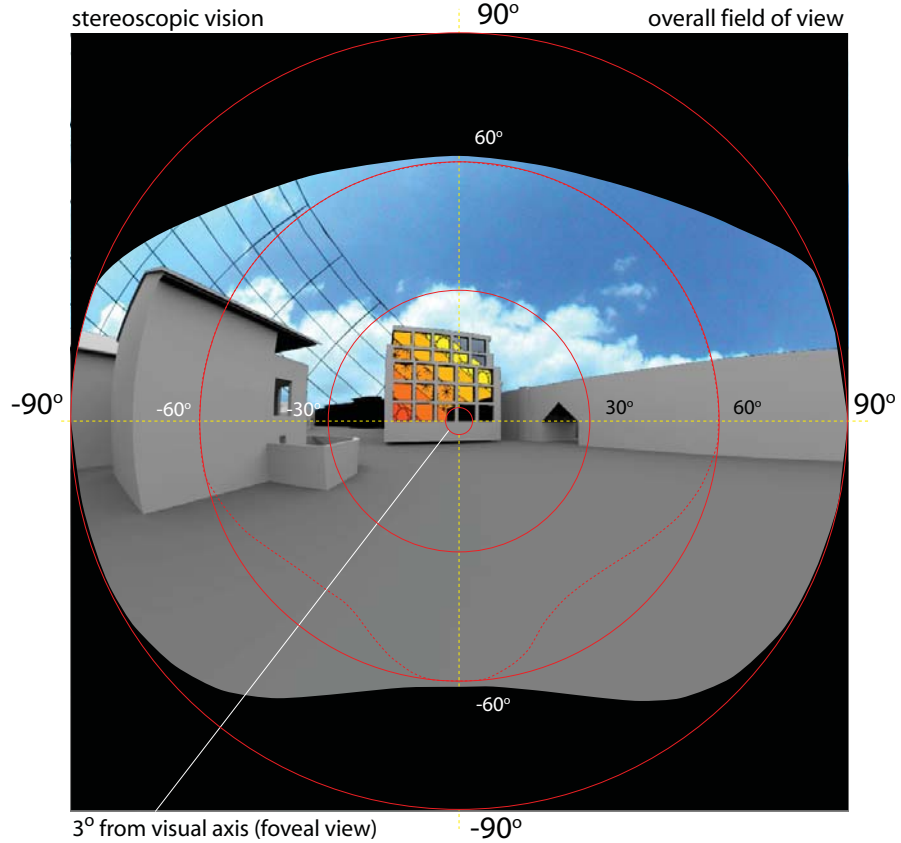
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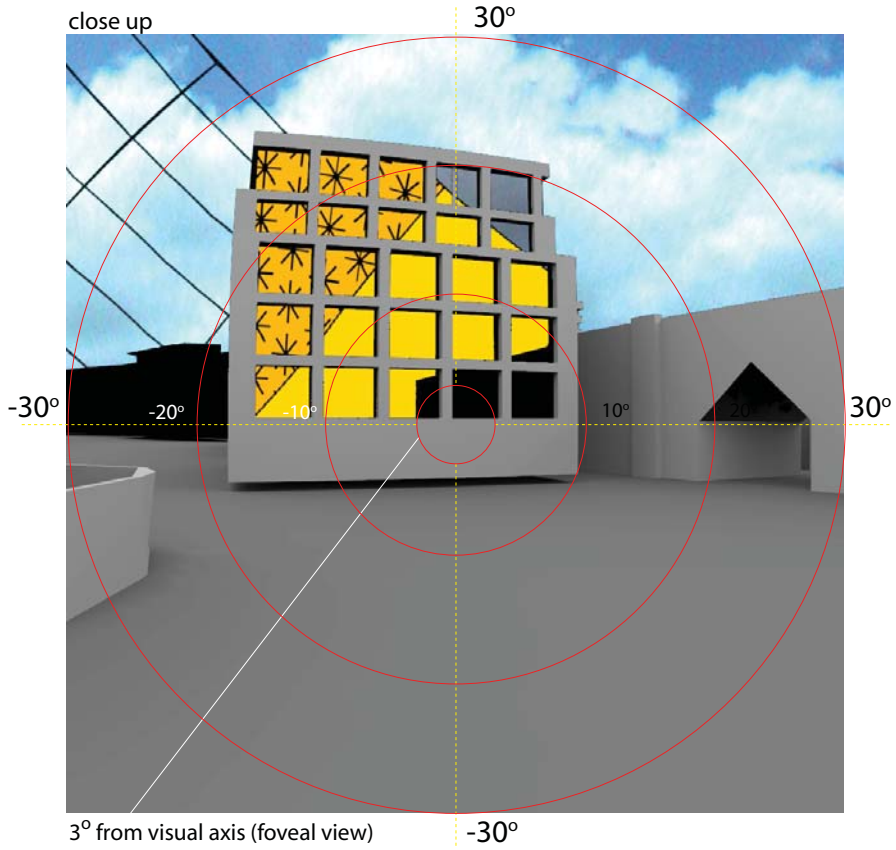
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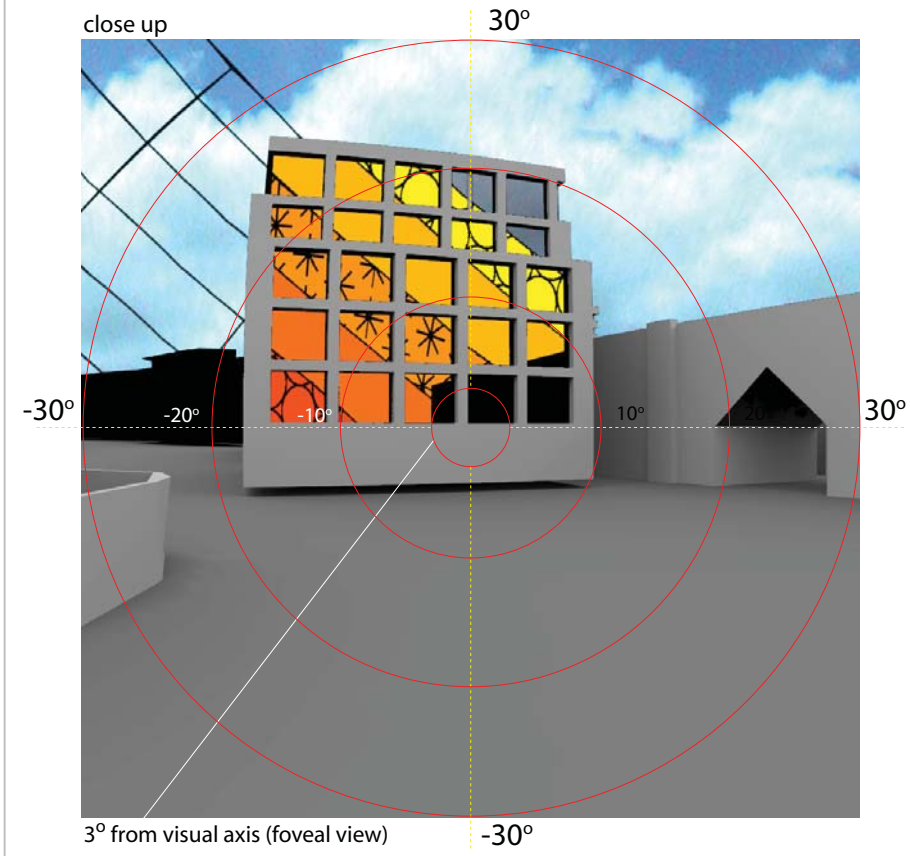
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View Position 4 - Existing

Sources of information:

- IR76-80_2801

Figure 4: Approximate view from assessment point 4 - Existing Scenario

Reflected Solar Glare Report
Eastern Parameter

Camden Lock Village
Project No: 2801

December 30, 2012

DAYLIGHT+SOLAR DESIGN

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Client	Stanley Sidings Ltd
Architect	AHMM & MAKE
Project Title	Camden Lock Village
Project Number	2801
Report Title	Reflected Solar Glare Report - Eastern Parameter
Dated	December 30, 2012

Written by	Alex Buckley
Checked by	SP
Type	Planning

Revisions		Date:	Notes:	Signed:
	A	09/11/11	Update View 4	AB
	B	21/12/11	Update to represent new scheme	AB

1. Executive Summary

The assessment has shown no instances of glare to occur in two of the four points assessed. Whilst glare is visible to varying degrees from the other two assessment points, it is either very minor (point 2) or very similar to that which will occur in the existing scenario (point 4).

We therefore consider the proposed development to be acceptable in terms of reflected solar glare.

2. Introduction and Objective

GIA has been instructed to provide a report upon the potential impact of Reflected Solar Glare which may be caused by the proposed scheme prepared by MAKE & AHMM Architects. The assessment will consider the possible impact upon sensitive transport arteries surrounding and facing the proposal. These may include: signalled road intersections, pedestrian crossings, non signalled road junctions and railway signals.

GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon 3D models provided by MAKE & AHMM Architects.
- Carry out a solar glare assessment using the methodologies set out in section 4 of this report.
- Prepare a report setting out the analysis and our findings and recommendations.

3. Guidelines

The CIE 146:2002 Collection on glare states:

> *"Disability glare is glare that impairs vision (CIE, 1987). It is caused by scattering if 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."*
>
> *"The magnitude of the veiling luminance depends on the intensity and distance of the glare source which together determine the relevant parameter E_{glare}, the illuminance at the eye caused by the glare source, and the angle between the glare source and the line of sight Q."*
>
> *"Many investigators (see Vos, 1984) have determined L_{veil} / E_{glare} as a function of Q in various parts of the angular domain, using photometric techniques."*

Glare instances are exacerbated with the effects of age and eye pigmentation which can now be accounted for with more complex formulae. These extremes bear also a strong dependency from the angle determined by the instance of glare in respects of the viewer line of sight.

This is accounted for, amongst age dependency and eye pigmentation, in three separate formulae each valid within their angular domain. These, based upon empirical photometric studies, describe the influence of the angular function with the use of the power of the angle Q, respectively

- Q^3 for angles between 0.1° and 1°,
- Q^2 for angles between 1° and 30° and
- Q for angles beyond 30°.

We can therefore state that the closer the instance of glare to the line of sight of the viewer the worse the veiling effect becomes.

The Building Research Establishment (BRE) have set out in their handbook '*Site Layout Planning for Daylight and Sunlight a Guide to Good Practice*' (1991) and their Information Paper *IP 387*, a methodology for the measurement of the occurrence and duration of Reflected Disability Glare, which might be caused by proposed buildings. IP 387 states:

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

This document also suggests that highly reflective glass coating can increase the risk of reflected solar dazzle, especially in combination with sloping facades.

Unfortunately this document does not provide detailed advice on how to determine the severity of a potential instance of glare based on its duration and it will be the planners responsibility to deduce the level of risk related to the particular instance assessed.

1. Methodology

The methodology described below is not aimed at addressing the intensity of an instance of reflected solar glare, but its 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 the purpose of our assessment the facades of the proposed development are modelled with surfaces onto which we apply the specular properties of a specific glass.

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

Potentially sensitive viewpoints around the site are selected. These viewpoints represent locations where reflected solar glare may cause adverse impacts to those travelling towards the development, such as road users or train drivers. 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 $D_{total} = D_{thinking} + D_{breaking} = V*T + V^2/(2\mu*g)$, 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 1.5m for cars, 2.0m for busses and 2.5m for trains.

I.e. A viewpoint for car driving at 30mph would be placed at 23m (see fig.1) from a traffic light and at 2.5m above the ground.

Figure 1: Typical car stopping distances for various speed limits

1.1. Field of view

"The field of view (also field of vision) is the angular extent of the observable world that is seen at any given moment."

"Different animals have different fields of view, depending on the placement of the eyes. Humans have an almost 180-degree forward-facing field of view[...]."

(http://en.wikipedia.org/wiki/Field_of_view)

"The normal human visual field extends to approximately 60 degrees nasally (toward the nose, or inward) in each eye, to 100 degrees temporally (away from the nose, or outwards), and approximately 60 degrees above and 75 below the horizontal meridian. In the United Kingdom, the minimum field requirement for driving is 60 degrees either side of the vertical meridian, and 20 degrees above and below horizontal. The macula corresponds to the central 13 degrees of the visual field; the fovea to the central 3 degrees."

(http://en.wikipedia.org/wiki/Visual_field)

"The fovea centralis, also generally known as the fovea, is a part of the eye, located in the center of the macula region of the retina. The fovea is responsible for sharp central vision (also called foveal vision), which is necessary in humans for reading, watching television or movies, driving, and any activity where visual detail is of primary importance."

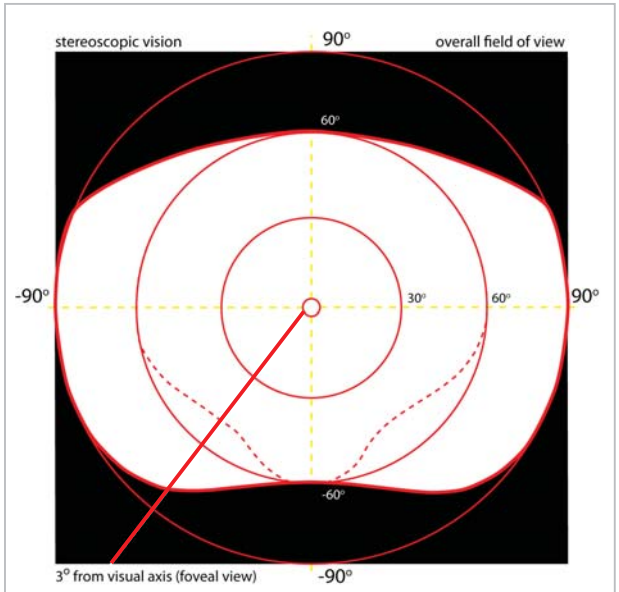


Figure 2: Modified typical human field of view

(http://en.wikipedia.org/wiki/Fovea_centralis_in_macula)

1.2. Image Analysis

The assessment shows the path of the sun for the entire year around the development. Two computer generated angular images are produced for each selected viewpoint, indicating the area which sees the reflection of the sun-path at any point during the year. A modified diagram portraying a standardised extent of human vision (figure 2) is then overlaid onto the image.

The diagram highlights the degrees of vision corresponding to the foveal view with a red circle of 3° of angle in order to identify the area most sensitive to reflected solar glare.

Another red circle represents the incidence of the 30° radius of our typical field of view in order to identify a secondary area of sensitivity to potential reflected glare instances.

As stated in the 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.

1.3. Limitations

It should be noted that as well as reflected glare off the proposed development's facades, this assessment will highlight direct sunlight. As this direct sunlight is not subject to assessment, areas of coloured reflection that do not fall on the proposed buildings facades can be discounted.

The methodology described above is not suitable to quantify the intensity of reflected solar glare. Wherever the potential for reflected solar glare is identified it should be assumed that its intensity is sufficient to cause nuisance and thus mitigating measures ought to be investigated.

Although great care is taken in identifying typical viewpoints around a the new development this does not guarantee that there are no further sensitive locations where reflected solar glare could present a particular risk. This assessment is based on the assumption that in an urban environment moving traffic represents the biggest risk factor and so viewpoints and focus points are selected accordingly.

For practical reasons the area of the assessment is limited to the vicinity of a new development. The occurrence of reflected solar glare at greater distances is not subject of this assessment.

IMPORTANT: The hours shown in the diagrams and described in the text reflect solar time and therefore do not take Daylight Saving Hours into account.

2. Conclusion

2.1. Conclusions on Reflected Solar Glare

Solar Glare assessments have been undertaken at four locations around the site. These locations are identified in figure 3 and have been selected as road junctions where the driver is within sight of the proposed development.

For the purposes of this assessment all commercial areas, including the school, have been assumed to be fully glazed/reflective in order to present a 'worst-case' scenario.

View Position 1

The assessment has shown no instances of glare from view position 1

View Position 2

Minor instances of solar reflection are visible on pages 10 & 11. These occur briefly in the winter evenings and the summer mornings at approximately the following times:
0500-0600 - 20th March until 1st May
0500-0600 - 12th August until 25th September
1500-1600 - 9th February until 23rd February
1500-1600 - 19th October until 3rd November
0400-0600 - 20th May until 23rd July
1600-1800 - 5th March until 2nd April
1600-1800 - 10th September until 6th October

The proposed design presents a typical percentage of glazing versus opaque facade and thus we consider the instances of reflected sunlight to be non material.

View Position 3

The assessment has shown no instances of glare from view position 3

View Position 4

Instances of reflected sunlight from the proposed development are visible from view position 4 (pages 14 & 15). The assessment has shown these to occur during mid-season and summer mornings (approximately between 5am and 7am from 20th March to 23rd September). The occurrences depicted in the diagrams could potentially result in instances of glare.

It should be noted here that the glazed facade of the proposed Block D is very similar to the existing building, shown in figure 4 on page 16, and therefore the instances visible in the assessment would also occur in the existing scenario. For this reason, we do not consider the proposed development to materially increase the potential for reflected glare.

We would recommend to minimise the reflection of sunlight through the use of low-reflective glazing on the facade in question.

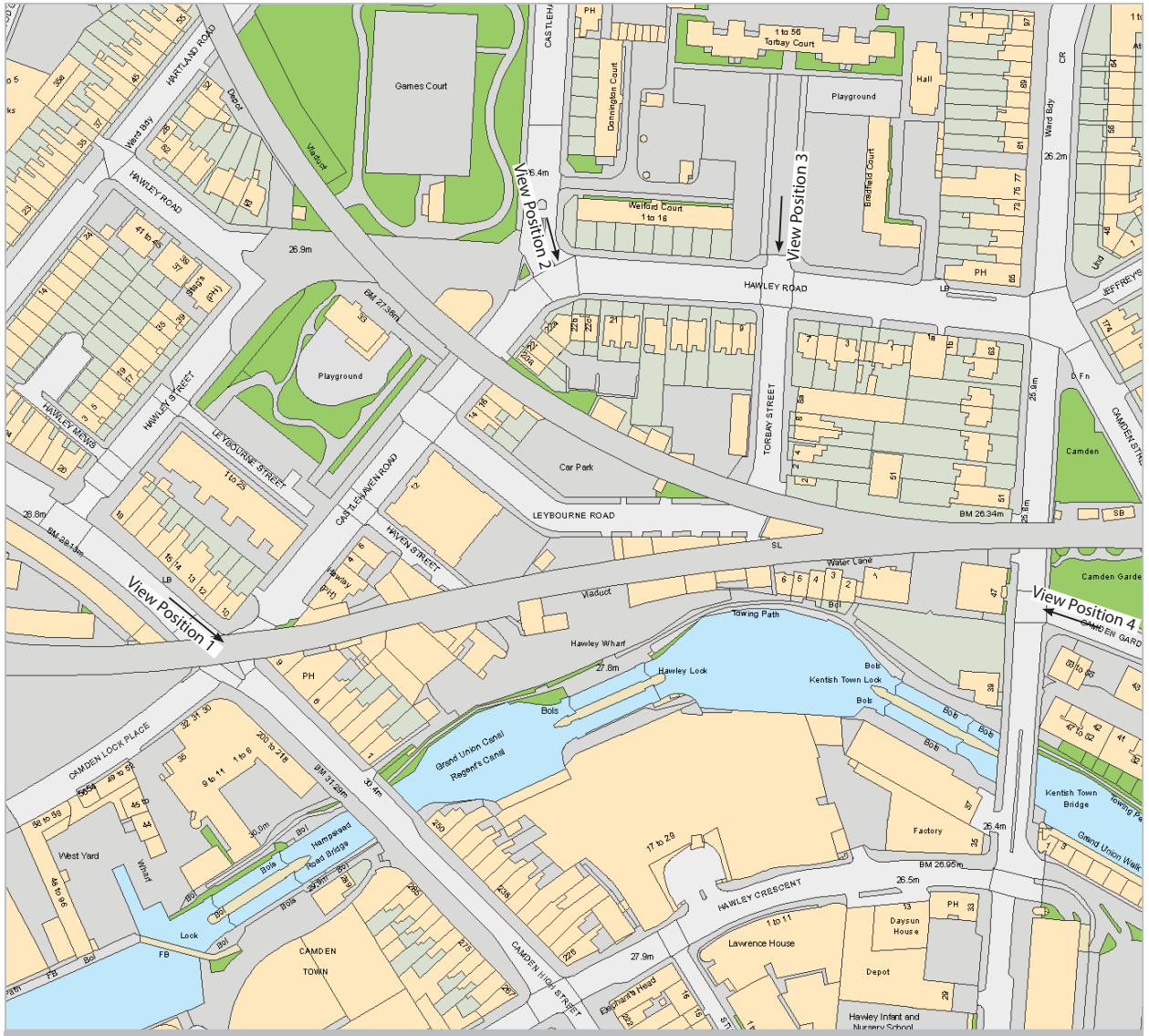
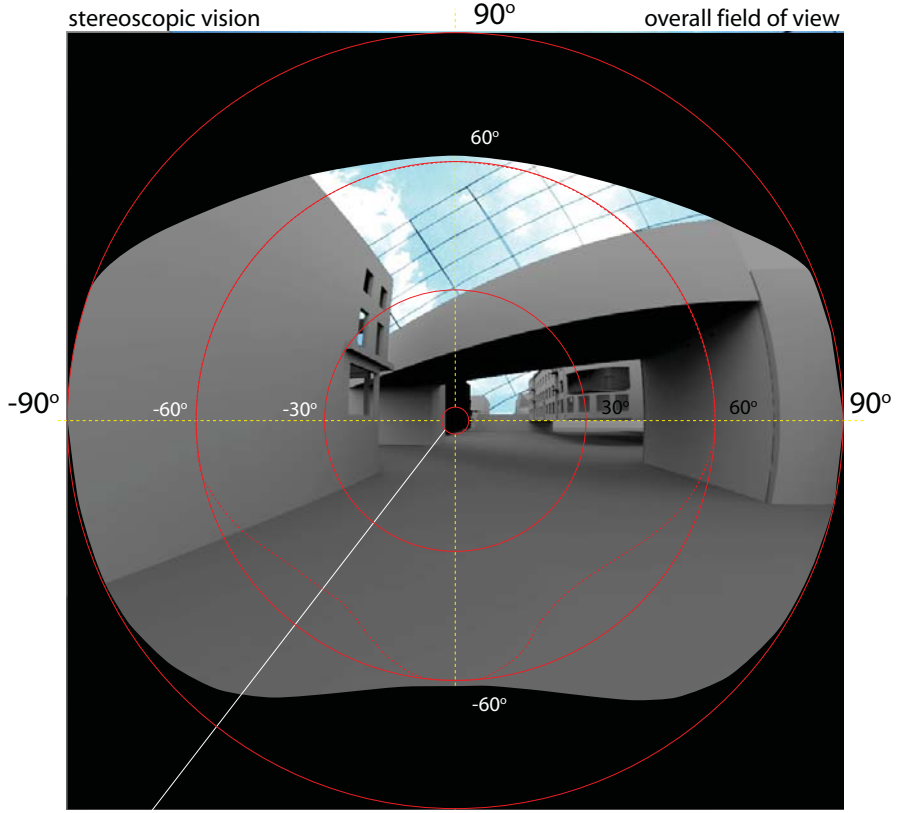


Figure 3: Site Plan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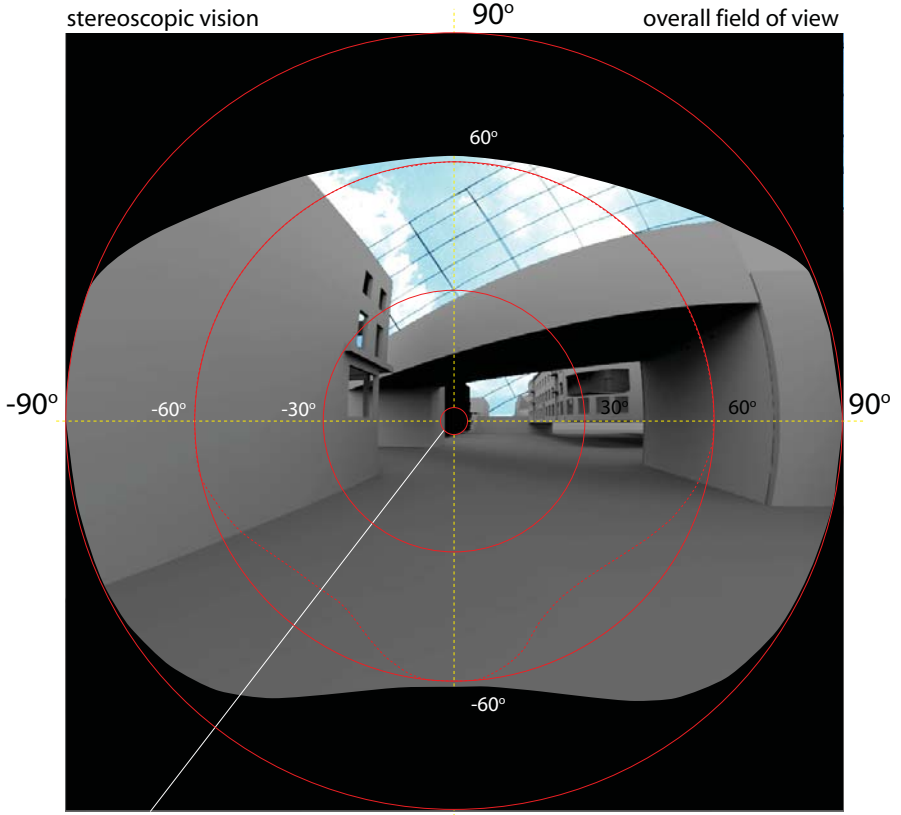
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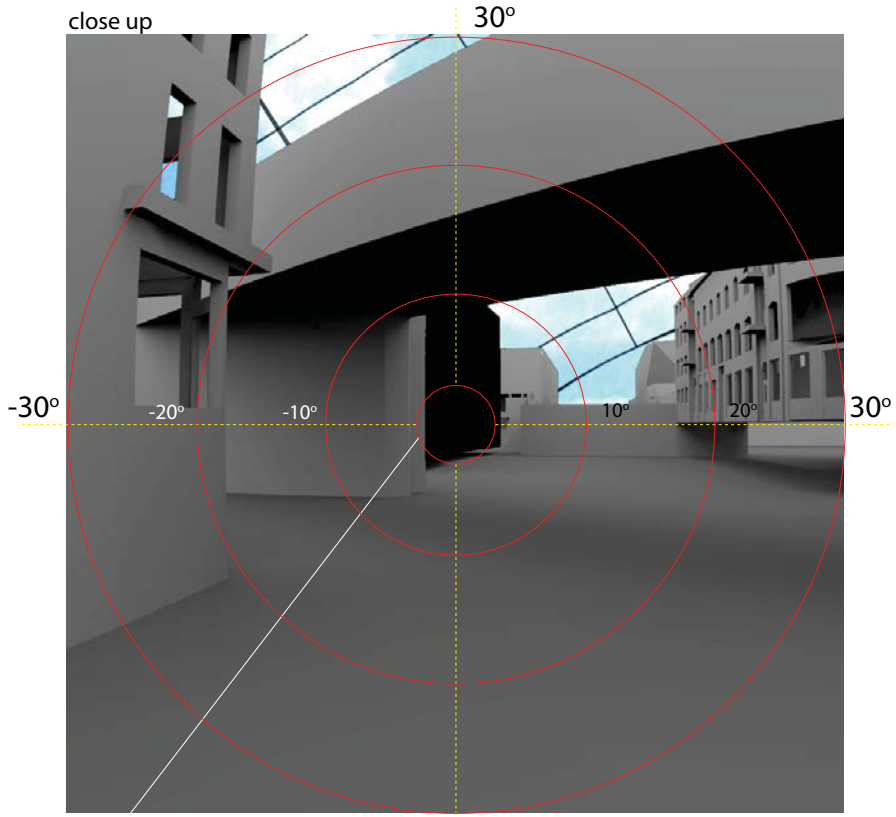
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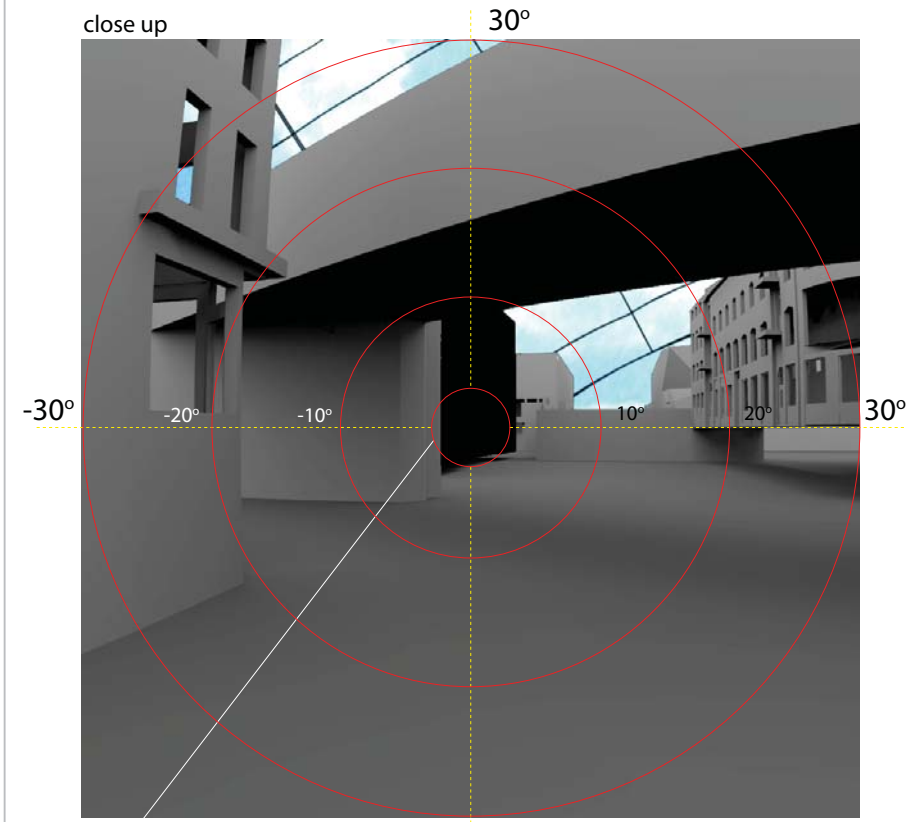
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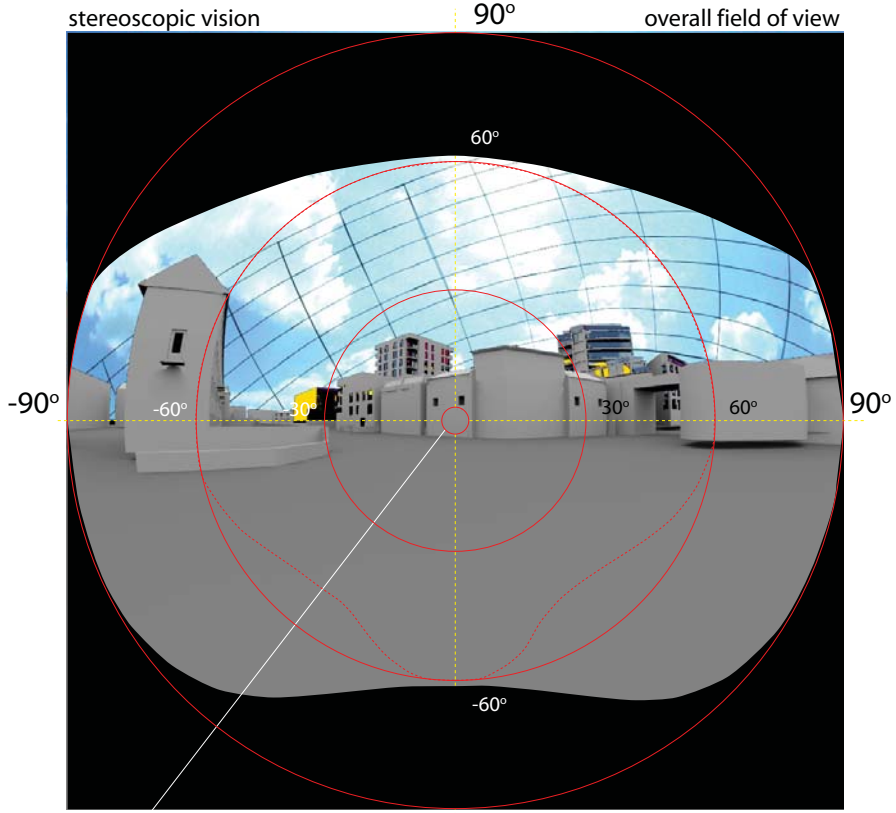
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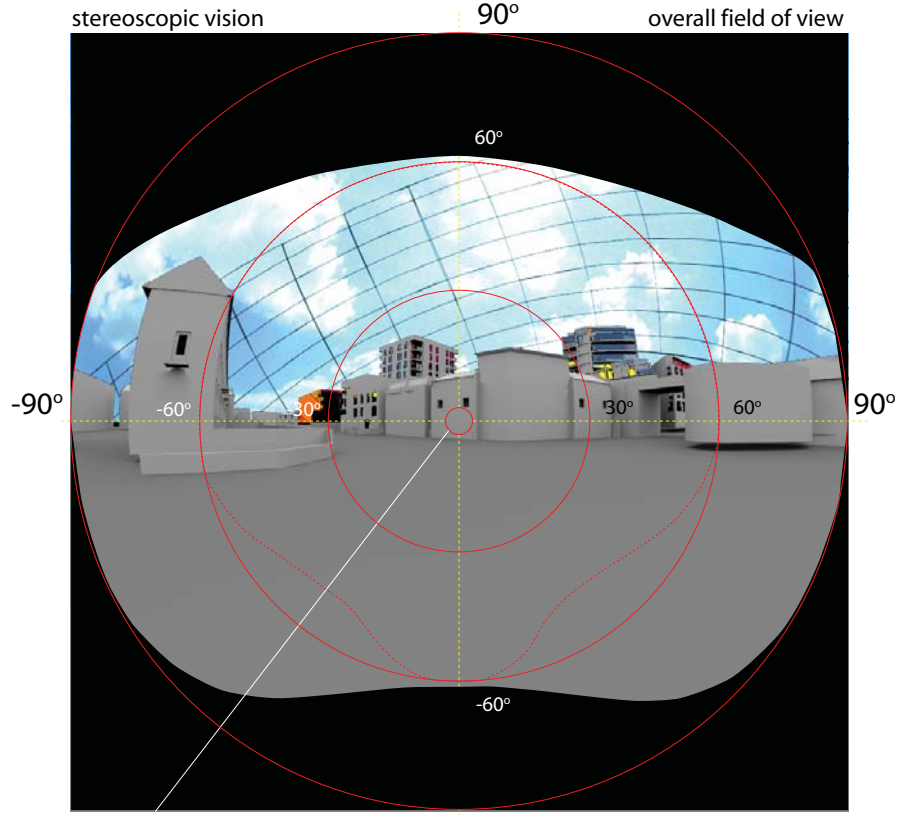
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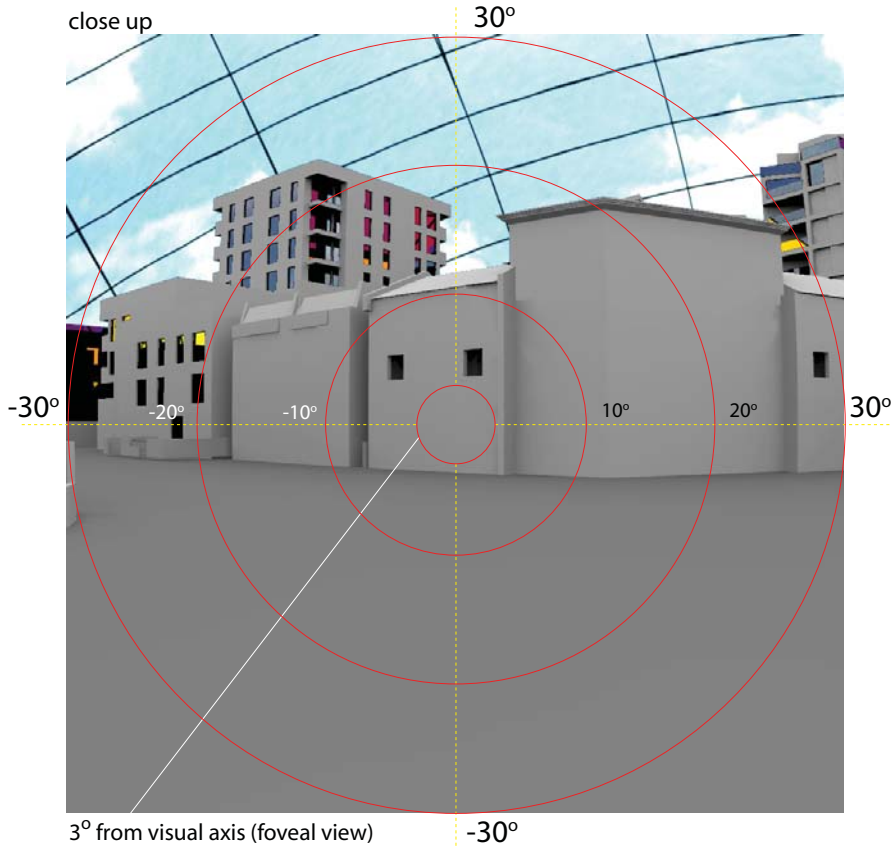
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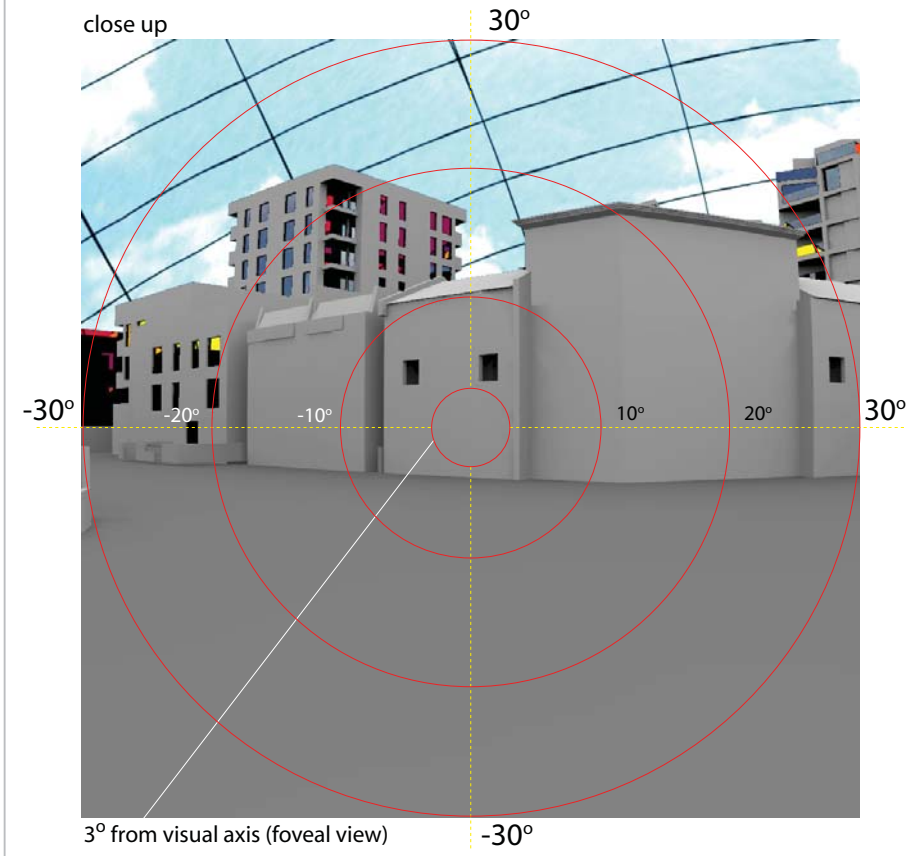
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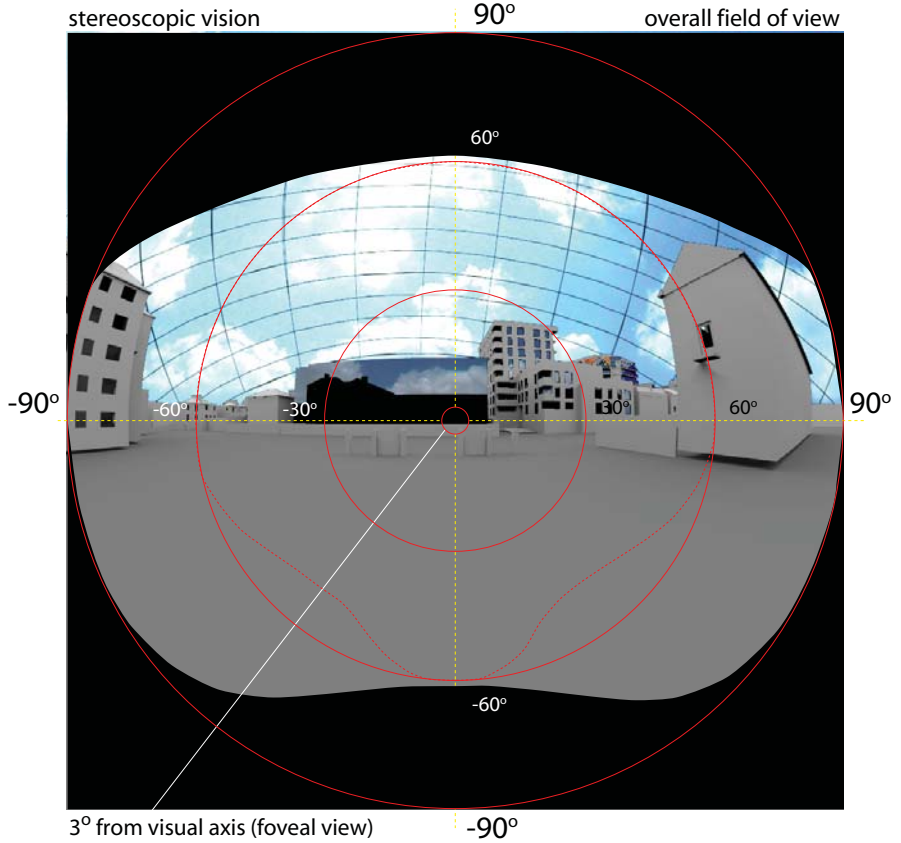
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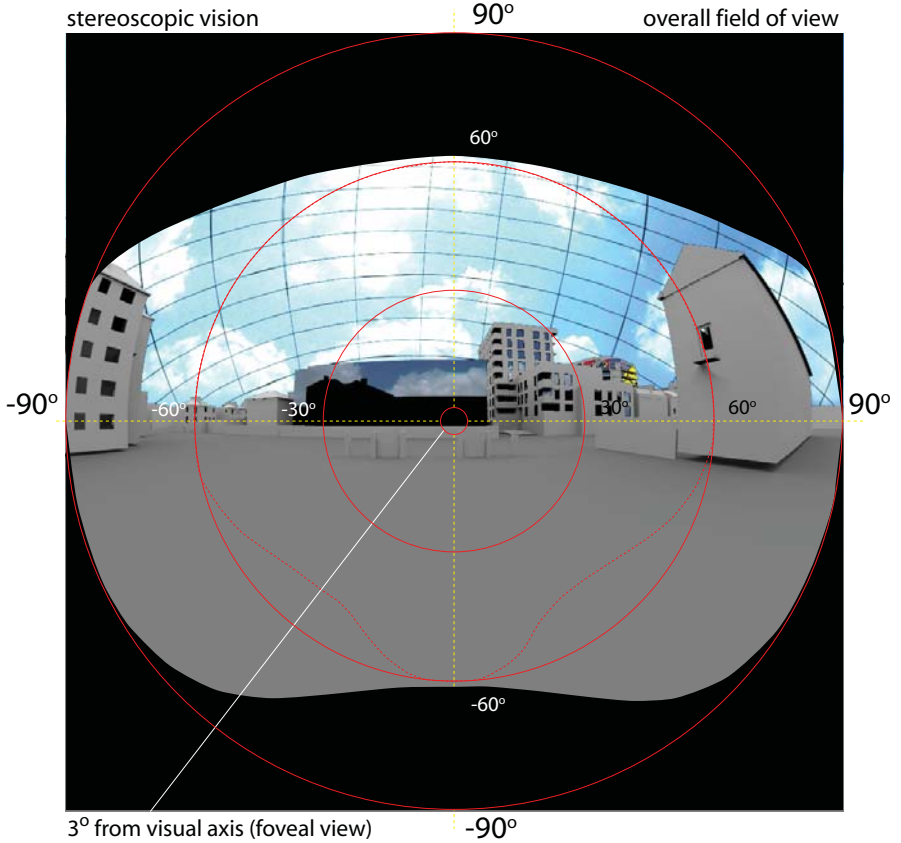
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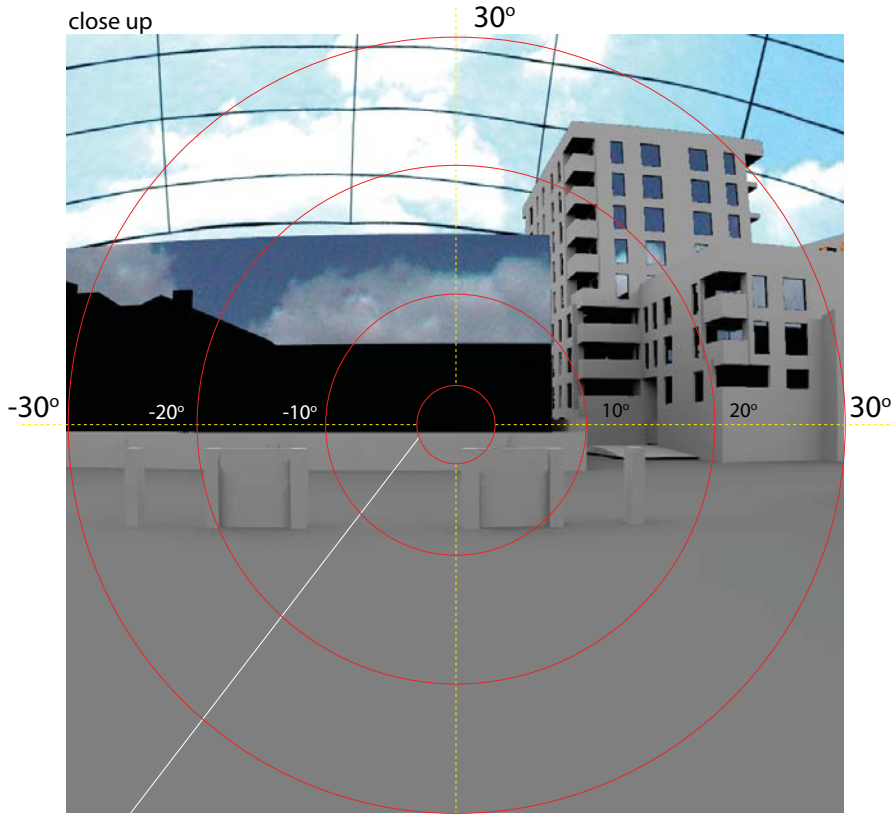
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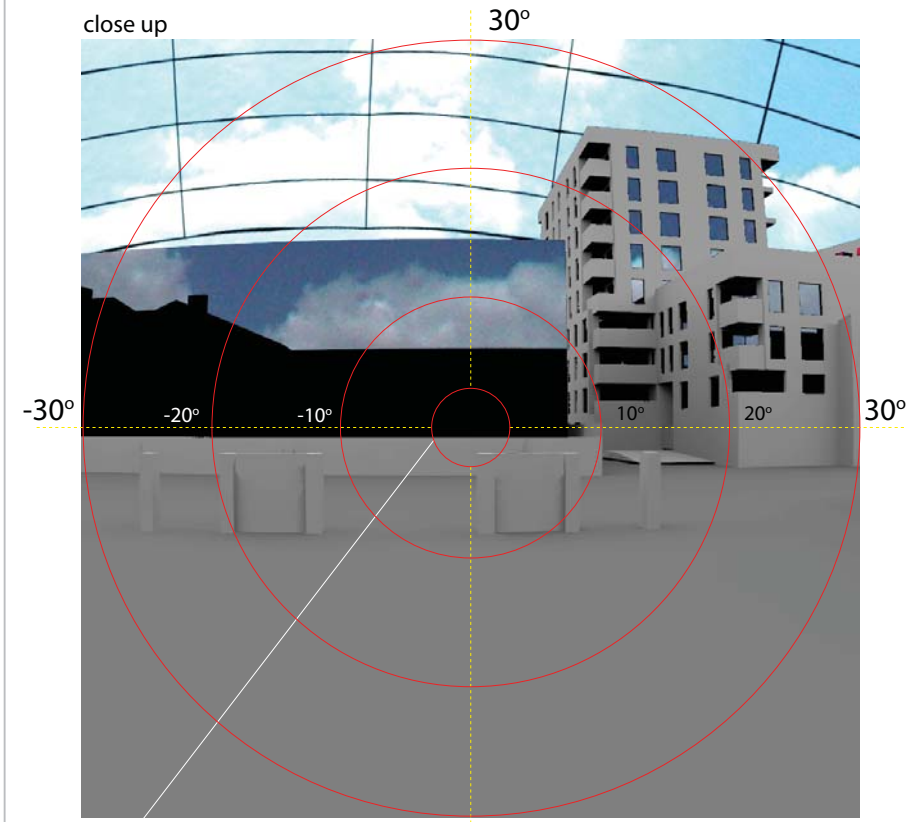
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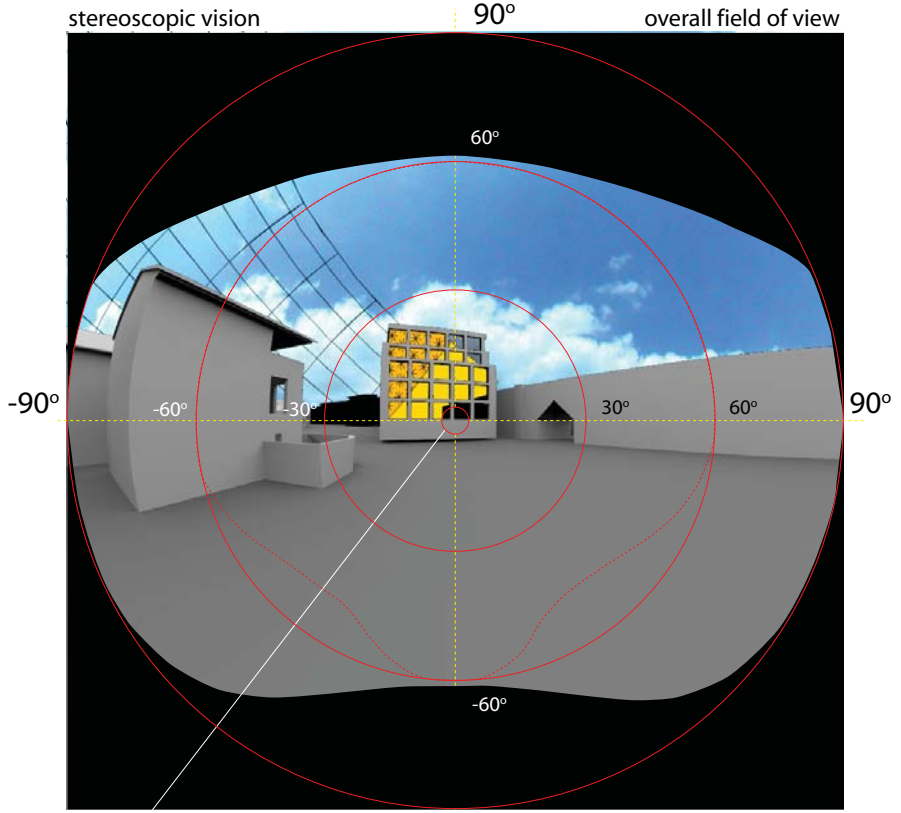
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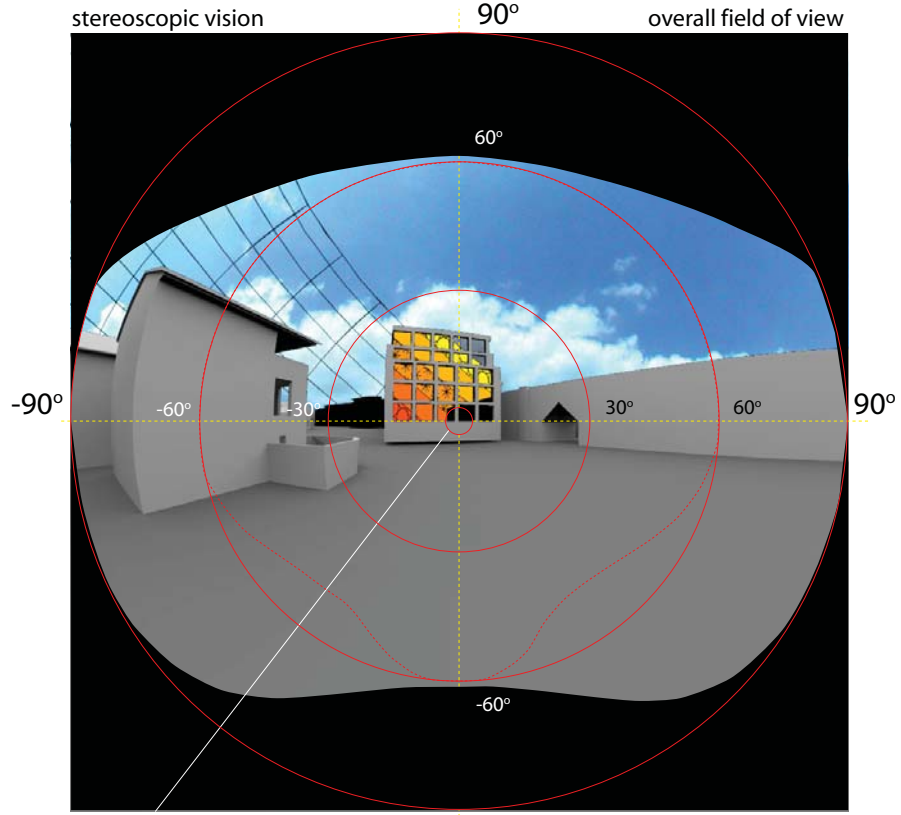
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SUMMER
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AUG 27
SEP 10
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DEC 21
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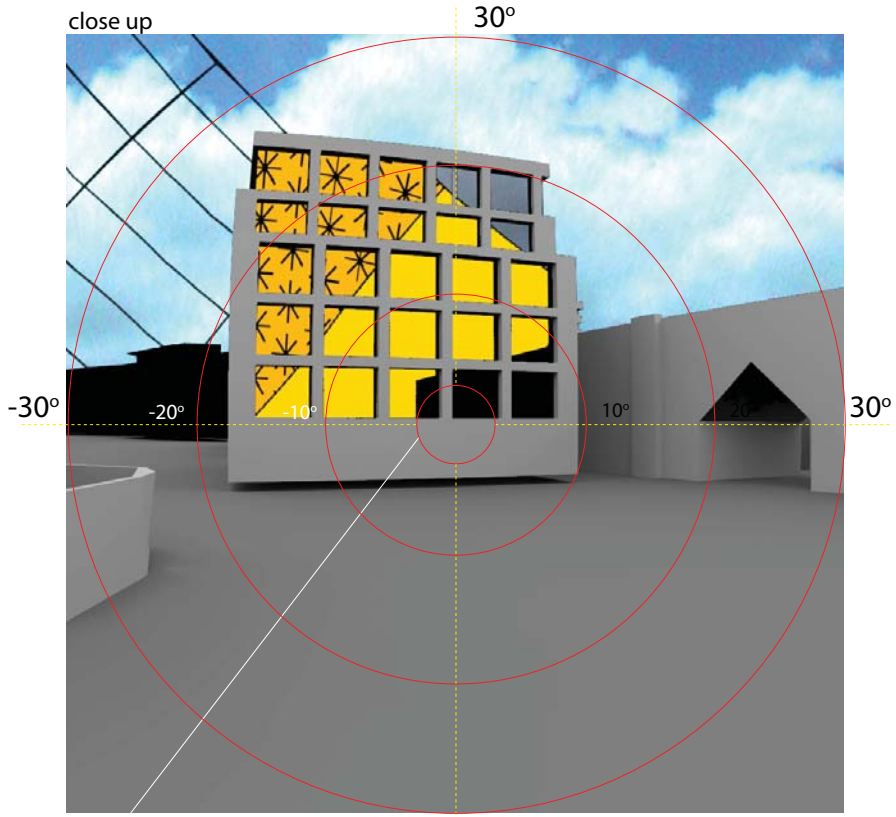
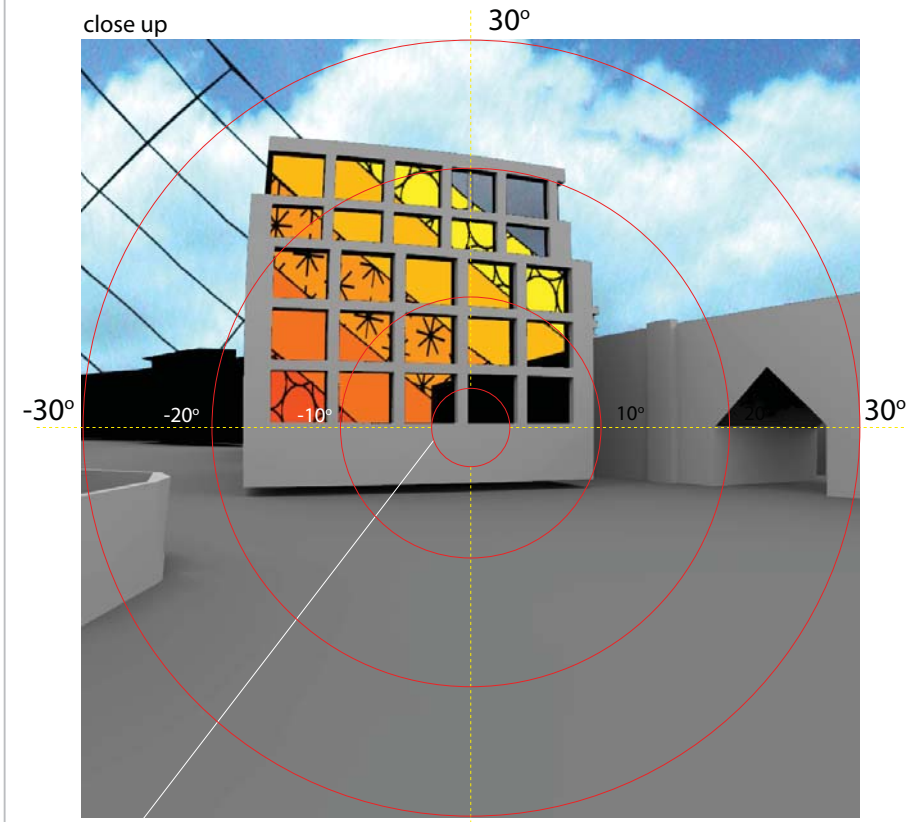
APR 16
APR 02
MAR 20
MAR 05
FEB 23
FEB 09
JAN 21
DEC 21


close up
30°
-30°
-20°
-10°
10°
20°
30°
3° from visual axis (foveal view)
-30°


close up
30°
-30°
-20°
-10°
10°
20°
30°
3° from visual axis (foveal view)
-30°


MORNING
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View Position 4 - Existing

Sources of information:

- IR76-80_2801

Figure 4: Approximate view from assessment point 4 - Existing Scenario