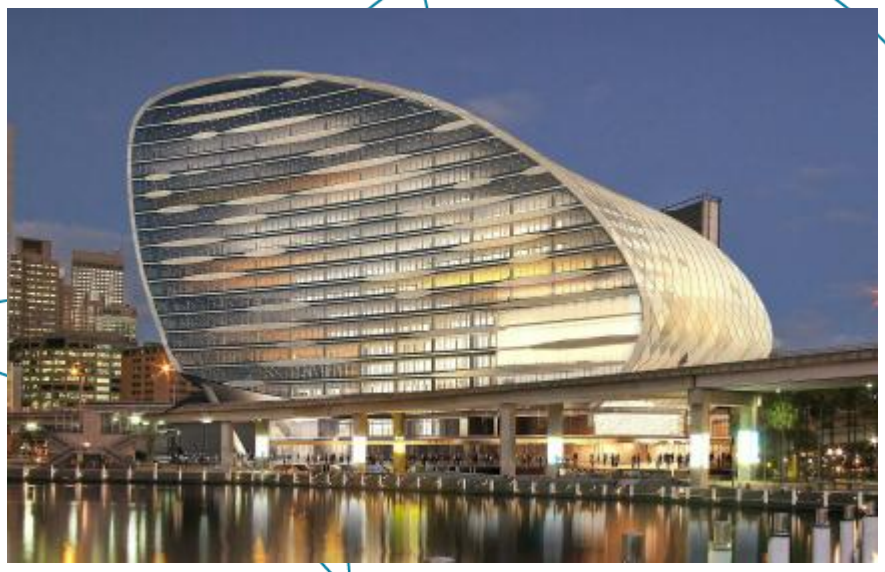
CUNDALL

04-Sep-2013

Reflectivity Study

1005965 The Ribbon, 31 Wheat Road



Prepared for:

Grocon Group

By Cundall
Level 1, 48 Alfred Street
Milsons Point, NSW 2061
Ph (02) 8424 7000
Fax (02) 8424 7099

Please contact: David Collins

Author:	Clinton Craggs	
Checked by:	Natalie Rosenbaum	
Approved by:	David Collins	

Revision	**Description**	**Date**
Draft	Draft for Comments	30/05/2012
B	Final report for DA submission	7/06/2012
C	Final report for DA submission – revised drawings	30/11/2012
D	Updated address	18/12/2012
E	Updated for revised design	11/07/2013
F	Revised project address	04/09/2013

The success and realisation of the proposed initiatives will be dependent upon the commitment of the design team, the development of the initiatives through the life of the design and also the implementation into the operation of the building. Without this undertaking the proposed targets may not be achieved.

Contents

Executive Summary

This report has been prepared for the development application of The Ribbon, 31 Wheat Road, in Darling Harbour, Sydney, to assess any facade sun light reflectivity issues with respect to nearby roads and pedestrian routes.

The maximum recommended specular reflectivity requirement for each facade is detailed in the table below:

Facade orientation	Maximum Visible Light Reflectivity
North Glazing	8%*
South Glazing	15%
West Ribbon	15%
East Ribbon	15%

Table 1 – Recommended Surface reflectivity * 15% with some vertical elements as required

Subject to the facade material selection, satisfying the reflectivity values stated above, any potential glare reflected from the building should be within acceptable limits according to the requirements of the City of Sydney and the Sydney Harbour Foreshore Authority.

1 Introduction

This report has been prepared for the development application of The Ribbon, 31 Wheat Road, in Darling Harbour, Sydney, to assess any facade sun light reflectivity issues with respect to nearby roads and pedestrian routes.

The proposed development a 5-storey retail podium and a 15-storey commercial tower with significant amounts of glazing facing north over the harbour, south over Darling Walk and a cladding ribbon running east to west.

Reflective materials used on the exterior of buildings can result in discomfort glare for pedestrians and temporarily disabling glare for drivers. The objective in the City of Sydney Development Control Plan is to restrict the reflection of sunlight from buildings to surrounding areas.

Visible light reflectivity from all facade materials should not exceed 20%.

1.1 Limitations

Whilst Cundall have endeavoured to ensure the information used is accurate, we do not accept any liability in relation to the results due to the reliance of third party information.

2 Methodology

Observation points for both drivers and pedestrians have been selected in order to assess the potential glare issues. Points 1 to 4, as shown below, relate to view points from cars and the travel direction is indicated by the arrow. Pedestrian observation points represented by Points 5 to 9 were also chosen on the elevated footpath, stairs, the Darling Harbour concourse and Darling Quarter Kid's Playground.

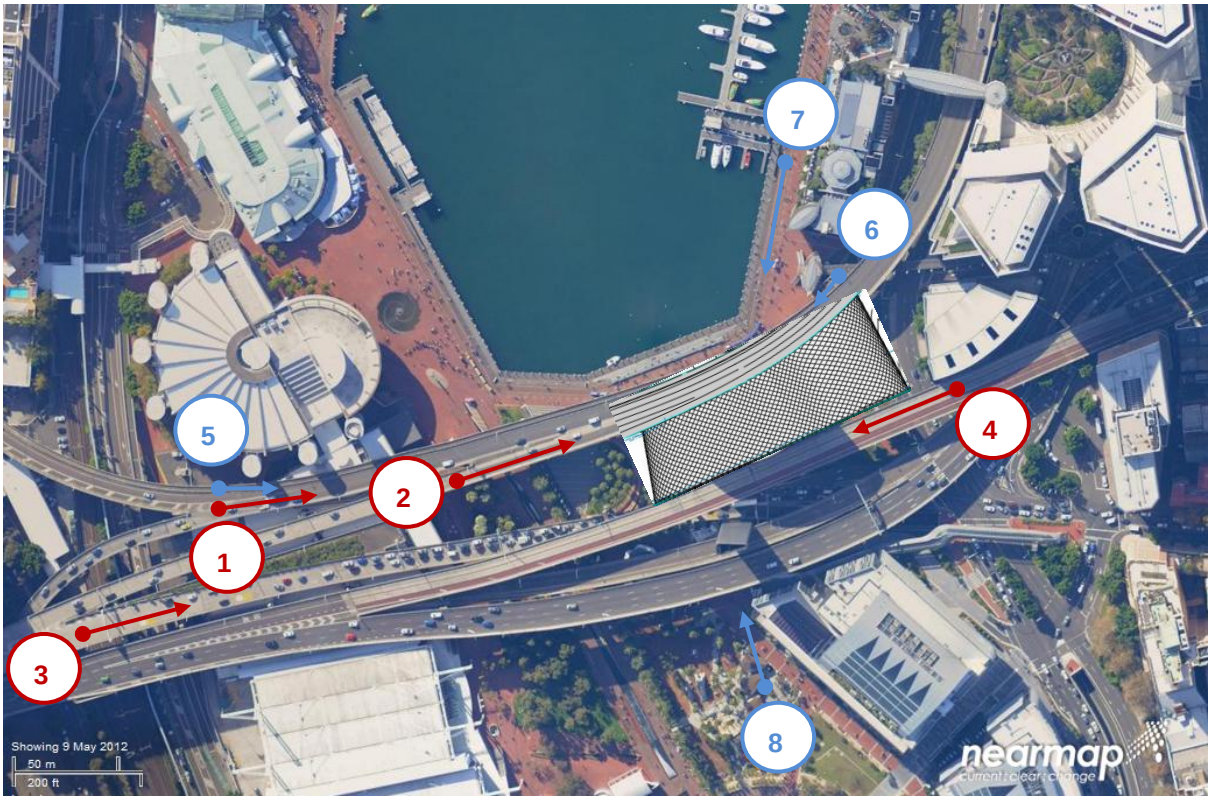


Figure 1 – Aerial photograph showing proposed building and critical view paths

Glare is assessed using the methodology in David Hassall's publication *Reflectivity: Dealing with Rogue Solar Reflections* (1991). This methodology defines the process as follows; views from the selected observation points are plotted on a glare protractor and critical facades are then assessed on a sunpath diagram to determine if and when the sun will be reflected.

For the purposes of this study the commercial tower is the main focus of the reflectivity analysis as the retail podium will be overshadowed by the elevated Western Distributor, although reflectivity targets for the tower are recommended for the podium too.

Cundall have based the assessment on the DA documentation and preliminary reflectivity studies during concept design.

3 Results

3.1 Observation Point 1

View travelling east along the Pyrmont Street entry onto the Western Distributor.

Figure 2 – Observation Point 1

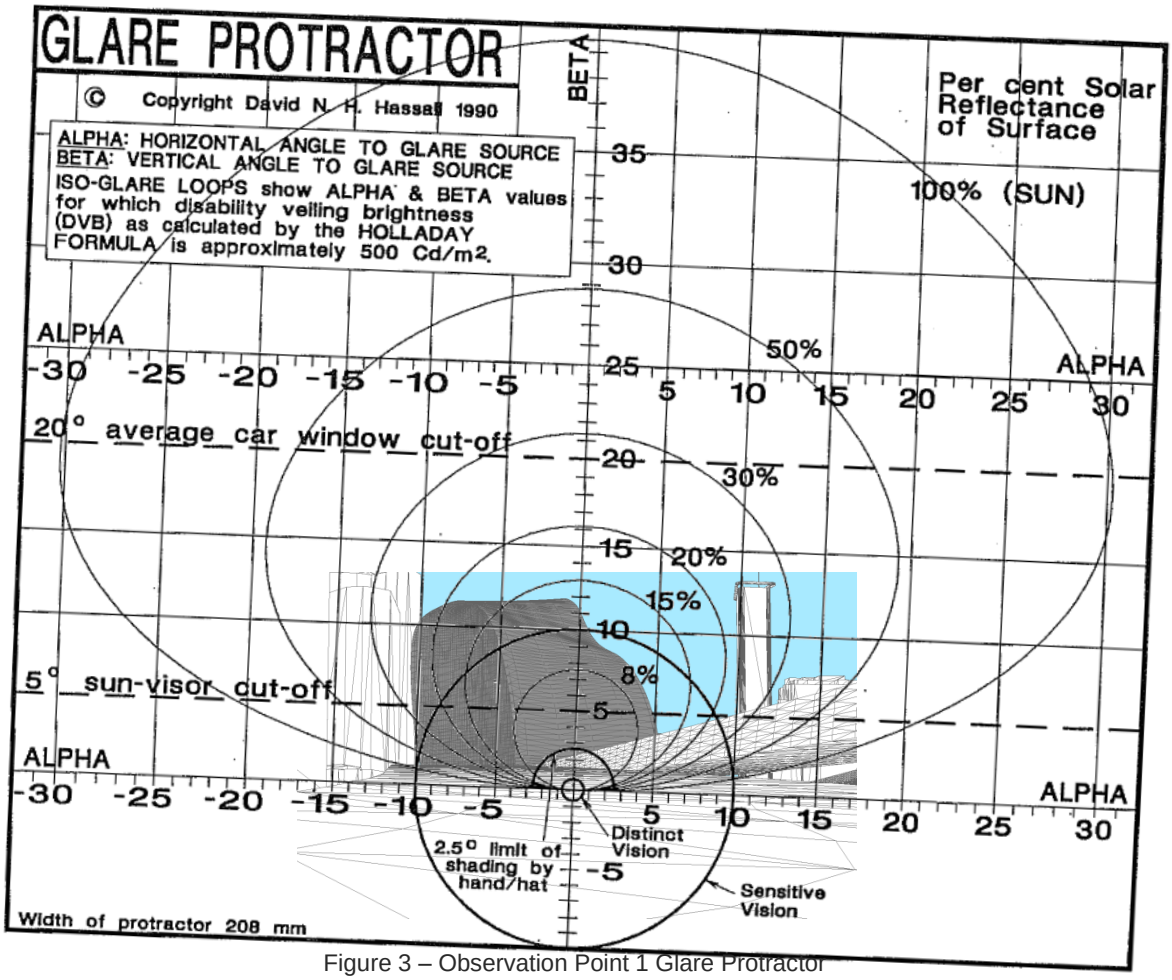


Figure 3 – Observation Point 1 Glare Protractor

3.1.1 North Aspect Glazing

No instances of glare are expected from the northern glazing at this observation point.

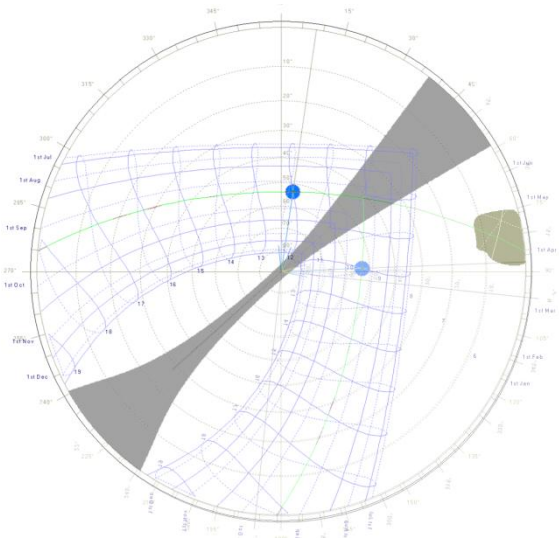


Figure 4 – OP1 North Glazing Sunpath Diagram

3.1.2 West Aspect Ribbon

In the late afternoon in summer, from 5pm EST, the sun reflects off the building towards this observation point. Late afternoon sun may reflect off the building towards cars travelling eastwards on the western distributor. The section of the building known as 'The Ribbon' should be made of diffuse material or 15% maximum specular reflectance for cladding/glazing.

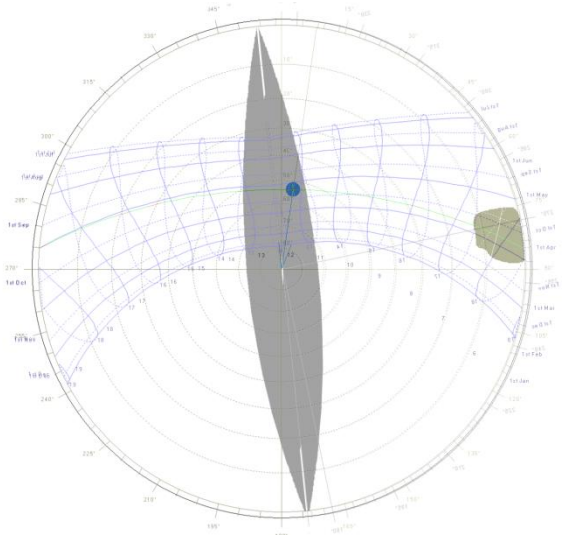


Figure 5 –OP1 West Ribbon Sunpath Diagram

3.2 Observation Point 2

View travelling east along the Western Distributor.

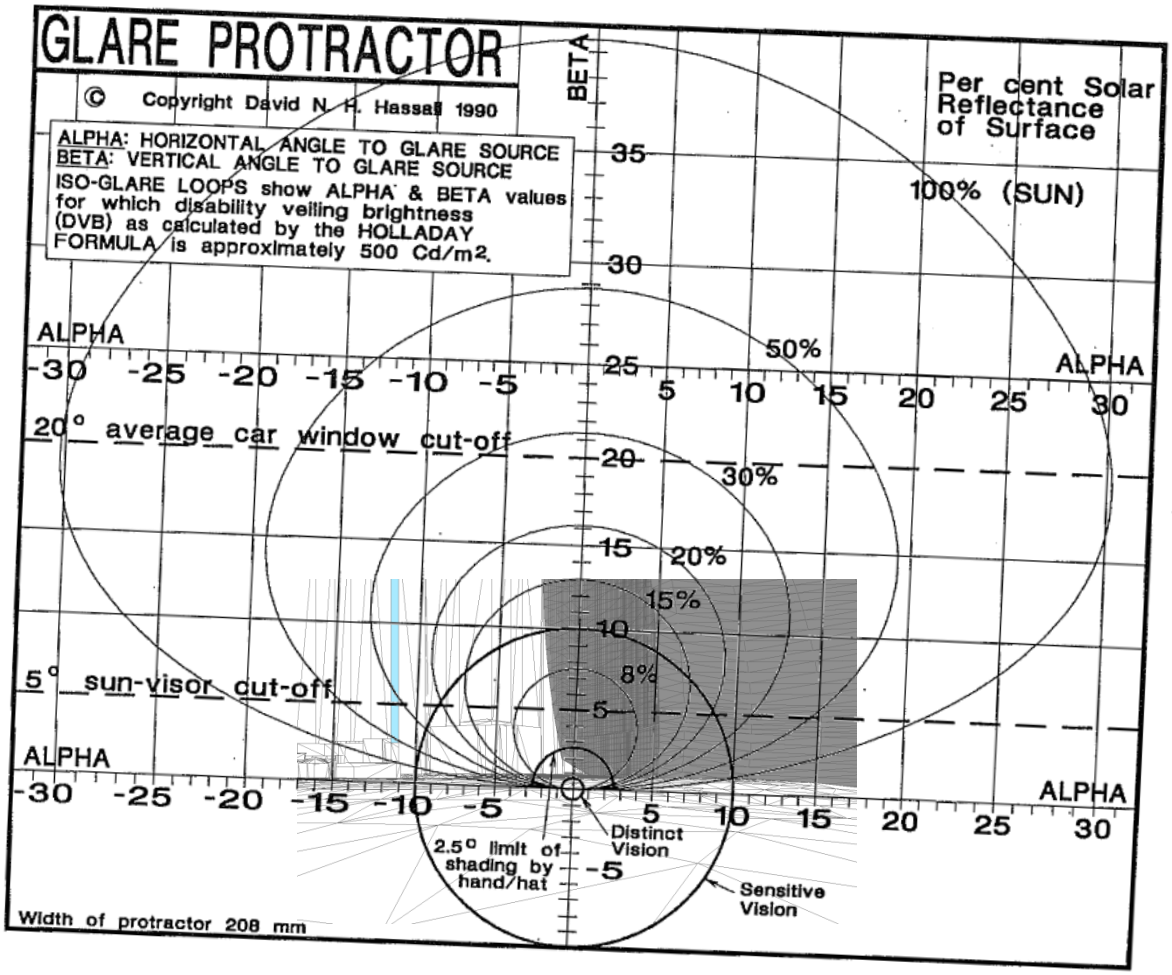


Figure 6 – Observation Point 2 Glare Protractor

3.2.1 North Aspect Glazing

Similar to observation point 1, no instances of glare are expected from the northern glazing at this observation point.

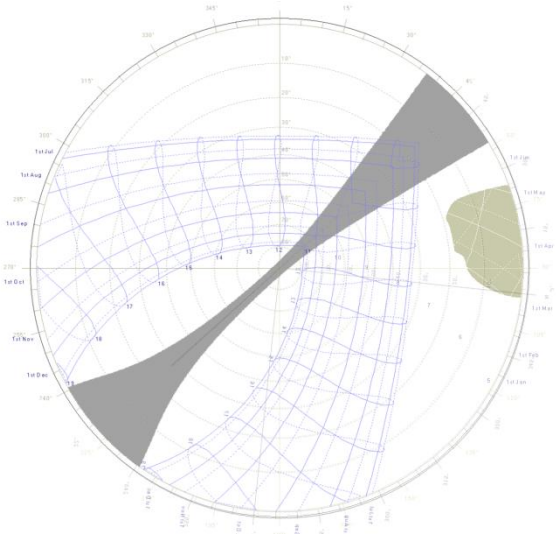


Figure 7 – OP2 North Glazing Sunpath Diagram

3.2.2 West Aspect Ribbon

In the late afternoon in summer, from 5pm EST, the sun reflects off the building towards this observation point. Late afternoon sun may reflect off the building towards cars travelling eastwards on the western distributor. The section of the building known as 'The Ribbon' should be made of diffuse material or 15% maximum specular reflectance for cladding/glazing.

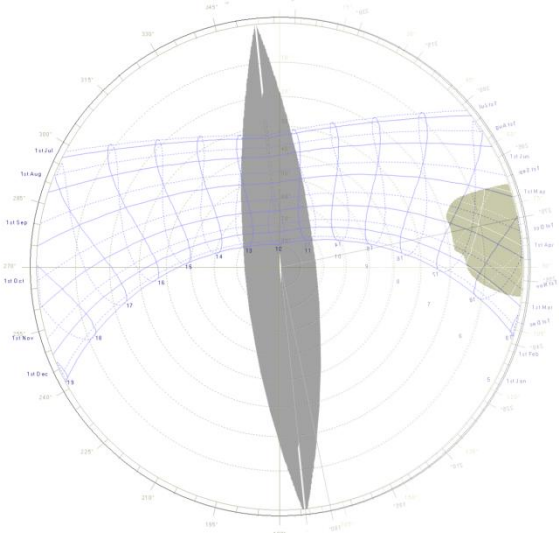


Figure 8 – OP2 West Ribbon Sunpath Diagram

3.3 Observation Point 3

View travelling east along the Western Distributor ramp down to Cross City Tunnel.

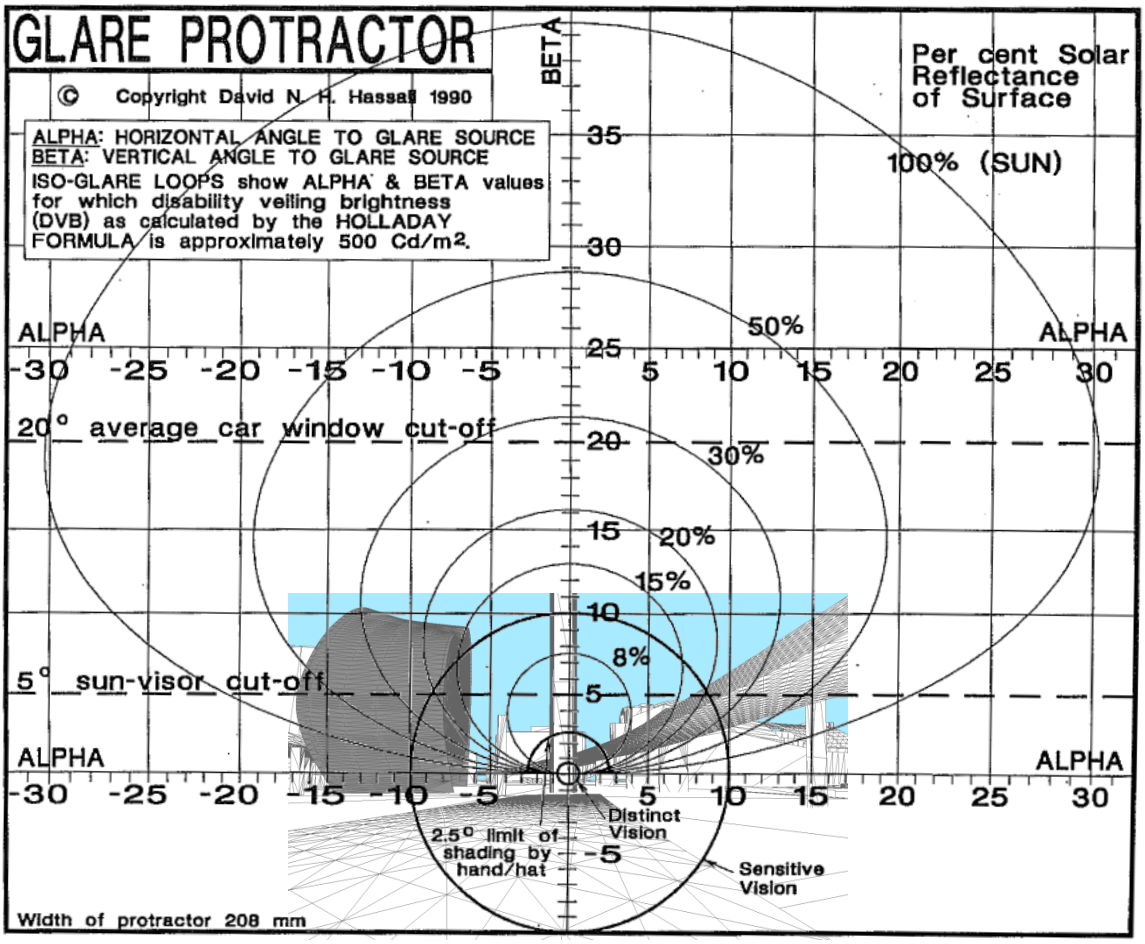


Figure 9 – Observation Point 3 Glare Protractor

3.3.1 West Aspect Ribbon

In the late afternoon in winter, from 5pm EST, the sun reflects off the building towards this observation point. The section of the building known as 'The Ribbon' should be made of diffuse material or 15% maximum specular reflectance for cladding/glazing.

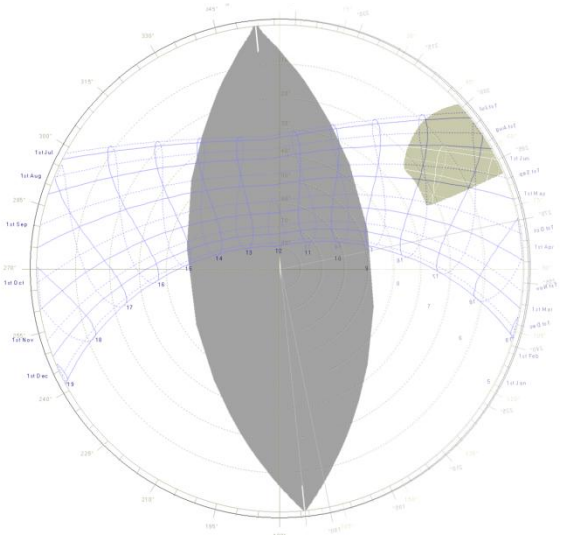


Figure 10 – OP3 West Ribbon Sunpath Diagram

3.4 Observation Point 4

View travelling west along the Western Distributor.

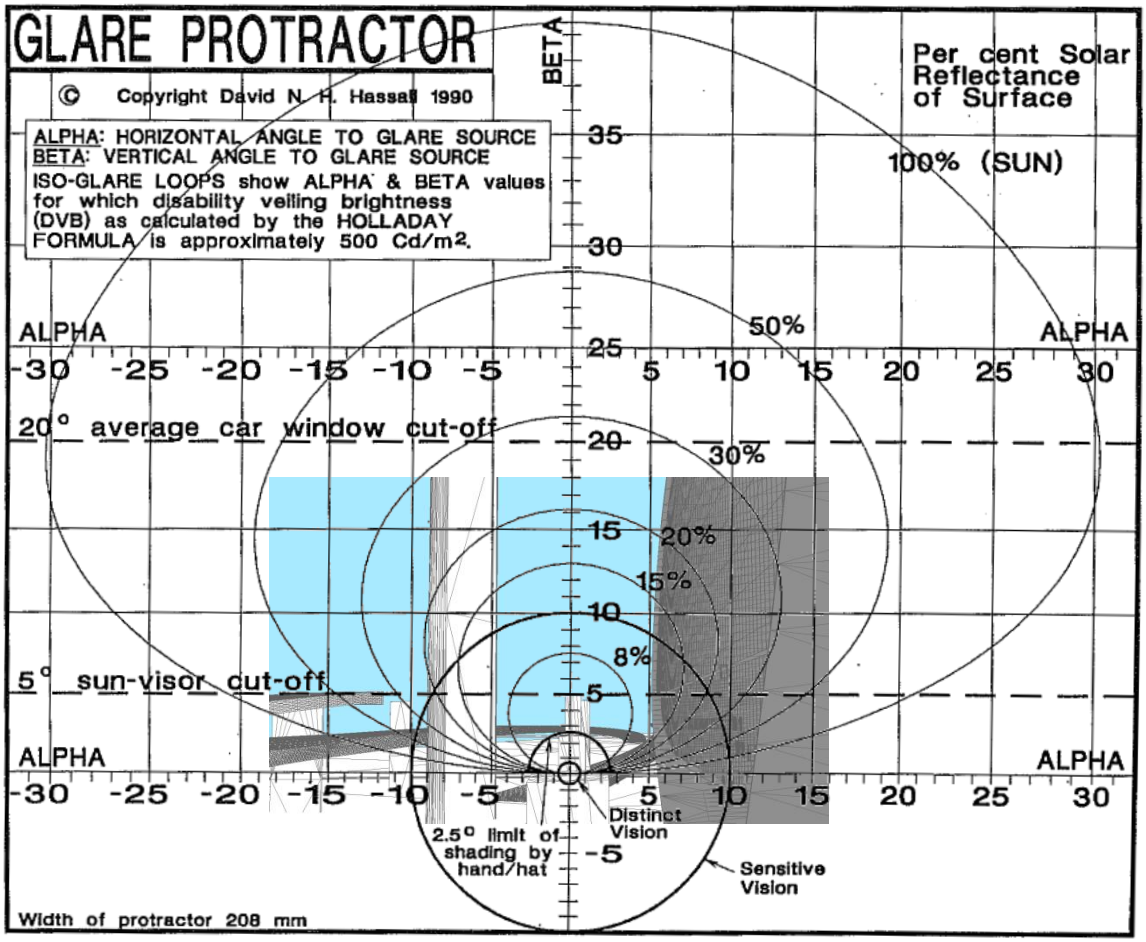


Figure 11 – Observation Point 4 Glare Protractor

3.4.1 South Aspect

For cars travelling west along the Western Distributor on late summer afternoons the sun will be reflected at a shallow angle towards this point. This should be no surprise as the actual sun will be low in the sky at the same time and likely to be in the field of vision. It is recommended that the maximum reflectivity of the glazing on the southern elevation is 15% to minimise risk of discomfort or veiling glare.

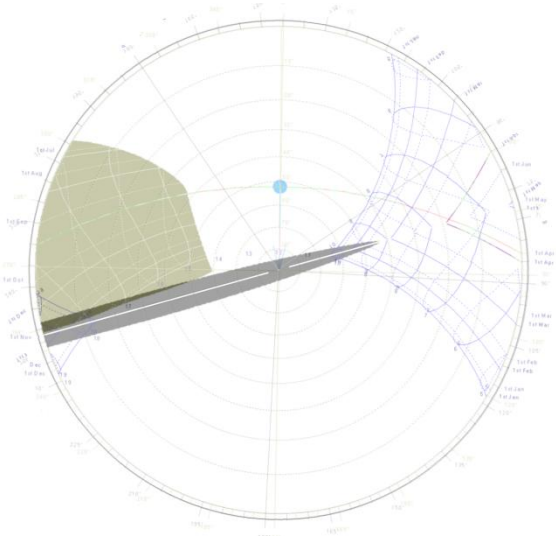


Figure 12 – OP4 South Glazing Sunpath Diagram

3.4.2 East Aspect Ribbon

For cars travelling west along the Western Distributor the building, sun may reflect off the ribbon on early winter mornings, when this elevation is not shaded by the buildings in Darling Park. It is therefore recommended that the ribbon's specular reflectivity be restricted to 15%.

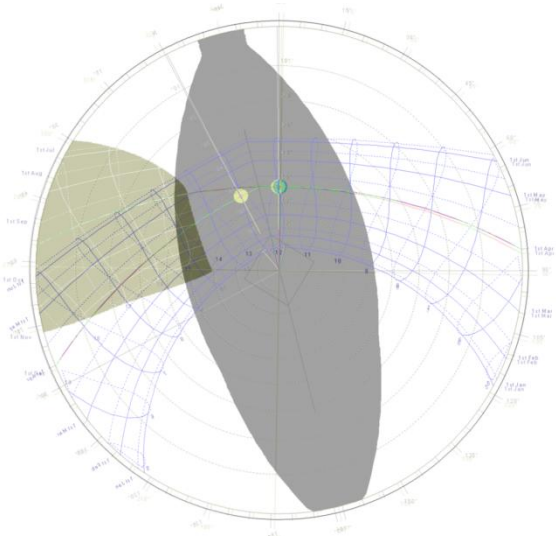


Figure 13 – OP4 East Ribbon Sunpath Diagram

3.5 Observation Point 5

View travelling east along the elevated walkway.

This point is expected to be similar to Observation Point 1.

3.5.1 North Aspect Glazing

No instances of glare are expected from the northern glazing at this observation point.

3.5.2 West Aspect Ribbon

In the late afternoon in summer, from 5pm EST, the sun reflects off the building towards this observation point. Late afternoon sun may reflect off the building towards cars travelling eastwards on the western distributor. The section of the building known as 'The Ribbon' should be made of diffuse material or 15% maximum specular reflectance for cladding/glazing.

3.6 Observation Point 6

View travelling west along the elevated walkway.

Figure 14 – Observation Point 6

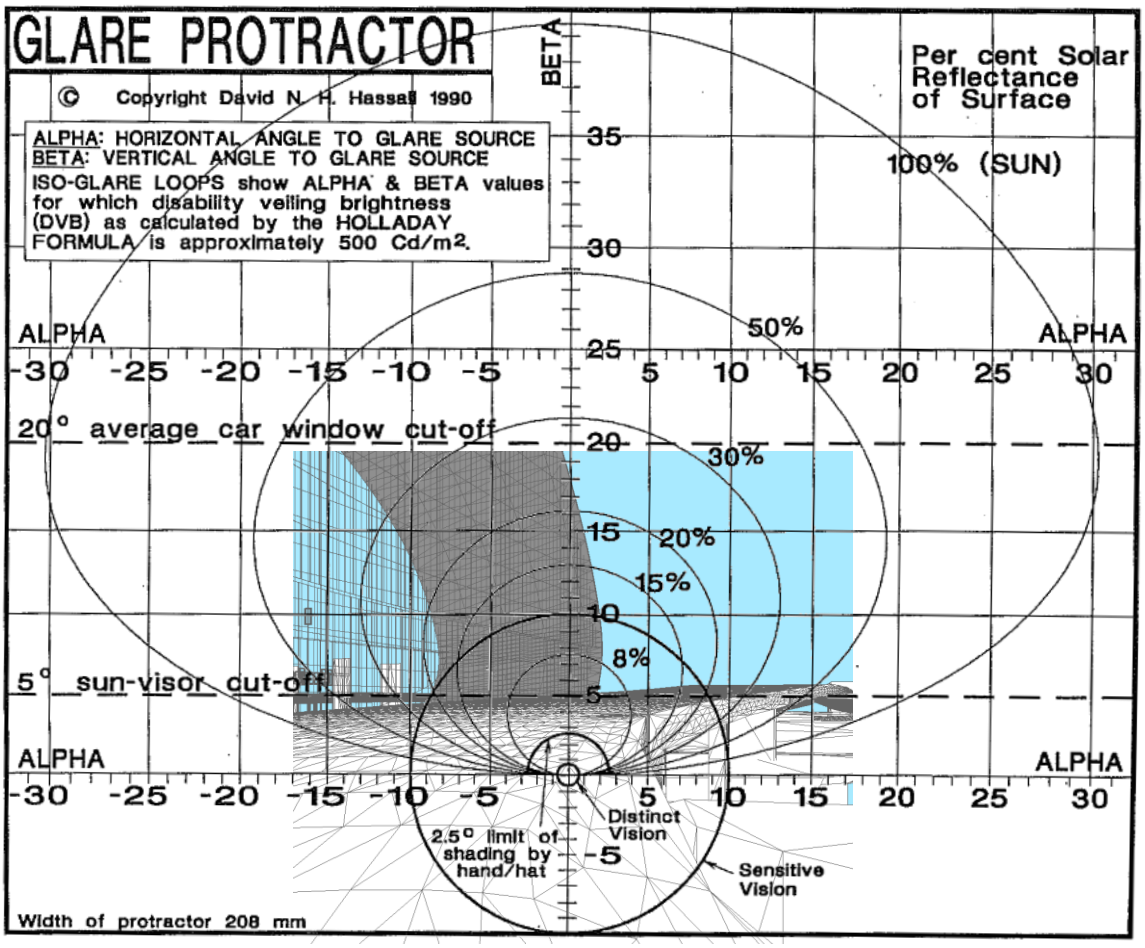


Figure 15 – Observation Point 6 Glare Protractor

3.6.1 North Aspect Glazing

Low angle summer sun during the afternoon will reflect off the northern elevation. The high angle of incidence means that the reflectance is a lot higher than normal and could approach 80-90%. This should be no surprise as the actual sun will be low in the sky at the same time and likely to be in the field of vision. While the reflection from the north elevation could be shaded by a hand or hat it is recommended that the maximum reflectivity of the glazing on the northern elevation is 8% to minimise risk of discomfort or veiling glare. If double glazing is selected and the reflectivity is less than 15%, then some vertical shading elements could be used to mitigate the glare for pedestrians on the elevated walkway, as shown on the elevation below in yellow. The popout window boxes will provide some additional shading and break up the surface.

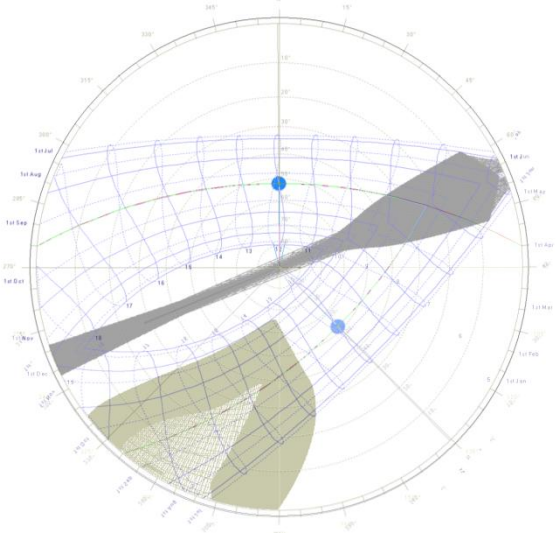


Figure 16 – OP6 North Glazing Sunpath Diagram

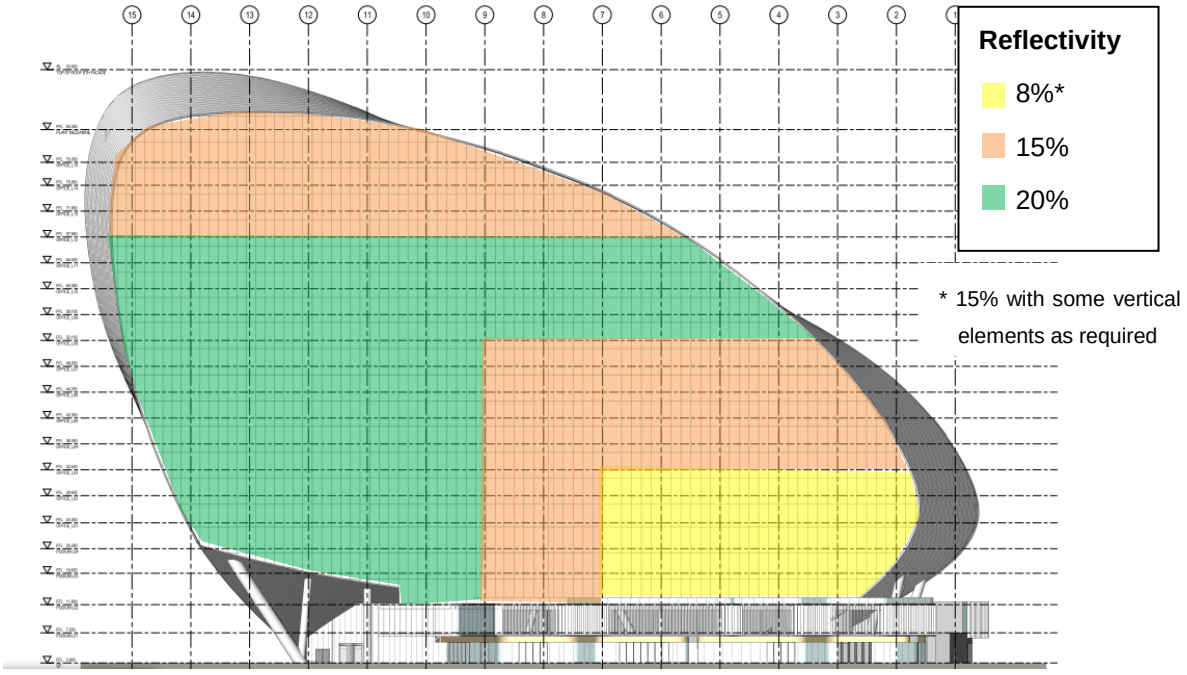


Figure 17 – North Glazing Reflectivity

Observation Point 7

View travelling south along Darling Harbour concourse.

Figure 18 – Observation Point 7

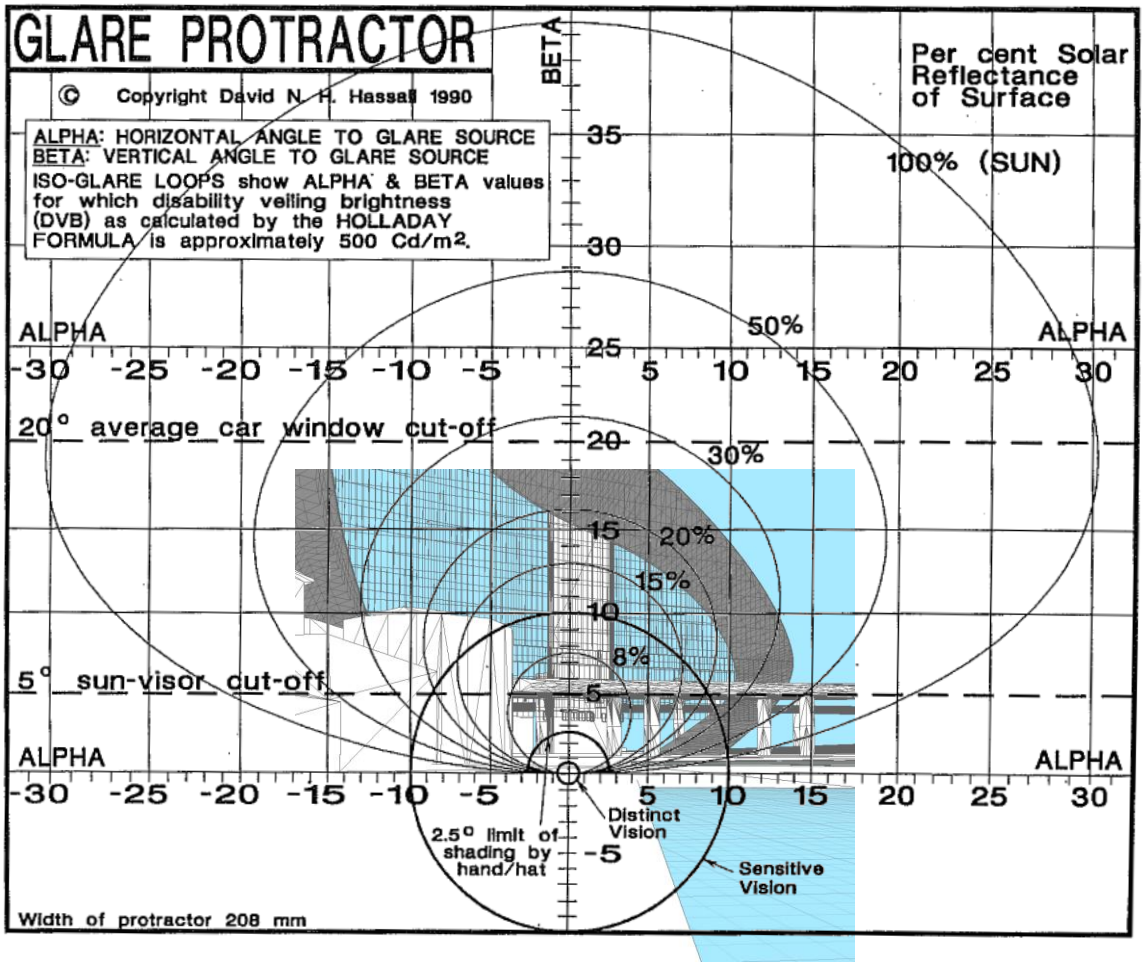


Figure 19 – Observation Point 7 Glare Protractor

3.7.1 North Aspect Glazing

Midseason sun during the afternoon could reflect off the northern elevation towards pedestrians travelling south along the concourse. While the reflection from this elevation could be shaded by a hand or hat, it is recommended that the maximum reflectivity of the glazing on the northern elevation is 8% to minimise risk of discomfort or veiling glare.

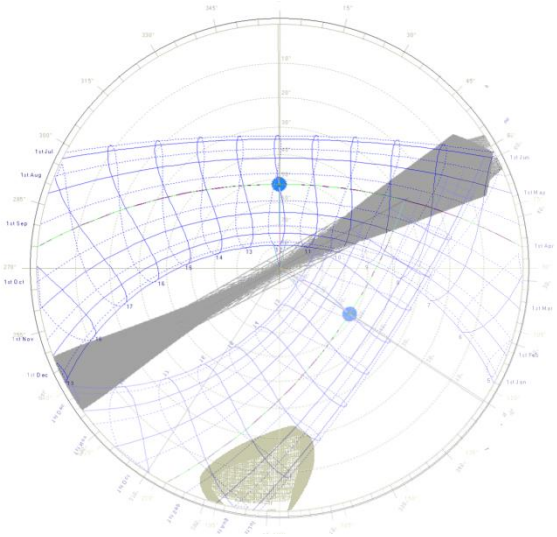


Figure 20 – OP7 North Glazing Sunpath Diagram

3.8 Observation Point 8

View north from Darling Quarter Kid's Playground.

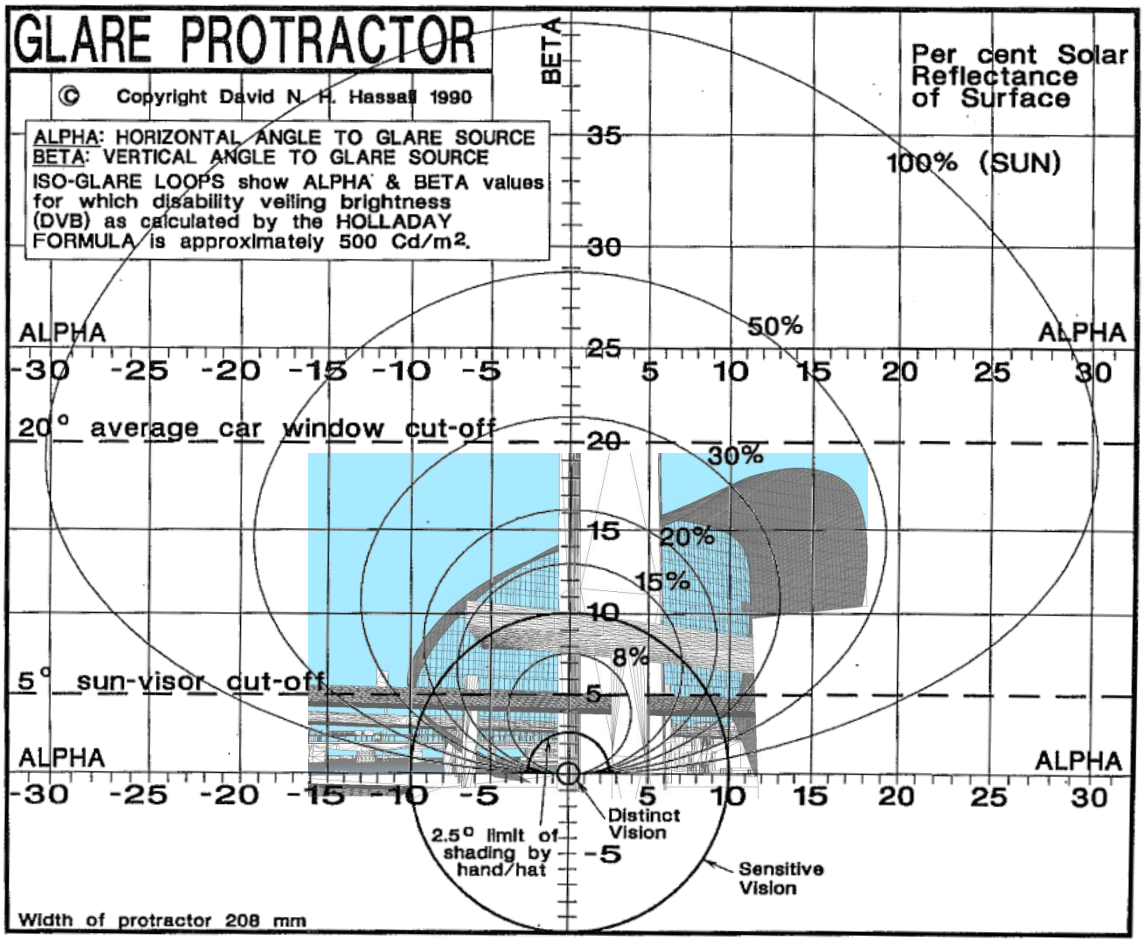


Figure 21 – Observation Point 8 Glare Protractor

3.8.1 South Aspect

No instances of glare are expected from the southern glazing at this observation point.

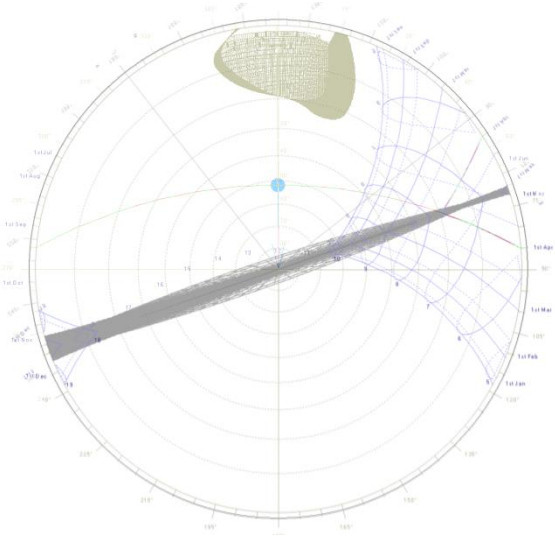


Figure 22 – OP1 South Glazing Sunpath Diagram

4 Conclusions

In general, glazing and any other specular cladding materials should have a maximum visible light reflectivity of 20%. The northern glazed elevation should have a maximum reflectance of 8%. If double-glazing is selected and the reflectivity is less than 15%, then some vertical shading elements could be used to mitigate the glare for pedestrians on the elevated walkway. The southern glazed elevation should have a maximum reflectance of 15%. For the ribbon a maximum reflectance of 15% is recommended to reduce the risk of disability veiling glare for drivers travelling along the Western Distributor from the east and from the west and discomfort glare for pedestrians on the elevated walkway and looking up from the Darling Harbour concourse. These recommendations are summarised in the table below.

Facade orientation	Maximum Visible Light Reflectivity
North Glazing	8%*
South Glazing	15%
West Ribbon	15%
East Ribbon	15%

Table 2 – Recommended Surface reflectivity * 15% with some vertical elements as required

Subject to the facade material selection satisfying reflectivities stated above, any potential glare reflected from the building should be within acceptable limits according to the requirements of the City of Sydney.