December 7, 2009

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Laing O'Rourke Australia Pty Ltd
PO Box 1505,
North Sydney, NSW 2059

Attn: Mr Perry Milledge

RE: 100 Mount Street, North Sydney – Response to Department of Plannings Query regarding the Solar Light Reflectivity Study

Dear Mr Perry Milledge,

This letter is to comment on the effect of the recent changes to the podium levels on the solar light reflectivity analysis. The letter also responds to comments raised in the Department of Planning submission in relation to solar light reflectivity effects of the proposed development on the Beau Monde residential units.

A review of the recent changes to the podium levels indicates that these changes will have no impact on the results of our analysis of the solar light reflectivity impacts of the proposed development.

Our report presents a general condition in relation to the impact on the occupants of neighbouring buildings as opposed to analysing the glare intensity. The reason for restricting the analysis of glare intensity to drivers is due to the fact that sightline of drivers is restricted to the direction in which they are travelling, whereas pedestrians and occupants of neighbouring buildings have greater flexibility in terms of their sightline. Our experience indicates that provided no surface on the subject development has a normal specular reflectivity greater than 20% then the impact is minimal. A 20% normal specular reflectivity restricts the sightline of occupants to about 10-degrees from the offending section of the building for the time when the sun is actually reflected from that aspect.

I draw your attention to the attached discussion paper, which looks at this issue in some detail.

Yours sincerely,

WINDTECH Consultants Pty Ltd
Tony Rofail
Director

REFLECTIVITY IMPACT ON OCCUPANTS OF NEIGHBOURING PROPERTIES

Antonios Rofail, Windtech Consultants Pty Ltd, Sydney
Beres Dowdle, John Perry, Connell Mott MacDonald, Sydney

1.0 INTRODUCTION

Glass selection is becoming increasing important in project delivery, particularly as the focus of glass products greatly influences both energy consumption and occupant comfort of buildings. In order to achieve these requirements designers increasing turn to coated glass products which have moderate levels of reflectance. Additionally designers are seeking glass products with high light transmittance requiring higher reflectance levels to meet the energy / comfort requirements.

Additionally as pressure on available land is increasing buildings are becoming taller and with a greater capacity to result in glare impact to areas further away from the reflecting building, particularly in the case of buildings having a flat glass facade. This increases the potential for new developments to impact on drivers and occupants of buildings extending to greater distances from the site, although the impact on drivers can potentially have more serious consequences. Glare and external reflectivity has been a significant driver of what can be considered when selecting glass products. To date the methods used for assessing the impact of glare (disability) on the population has been limited to drivers of vehicles, pedestrians for safety and to a lesser extend occupants of office (for comfort and disruption) who largely stationary in their work stations. There exist no guidelines for determining glare limits for occupants of residential building.

As more new buildings are bordering residential areas and residential construction have entered into commercial district, closer proximity of buildings etc has resulted in need to provide a method of assessing the impact of these development on one another.

This paper proposes a brief review of current methods and limitations and proposes a methodology of assessing impact on occupants of neighbouring buildings, with particular emphasis on arriving at a method of assessing the impact onto the occupants of neighbouring residential buildings. This paper proposes an approach to this aspect and outlines the required field studies necessary to give it sufficient basis for it to be enacted upon.

2.0 CURRENT APPROACHES

In 1992, Sydney City Council[1] suggested a criterion for “maximum reflected solar glare” (veiling luminance) on vehicle drivers of 500 candelas per square metre. However, the question remains unanswered as to whether there should be a criterion for glare impact onto the occupants of neighbouring buildings. As practitioners, we are constantly being asked whether a certain development will have an adverse impact on the occupants of a neighbouring building. In attempt to address this, Sydney City Council later adopted a limit to the level of normal reflectivity of the exterior surface of a building to 20%. This has in turn been adopted by most local authorities in the Sydney metropolitan region. The authors are not aware of other local authorities who have adopted this requirement other than various local authorities from around Sydney and in the Melbourne CBD. A similar approach has been taken in Singapore and Rotterdam. In the case of Singapore, the current reflectivity limit of 10% is about to be relaxed to 15%. This is a positive and practical move but may not be adequate in certain situations. In the other extreme, this limitation to the reflectivity of the exterior surface of a building may possibly be too restrictive, particularly in cases where the orientation of the building lends itself to measures that can offset the additional glare such as by increasing the depths of the mullions.

Another question is whether we should only consider the impact on the occupants of the surrounding commercial buildings only or should we also consider the impact on the occupants of the surrounding residential buildings. Until recently, an approach has been taken by Windtech Consultants whereby the impact on occupants of neighbouring residential buildings has been ignored due to the low probability that an occupant is required to look out in the direction of the study building.

In the case of reflections to occupants of a neighbouring commercial building, Tony Rofail has developed a simplistic criterion in collaboration with David Hassall, which has been used in some cases. This approach estimates the glare intensity based on the Halliday formula and then requires that the reflectivity not exceed 500 candelas per square metre for sightlines oriented 10-degrees or more from the reflecting surface. The first step is to prepare sun-chart diagrams for each reflective aspect of the development. An example of a sun-chart diagram is given in Figure 2, below.

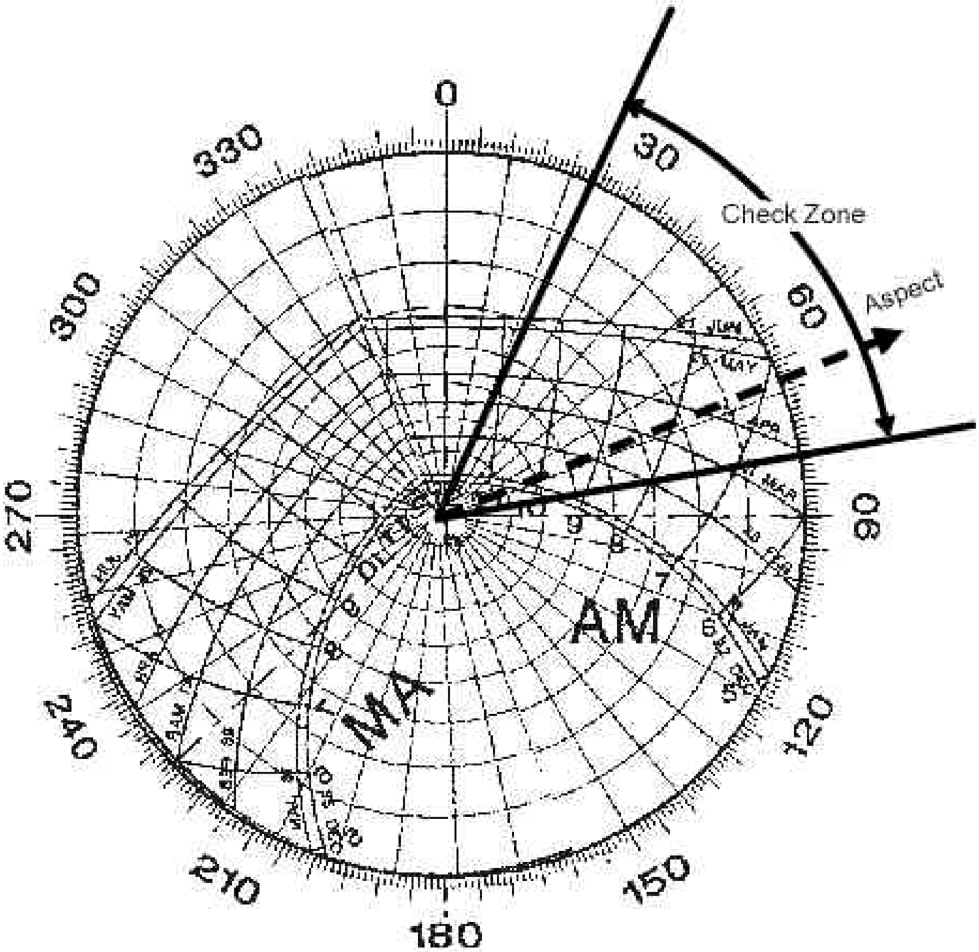

Figure 3: A sample solar chart diagram – this one is for a 68° aspect.

The next step is to determine if low altitude sun will reflect to the neighbouring building – this is determined from a check-zone diagram. An example of a check-zone diagram is given in Figure 3, below.

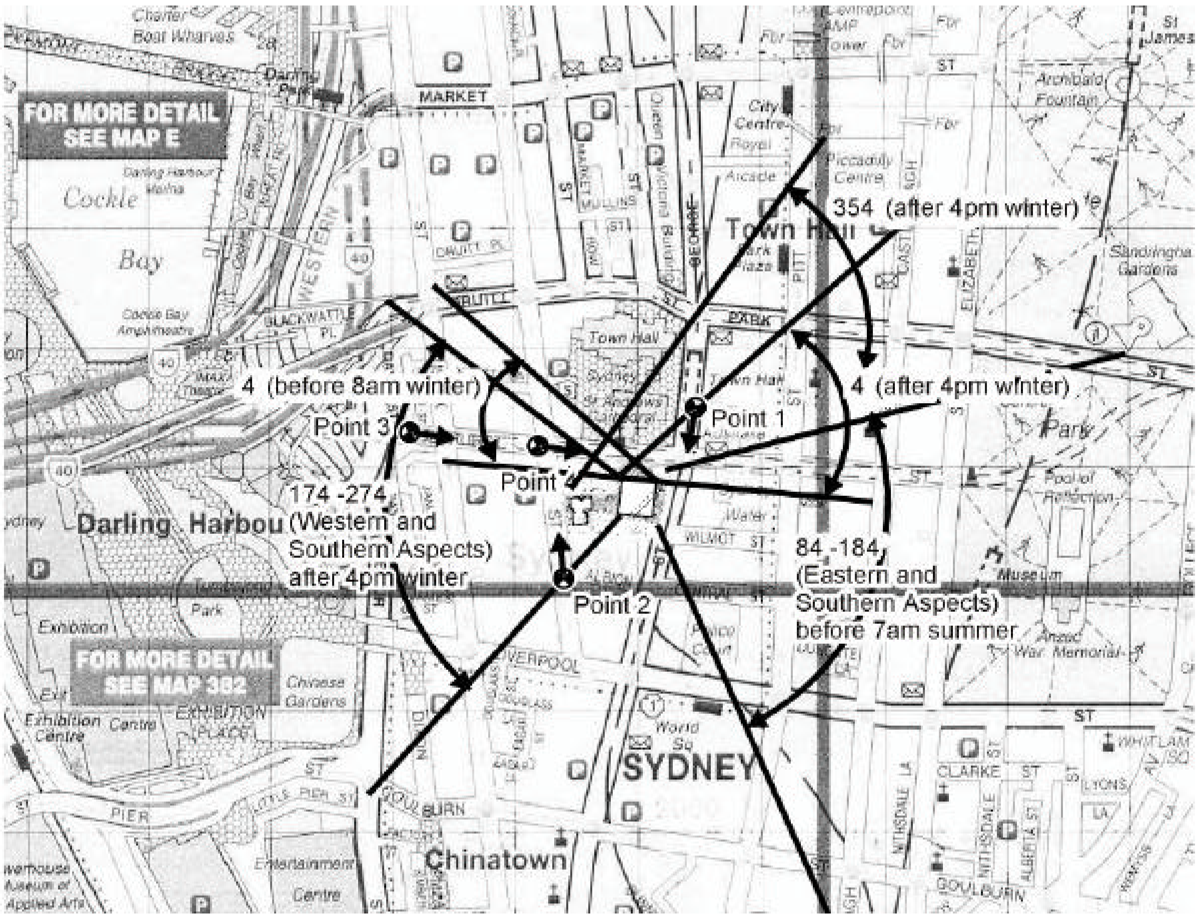

Figure 3: A sample check-zone diagram

Once it is established that solar reflections will occur to a particular area of a façade of a neighbouring commercial building, the intensity of the glare is determined using the Halliday formula. The exact times of occurrence of the reflections can also be determined by plotting the extent of the reflecting surface on the solar chart for the aspect of that surface.

However, this approach ignores aspects of the reflection such as the duration of time over which reflections occur to the neighbouring building, the effect of the type of glazing on the neighbouring building in providing some protection, the presence of blinds, etc.

3.0 PROPOSED NEW APPROACH

The current practice looks at the maximum instantaneous glare impact. This is appropriate for drivers but not necessarily for occupants of neighbouring buildings, particularly residential buildings. Glare intensity is dynamic and changing in nature and hence a different approach may be required for impact on occupants of neighbouring buildings.

It is true that glare to occupants of a residential building does not pose a safety risk. Also, it may not necessarily result in discomfort, as residents have options not as readily available to office occupants with regards to orientation or sight-lines. However, residents do have rights not to have their views or outlook disrupted due to solar glare impact. Hence the proposed criteria should include residential buildings. It should be emphasised that glare impact to residents if substantially less critical to that of occupants of neighbouring commercial buildings, hence the more lenient set of criteria for residential buildings.

It is proposed that the criteria take a form similar to that illustrated in Figure 3, below. This is analogous to the "Degree days" concept in heating and cooling loads. That is, it factors in the duration (hours) and the intensity of glare impact (Candelas per square metre).

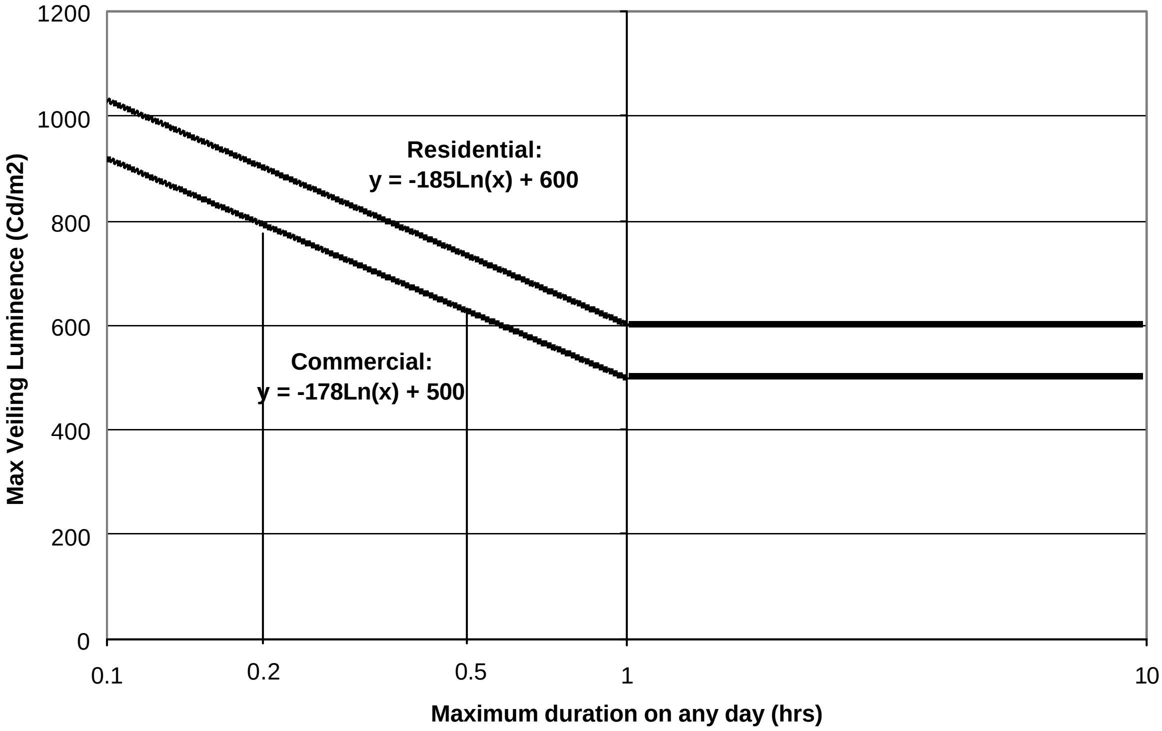

Figure 3: Sample criteria for maximum veiling luminance onto occupants of neighbouring buildings

It is important that a study is carried out to determine the acceptability of different levels of intensity of reflected solar glare on the occupants of a number commercial and residential buildings at risk. This could possibly result in a refinement of the set of criteria illustrated above. This work would involve a discomfort survey being carried out with various occupants from each of a number of residential and commercial buildings that are located within the check-zones of a reflecting building. An example of a survey form is given in Figure 4, below. This survey will help in assessing any upper limits as well as a threshold value below which there is minimal distraction/ impact. Such a survey can also assist in determining the most appropriate method of measuring the level of discomfort. The survey should ideally be carried out at a time when glare impact from the study building is occurring.

Solar Glare Impact Questionaire

This questionaire should take approximately 30 seconds of your time. Please tick the appropriate box.

1. Can you manually adjust your blinds? Yes No We don't have blinds

With regards to solar glare from the building:____

2. Does it normally bother you when the sun reflects from that building? Yes No

3. If your answer to question 2 is "no", please answer the following;
For how long have you been at this location in your office? __________________________

4. If your answer to question 2 is "yes", please answer the following;
a. My normal reaction is to;

keep the blind open close the blind look in another direction

re-orient my monitor move to a different location

other (please specify) ____

b. When reflections occur from that building, for how long does it bother you?

Less than 5minutes per day Less than 15minutes per day

Less than 30minutes per day Less than 1hour per day more than 1hour per day

Thank you for your time.

Surveyor to record:
Orientation of interviewee with respect to the window: __________ degrees (0 degrees = facing window).
Orientation of interviewee with respect to the study building: __________ degrees.
Type of glass used in the window ____

Presence of deep mullions, concrete eyebrows, fins, etc, that would obscure: Yes No

Date: _____ / _____ / _________ Time: ____________________

Figure 4: Sample questionaire for occupants of neighbouring buildings

Acknowledgements:
The authors wish to thank Mr David Hassall for his comments on this discussion paper.

References:

1. Sydney City Council. "Interim Planning Controls and Design Principles", Item 20. Adopted on December 10, 1992.
2. David N.H. Hassall, "Reflectivity: Dealing with rogue solar reflections", published by author, 1991.