RWDI Australia Pty Ltd
Suite 602, Level 6, 80 William Street,
Woolloomooloo, NSW 2011
ABN 86 641 303 871

3 October 2024

Poonam Chauhan
Deicorp
Level 3, 161 Redfern Street,
Sydney NSW 2016

Re: Solar Reflectivity – Preliminary Desktop Review for SSDA
129-153 Parramatta Road & 53-74 Queens Road, Five Dock (RWDI #2306785)

Dear Poonam,

RWDI was retained to conduct an assessment of the potential effects of light reflected by the proposed development located at 129-153 Parramatta Road & 53-74 Queens Road, Five Dock (the Project). This letter provides background information on solar reflections from buildings as well as a preliminary review of the Project's potential solar reflection effects based on architectural drawings received (Drawing Ref: Issue For Information, Date: 16.9.24). A detailed assessment via computational simulations is currently being undertaken by RWDI.

Background

Metrics

There are currently no universal standards that define how much reflected light from a building is 'too much'. Many approaches to studying this phenomenon are used in jurisdictions around the world. In Australia, a common approach is to compute the so-called *veiling luminance* [1] of a reflection. This quantitative approach requires the understanding of not just the intensity of the reflection but also its source location relative to a person's direction of view. Reflections with a veiling luminance at or above 500 cd/m² are then defined as "glare" [2]. For some jurisdictions such as Sydney, any reflection that exceeds this threshold is considered problematic, though in other jurisdictions RWDI has worked in, some potential for glare is acceptable so long as it is not excessive compared to what the existing buildings create.

While the veiling luminance metric allows a prediction of the potential for visual impact, it does not address the potential for a building's reflections to cause thermal effects to people and property. Thermal impacts occur when a building's shape results in multiple reflections converging in the same area (e.g., inward curving facades). Depending on the combined intensity of the reflections and the nature of the objects exposed to them, significant heat gains can occur. There is limited research into this topic, but RWDI has developed our own thresholds for reflected solar energy [3] which are consistent with the guidelines that do exist [4-7].

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Calculation

The actual calculation of the above metrics requires an understanding of the materiality of the building envelope since light reflects from different materials in different ways. *Specular* reflectors (e.g., glass, polished metals) are those where the reflected energy all travels in the same direction. This is different from *diffuse* reflectors (e.g., concrete, plasterboard) which scatter the reflected light in all directions. Reflection studies generally focus on the specular reflections since it is these reflections that can lead to reflection convergence and also tend to have a larger visual impact due to their directional nature.

A key aspect of specular reflectors that must be understood is that their reflectivity value is *not* a fixed value. The reflectivity will only be approximately constant for light striking the surface up to a critical angle away from perpendicular (approximately 56° for glass). As light strikes the surface at more glancing angles, the reflectivity will exponentially increase. This behaviour will occur for *any* specular reflector, including glass. This is why setting limits on facade reflectivity does not necessarily prevent glare. Modern insulated glazing units can also feature coatings that selectively reflect the sun's thermal energy but not the visible light. This is done to lower solar heat gains while still providing high levels of daylight internally. This fact further complicates the use of façade reflectance thresholds since a window could be reflecting much more infrared energy than the visible reflectance values stated by the manufacturer may suggest.

Project Review

Due to the nuances described above, the actual prediction of a building's potential for glare or thermal impacts is recommended to be undertaken using computational techniques. That said, RWDI's experience in studying this phenomenon does permit us to provide a preliminary discussion of what the potential effects of the Project may be on its surrounds. Note that for the purposes of this review, based on our review of the drawings provided, all windows, sliding doors and balustrades are glazed and therefore assumed to be reflective. Other building elements are assumed to be not significantly reflective.

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Some key observations regarding the solar reflectivity performance of the Project are as follows:

1. A positive feature of the Project is the setback design of the balconies on selected facades and towers which provides self-shading for the glazed doors and windows. This is anticipated to likely reduce the potential impacts of reflections that may affect drivers within the immediate vicinity of the Project by lowering the sun exposure to these reflective elements.

2. We have also noted fins and facade/window insets especially on buildings B, C, D and E. Both of these are positive features that would act to reduce some reflections emanating from the Project.

3. The current design of the Project does not feature concave (inward curving) building forms on all aspects of both towers. Therefore, we do not anticipate substantial heat impacts within the various communal open spaces.

4. Given the building orientation, the extent of the glazed areas of the development and the sun path for the site, drivers travelling along Parramatta Road, Queens Road and William Street have the potential to experience reflection impacts especially in the mornings and afternoons. Drivers travelling on Spencer Street, Lang Street and Short Street also have the potential to experience reflections emanating from the Project, though this is anticipated to be confined to selected times of the day or year.

5. Simulations would be required to quantify the potential for glare mentioned above and inform the specifics of any mitigation measures (if any).

Overall, there are several positive features of the Project's design as it pertains to reflections. However, given the Project's location and surrounding context, simulations are needed to quantify the visual glare potential onto the surrounding roads to typical Australian standards. This is currently being undertaken by RWDI.

Yours truly,
RWDI

Ghar Ek Lau, *Ph.D.*
Senior Scientist Engineer | Associate

Joseph Gallace *BE(Aero), DipPM, MIEAust*
Project Manager

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References

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