1.0 SOLAR ACCESS OF SSDA - PITT STREET SOUTH OSD (PSS OSD)

ThIs document is in response to requests for information. The document demonstrates the changes that have happened to solar access for not only the PSS OSD site, but also its resultant impacts on the Princeton Apartments. It will summarise and update the following documents which have been issued over time:

- SSDA Application Report Revision C dated 15th May 2020.
- Response to Submissions Revision B dated 28th August 2020.
- Further response to submissions memo dated 10th November 2020.
- Amended SSDA Application Report Revision D dated 3th December 2020.

During the latter assessment phase of the application, it has come to the project team's attention that the extent of the Sydney Metro station box represented in the model used to inform the solar access assessment of Princeton Apartments was incorrectly represented. The building model used to inform the solar analysis for the original SSD lodgement and the RTS excluded part of the station box located at the Pitt Street frontage, up to RL 56.75.

This modelling discrepancy **does not** pertain to any portion of the building for which development consent is sought by this application.

An updated solar analysis summary is therefore provided below in an effort to genuinely describe the resultant gain in solar access (minutes) to Princeton Apartments generated by the overall integrated building design. The change in solar access (minutes) now assessed for Princeton Apartments is attributed to the now accurate modelling of the approved station box structure. The change in solar access (minutes) is not attributable to the OSD building.

The principles of the solar assessment do not change. The detailed OSD building design results in

- No change in solar access compliance by Princeton from that assessed as generated from the Concept Envelope (number of apartments achieving 2 hours solar access to living rooms and private open space at midwinter between 9am and 3pm)
- An overall increase in solar access to Princeton Apartments, as a matter of minutes across the building, from that generated by the Concept Envelope
- A slight improvement to the number of minutes of solar access to 12 Princeton Apartments at their north eastern corner, from that generated by the Concept Envelope
- A slight reduction to the number of minutes of solar access to 9 Princeton Apartments at the north western corner, from that generated by the Concept Envelope

The updated analysis also demonstrates that the increased eastern setback generates improved solar access to Princeton Apartments (by matter of minutes) than that which would result from an increased western setback for the south western apartment.

2.0 SOLAR ACCESS TO SSDA

2.1 ORIGINAL SSDA

The original SSDA Report (Revision C) outlines how solar access is calculated, the ADG Design Criterion, as well as a detailed explanation of the results. The below table is an extract from that report.

Total number of units	234	
Units which achieve 2 hours or more sunlight to living glazing and POS 9am - 3pm June 21	119	**50.9%**
Units which achieve 2 hours or more sunlight to living glazing and POS 8am - 4pm June 21	133	**56.8%**
Units with no sun between 9am and 3pm June 21	42	17.9%

Table 1: Summary of solar access for SSDA scheme (SSDA Application Report – Revision C, dated 15th May 2020)

A detailed take-off done at half hourly intervals was included in the appendices of the report.

2.2 CHANGE TO MINUTE BY MINUTE ANALYSIS

Prior to undertaking any revised analysis of the Response to Submission Modification, we were asked by DPIE to expand our table of solar compliance to be a minute by minute analysis instead of the half hourly intervals. A new analysis was included as Appendix C in this document, which demonstrates this minute by minute analysis for the Original SSDA. We note that the overall compliance numbers are slightly different to the Revision C report submitted with the Original SSDA as a minute by minute look at the building is more accurate than a half hourly analysis. The revised solar access numbers are noted below.

Total number of units	234	
Units which achieve 2 hours or more sunlight to living glazing and POS 9am - 3pm June 21	117	**50.0%**
Units which achieve 2 hours or more sunlight to living glazing and POS 8am - 4pm June 21	124	**53.0%**
Units with no sun between 9am and 3pm June 21	43	18.4%

Table 2: Summary of solar access for SSDA scheme at minute by minute analysis (Response to Submissions – Revision A, dated 28th August 2020)

2.3 RESPONSE TO SUBMISSIONS

As part of the Response to Submissions, we were asked to study various items; some of which included the overshadowing impacts to Princeton Apartments. Any overshadowing studies are discussed in part 3 of this memo.

As part of the Response to Submission we were asked to comment on various balconies to the South Eastern apartment of the subject SSDA site. The below table depicts that some balcony and glazing designs have ADG compliant solar access, and other do not. All options were taken to the Design Review Panel.

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Apartment Data:	Option 1	Option 2	Option 3	Option 4
Type:	2B/2B	2B/2B	2B/2B	2B/2B
Internal Area (75m2)	79	76.5	72.4	70
External Area (10m2)	10	6.4	8	7
ADG Data:				
Min. Apartment area (75m2)	√	√	X (Complies 2B/1bth)	X (Complies 2B/1bth)
Min. balcony area (10m2)	√	X	X (Complies 1B)	X
Living room width (4m)	√	X (Complies 1B)	X (Complies 1B)	X (Complies 1B)
2hr solar to living room	√	X (1.5 Achieved)	X (1.5 Achieved)	√
2hr solar to balcony	√	√	√	X
Residential Apartments				
2B/2B	√	√	√	√
Balcony amenity - wind	X	X	-	√
Balcony amenity - width	X	√	√	√
DPIE requirements				
Increased view	X	√	√	√
Increased privacy	X	X	X	√
Increased solar	X	X	-	-
Total:	**1**	**-1**	**-1**	**2**
Recommendation:	Not Recommended	Not Recommended	Not Recommended	Recommended

The Design Review Panel looked at each option's positive and negative factors. In the end, the DRP considered the privacy of Princeton Apartments was more important than solar access to these apartments, and as such we were advised that they endorsed an option 2 whereby the minutes reflect "The panel supports the improved amenity afforded to the SE corner apartments due to indenting the balcony, and the resultant reduction of balcony sizes."

We were asked to submit a Response to Submissions Report dated 28th August 2020. As part of this, we were supplied with a model which shows the half width balcony on the South Eastern Apartments. The Response to Submissions report was undertaken on the supplied model which although included a half width balcony, the living room glazing was still at the same locations as the SSDA Application. This therefore resulted in no loss of solar access during standard hours.

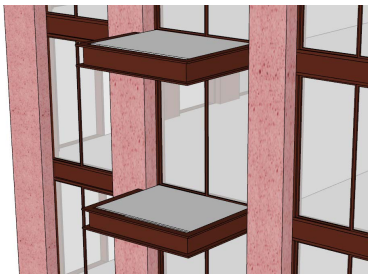


Image of Response to Submissions Model.

Our report for the Response to Submissions included the below compliance figures.

Total number of units	234	
Units which achieve 2 hours or more sunlight to living glazing and POS 9am – 3pm June 21	117	**50.0%**
Units which achieve 2 hours or more sunlight to living glazing and POS 8am – 4pm June 21	124	**53.0%**
Units with no sun between 9am and 3pm June 21	43	18.4%

Table 3: Summary of solar access for Response to Submissions scheme (Response to Submissions – Revision A, dated 28th August 2020)

2.4 UPDATED SSDA REPORT - CURRENT SOLAR ACCESS.

Whilst the previous figures were noted in the Response to Submissions model, further work was undertaken to get the endorsement of the Design Review Panel. The balconies were kept at the half width, but a hybrid of Option 2 and 3 was preferred by the Design Review Panel; whereby, the living room glazing was pushed back to allow for compliant apartment sizes and a larger balcony (yet still non-compliant) area than Option 2. When both option 2 and 3 where presented to the DRP, it was noted that solar access to the living room is lost under these arrangements. This meant that the solar access to the development has been reduced. This has now lead to the below results, but it is important to note that the changes were critical to the Design Review Panel endorsement for design excellence.

Total number of units	234	
Units which achieve 2 hours or more sunlight to living glazing and POS 9am - 3pm June 21	116	**49.6%**
Units which achieve 2 hours or more sunlight to living glazing and POS 8am - 4pm June 21	118	**50.4%**
Units with no sun between 9am and 3pm June 21	54	23.1%

Table 4: Summary of solar access for Current scheme (Amended SSDA Application Report – Revision D, dated 3rd December 2020)

Whilst there has been a reduction in solar access compared to the original application, this has been driven by the applicant achieving Design Excellence as guided by the Design Review Panel.

The important element for us has been that if the building were allowed to have a far greater glazed façade, and it was situated in a green field site, the development would have originally had 100% solar compliance. This means that the design meets the design guidance of the Apartment Design Guide as it maximised solar access. The reduction in solar compliance has been due to existing overshadowing of the site coupled with meeting the Design Review Panels criteria to gain Design Excellence.

- 100% solar compliance with glazed façade and no overshadowing.
- Overshadowing accounts for a reduction of 47.4% (9-3)
- GRC glazing depth accounts for a reduction of 1.7% (9-3)
- Changes to South East Apartment accounts for a reduction of 1.3% (9-3).

In our considered opinion, the most equitable way of calculating the achieved solar access compliance is to compare the number of apartments which achieve the required minimum solar access exposure to the number of apartments which receive usable durations of direct sun, after accounting for overshadowing by buildings around the development.

- There are 234 apartments in the SSDA Scheme
- Only 123 apartments have the chance of complying due to existing overshadowing onto the site.
- Of the 123 apartments, 4 do not receive sun due to the depth of the GRC.
- Of the 123 apartments, 3 do not receive sun due to changes to the South Eastern apartment.
- Overall, 94.3% of apartments that have solar access potential comply.

The 94.3% compliance demonstrates that there has been great design rigour to ensure that all those apartments that have the potential of complying do comply. The 5.7% of apartments in this calculation that do not comply are due to elements that are required by the Design Review Panel to receive Design Excellence.

3.0 SOLAR ACCESS TO PRINCETON APARTMENTS

3.1 ORIGINAL SSDA

The original SSDA Report (Revision C) outlines how solar access is calculated, the ADG Criteria, as well as a detailed explanation of the results. The below table is an extract from that report.

	EXISTING	PROJECTED	CHANGE
>2 hrs 9-3 Living	54 / 116 = 46.6%	6 /116 = 5.2%	41.4%
>2 hrs 8-4 Living	56 / 116 = 48.3%	24 /116 = 20.7%	27.6%
>2 hrs 8-4 Habitable	56 / 116 = 48.3%	39 / 116 = 33.6%	14.7%
No sun	19 / 116 = 16.4%	31 /116 = 26.7%	10.3%

Table 6: Summary of Overshadowing to Princeton Apartments at SSDA

A detailed take-off done at half hourly intervals was included in the appendices of the report. It was highlighted that 6/116 was a better result than what the Stage 1 DA was approved on, which originally highlighted 5/116 units would comply.

3.2 CHANGE TO MINUTE BY MINUTE ANALYSIS

Prior to undertaking any revised analysis of the Response to Submission Modification, we were asked to expand our table of solar compliance to be minute by minute analysis instead of the half hourly intervals. A new analysis was included as Appendix A of the Response to Submission document which demonstrates this minute by minute analysis for the Existing, Stage 1 Envelope, and the proposed development. This table created the new base line to which all subsequent analysis references.

With the updated station box, there was a net benefit to Princeton Apartments of 156 minutes of additional solar access with regards to the Original SSDA compared to the Approved Concept Envelope.

Further detail was discussed in this document, including why there are differences between Stage 1 and Stage 2 figures; notably the Development Application Approval of 116 Bathurst Street Sydney which has been included in Stage 2 SSDA analysis but not in Stage 1 Concept analysis.

3.3 RESPONSE TO SUBMISSIONS

As part of the Response to Submissions as requested by DPIE, we looked at increased setbacks to the South Western Unit, changes to the South Eastern Balcony, and variances in the GRC depth.

We noted that if an 8m setback were to be imposed on the Pitt Street side in lieu of the 4.885m setback in the original SSDA, it would only increase the amount of sun to 15 units by a maximum of 12 minutes (actual amount varies for each unit). Whilst there is an increase in minutes of solar access, none of these apartments would meet the minimum requirements to comply for solar access under the Apartment Design Guide.

We also investigated what the change of the South Eastern apartment's balcony would do to the solar access of Princeton apartments. It was noted that there is no change to the solar access of Princeton Apartments due to this change; however, the Design Review Panel considered its privacy benefits as important.

Lastly we investigated differing GRC depths. We undertook analysis of a 0mm projection from the Approved Concept Envelope. The reduction in the façade articulation depth meant that all 9 units that previously lost 3 minutes of solar access now have no reduction in solar access in comparison to the Approved Concept Envelope.

With the updated station box, the change to the GRC depth resulted in a net benefit to Princeton Apartments of 192 minutes of additional solar access with regards to the Response to Submissions compared to the Approved Concept Envelope.

3.4 FUTHER RESPONSE TO SUBMISSIONS

We provided a memo for a meeting with NSW Department of Planning, Industry and Environment dated 10/11/2020. It was asked that we summarise our minute by minute analysis into half hour intervals. The below table was presented.

AMOUNT OF SUN (MINUTES)	EXISTING SOLAR ACCESS	APPROVED CONCEPT ENVELOPE SOLAR ACCESS	PROPOSED SOLAR ACCESS
NIL	34	50	48
1-30	1	17	15
31-60	1	13	16
61-90	6	13	14
91-120	17	17	17
>120	57	6	6

Table 7: Summary of Overshadowing to Princeton Apartments from Response to Submissions (minute by minute analysis)

3.5 UPDATED SSDA REPORT – CURRENT SOLAR ACCESS.

The updated SSDA has increased the GRC depth as the RTS changes were not approved by the Design Review Panel at meeting #12 or #13. It was only supported with the 200mm projection beyond the Concept Envelope.

Due to the above, the updated solar access numbers result in a net benefit to Princeton Apartments of 168 minutes of additional solar access with regards to the Updated SSDA compared to the Approved Concept Envelope.

The current scheme has been summarised into half hour intervals and the results are below:

AMOUNT OF SUN (MINUTES)	EXISTING SOLAR ACCESS	APPROVED CONCEPT ENVELOPE SOLAR ACCESS	PROPOSED SOLAR ACCESS
NIL	34	50	48
1-30	1	17	15
31-60	1	13	16
61-90	6	13	14
91-120	17	17	17
>120	57	6	6

Table 8: Summary of Overshadowing to Princeton Apartments from current SSDA (minute by minute analysis)

3.6 REQUEST FOR INFORMATION FROM DPIE

We were asked to investigate what different setbacks would achieve for the solar access of Princeton Apartments.

It has already been established in Part 3.2 of the report that the Princeton Apartments have 156 minutes of additional solar access with regards to the Original SSDA compared to the Approved Concept Envelope.

After the SSDA was lodged, as part of the Response to Submissions, the South Western corner of the building has been pulled back to increase the solar access to Princeton Apartments. The Response to Submissions scheme resulted in additional solar access compared to the Approved Concept Envelope and Original SSDA. These changes were not approved by the DRP, and as a result the latest scheme has 168 minutes of additional solar access with regards to the Current SSDA compared to the Approved Concept Envelope.

Further to this, we have been asked to investigate different setback options and the resultant benefits.

Eastern Setback

We investigated what a setback on the eastern side of the development would do for Princeton Apartments. Our investigations noted that if the South eastern corner was to have a 4.5m setback instead of 3m setback, the north eastern units Princeton Apartments would receive additional solar access. Instead of compliance ending at 9:58am under a 3m setback, a 4.5m setback means those apartments now receive sun until 10:03am. This accounts for an additional 5 minutes of sun to a total of 12 units.

Western Setback

We investigated what a setback on the western side of the development would do for Princeton Apartments. Our investigations noted that if the South Western corner was to have a 6.2m setback instead of the proposed 4.7m setback, the north western units Princeton Apartments would receive additional solar access. Instead of compliance starting at 12:04pm under a 4.7m setback, a 6.2m setback means those apartments now receive sun from 11:59am. This accounts for an additional 5 minutes of sun to a total of 9 units.

The above demonstrates that in the SSDA scheme, an eastern setback is more beneficial to Princeton than any western setback.

We have also been asked to demonstrate where the main gains of solar access have been across the current SSDA verse the Approved Concept Envelope. Firstly we need to establish the difference between minutes gained verse the quantum of sun gained. At some times which are noted below, a unit may have complying solar access, but due to changing the balcony width, the amount of sun received by that unit may increase from $1m^2$ to say $4m^2$. For our calculations, anything over $1m^2$ is counted as complying solar access, but a unit may now receive significantly more sun; therefore improving the amenity afforded to these units.

The Current SSDA has an increased setback to the East of the site. The SSDA building has been set back to allow an increased amount of sun to Princeton Apartments. The below image is taken at 10am and it shows the Approved Concept Envelope in blue, with the current SSDA and Princeton Apartments in a solid white. The Princeton Apartments that you can see in the blue area of the image below all would have been overshadowed at this time under the Approved Concept Envelope; but by setting the building back, these apartments all receive extra sun.

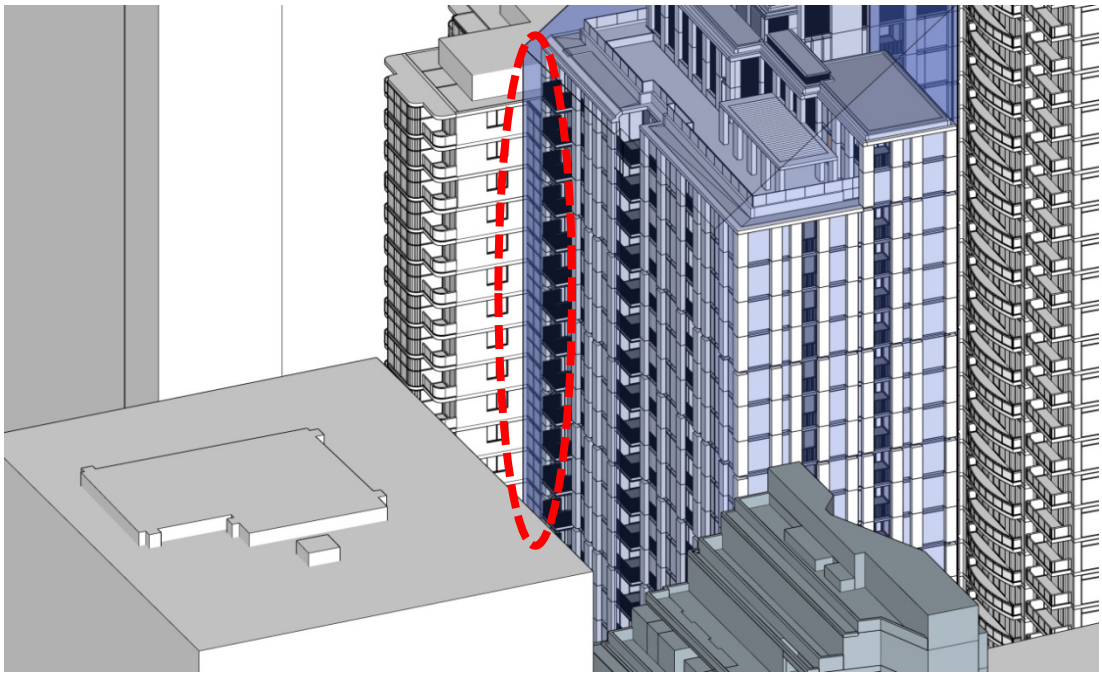


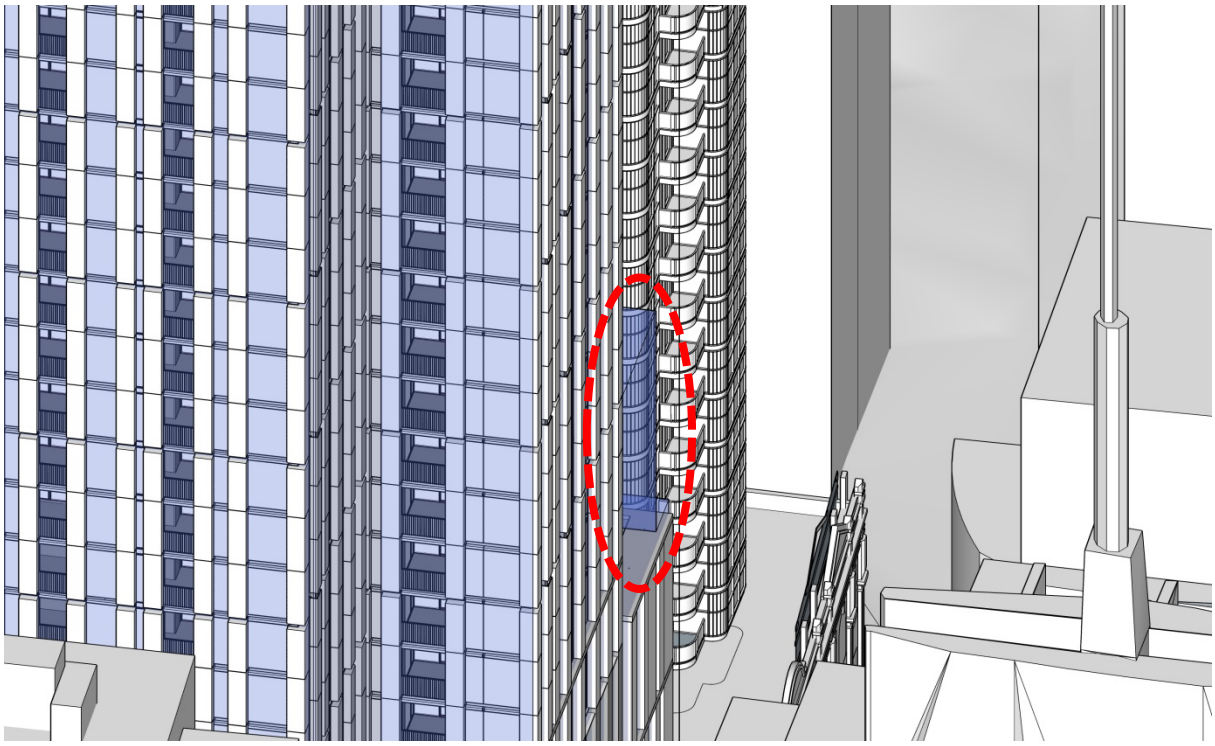
Image 1 – View From Sun at 10am showing units of Princeton Apartments that would have been overshadowed by SSDA Application.

Image 2 – Zoomed in image of View From Sun at 10am.

Not only has the setback improved the amount of minutes a unit may receive, but changes to the model between the Original SSDA and the Current SSDA have led to increased amenity to these Princeton Apartments. In the below image you will see where the balconies used to be full width, they used to cover much more of the glazing of these Princeton Apartments. Whilst we have noted there has been no change to the Solar Access due to the change of these balconies, we need to make clear that this is only talking from a strict compliance perspective. We count solar access from $1m^2$, which is still received by these Princeton Apartment in the Original SSDA. Now that the balconies have reduced in width, we now have an increased quantum of sun to each apartment. This increased quantum of sun leads to a better amenity outcome to each unit.

Image 3 – Showing increased quantum of sun due to reduced balcony widths.

The other area of gain is due to the reduced bulk of the South Western corner of SSDA. You will note the reduced bulk for the podium element of the Concept Approved Envelope. The reduction in bulk leads to increased amount of solar access to these 4 units.



Overall there are two main areas of solar access gain in terms of minutes gained. There is also one area that has an increased amenity due to an increased amount of sun on what was an already complying window. These two factors demonstrate that there is a benefit to Princeton Apartments when compared with the Approved Concept Envelope.

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Walsh Analysis