venues.
new south wales

**Jake Shackleton**
Acting Director
Department of Planning, Industry and Environment
4 Parramatta Square
12 Darcy Street
PARRAMATTA NSW 2150

03 / 06 / 2021

Attention: Shiraz Ahmed

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The Entertainment Quarter
122 Lang Road
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GPO Box 150
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ABN 26 283 293 435

**SSD 9835 Sydney Football Stadium Redevelopment – Condition B8(d) detailed design of the south eastern corner**

I refer to SSD 9835 for Sydney Football Stadium Stage 2 (Design, construction and operation), which was approved by the Minister for Planning and Public Spaces on 6 December 2019 and modified in December 2020 to facilitate the construction of the Stadium Fitness Facilities.

The project team is progressing Crown Certificates of the Stadium Fitness Facilities in accordance with SSD 9835 and the approved Staging Plan.

Conditions B8(a) – (c) collectively require evidence to be provided to the satisfaction of the Planning Secretary to demonstrate that a desktop aero-acoustic noise (wind generated noise) assessment has been conducted to inform the final detailed design of the stadium and / or the public domain areas. In addition, the Applicant must demonstrate that any recommendations in the Stage 2 SSDA – Noise and Vibration Assessment prepared by ARUP dated 30 August 2019 (as approved), in relation to aero-acoustic noise (wind-generated noise), have been incorporated into the design of the Stadium Fitness Facilities to reduce wind generated noise from the stadium structure and / or the public domain areas within the site.

The appointed contractor (John Holland) has re-engaged Arup to specifically investigate the Stadium Fitness facilities (Attachment 1). Arup has concluded that the proposed design would have minimal potential to produce tonal wind noise. The only element that has the potential to generate noise is the porous panel on top of the pedestrian ramps to the east of the Stadium Fitness Facility rising to the stadium's concourse level. The form and regularity of the hole pattern is in a range that has the potential to induce aeroacoustic noise, particularly if the holes are jet or laser cut rather than punched. However, this risk could be reduced if the material is thickened to 5 mm, the diameter or shape of the hole is varied, and/or the hole pattern is varied across the material. Holes with a diameter of greater than 20 mm are significantly less likely to cause aeroacoustic issues. For this excitation mechanism a sample could be wind-tunnel tested to determine whether there is potential for aeroacoustic noise. .

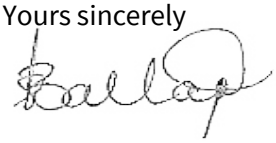
I can confirm that Arup's recommendations have now been considered by the design team and have been incorporated into the design as evidenced by the

documents provided by Cox enclosed at Attachment 2. The implementation of these design features will ensure a low risk of aero acoustic noise for these façade components as concluded by Arup.

Pursuant to Condition B8(c), the Applicant is required to provide evidence to the satisfaction of the Planning Secretary to demonstrate the Design Integrity Assessment (DIA) Report has been updated reflecting any amendments to the design plans to comply with Condition B7 or B8(a) and endorsed by the members of the DIA panel. The DIP members have considered the proposed recommendations and confirmed that they have no objection to the design incorporating Arup's recommendations (Attachment 3).

Should you have any questions regarding this letter or the enclosed information please contact the undersigned on 0412 775 365.

Yours sincerely



**Stephanie Ballango**
Director
Consultant to Infrastructure NSW

John Holland Group

# Sydney Fitness Facility

## Aeroacoustic wind report

Wind

Rel.01 | 7 May 2021



Job number 276040-05

Arup Australia Pty Ltd
ABN 76 625 912 665

**Arup**
Level 5, 151 Clarence Square
Sydney, NSW 2000
Australia
www.arup.com

ARUP

# Document Verification

ARUP

| | | | | | |
|---|---|---|---|---|---|
| **Job title** | | Sydney Fitness Facility | | | **Job number** 276040-05 |
| **Document title** | | Aeroacoustic wind report | | | **File reference** |
| **Document ref** | | Wind | | | |
| **Revision** | **Date** | **Filename** | SFF Aeroacoustic_ARUP REP_210507 | | |
| Rel.01 | 07 May 2021 | **Description** | Initial release | | |
| | | | Prepared by | Checked by | Approved by |
| | | Name | Graeme Wood | Lauren Boysen | Graeme Wood |
| | | **Filename** | | | |
| | | **Description** | | | |
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| | | | Prepared by | Checked by | Approved by |
| | | Name | | | |
| | | | **Issue Document Verification with Document** | | ✓ |

# Executive summary

Arup have been commissioned by John Holland Group to provide an experienced-based assessment of the aeroacoustic noise potential for the proposed Sydney Fitness Facility.

It is considered that the proposed design would have minimal potential to produce tonal wind noise. The only element that has the potential to generate noise is the porous panel on top of the pedestrian ramps to the east of the facility rising to the concourse level. The form and regularity of the hole pattern are in a range that have the potential to induce aeroacoustic noise, particularly if the holes are jet or laser cut rather than punched. The risk could be reduced if the material is thickened to 5 mm, the diameter or shape of the hole is varied, and/or the hole pattern is varied across the material. Holes with a diameter of greater than 20 mm are significantly less likely to cause aeroacoustic issues. For this excitation mechanism a sample could be wind-tunnel tested to determine whether there is potential for aeroacoustic noise.

Due to the curved form of the structure with limited vertical façade articulation, the broad-band noise generated from the design would be expected to be less than a more angular design.

# Contents



## Disclaimer

This assessment of potential aeroacoustic issues is presented based on engineering judgement. No detailed simulation, physical or computational study has been made to develop the recommendations presented in this report.

# 1 Introduction

John Holland Group have engaged Arup to provide a qualitative assessment for the potential for the proposed Sydney Fitness Facility to produce aeroacoustic noise due to wind flow over and around the structure. This report outlines the assessment and recommendations for additional studies. This study predicts the potential for any aeroacoustic mechanisms from the design and recommendations for further analyses to de-risk the potential for any aeroacoustic noise.

# 2 Site description

The proposed Sydney Fitness Facility site is located to the south-west of the Sydney Football Stadium, Figure 1. The surrounding area has a complex tiered ground plane dropping to the west and south.

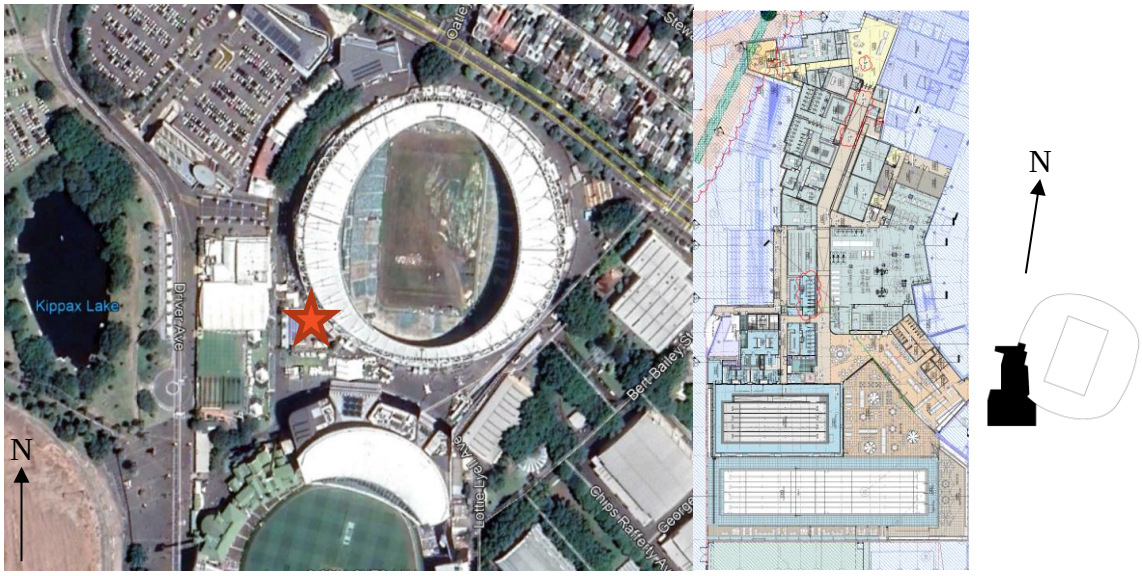



Figure 1 Site location (source: Google Maps) and ground floor plan

The Sydney Fitness Facility is low-rise facility close to the SFS, Figure 2 and Figure 3. The stadium would offer shielding for winds from the north-east and south-west, but smoother accelerated flow for winds from the south-east and north-west. This is confirmed from the pedestrian level wind-tunnel tests conducted around the stadium. Smoother, faster, more correlated flow generally creates more conducive conditions to produce aeroacoustic noise issues.

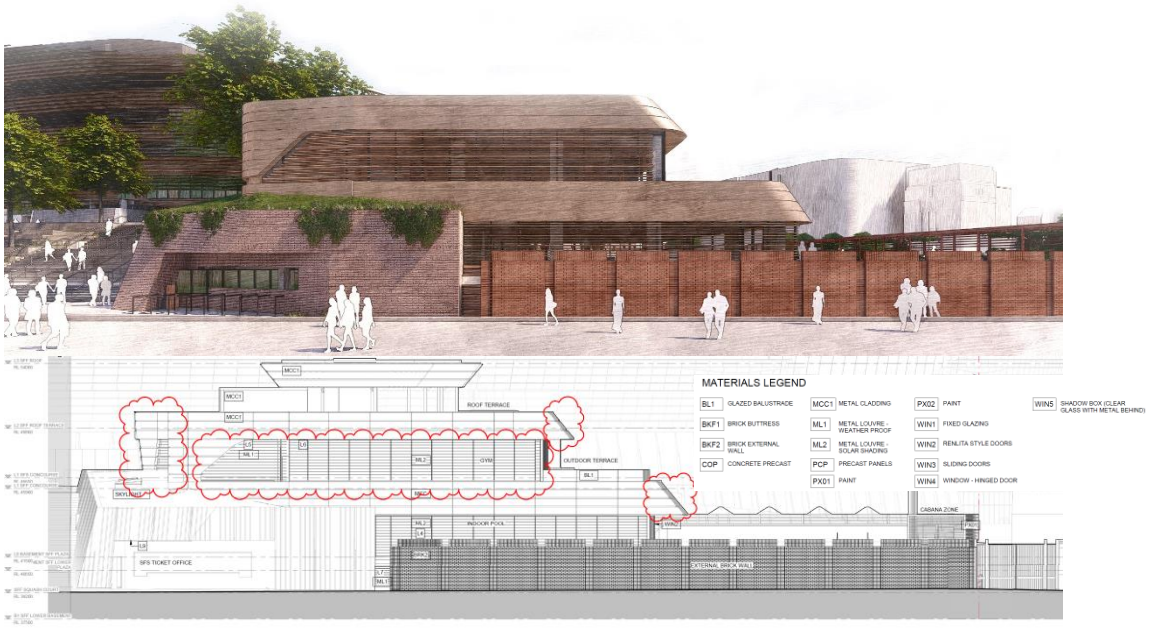



Figure 2: West artistic view and elevation

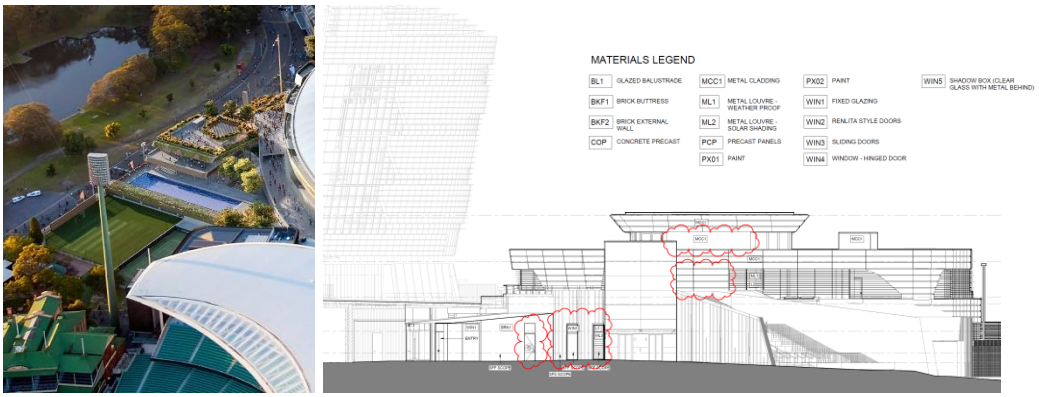



Figure 3: Artistic view from south-east and north elevation

# 3 Wind climate

The wind rose at 10 m above ground level at Sydney Airport is presented in Figure 4. The arms of the wind rose point in the direction from where the wind is coming from. The directional wind speeds measured here are considered representative of the incident wind conditions at the site, due to close proximity to the site.

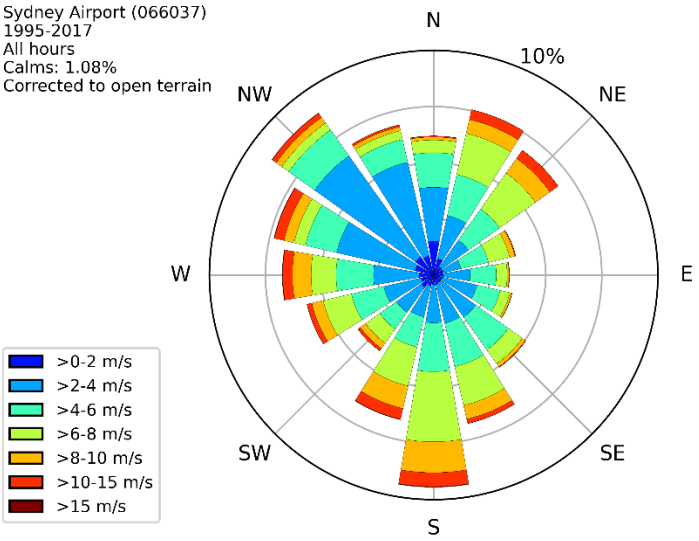



Figure 4: Sydney Airport wind rose

# 4 Aeroacoustic mechanisms

Wind-induced noise from façade elements is highly complex, as there any many potential excitation mechanisms to generate noise. There are two fundamental types of aeroacoustic noise: broad-band (a wide range of frequencies, general wind noise), and tonal noise (single frequency, whistling).

With the increasing intricacy of external facades, this is a developing field with experience-based knowledge increasing through testing and investigating full-scale issues post-construction. A number of excitation mechanisms are difficult to model or reproduce in the wind-tunnel due to scaling effects and reproduction of the full-scale wind environment.

**Broad-band noise**

Broad-band is generated when flow passes over **any** sharp-edged obstruction such as a fin element. The faster the local wind speed, the greater the sound level. The onset of audible broad-band noise generally occurs at about 8 m/s.

As flow generally passes horizontally around a building, it is typically the number of vertical elements protruding from the façade that are of greater concern compared with horizontal elements. The detailed design of the façade would be expected to have little impact on the broad-band noise level, compared with simply reducing the number of sharp-edged elements. The more sharp-edges in accelerated zones, the greater the noise level. Full-scale testing is not considered necessary for this mechanism.

There are examples of buildings with numerous external façade elements where internal perimeter meeting rooms cannot be used during strong winds, due to the magnitude of the generated broad-band noise level.

**Narrow-band noise**

Unlike broad-band noise, which is directly related to local wind speed, tonal noise mechanisms generally occur over a range of specific wind speeds. With increasing local wind speed the noise level may stop, or change tonal frequency while increasing or decreasing in sound level. These mechanisms are generally associated with the local mean wind speed rather than the gust wind speed as it takes a period of time for lowly-damped façade elements or pressure fluctuations to increase to a magnitude where noise is registered.

There are a large number of known mechanisms that can generate tonal noise, some include:

- **whole-body vibration** of elements through the vortex shedding process at a natural frequency in the audible range: can occur on a range of elements from tensioned cables (Aeolian noise), similar to a stringed instrument, to larger plate elements, similar to a wobbleboard. Narrow range of wind speeds and narrow to wide range of wind direction based on the shape of the element.
- flow passing through **perforated materials** with regular small holes and gaps: the vortices shed on the downstream side of the porous sheets can be in the audible range, and can be further amplified through dynamic resonance based on the size and structural dynamic properties of the porous element. Circular sharp-edged holes in a regular pattern up to a diameter of about 20 mm are the most likely to cause issues. Large range of wind speeds and incident wind directions.
- flow passing over continuous slots or hollow elements: quarter- or half-wave **resonators**, similar to an organ pipe. Large range of wind speeds, but low range of wind directions.
- flow through **parallel plates**: the shedding frequency from parallel plates (including flow over V or Z sections) generates a resonant pressure effect between the plates. This fluctuating pressure propagates upstream and downstream from the plates. This mechanism is dependent on geometry and air speed, and independent of the structural dynamic properties of the plates occurring over a large range of wind speeds and angles.
- resonant pressure effects: such as **Helmholtz resonators**, similar to the noise generated in a car with a window slightly open, or blowing over a bottle.

Whole-body vibration is difficult to model in the wind-tunnel, but is more easily fixed on site, whereas the other mechanism can be tested in the wind-tunnel to de-risk the full-scale potential for noise, but cannot be readily fixed in the field.

Full-scale testing is warranted for some of these mechanisms, but not all. Replicating the exact stiffness of the façade elements in the wind-tunnel is virtually impossible as the connection to the building cannot be replicated. Secondly, the scale of turbulence in the wind-tunnel is incorrect to reproduce the full-scale building generated turbulence scales.

Testing at a smaller model scale cannot be used effectively, as acoustic scaling is incompatible with structural and fluid scaling requirements.

# 5 Aeroacoustic assessment

### Broad-band noise

In general terms, from a broad-band noise perspective, the low-rise curved structure has few discontinuities to develop broad band noise. The building is expected to perform similarly to other small buildings and not be noticeable except during very strong winds when broad-band noise is generated from all buildings, tress, and bluff objects.

### Narrow-band noise

Various local details have been assessed in terms of the potential to induce tonal noise as noted on Figure 5.


Figure 5: Areas of potential aeroacoustic noise

The horizontal slots wrapping around the façade, Figure 5 and Figure 6, have the potential to act as a **resonator**. To activate this mechanism, the flow generally has to the perpendicular to the length of the slot. Since the slots are horizontal and the flow would not be vertical along the length of the slots, the potential for aeroacoustic noise is expected to be low.

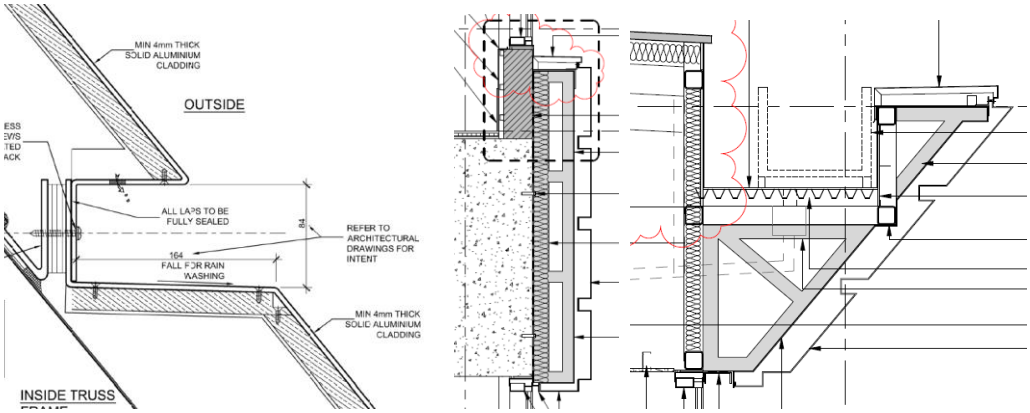



Figure 6: Cladding elements with horizontal slot

External sunshade elements are located around the facades, either in front of a solid façade or open weatherproof louvres, Figure 7. There is the potential for

**parallel plate** pressure noise through the solar louvres or V-shaped louvres, but not when there is a solid surface behind.

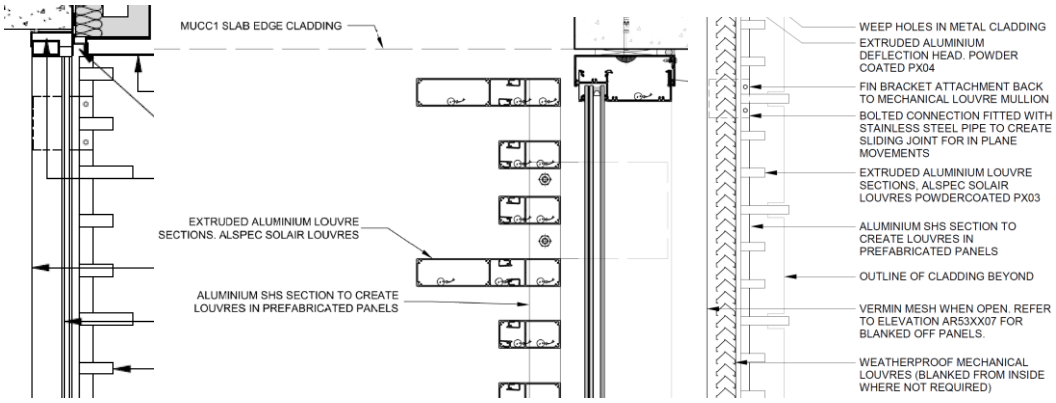



Figure 7: Sunshades and mechanical louvres

For the sunshade elements with a solid structure behind, the flow mechanism would not produce aeroacoustic noise. There is a greater potential when there is flow through the sunshades and louvres. As the louvres generally open into an enclosed plant room, there is a limited flow path and the flow through the louvres would be primarily be governed by the plant. This is highly unlikely to cause any aeroacoustic issues. The only location where there is potential for increased wind speed is in the north-west corner, where the plant room is open to the north and west, Figure 8. The relative orientation and proximity of the louvres and sunshade elements would be expected to significantly reduce the potential for aeroacoustic noise by disrupting any pressure propagation. The risk of this mechanism producing noise is consider low.

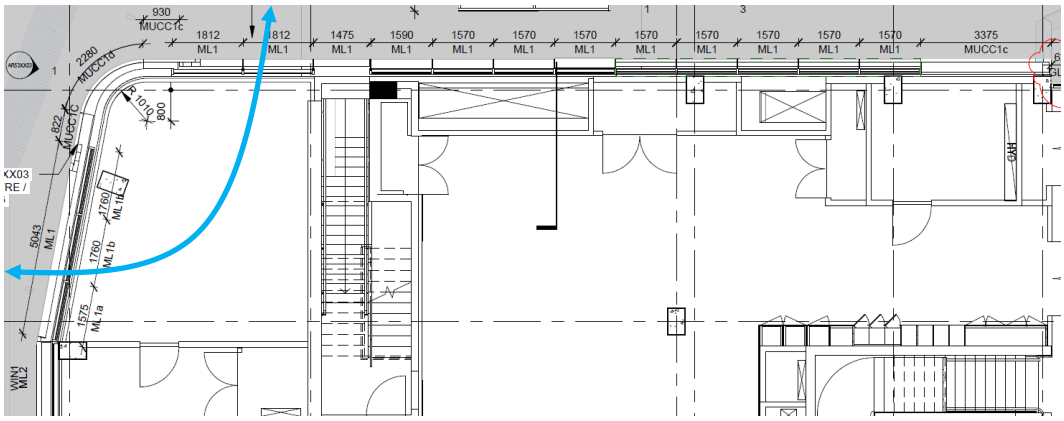
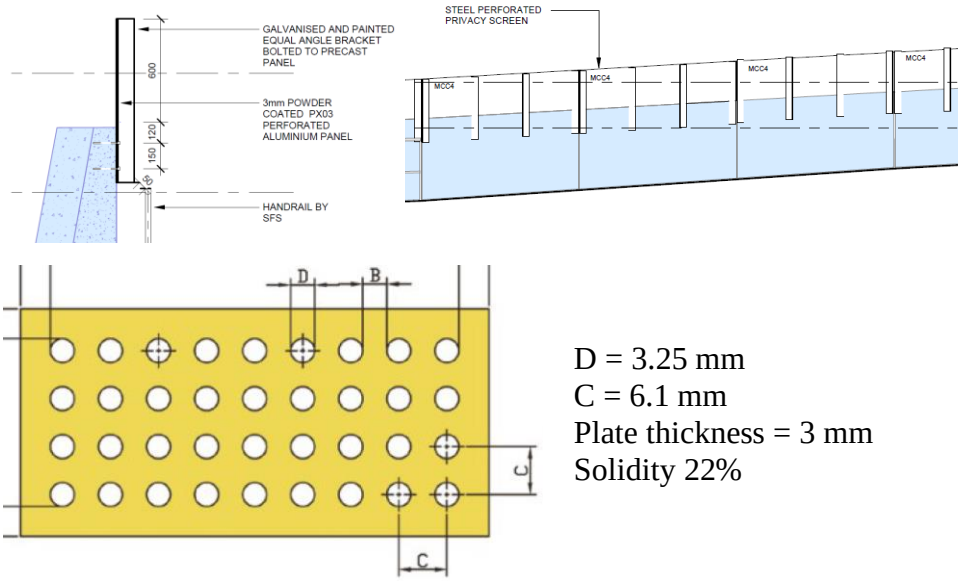



Figure 8: Level 1 plan of north-east corner showing mechanical rooms

The **perforated** aluminium panels on top of the walkway ramp balustrades have the potential to produce noise, Figure 9. The current size and regularity of the holes are presented in Figure 9. From previous testing, the ratio of hole diameter to plate thickness is in the range when aeroacoustic noise could occur. The uniform circular hole pattern is the most susceptible pattern to induce aeroacoustic noise over a range of incident wind directions. This design would cause a moderate risk of aeroacoustic noise generation. Thickening the plate to 5 mm, varying the diameter or shape of the hole, and/or varying the hole pattern across the plate would reduce the potential for aeroacoustic noise.







D = 3.25 mm
C = 6.1 mm
Plate thickness = 3 mm
Solidity 22%

Figure 9: Perforated aluminium panels

27h May, 2021

John Holland
Level 3, 65 Pirrama Rd
Pyrmont NSW 2009

Dear Stuart,

Cox confirm that the privacy screens mounted to the precast panels on the western edge of the SFS ramp 1 have been designed in accordance with Arups' recommendations, in response to the Stage 2 SSDA Noise and Vibration Report dated 30 August 2019, to reduce wind generated noise from the stadium structure and/or the public domain areas within the site.

We confirm that the thickness of the sheet and the hole size have been designed in accordance with the original design intent, with a perforation hole size and setting out responding to the required acoustic requirements.

Yours sincerely,

**Alex Small**
Director

alex.small@cox.com.ai

**Sydney studio**
Level 6, 155 Clarence St
Sydney NSW 2000 Australia

T +61 2 9267 9599
F +61 2 9264 5844
coxarchitecture.com.au

COX Architecture Pty Ltd
ACN 002 535 891

Nominated Architects:
Joe Agius No. 6491
Russell Lee No. 6367

# Re: Fw: SFF - Aero acoustic report

John Perry <perryjc55@gmail.com>

Thu 3/06/2021 10:06 AM

**To:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>

Hi Jodie,
I read the Cox letter and am assuming that their last paragraph means that they have varied both the hole size and pattern as suggested in the Arup report.
The Arup report did not provide guidance on how much hole diameter variability and spacing change is required to reduce the risk of noise generation or by how much. The report is quite specific about being qualitative so this is not surprising.
Therefore, I do not know anything more than I did before I read the documents.
I see little benefit in going any further down this route.
So, I support the design change on the basis that it is an improvement on the previous design.
Trust this is OK,
regards
John

On Wed, 2 Jun 2021 at 12:10, Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au> wrote:

> Good afternoon John,
>
> I hope you have been well.
>
> Just touching base on the below to check if you have had a chance to review? If you could please confirm via return email if you agree with Cox's assessment and support the proposed design change that would be appreciated.
>
> Thank you John, please feel free to contact me if you have any questions or require any further information.
>
> Kind regards,
> Jodie
>
> ---
>
> **From:** Tom Gellibrand <Tom.Gellibrand@infrastructure.nsw.gov.au>
> **Sent:** Monday, 31 May 2021 10:25 AM
> **To:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>; Peter Poulet <Peter.Poulet@gsc.nsw.gov.au>; Peter Poulet <peterpoulet@gmail.com>; Kim Crestani <kim@orderarchitects.com>; John Perry <perryjc55@gmail.com>
> **Cc:** Peter Hynd <Peter.Hynd@infrastructure.nsw.gov.au>
> **Subject:** RE: SFF - Aero acoustic report
>
> Hi Jodie and Panel members
>
> I have considered this issue and the expert report from Arup. I think the issue of noise is important but the design impacts of the mitigation are very minor.
>
> I confirm that I support the proposed design changes and Cox's assessment and consider there are no material impacts and design and that design excellence is maintained.
>
> Consequently I do not consider that the DIA needs to be updated.
>
> Thanks Tom G

**Tom Gellibrand**
**Head of Projects NSW**

P 02 8016 0134 | 0418 625 143
E Tom.Gellibrand@infrastructure.nsw.gov.au | www.insw.com
Level 27, 201 Kent Street, Sydney NSW 2000

we are insw Infrastructure New South Wales

**A/Executive Assistant zeinab.farhat@infrastructure.nsw.gov.au**

*I acknowledge and pay my respects to the traditional owners and custodians on whose land I walk, work and live.*

---

**From:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>
**Sent:** Monday, 31 May 2021 9:57 AM
**To:** Tom Gellibrand <Tom.Gellibrand@infrastructure.nsw.gov.au>; Peter Poulet <Peter.Poulet@gsc.nsw.gov.au>; Peter Poulet <peterpoulet@gmail.com>; Kim Crestani <kim@orderarchitects.com>; John Perry <perryjc55@gmail.com>
**Cc:** Peter Hynd <Peter.Hynd@infrastructure.nsw.gov.au>
**Subject:** SFF - Aero acoustic report

Good morning Design Integrity Panel,

By way of background, The SFF team has commissioned the attached aeroacoustics report for the Stadium Fitness Facility (SFF) to satisfy Condition B8 of the Planning Consent. The condition requires INSW to provide evidence to demonstrate that the measures recommended by the approved aero-acoustic assessment have been considered by the design team and have been incorporated into the design. The condition also provides that INSW is required to update the Design Integrity Assessment (DIA) Report to reflect any amendments to the design plans to comply with condition B8(a) (being the aero acoustic assessment preparation) and that this is endorsed by the members of the DIA panel.

The approved aero-acoustic assessment suggests that a revision to the perforations and thickness of the plate on the walkway ramp balustrades will mitigate aero-acoustic noise. A letter from Cox confirming that the recommended change in perforation and thickness of the panel is consistent with the original design and DIA is attached for reference.

As with the original report, DPIE requires the Design Integrity Assessment report to be updated, and to secure the Design Integrity Panel's endorsement of the revised Assessment report. Although the recommendation to reduce the perforations is a level of detail that is beyond the content in the DIA, to respond to the DPIE's request we either need to have the DIA report updated and endorsed by the Panel or alternatively perhaps the Panel could consider the submitted package and confirm that it:

- supports the proposed design changes and confirm that design excellence is maintained;
- forms the view that the DIA does not need to be updated; or
- advises that the DIA report should indeed be updated for Panel endorsement.

Could the DIP please confirm via return email if it agrees with Cox's assessment and supports the proposed design change, and if it believes that the DIA is required to be updated for Panel endorsement (or if it is comfortable that the proposed changes do not necessitate an update to the DIA).

Please feel free to contact me if you have any questions or require any further information.

Kind regards,
Jodie

**Jodie Duggan**
**Project Manager**

P 02 8016 0175
E jodie.duggan@infrastructure.nsw.gov.au | www.insw.com
Level 27, 201 Kent St, Sydney NSW 2000


## Disclaimer

# Re: SFF - Aero acoustic report

Kim Crestani <kim@orderarchitects.com>

Wed 2/06/2021 8:31 AM

**To:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>

Hi Jodie

I have had a chance to read the report by ARUP and Alex Small / Director of Cox letter and I confirm acceptance of Cox letter of assessment and I support the design changes

Many thanks

Kim crestani

Sent from my iPad

> On 31 May 2021, at 9:58 am, Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au> wrote:
>
> Good morning Design Integrity Panel,
>
> By way of background, The SFF team has commissioned the attached aeroacoustics report for the Stadium Fitness Facility (SFF) to satisfy Condition B8 of the Planning Consent. The condition requires INSW to provide evidence to demonstrate that the measures recommended by the approved aero-acoustic assessment have been considered by the design team and have been incorporated into the design. The condition also provides that INSW is required to update the Design Integrity Assessment (DIA) Report to reflect any amendments to the design plans to comply with condition B8(a) (being the aero acoustic assessment preparation) and that this is endorsed by the members of the DIA panel.
>
> The approved aero-acoustic assessment suggests that a revision to the perforations and thickness of the plate on the walkway ramp balustrades will mitigate aero-acoustic noise. A letter from Cox confirming that the recommended change in perforation and thickness of the panel is consistent with the original design and DIA is attached for reference.
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endorsement (or if it is comfortable that the proposed changes do not necessitate an update to the DIA).

Please feel free to contact me if you have any questions or require any further information.

Kind regards,
Jodie

**Jodie Duggan**
**Project Manager**

P 02 8016 0175
E jodie.duggan@infrastructure.nsw.gov.au | www.insw.com
Level 27, 201 Kent St, Sydney NSW 2000
<image.png>



<20210527 SFF Aeroacoustic_ISSUED.pdf>
<Letter regarding privacy screens 26.05.2021.pdf>

# Re: SFF - Aero acoustic report

Peter Poulet <peterpoulet@gmail.com>

Wed 2/06/2021 1:33 PM

**To:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>

Hi Jodie,
Apologies for the slow response, I'm away at the moment and not always connected.
The report seems fine and I agree with Tom's assessment that's it's OK.
Regards,
Peter

On Mon, 31 May 2021 at 9:57 am, Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au> wrote:

> Good morning Design Integrity Panel,
>
> By way of background, The SFF team has commissioned the attached aeroacoustics report for the Stadium Fitness Facility (SFF) to satisfy Condition B8 of the Planning Consent. The condition requires INSW to provide evidence to demonstrate that the measures recommended by the approved aero-acoustic assessment have been considered by the design team and have been incorporated into the design. The condition also provides that INSW is required to update the Design Integrity Assessment (DIA) Report to reflect any amendments to the design plans to comply with condition B8(a) (being the aero acoustic assessment preparation) and that this is endorsed by the members of the DIA panel.
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> Kind regards,
> Jodie
>
> **Jodie Duggan**
> **Project Manager**
>
> P 02 8016 0175
> E jodie.duggan@infrastructure.nsw.gov.au | www.insw.com

Level 27, 201 Kent St, Sydney NSW 2000

we are nsw Infrastructure New South Wales



--

Peter Poulet

# RE: SFF - Aero acoustic report

Tom Gellibrand <Tom.Gellibrand@infrastructure.nsw.gov.au>

Mon 31/05/2021 10:25 AM

**To:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>; Peter Poulet <Peter.Poulet@gsc.nsw.gov.au>; Peter Poulet <peterpoulet@gmail.com>; Kim Crestani <kim@orderarchitects.com>; John Perry <perryjc55@gmail.com>
**Cc:** Peter Hynd <Peter.Hynd@infrastructure.nsw.gov.au>

Hi Jodie and Panel members

I have considered this issue and the expert report from Arup. I think the issue of noise is important but the design impacts of the mitigation are very minor.

I confirm that I support the proposed design changes and Cox's assessment and consider there are no material impacts and design and that design excellence is maintained.

Consequently I do not consider that the DIA needs to be updated.

Thanks Tom G

**Tom Gellibrand**
**Head of Projects NSW**

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*I acknowledge and pay my respects to the traditional owners and custodians on whose land I walk, work and live.*

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**From:** Jodie Duggan <Jodie.Duggan@infrastructure.nsw.gov.au>
**Sent:** Monday, 31 May 2021 9:57 AM
**To:** Tom Gellibrand <Tom.Gellibrand@infrastructure.nsw.gov.au>; Peter Poulet <Peter.Poulet@gsc.nsw.gov.au>; Peter Poulet <peterpoulet@gmail.com>; Kim Crestani <kim@orderarchitects.com>; John Perry <perryjc55@gmail.com>
**Cc:** Peter Hynd <Peter.Hynd@infrastructure.nsw.gov.au>
**Subject:** SFF - Aero acoustic report

Good morning Design Integrity Panel,

By way of background, The SFF team has commissioned the attached aeroacoustics report for the Stadium Fitness Facility (SFF) to satisfy Condition B8 of the Planning Consent. The condition requires INSW to provide evidence to demonstrate that the measures recommended by the approved aero-acoustic assessment have been considered by the design team and have been incorporated into the design. The condition also provides that INSW is required to update the Design Integrity Assessment (DIA) Report to reflect any amendments to the design plans to comply with condition B8(a) (being the aero acoustic assessment preparation) and that this is endorsed by the members of the DIA panel.

The approved aero-acoustic assessment suggests that a revision to the perforations and thickness of the plate on the walkway ramp balustrades will mitigate aero-acoustic noise. A letter from Cox confirming that the recommended change in perforation and thickness of the panel is consistent with the original design and DIA is attached for reference.

As with the original report, DPIE requires the Design Integrity Assessment report to be updated, and to secure the Design Integrity Panel's endorsement of the revised Assessment report. Although the recommendation to reduce the perforations is a level of detail that is beyond the content in the DIA, to respond to the DPIE's request we either need to have the DIA report updated and endorsed by the Panel or alternatively perhaps the Panel could consider the submitted package and confirm that it:

- supports the proposed design changes and confirm that design excellence is maintained;
- forms the view that the DIA does not need to be updated; or
- advises that the DIA report should indeed be updated for Panel endorsement.

Could the DIP please confirm via return email if it agrees with Cox's assessment and supports the proposed design change, and if it believes that the DIA is required to be updated for Panel endorsement (or if it is comfortable that the proposed changes do not necessitate an update to the DIA).

Please feel free to contact me if you have any questions or require any further information.

Kind regards,
Jodie

**Jodie Duggan**
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