

20 September 2018

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PO Box 1262
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Attention: Christine McMillan

Dear Christine

HWCP INVERCARGILL CENTRAL - RESIDENTIAL ACTIVITY

As part of the HWCP Invercargill Central development, the tower block proposed for the corner of Esk and Dee Streets will have residential activity (penthouse apartments) on the top floor (seventh). As the building is located within the *Entertainment Precinct*, we understand that Invercargill City Council has requested an assessment of noise effects on the proposed residential activity.

District Plan Provisions

The potential for reverse noise sensitivity in the Entertainment Precinct is addressed in Rule 3.13.9 of the proposed Invercargill City District Plan¹ which states:

3.13.9 Business 1 Zone – Entertainment Precinct

- (A) *All new noise sensitive activities and additions to existing noise sensitive activities within the Business 1 Zone – Entertainment Precinct shall:*
 - (a) *Be designed, constructed and maintained to meet the “satisfactory” internal design sound levels in AS/NZS2107:2000 “Recommended design sound levels and reverberation times for building interiors”, based on an incident external noise level as follows:*

	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
<i>Design incident sound pressure level at building façade (dB re 2 x 10⁻⁵ Pa)</i>	71	61	54	48	45	44	44

- (B) *Prior to the operation of any noise sensitive activities on the site, an acoustic design certificate from a suitably qualified acoustic engineer is to be provided to the Council demonstrating that the above internal sound levels will be achieved.*

The District Plan defines a “noise sensitive activity” as follows:

Noise Sensitive Activities: *Means buildings or parts of buildings used for, or able to be used for the following purposes:*

- (A) *Residential activity;*
- (B) *Visitor accommodation;*

¹ Appeals Version – January 2017. Updated 5 October 2017

- (C) Residential care activity;
- (D) Education activity, except training related to Airport and aircraft operations;
- (E) Hospital activity;
- (F) Healthcare activity;
- (G) Child Daycare activity;
- (H) Marae activity; and
- (I) Caretaker accommodation

Methodology

At this early stage of the project, the design of the proposed tower block is not sufficiently progressed to enable us to perform a rigorous analysis. Therefore, our proposed approach for this assessment is to provide an example of the types of construction that will be required to comply with Part (A) of Rule 3.13.9.

In order to provide confidence to ICC that the intent of the rule will be achieved in practice, we propose a condition of consent that requires an acoustic design certificate to be submitted with building consent documentation. In essence, we will propose that Rule 3.13.9 Part (B) (or a variation thereof) becomes a resource consent condition.

Assessment

District Plan Rule 3.13.9 Part (A)

This rule requires internal noise levels within the development to meet the “satisfactory” criteria from AS/NZS 2017:2000. Table 1 provides a summary of the applicable criteria that are likely to apply.

AS/NZS 2017 Occupancy / Activity	Recommended “satisfactory” design sound level dB LAeq
Houses and apartments near major roads—	
Living Areas	35
Sleeping Areas	30
Work Areas	35
Apartment common areas (e.g. foyer, lift lobby)	45

The most stringent design criterion to achieve is 30 dB LAeq in apartment sleeping areas and we have used this criterion for the purposes of our assessment outlined below. For our calculations, we have assumed bedroom (sleeping area) with the following physical characteristics:

1. Volume of 50m³
2. Surface finishes and furnishings to provide a reverberation time (T₆₀) of 0.5 seconds
3. 10 m² external façade comprising:
 - a. 5 m² of glazing with a typical configuration of 4mm float/12mm cavity/4mm float (34 dB R_w)
 - b. 5 m² of external cladding with nominal build-up of 100mm autoclaved aerated concrete (AAC) panel (e.g. Hebel) fixed to timber framing with 10mm plasterboard internal lining (46 dB R_w)

The constructions outlined above are relatively typical in modern high-rise buildings, with the exception that the glazing area has been increased to 50 % of the façade area to reflect a conservative situation – glazing is the acoustically weakest part of the façade.

Using the required external façade sound level stipulated in Rule 3.13.9 Part (A), the **predicted internal noise level resulting from the constructions described above is 28 dB L_{Aeq} which is 2 dB below the 30 dB L_{Aeq} criterion** from AS/NZS 2017:2000. A summary of the prediction is provided in Appendix A.

Our assessment indicates that commonly encountered constructions can satisfy the most stringent noise level requirements of Rule 3.13.9 Part (A), without the need for specific noise control measures. However, the calculations confirm that if windows are open to provide the ventilation, intrusive noise levels will likely exceed the 30 dB L_{Aeq} criterion in bedrooms.

We therefore recommend that an alternative means of ventilation is provided as appropriate so that compliance with Rule 3.13.9 can be achieved concurrently with any Building Code ventilation requirements.

District Plan Rule 3.13.9 Part (B)

This part of the rule requires the final design of noise sensitive spaces within the proposed building to be subject to a detailed assessment of noise intrusion. Typically, the most appropriate time for this to occur is with the building consent application at which point the building design will be sufficiently detailed.

We therefore propose that this requirement is included as a condition of consent.

Summary

The design of the proposed building at the corner of Dee and Esk Streets is not sufficiently progressed to permit a detailed analysis of noise intrusion within the Entertainment Precinct as required by Rule 3.13.9 of the ICC District Plan.

However, our preliminary assessment, using typically encountered constructions, indicates that the most stringent noise criterion of 30 dB L_{Aeq} from AS/NZS2107:2000 will be complied with, provided that an alternative means of ventilation is provided. As a result, reverse sensitivity noise effects on proposed residential activity will be acceptable and consistent with the anticipated noise environment for noise sensitive activity in the zone.

In order to give effect to Rule 3.13.9, we have provided the following suggested text for a resource consent condition that should apply to the development:

Prior to the issue of Building Consent, an acoustic design certificate from a suitably qualified acoustic engineer is to be provided to the Council demonstrating that internal sound levels will be achieved when assessed in accordance with the requirements of Rule 3.13.9 (A). An alternative means of ventilation shall be provided so that compliance with Rule 3.13.9 can be achieved concurrently with any Building Code ventilation requirements.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD



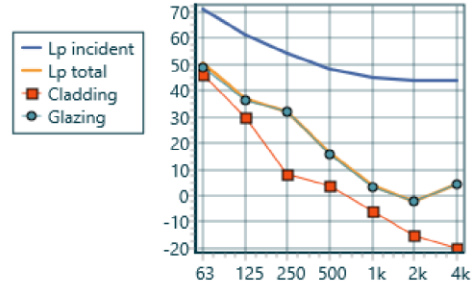
Jon Farren
Principal

APPENDIX A SUMMARY OF SOUND INTRUSION CALCULATION

Outdoor To Indoor Sound Transmission (v9.0.10)

Program copyright Marshall Day Acoustics 2017
margin of error is generally within $R_w \pm 3$ dB
- Key No. 0003
Job Name: **HWCP Development**
Job No.: **20180801**
Date: 20/09/2018
File Name:

Initials: jon.farren



Comment: Assessment in accordance with Rule 3.13.9 of ICC District Plan

Octave Band Centre Frequency (Hz)								
Source	63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	71	61	54	48	45	44	44	53
Path								
Element 1 ,Cladding STL	-23	-29	-44	-42	-49	-57	-62	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [5.0 m ²]	7	7	7	7	7	7	7	
Element sound level contribution	46	30	8	4	-6	-15	-20	21
Element 2 ,Glazing STL	-20	-23	-20	-30	-40	-44	-37	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [5.0 m ²]	7	7	7	7	7	7	7	
Element sound level contribution	49	36	32	16	3	-2	4	27
Receiver								
Room volume(-10LogV) [50 m ³]	-17	-17	-17	-17	-17	-17	-17	
Reverberation time (s)	1	1	1	1	1	1	1	
RT (+ 10LogT)	-3	-3	-3	-3	-3	-3	-3	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	50	37	32	16	4	-2	4	28

Wall Cladding: 1 x 100 mm Hebel Block + Timber stud (100 mm x40 mm) + 75 mm Fibreglass (10kg/m3) + 1 x 10 mm Plasterboard
Glazing: 4 mm /12 mm air / 4 mm