

**BEFORE A PANEL OF INDEPENDENT HEARING COMMISSIONERS  
AT WELLINGTON**

**I MUA NGĀ KAIKŌMIHANA WHAKAWĀ MOTUHEKE  
O TE WHANGANUI-A-TARA**

**IN THE MATTER  
AND  
IN THE MATTER**

**of the Resource Management Act 1991**

**of the hearing of submissions on Te Mahere -  
Rohei Tūtohua the Wellington City Proposed  
District Plan**

**HEARING TOPIC:**

**Stream 5 – Noise**

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**STATEMENT OF REBUTTAL EVIDENCE OF LANCE MICHAEL JIMMIESON  
ON BEHALF OF KĀINGA ORA – HOMES AND COMMUNITIES**

**VENTILATION**

**25 JULY 2023**

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## 1. EXECUTIVE SUMMARY

- 1.1 The basis of the evidence presented within this statement of rebuttal evidence is aimed at achieving acceptable levels of indoor air quality to ensure the creation of lifelong healthy homes, as well as ensuring minimum levels of comfort are achieved for dwellings located within noise affected areas, where it is accepted that external doors and windows will be required to remain closed to ensure the integrity of specialist acoustic treatment, and in order to ensure acceptable internal noise levels are maintained within all habitable rooms.
- 1.2 Having reviewed the evidence submitted by Waka Kotahi, KiwiRail and WIAL referring to the ventilation requirements as expressed in Noise-S6, it is apparent that NOISE-S6 has largely been constructed based on recommendations from Mr Malcolm Hunt, who is himself an Acoustic Consultant. Mr Hunt has based his proposed changes to Noise-S6 on information provided by Mr Owen Brown, a Senior Mechanical Engineer at GHD. In submitting my rebuttal evidence, I have therefore considered and responded to the relevant expert evidence on behalf of Waka Kotahi, KiwiRail as well as WIAL, in the context of Mr Hunt's proposed changes to Noise-S6.
- 1.3 In carrying out my assessment, I have referred to applicable NZ and Australian Standards and the NZ Building Code G4/AS1 as reference documents for recommending solutions proposed for adoption by the Wellington City Council pertaining to this matter. Standards include NZS4303:1990 - Ventilation for acceptable indoor air quality and AS 1668.2-2002 - The use of ventilation and air conditioning in buildings - Part 2: Mechanical ventilation in buildings.
- 1.4 It is important to retain sufficient flexibility in the PDP to allow a range of compliance methods by designers, while ensuring minimum standards are clearly articulated and achieved. The adoption of minimum ventilation rates and minimum / maximum internal temperature ranges will result in a combination of heating, cooling and ventilation systems to ensure compliance. As such, capital costs, maintenance costs and running (energy consumption) costs must all be

considered by the system designer. Choice of fuels should also be considered within a sustainability framework, including exclusion of fossil fuels.

## **2. INTRODUCTION**

2.1 My full name is Lance Michael Jimmieson. I am a specialist Building Services Engineer and Managing Director of Jacksons Engineering Advisers Limited, having been an owner and Managing Director for the past 23 years. I lead a team of 26 Building Services consulting engineers in the design, construction, and assessment of building services, working across New Zealand and internationally.

2.2 I have a NZ Certificate in Engineering (HVAC) from the Central Institute of Technology obtained in 1981 and approximately 43 years of experience in the HVAC industry. I have developed specialist skills in diagnosing problems and improving the performance of existing buildings, leading a company specialising in the upgrade and improvement of existing building stock. I am a course developer and trainer in Building Services courses operated by Carbon and Energy Professionals New Zealand, as well as publishing technical white papers to help train industry professionals, further demonstrating my focus on improving the service delivery from the Building Services sector.

2.3 This rebuttal statement responds to the proposed amendments to the ventilation standards within the Noise Chapter provisions of the PDP, as set out in the evidence in chief (EIC) of both Ms O'Sullivan (Wellington International Airport Limited) and Ms Heppelthwaite (KiwiRail and Waka Kotahi). In preparing this evidence I have also read the Section 32 and Section 42A reports together with the associated appendices prepared by Council staff, including the evidence prepared by Mr Malcolm Hunt.

2.4 The recommended amendments to the provisions under consideration in Hearing Stream 5 that are included in Attachment A to Mr Lindenberg's statement of rebuttal evidence include my input and recommendations.

### **Code of Conduct**

- 2.5 Although this is a Council hearing, I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence.
- 2.6 Except where I state that I am relying on the evidence of another person, I confirm that this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

### **Scope of Evidence**

- 2.7 My evidence covers submissions and further submissions on the Wellington City Proposed District Plan Change in relation to the provisions that manage the mechanical ventilation and thermal performance of buildings from an occupant perspective, where natural ventilation via openings windows is not acceptable due to external noise, as defined by others.
- 2.8 My evidence will address the following matters:
- (a) The amendments I propose for the heating, ventilation and air conditioning provisions set out in NOISE-S6.
  - (b) The reasons why I generally support most elements of the evidence submitted by Malcolm Hunt for Wellington City Council, utilising NOISE-S6 as the primary standard to address ventilation within the Noise Chapter, as proposed by the Council and generally supported by Ms Heppelthwaite (Waka Kotahi and KiwiRail) – being that they are generally aligned with creating healthy and comfortable internal environments within the affected dwellings where the use of openable windows is restricted.
  - (c) The reasons why I generally do not support some elements of the evidence submitted by Malcolm Hunt for Wellington City Council is there are conflicts between requiring high levels of ventilation (up to 6 air changes per hour), with the requirement

to provide thermal comfort in the form of heating and cooling provisions.

- (d) From a purely ventilation perspective, I do not consider there is a need for a new / separate ventilation standard relating specifically to the airport, as proposed by Ms O'Sullivan (WIAL), as once it has been established that acoustic treatment to affected housing is required, driving the requirement for mechanical ventilation and thermal comfort measures, these measures do not differ based on the source of the external noise.
- (e) Where appropriate and relevant, my evidence will reference and rely on previous work undertaken by Jackson Engineering Advisers for Queenstown Lakes District Council. My evidence will reference the evidence of Mr Malcolm Hunt for the WCC and Mr Matt Lindenberg and Mr Jon Styles for Kāinga Ora.

### **3. HEATING, VENTILATION AND AIR CONDITIONING OF BUILDINGS**

- 3.1 The minimum general ventilation requirements of buildings are set out in the New Zealand Building Code, under section G4. The acceptable solution (G4/AS1) requires occupiable spaces to have either an openable window area equivalent to 5% of the floor area (per space), or mechanical ventilation complying with NZS 4303:1990 and AS1668.2:2002.
- 3.2 In addition to the minimum general ventilation requirements, NZBC G4 requires mechanical exhaust ventilation to cooktops, showers and baths. Consideration is needed to ensure ventilation solutions acknowledge all aspects of NZBC compliance to ensure integrated, practical and cost effective solutions are available, taking into account interactions between all ventilation and air conditioning systems within a dwelling.
- 3.3 Ventilation via openable doors and windows is effected by a human response to prevailing climate and building operating conditions. A wide range of ventilation effectiveness is achievable through an occupants'

innate ability to open or close external doors or windows to an extent they deem appropriate in response to climatic conditions. This infers that higher or lower ventilation rates can be achieved due to events such as temporary increases in occupancy numbers, periods of high internal moisture, washing and drying clothes etc. A human response also caters for periodic or extraordinary events such as recovery from a water leak within the house, re-habitation of a dwelling after an extended absence etc.

- 3.4 I disagree with clause 103 with reference to Waka Kotahi statement “The ventilation system must be adequate to provide thermal comfort so that residents have a free choice not to open windows”, as ventilation alone cannot meet the target indoor temperature requirements of 18 – 25°C.
- 3.5 I do not agree with the proposed district plan section Noise-S6, that levels of outdoor air ventilation significantly above NZBC minimums are required regardless of other design aspects. For example, high rates of outside air ventilation along with the use of mechanical heating and cooling equipment will drive a requirement for much higher capacity heating and cooling equipment, with resultant increases in capital costs, energy consumption and operating costs.
- (a) I partially agree with section 112 of Malcolm Hunt’s evidence. I propose where continuous mechanical ventilation is provided, the requirement for increased ventilation rates can be significantly reduced to a minimum acceptable level, less than 6 ACH.
- (b) I generally agree with sections 113 and 114 of Malcolm Hunt’s evidence submission with respect to relaxing the requirement for mechanical room flushing where habitable rooms are provided with windows openable to the outside, sufficient in area to meet the minimum ventilation requirements of the NZBC.
- (c) I propose alterations to Noise-S6 based on these comments.

- 3.6 Where opening windows are not provided or are inadequate to meet the requirements of NZBC G4, supplementary levels of mechanical ventilation (up to 1ACH as per CIBSE Guide A Environmental Design Table 1.5) are proposed on a pro-rata basis relative to the extent of opening windows provided (in relation to the building code requirements). i.e., where no opening windows are provided a minimum of 1ACH of mechanical ventilation will be required.
- 3.7 Overheating of internal spaces due to climatic conditions and/or internal heat generation has historically been managed by the home occupants via opening windows. Where windows are inadequate (less than 5% of floor area), cannot be physically opened, or external noise levels dictate that windows cannot be opened without compromising living standards, it is accepted that some additional form of climate control is required to achieve acceptable indoor air temperatures.
- 3.8 Internal space temperature limits are not set out in the New Zealand Building Code for many building usage types. Minimum internal space temperatures are required by the New Zealand Building Code G5 for old people's homes and early childhood centres only. These requirements do not apply to the majority of buildings constructed for commercial or residential use. I consider a suitable reference guide to be the Chartered Institute of Building Services Engineers (CIBSE) – Guide A Environmental Design Table 1.5. This provides guidance on internal temperature limits which largely aligns with the currently proposed minimum winter indoor temperature of 18°C and a Maximum summer indoor temperature of 25°C.
- 3.9 It is noted that even where increased amounts of outdoor air ventilation are provided, internal space temperatures will not necessarily be considered comfortable during periods of high temperature weather. Even where large quantities of outdoor air ventilation are provided, it is possible and likely that internal space temperatures may rise above external temperatures due factors such as solar gain (sunlight entering through glazed elements of the building and heating up internal features) and internal heat loads typically generated by electrical appliances within the building.



3.10 I have not sighted any correspondence on the relationship between the proposed 18-25°C temperature range and the prevailing ambient conditions. I recommend that the proposed internal space temperature limits in the PDP are achieved based upon an agreed weather condition. I propose designers are required to use a 2.5% design weather dataset (i.e. 24 hour data as published by NIWA) for ensuring heating and cooling solutions work appropriately for the geographic location. This requires the designer to select a heating or cooling device which could maintain the internal space temperature between 18-25°C year round, based upon a regionalised historical average outside air temperature which would not be exceeded more than 2.5% of the duration of a typical year.

#### **4. NOISE LEVEL MEASUREMENTS FOR MECHANICAL EQUIPMENT**

4.1 Acoustic assessments are outside of my professional area of expertise. My advice relates to the design and practical considerations of the mechanical equipment selection and installation. However, I support the proposed target of achieving internal noise levels from mechanical ventilation or air conditioning equipment levels of up to 35 dB LAeq(30s), measured at 1.5m from the equipment.

I note that some mechanical equipment can be installed remotely, hence will typically have a reduced noise impact on the occupied space. I also note that some items of mechanical equipment do not include a grille or diffuser. For these reasons, I suggest wording in PDP Noise-S6 should refer to the noise impact from any part of the mechanical system, rather than referencing a distance to a grille or diffuser.

#### **5. WIAL PROPOSED NOISE-S17**

5.1 I generally agree with section 50 of Malcolm Hunt's submission in regard to WIAL's proposal for a standalone ventilation standard. I believe Noise-S6 can be appropriately worded to satisfy the requirements of all affected parties.

**6. VENTILATION OF HABITABLE ROOMS  
(REF: MALCOLM HUNT STATEMENT OF EVIDENCE)**

- 6.1 I consider an additional 'Flush' function as mentioned in clause 107, would only apply to dwellings where no openable windows are provided. Where opening windows are provided, they can be used to effectively flush out built up room heat and odours and accept that during this period, external noise will enter the space. An increased rate of ventilation to 2 ACH can be provided for buildings which are not provided with openable windows.
- 6.2 I agree with clause 110 for the simultaneous requirement to meet NOISE-S4 and NOISE-S5 requirements, as well as meeting noise criteria set out for the mechanical ventilation and air conditioning systems.
- 6.3 I disagree with clause 111 paragraph a) with respect to minimum ventilation rates. Section 1.5 Mechanical Ventilation of NZBC G4/AS1 required a minimum of 0.5 ACH, and CIBSE Guide A Environmental Design Table 1.5 requires up to 1 ACH, which is adequate for compliance and healthy building home standards.
- 6.4 I agree with clause 111 paragraph b) that rooms should be provided with heating and cooling, occupant controlled & capable of maintaining room conditions of 18 – 25°C within the 2.5% ambient temperature ranges for the applicable region.
- 6.5 I agree with clause 111 paragraph c) that the ventilation and air conditioning systems should each have maximum noise levels no higher than 35 dB LAeq(30s).
- 6.6 I disagree with clause 112 that a mechanical system delivering up to six air changes per hour is required for room flushing. Refer our clause 6.2 above.
- 6.7 I agree with clauses 113 & 114 that room flushing can be accomplished by the use of openable windows where provided and that noise from outside would be brief and inconsequential.

6.8 I consider clauses 115 and 116 of no consequence as I do not support the requirement to achieve 6 air changes per hour under any circumstances. The main reason for this is that to achieve the required room temperature range of 18 – 25°C, it is uneconomic and impractical to design a heating and cooling system to achieve these conditions while at the same time delivering 6 air changes per hour of outside air into the building.

## 7. CONCLUSION

7.1 Due to the requirement to simultaneously achieve acceptable levels of indoor air quality (to ensure the creation of lifelong healthy homes), ensure minimum levels of comfort (Internal temperatures of 18 – 25°C) and acceptable internal noise levels of 35 dB LAeq(30s), I believe the minimum requirements for dwellings' fitted with openable windows should be based on mechanical ventilation compliant with section 1.5 Mechanical Ventilation of NZBC G4/AS1, together with a suitable cooling and heating system that is controllable by the occupant and capable of maintaining the internal design temperatures within the specified noise criteria.

7.2 Where buildings are fitted with non-compliant or fixed windows, the minimum ventilation requirement should be increased to 1 air change per hour and a flushing function capable of 2 air changes per hour may also be provided.

7.3 Alternatively, a specific engineered system can be proposed by a suitably qualified HVAC expert, provided the above outcomes can be achieved.



**Lance Michael Jimmieson**

**25 July 2023**

