
Noise Impact Assessment

Royal Buildings, Manchester

For Criterion Capital

Report Quality Management			
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1 Introduction

- 1.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by Criterion Capital to undertake a noise assessment in relation to a planning application for a proposed change of use of office to hotel accommodation for the upper floors of Royal Buildings, 2 Mosley Street, Manchester, within the administrative area of the Manchester City Council (MCC).
- 1.2 This assessment considers:
- potential noise impact associated with the installation of proposed noise generating plant British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142) [1];
 - internal noise levels within proposed hotel bedrooms, from external noise sources including local transport and existing mechanical plant; and
 - noise breakout from the hotel potentially affecting neighbouring land uses.
- 1.3 The technical content of this assessment has been provided by Savills personnel, all of whom are corporate members, i.e. Member (MIOA) or Fellow (FIOA), or associate members (AMIOA) of the Institute of Acoustics (IOA), the UK's professional body for those working in acoustics, noise and vibration. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the IOA.
- 1.4 The Team is also a member of the Association of Noise Consultants (ANC) which seeks to raise the standards of acoustic consultancy and improve recognition of the vital role which good acoustics, and the management and mitigation of noise and vibration play in achieving good design and effective planning in the built and natural environment. Membership of the ANC indicates that the Team is sufficiently competent to pass the high standards for entry to the association.
- 1.5 This report and assessment has been peer reviewed within the Savills team to ensure that it is technically robust and meets the requirements of our Integrated Management System.
- 1.6 Personnel and individual qualifications are provided within the Quality Management table at the start of this report and in Appendix A in accordance with the requirement of BS 4142.

2 Basis for Assessment & Assessment Methodology

Basis for Assessment

- 2.1 This assessment has been undertaken to establish if operation of the proposed development, as currently considered, would be compliant with relevant national and local planning policy and guidance and the appropriate British Standards, upon which the proposed change of use planning application will be determined.

National Planning Policy & Guidance

- 2.2 A summary of relevant National Planning Policy and Guidance, pertinent to this assessment, is provided below.

Noise Policy Statement for England

- 2.3 The Noise Policy Statement for England (NPSE) [2] sets out the long term overarching vision of Government noise policy, which is to promote good health and a good quality of life through the management of noise within the context of Government policy on sustainable development.
- 2.4 The NPSE describes a 'Noise Policy Vision' and three 'Noise Policy Aims' and states that these visions and aims provide:

"the necessary clarity and direction to enable decisions to be made regarding what is an acceptable noise burden to place on society."

- 2.5 The 'Noise Policy Vision' is supported by the following aims:
1. avoid significant adverse impacts of health and quality of life;
 2. mitigate and minimise adverse impacts on health and quality of life; and
 3. where possible, contribute to the improvement of health and quality of life.
- 2.6 The aims of the policy differentiate between noise impacts on health and noise impacts on quality of life. The aims also differentiate between 'significant adverse impacts' and 'adverse impacts'. The explanatory note to the NPSE clarifies that a significant adverse impact is deemed to have occurred if the 'Significant Observed Adverse Effect Level' (SOAEL) is exceeded. An adverse effect, on the other hand, lies between the 'Lowest Observed Adverse Effect Level' (LOAEL) and the SOAEL.

National Planning Policy Framework

- 2.7 The National Planning Policy Framework (NPPF) [3] sets out the Government's planning policies for England and how these are expected to be applied. In relation to noise, Paragraph 185 of the NPPF states:

“Planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from the development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”*

Planning Practice Guidance - Noise

- 2.8 Planning Practice Guidance on Noise (PPG-N) [4] provides guidance to local planning authorities to ensure effective implementation of the planning policy set out in the NPPF.
- 2.9 The PPG-N reiterates general guidance on noise policy and assessment methods provided in the NPPF, NPSE and British Standards.
- 2.10 The PPG-N provides a relationship between various perceptions of noise, effect level and required action in accordance with the NPPF. This is reproduced in Table 2.1 below.
- 2.11 In line with the NPPF and NPSE, the PPG-N states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.
- 2.12 Also in line with the NPPF and NPSE, the PPG-N states that effects above the SOAEL should be avoided and that, whilst the economic and social benefits being derived from the activity causing the noise must be taken into account, such exposures are undesirable.

Table 2.1 Noise Exposure Hierarchy based on the Likely Average Response

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Local Planning Policy

2.13 The MCC 'Manchester Core Strategy 2012-2027' document [5] sets out detailed development management policies to assess planning applications. Policy DM1 'Development Management' of the Manchester Core Strategy, is considered pertinent with regard to this assessment, stating:

“All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:-

...

• Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.”

...”

- 2.14 During initial pre-application consultation with MCC, the Environmental Health Team at MCC provided the following comment with regard to noise:

“Provide details of the existing noise levels in the area including levels during daytime, night time and weekends along with an indication of noise levels that you propose to achieve within the accommodation and details of the acoustic glazing and acoustically treated ventilation you propose to use and what measures will need to be implemented on site to meet internal noise requirements. This will need to include consideration of the impact of Burger Kings existing plant.

In terms of the proposed uses, the study should identify the acoustic treatment and measures that will limit the breakout of noise in accordance with a noise study of the premises.

If A/C units are proposed, the Noise Impact Assessment should consider how these may impact on adjacent occupiers including:

- The noise levels that would be generated from the proposed equipment and the acoustic attenuation measures proposed to reduce the equipment’s noise output externally. Please note that any externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location*
- A technical specification of the proposed equipment from the manufacturer”*

Assessment Methodology

British Standard 4142

- 2.15 BS 4142 primarily provides a numerical method by which to determine the significance of sound of a commercial and/or industrial nature, i.e. the ‘specific sound’, at ‘noise sensitive receptor’ (NSR) locations.
- 2.16 The specific sound level may then be corrected for the character of the sound, if appropriate, and is then termed the ‘Rating Level’.
- 2.17 The commentary to paragraph 9.2 of BS 4142 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

“Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a rating penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. ... If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Other sound characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

- 2.18 The Rating Level is then compared to the background sound level, which should be representative of the period being assessed.
- 2.19 An initial estimate of the impact of the specific sound is obtained by subtracting the representative background sound level from the Rating Level.
- 2.20 Typically, the greater this difference, the greater is the magnitude of the impact:
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 2.21 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 2.22 Whilst there is a relationship between the significance of impacts determined by the method contained within BS 4142 and the significance of effects described in the PPGN, there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound, which is a key requirement of the Standard.

- 2.23 The significance of the effect of the noise in question (i.e. whether above or below the SOAEL and LOAEL) should be determined on the basis of the significance of the initial estimate of impact from the BS 4142 assessment with reference to the examples of outcomes described within the PPGN and after having considered the context of the sound at the receptor/s affected.

British Standard 8233

- 2.24 Annex H of BS 8233:2014: 'Guidance on sound insulation and noise reduction for buildings' [6] (BS 8233), provides guidance regarding internal noise levels within hotel bedrooms from external sources, including road, rail, air traffic and noise from activities outside the hotel and any adjacent premises.
- 2.25 Table H.3 of BS 8233, which provides indoor ambient noise level ranges for hotel bedrooms, is provided below as Table 2.2.

Table 2.2 Indoor ambient noise level ranges for hotel bedrooms

Period	Noise Level
Daytime (07:00 – 23:00 hrs)	30 – 40 dB $L_{Aeq,1hour}$
Night-time (23:00 – 07:00 hrs)	25 – 35 dB $L_{Aeq,1hour}$
Night-time (23:00 – 07:00 hrs)	45 – 55 dB L_{Amax}

3 Baseline Noise Description

- 3.1 Royal Buildings is located in the centre of Manchester City adjacent to Piccadilly Gardens, an area with other commercial and recreational land uses. The upper floors of the building have previously been used for offices. At ground floor level is an existing fast-food restaurant, which will be retained.
- 3.2 The nearest 'noise sensitive receptors' (NSRs) to the site are residential dwellings on Tib Street, approximately 100 m to the north, albeit significantly screened by substantial intervening buildings on Market Street. The nearest NSR that is not screened by intervening buildings is a hotel located approximately 130 m to the west on Piccadilly Gardens.

Baseline Conditions

- 3.3 In order to establish baseline acoustic conditions at the nearest NSRs, two unattended long term sound level surveys (LT1 and LT2) were deployed on Thursday 8 June and collected on Monday 12 June 2023. In addition a short-term attended survey (ST1) was also undertaken on Thursday 8 June 2023.
- 3.4 The first unattended sound level meter (SLM) was deployed on the roof of Royal Buildings (LT1), in a location not directly overlooking roads or tramlines.
- 3.5 At the time of setting up and collecting the survey, the following noise sources were noted as affecting the acoustic environment at the survey location: tram movements on Piccadilly Gardens below (albeit screened by Royal Buildings), general city centre type noise and distant car horns.
- 3.6 Noise associated with operation of kitchen extract plant from the ground floor fast-food restaurant was noted as being audible at this location, although it was not considered to be dominant or intrusive.
- 3.7 The second unattended SLM was deployed inside Royal Buildings (LT2), in an unoccupied room overlooking Piccadilly Gardens, where external ambient noise levels would be reasonably expected to be highest, due to the proximity of the road and tram lines.
- 3.8 At the time of setting up and collecting the survey, the following noise sources were noted as affecting the acoustic environment inside the room: tram movements on Piccadilly Gardens below, general city centre type noise and distant car horns. Noise associated with operation of kitchen extract plant was not noted as being audible in this room, or other rooms closer to the extract ductwork itself. No sources of internal noise were noted.
- 3.9 The short-term attended survey (ST1) was deployed outside Royal Buildings at 3 m above ground level, in a location below the room in which the survey LT2 was deployed. The survey was undertaken over a 15-minute period between 10:58 and 11:13 hours on Thursday 8 June 2023, after deployment of LT2.

- 3.10 Sound level measurements were made using a NRST Mk3 SLM (LT1 and ST1) and a Rion NL-52 SLM (LT2), both Type 1 SLMs in accordance with BS 7445-2:1991 'Description and measurement environmental noise Part 2: Guide to the acquisition of data pertinent to land use' [7]. The SLMs were set up to log the A-weighted broadband sound pressure level (SPL) in 125 ms periods. Raw data were post-processed into 15- and 5-minute periods.
- 3.11 The equipment calibration level was checked to 94 dB prior to and after the monitoring period; no significant deviation (i.e. above 0.5 dB) was noted.
- 3.12 Meteorological conditions were monitored via a publicly accessible nearby weather station¹. The survey period was dry and wind speeds were low and below 5 m/s. As such, no data have been removed from the subsequent analysis.

Measurement Results

- 3.13 Table 3.1 below provides a statistical summary of the baseline 15-minute background and residual sound levels measured over the 4-day survey period at LT1, for the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods.

Table 3.1 LT1 Background and Residual Sound Levels

Period (hours)	Background Sound Level (dB L _{A90,15min})					Residual Sound Levels (dB L _{Aeq,15min})				
	Min	25% ¹	50%	75%	Max	Min	25%	50%	75%	Max
Daytime ²	54	56	57	59	63	56	58	59	61	70
Night-time ²	54	55	56	56	64	54	56	57	58	75
Notes:										
1. Percentile value, for example 25% is the value below which 25% of the data are found.										

- 3.14 The 16- and 8-hour daytime and night-time ambient sound levels measured at LT1 are 60 and 59 dB L_{Aeq,T} respectively.
- 3.15 Table 3.2 below provides a summary of the baseline ambient and maximum sound levels measured over the 6-day survey period at LT2, for the daytime and night-time periods.

¹ <https://www.wunderground.com/dashboard/pws/IENGLAND869>

Table 3.2 LT2 Ambient and Maximum Sound Levels

Period	Level (dB)
Daytime ambient $L_{Aeq,16h}$	37
Night-time ambient $L_{Aeq,8h}$	32
Night-time L_{AFmax} not exceeded more than 10 times	51

3.16 Table 3.3 below provides a summary of the measured ambient sound levels measured at ST1 and LT2 during the same 15-minute period between 10:58 and 11:13 hours on Thursday 8 June 2023.

Table 3.3 ST1 and LT2 comparison

Start	ST1 $L_{Aeq,15m}$ (dB)	LT1 $L_{Aeq,15m}$ (dB)	Difference (dB)
10:58	65	34	31
11:03	67	35	33
11:08	67	36	32
Average	67	35	32

3.17 With reference to Tables 3.2 and 3.3 above, the sound level difference between the inside and outside of a room fronting Piccadilly Gardens is 32 dB. Consequently, the 16-hour daytime and 8-hour night-time external ambient sound levels for the facades fronting Piccadilly Gardens (where the internal survey LT2 was located) are 69 and 64 dB $L_{Aeq,T}$, 32 dB higher than as measured internally.

3.18 On the basis of the above and paragraph 3.14, external ambient sound levels are highest at the facades of Royal Buildings fronting Piccadilly Gardens, rather than at roof level, as would be reasonably expected.

BS 4142 Representative Baseline Sound Levels

3.19 BS 4142 requires that the background sound levels adopted for the assessment are representative of the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated (paragraph 8.13 of BS 4142).

3.20 However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the beginning and end of the night period, and the quieter middle part of the night period. The accompanying note states that *"a representative level should account for the range of background sounds levels and should not automatically be assumed to be either the minimum or modal value"*.

3.21 In this instance, the 25th percentile levels of the survey data measured at LT1 have been used to characterise the baseline sound environment at all NSRs.

- 3.22 This is not the lowest sound level encountered but is lower than that obtained using the average. It therefore represents somewhere in the range of lower sound levels that are likely to be encountered and provides a precautionary assessment. For 75% of the time, baseline sound levels will be higher than the 25th percentile levels. Use of the 25th percentile ensures that any periods when higher wind speeds (or other extraneous noise) could have affected the measured baseline sound levels do not unduly affect the analysis.
- 3.23 Similarly, representative baseline residual levels have been based on the 25th percentile level. Table 3.3 below provides a summary of representative sound levels used in the subsequent assessment.

Table 3.4 BS 4142 Representative Baseline Sound Levels

Period	Background Sound Level $L_{A90,T}$ (dB)	Residual Sound Level $L_{Aeq,T}$ (dB)
Daytime 07:00 to 23:00	56	58
Night-time 23:00 to 07:00	55	56

- 3.24 With regard to above, an analysis of the survey data measured at LT2 has also been undertaken to establish the baseline sound levels for facades overlooking Piccadilly Gardens. In this case the 25th percentile values of the daytime and night-time background sound levels are 29 and 26 dB $L_{A90,T}$ respectively, equivalent to external sound levels are 61 and 58 dB $L_{A90,T}$ respectively (external sound levels are 32 dB higher).
- 3.25 On this basis using the data logged at LT1 will allow for a more robust assessment as background sound levels are 5 and 3 dB lower.

4 Calculations and Modelling

- 4.1 In order to calculate specific sound levels at the nearest NSRs associated with operation of the proposed development, a 3D sound model has been built using SoundPLAN v8.2 noise modelling software.
- 4.2 The model predicts sound levels under light down-wind conditions based on hemispherical sound propagation with corrections for atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation' [8].

Modelled Noise Sources

- 4.3 Based on information provided by Ridge, the mechanical and electrical engineers working on this project, the following noise generating plant has been included within the model:
- 5 # 'air source heat pumps' (ASHPs) for heating & cooling, each with an associated sound power level (SWL) of 89 dBA L_W , when in heating mode and 83 dBA L_W when in cooling mode;
 - 6 # ASHPs for hot water generation, each with an associated SWL of 72 dBA L_W ; and
 - 1 # air handling unit (AHU) with an associated SWL of 93 dBA L_W .
- 4.4 All plant has been modelled as point sources at 1 m above roof level, with a 100% on time. The plant has not been modelled as being housed in a plantroom housing, or with any louvres or barriers, as such presents a 'worst case' assessment. Plant data is provided as Appendix C.
- 4.5 It should be noted that all SWL data are for the unit's operating at maximum capacity and that for the majority of the time plant would be operating at a reduced capacity with lower operational SWLs. However, for the purposes of the assessment all plant has been assumed to be operating at 100% capacity, for 100% of time, i.e. a 'worst case' scenario.
- 4.6 The following generic assumptions have been incorporated into the noise model:
- the topography of the site and the surrounding area has been obtained from publicly surveyed topographical data and Ordnance Survey (OS) 'Terrain 50' open data;
 - the effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Open Data 'Settlement Area' shape file data into the model; notably, the top roof area of Royal Buildings has been included, which effectively screens the rooftop plant area to NSRs to the north and east; and
 - the ground type in the model has been set to hard ($G=0$).

Model Results

- 4.7 Table 4.1 below provides a summary of modelled specific sound levels at the nearest NSRs. All levels are free-field equivalent. Levels are for the floor of each building with the highest modelled specific sound level (4th floor).

Table 4.1 Predicted Specific Sound Levels

NSR	Specific Sound Level (dB L _{Aeq, Tr})	
	Daytime (07:00 to 23:00 hours)	Night-time (23:00 to 07:00 hours)
Tib Street dwellings	32	32
Hotel on Piccadilly	43	43
Hotel on Marble Street	29	29

5 Assessment

BS 4142 Assessment

- 5.1 With reference to BS 4142, a character correction can be applied to the specific sound level depending on the acoustic characteristics of the sound, determined at the NSRs, including tonality, impulsivity, intermittency and other readily distinctive features.
- 5.2 In this case, it is not considered appropriate to apply any character correction on the basis that any specific features would not be audible or readily distinctive above the residual acoustic environment (specific sound levels at least 10 dB below the residual sound level). As such, modelled specific sound level are equal to the Rating Level.
- 5.3 On the basis of the above, and in accordance with BS 4142, Table 5.1 and Table 5.2 below provide an initial estimate of the noise impact at the nearest NSRs during operation of the proposed development during the daytime and night-time periods respectively.

Table 5.1: BS 4142:2014+A1:2019 Assessment - Daytime

NSR	Specific Sound Level (dB L _{Aeq, T})	Character Correction (dB)	Rating Level (dB L _{Ar, Tr})	Background Level (dB L _{A90, T})	Rating / Background Level Difference (dB)
Tib Street Dwellings	31	0	31	56	-25
Hotel on Piccadilly	42	0	42	56	-14
Hotel on Marble Street	36	0	36	56	-20

Table 5.2: BS 4142:2014+A1:2019 Assessment - Night-time

NSR	Specific Sound Level (dB L _{Aeq, T})	Character Correction (dB)	Rating Level (dB L _{Ar, Tr})	Background Level (dB L _{A90, T})	Rating / Background Level Difference (dB)
Tib Street dwellings	31	0	31	55	-24
Hotel on Piccadilly	42	0	42	55	-13
Hotel on Marble Street	36	0	36	55	-19

- 5.4 With regards to the rating/background level difference, BS 4142 states:
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;

- a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

- 5.5 With reference to Tables 5.1 and 5.2, as the Rating Level at the nearest NSRs is at least 13 dB below the representative background sound level, it is considered that there is a very low risk that operation of the proposed development would result in adverse impact at NSRs, depending on the context.
- 5.6 With reference to paragraph 3.11, the baseline residual sound levels during the daytime and night-time period are 58 and 56 dB $L_{Aeq,T}$ respectively. As such, the resultant ambient sound level (the baseline residual sound level plus proposed specific sound level), would not increase by more than 0 dB, a negligible increase and likely not noticeable².
- 5.7 Furthermore, the character of the sound associated with the operation of the proposed development, if audible, would be very similar to that currently experienced in the area, i.e. the operation of the existing commercial mechanical plant items such as fans and cooling plant.
- 5.8 It should also be noted that the Rating Levels are based on all plant operating at 100% capacity for 100% of the time. For the majority of the time, plant would not be concurrently operating at 100% capacity and Rating Levels would be appropriately lower.
- 5.9 On the basis of the above, operation of the proposed development would not result in any increase of the daytime or night-time ambient sound level above the baseline level, or introduce new noise sources that may be considered to be intrusive, distinctive or incongruous in comparison to the residual acoustic environment, affecting residential amenity or other commercial use.
- 5.10 Furthermore, with regard to the night-time period specifically, it is considered that operation of the proposed development would be very unlikely to cause any sleep disturbance. On the basis a partially open window provides ~15 dB of attenuation, internal noise levels associated with plant would be, at most, 25 dB $L_{Aeq,T}$, a low level which would not be discernible or of a magnitude likely to cause awakening, when compared to other external sources of noise (which are of a similar character).

² Residual sound level of 41 dBA + specific sound level of 32 dBA = ambient sound level of 41.5 dBA.

- 5.11 Consequently, it is considered that operation of the proposed development would very likely not be audibly discernible or adversely affect residential amenity and significant effects would be avoided.

BS 4142 Assessment Summary

- 5.12 In summary, when considering noise from the proposed development, this would:
- result in Rating Levels at NSRs, at least 13 dB below the representative background sound level and likely not to be audible or noticeable when compared to the baseline acoustic environment;
 - not be discernible or of a magnitude likely to cause sleep difficulty; and
 - not cause overall ambient sound levels to increase, or introduce new noise sources of an intrusive, incongruous or otherwise distinguishable character.
- 5.13 As such, it is considered that operational sound levels would be of a magnitude below the LOAEL, i.e. that whilst noise may just be heard during otherwise quiet periods, it would not be perceived as intrusive, and would not cause any change in behaviour, attitude or other physiological response, or adversely affect quality of life.
- 5.14 On the basis of the above, significant adverse noise impacts on health and the quality of life would be avoided and the amenity of NSRs would not be compromised. As such, no further mitigation measures, for example louvred barriers or similar, would be required.
- 5.15 Consequently, from a noise perspective, the proposal as currently considered would be compliant with National Planning policy (the NPSE and the NPPF) and MCC Planning Policy and ENS.

Internal Noise Level Assessment

- 5.16 With reference to Table 2.2, indoor ambient noise levels within hotel bedrooms should ideally be below 40 and 35 dB $L_{Aeq,1h}$ during the daytime and night-time periods respectively, with night-time maximum noise levels not normally exceeding 55 dB L_{AFmax} .
- 5.17 With reference to Table 3.2, indoor ambient noise levels within a room of Royal Buildings, overlooking Piccadilly Gardens, where external noise levels are highest, have been measured to be 37 and 32 dB $L_{Aeq,T}$ during the daytime and night-time periods respectively, with maximum noise levels not normally exceeding 51 dB L_{AFmax} .
- 5.18 On the basis of the above, the current façade design of Royal Buildings allows for appropriate internal noise levels for hotel use, with the existing façade providing a level of attenuation at least 3 dB better than that required. As such, no improvement works would be required.
- 5.19 With reference to paragraph 3.17, external noise levels outside rooms located away from Piccadilly Gardens, but otherwise slightly affected by operation of the ground floor fast-food restaurant, are lower than those that overlook Piccadilly Gardens. Consequently, the existing façade would also

allow for appropriate internal noise levels for hotel use and operation of the ground floor fast-food restaurant would not impact the proposed use.

- 5.20 With reference to Table 3.3, the level difference between the external and internal noise is 33 dB. On this basis, should any modifications be made to the existing facades, such as installation of through wall/window ventilation, the façade should be designed to attenuate external noise by at least 30 dB. This would still allow for internal noise levels to not exceed the guideline levels for hotel bedrooms.
- 5.21 For example, if through wall/window passive ventilation was installed, this should be specified to provide an attenuation of at least 30 dB $D_{n,e,w} + C_{tr}$.

Noise Breakout Assessment

- 5.22 No significant noise sources will be installed and no significant noise generating activity will be undertaken inside the hotel. As such, noise breakout, potentially affecting neighbouring properties, would be negligible, particularly considering the substantial physical structure of the building.
- 5.23 Furthermore, given the relatively high ambient sound levels in the vicinity of the building (reflecting the city centre location), and low noise sensitivity of the neighbouring land uses (i.e. commercial premises and fast-food restaurants etc.), the risk for adverse impact associated with any noise breakout is further reduced.
- 5.24 Consequently, there is considered to be a very low risk for noise breakout from the proposed hotel to adversely affect the neighbouring land uses.

Assessment Summary

- 5.25 Noise emissions from fixed plant items would result in sound levels at least 15 dB below the background sound level at the nearest NSR locations at all times, and of a magnitude below the LOAEL. As such, no further mitigation measures, for example louvred barriers or similar, would be required.
- 5.26 The current façade design allows for appropriate internal noise levels for hotel use, with the existing façade providing a level of attenuation at least 3 dB better than required. Should any modifications be made to the existing facades, such as installation of through wall/window ventilation, the façade should be designed to attenuate external noise by at least 30 dB.
- 5.27 There is considered to be a very low risk for noise breakout from the proposed hotel to adversely affect the neighbouring land uses.

6 Uncertainty

- 6.1 In all assessments, it is good practice to consider uncertainty which can arise from a number of different aspects. There are degrees of uncertainty associated with: instrumentation used for surveying; measurement technique and the variables influencing the measurement results such as transmission path and weather conditions; source terms used for modelling; calculation uncertainty; assessment uncertainty; and the subjective response of residents to noise sources.
- 6.2 Uncertainty due to instrumentation has been significantly reduced with the introduction of more modern instrumentation and is reduced further by undertaking field calibration checks on sound level meters before and after each measurement period and that all instrumentation is within accepted laboratory calibration intervals.
- 6.3 Every effort has been made to reduce the uncertainty of the baseline sound level measurements. The 4-day duration of the baseline survey, over a weekend period, is considered to significantly reduce the uncertainty associated with the baseline sound levels. Based on professional judgement including substantial experience of acquiring and analysing baseline data for numerous sites in various locations, and a desk-based review of the site and surrounding area, it is considered that the baseline data acquired during the survey is typical of the area.
- 6.4 Calculation uncertainty and assessment uncertainty have been reduced by peer review of all baseline data, model input data, model results and assessment calculations, and by using the appropriate level of precision at each stage of the assessment calculations.
- 6.5 A quantitative assessment has been undertaken based on information provided by the project team for the proposed development and professional judgement based on recognised and accepted empirical calculation methodologies. Where assumptions have been made, these have been informed through assessment and visiting many similar facilities and have favoured a worst-case scenario, allowing for a reasonable and robust assessment.
- 6.6 With regards to subjective response, the noise standards adopted for the assessment will have been based upon the subjective response of the majority of the population or will be based upon the most likely response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective response which will vary dependent upon a wide range of factors.
- 6.7 All areas and potential consequences of uncertainty have been minimised at every stage of the assessment process. On the basis of the above, and in the context of subjective response, the effects of uncertainty on the assessment are considered minimal.

7 Summary & Conclusions

- 7.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by Criterion Capital to undertake a noise assessment in relation to a planning application for a proposed change of use of office to hotel accommodation for the upper floors of Royal Buildings, 2 Mosley Street, Manchester, within the administrative area of the Manchester City Council (MCC).
- 7.2 Noise emissions from fixed plant items would result in sound levels at least 15 dB below the background sound level at the nearest noise sensitive receptor locations at all times, and of a magnitude below the 'Lowest Observed Adverse Effect Level' (LOAEL). As such, no further mitigation measures, for example louvred barriers or similar, would be required.
- 7.3 The current façade design of Royal Buildings allows for appropriate internal noise levels for hotel use, with the existing façade providing a level of attenuation at least 3 dB better than required. As such, no improvement works would be required. Should any modifications be made to the existing facades, such as installation of through wall/window ventilation, the façade should be designed to attenuate external noise by at least 30 dB.
- 7.4 There is considered to be a very low risk for noise breakout from the proposed hotel to adversely affect the neighbouring land uses.
- 7.5 Consequently, from a noise perspective, the proposal would be compliant with both National Planning Policy (the 'National Planning Policy Framework') and MCC Planning Policy.

References

- 1 British Standards Institution. British Standard 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.
- 2 Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. Defra. 2010.
- 3 Ministry of Housing, Communities and Local Government. National Planning Policy Framework: HMSO. July 2021.
- 4 Department for Communities and Local Government. National Planning Practice Guidance
- 5 Manchester City Council. Manchester Core Strategy 2012-2027.
- 6 British Standards Institution. British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings'.
- 7 British Standards Institution. British Standard 7445-2:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use.
- 8 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

Appendices

Appendix A: BS 4142 Statements

Phil Evans: Director - Acoustics

BSc (Hons) Geology; MSc Acoustics, Vibration and Noise Control; Fellow of the Geological Society; Fellow of the Institute of Acoustics; Associate Member Acoustical Society of America

- A.1 Phil is a Director and leads the Savills Acoustics Team. He is a specialist in environmental acoustics and is active on a number of committees including the Association of Noise Consultants' Vibration Working Group; British Standards Institution (BSi) Committee GME/21/6/4 - BS 6472: Guide to Evaluation of Human Exposure to Vibration in Buildings; BSi Committee B/564/01 on BS 5228: Noise and Vibration Control on Construction and Open Sites which has now also revised and issued BS 8233:2014 Guidance on sound insulation and noise reduction in buildings. He has been a corporate Member of the Institute of Acoustics for over 20 years and is now a Fellow.
- A.2 Phil has over 30 years' experience in the project management of, and technical input to, environmental noise and vibration impact assessments for major developments. He is an expert in the industrial/commercial, transportation and construction sectors including the measurement, calculation, evaluation and mitigation of environmental noise and vibration. Phil has significant experience in the preparation and presentation of technical evidence and reports for public inquiries and planning applications. He is experienced in consultation and liaison with government departments, local authorities and other statutory bodies. He is an experienced expert witness. He has a Continuous Professional Development Record to support this competency and experience.
- A.3 Phil has been involved in many BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. He has given evidence at public inquiries where BS 4142 has been the primary assessment methodology. He is very familiar with the Standard and attended the joint ANC/BSi launch of the 2014 version of the Standard. On the basis of Phil's overall experience in acoustics combined with particular focus on BS 4142, he is deemed competent for BS 4142 assessments.
- A.4 For this project, Phil has taken on the role of Project Director and has been responsible for overseeing and delivering the project.

Peter Barling: Associate - Acoustics

BSc (Hons) Physics; PGDip Environmental Assessment and Management; Member of the Institute of Acoustics

- A.6 Peter is an Associate Consultant in Acoustics and environmental acoustics specialist with nine years' experience. He has a Degree in Physics and also has a Post Graduate Diploma in Environmental Assessment and Management. He has been a member of the Institute of Acoustics since 2013.
- A.7 Peter has project managed and undertaken noise assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; on-shore substations for off-shore windfarms; energy from waste facilities; manufacturing facilities; distribution centres; retail units; minerals extraction and exploration; solar farms; and petrol service filling stations. He has provided input into Environmental Impact Assessments (EIAs) and undertaken noise assessments to support planning applications and discharge planning conditions. He has a Continuous Professional Development (CPD) Record to support this competency and experience.
- A.8 Peter has undertaken BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. He is familiar with the Standard and has attended and participated in internal and external CPD training seminars regarding the revised 2014 version of the Standard. On the basis of Peter's overall experience in acoustics, combined with particular focus on BS 4142, he is deemed competent for BS 4142 assessments.
- A.9 Peter was responsible for undertaking the baseline acoustic survey and review of the assessment and report.

Harry Russell-Less: Senior Consultant - Acoustics

BSc (Hons) Music Technology and Audio Systems; Member of the Institute of Acoustics;

- A.10 Harry is a Senior Acoustic Consultant and noise specialist with 5 years' experience. He has been a member of the Institute of Acoustics since 2017.
- A.11 Within the past four years Harry has been involved in a significant number of BS 4142 assessments, from both fixed plant and more complex industrial sources. On the basis of Harry's overall experience in acoustics, combined with particular focus on BS 4142 and with the assistance of more experienced colleagues, he is deemed competent for BS 4142 assessments.
- A.12 For this project, Harry has been responsible for the assessment, undertaking the modelling and preparing the report, figures and appendices.

Appendix B: Baseline Data



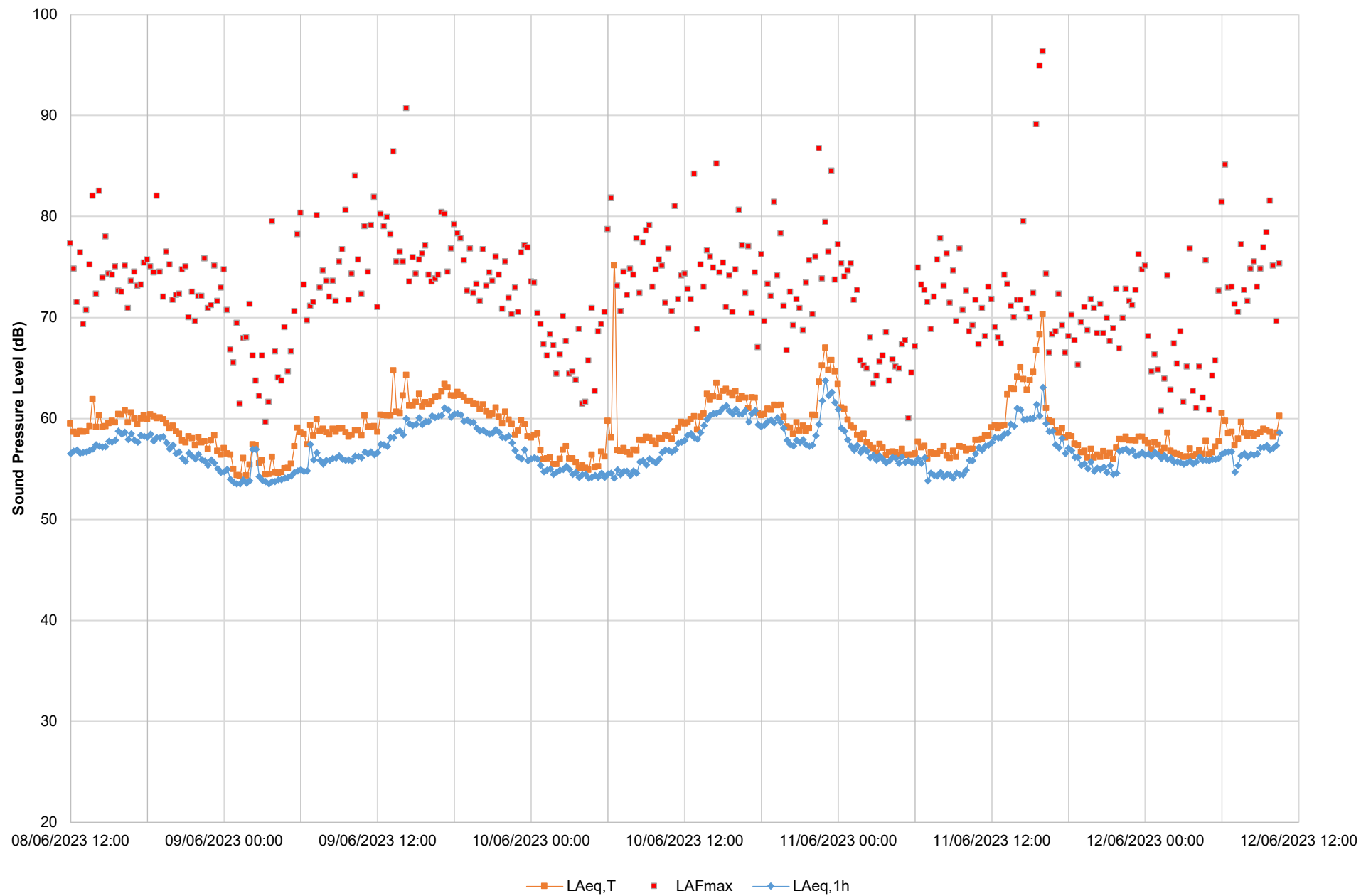
Sound Level Survey Record

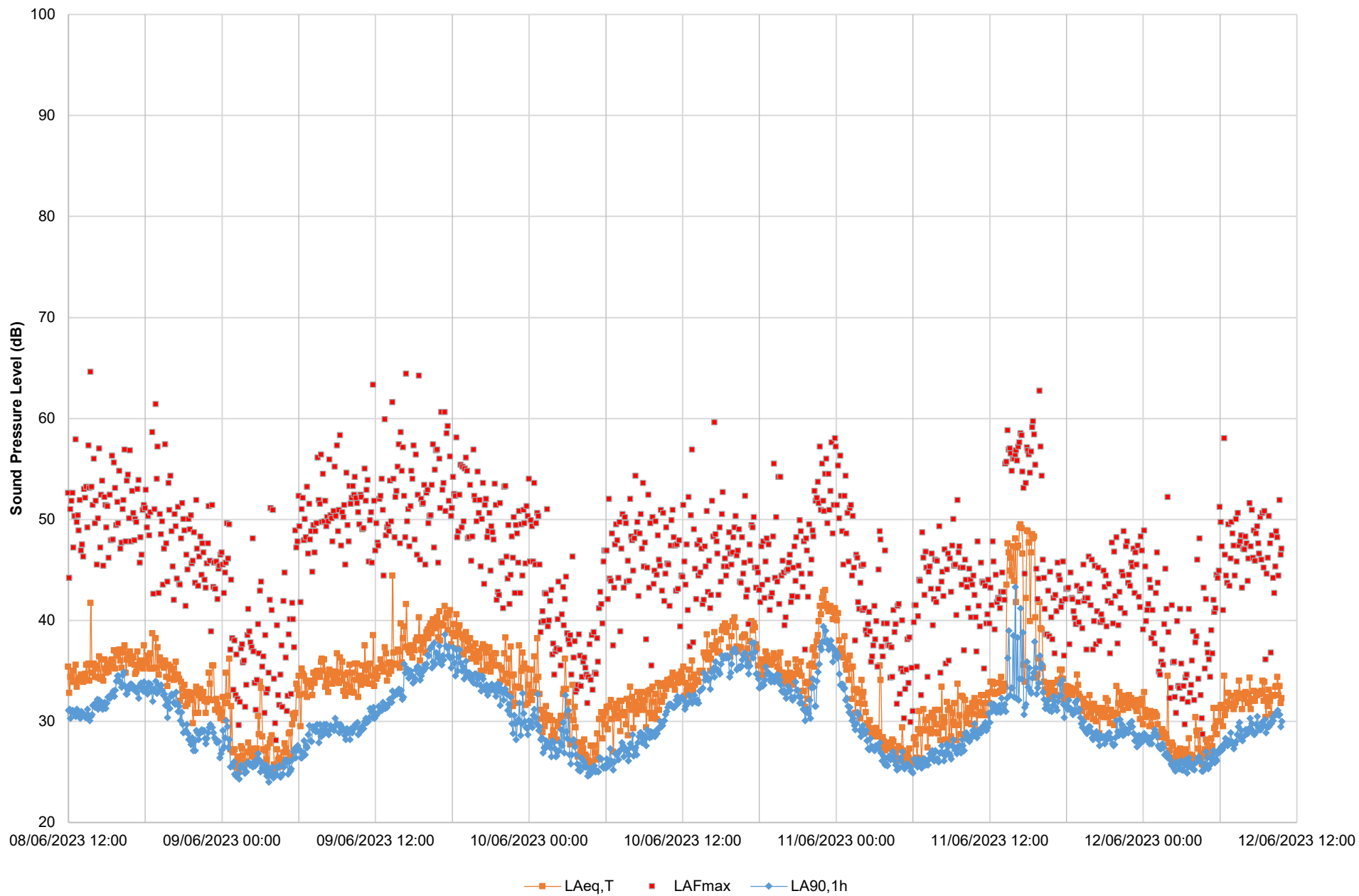
Project Name and Number		Royal Buildings	
Location		Roof	
Purpose of Monitoring		Baseline	
Relevant Guidance / Standard		BS 4142:2014	
Sound Measurement System			
ID	Manufacturer / Model	Serial Number	Last Lab Verification
-	NSRT Mk3 SLM	SLM1	27/12/2021
Microphone Height	Façade / Freefield	Measurement Interval	Filename
2.5	Freefield	125 ms	1
START		END	
Personnel		GR	
Date / time		08/06/2023 11:30	
Reference level		94.0	
Meter reading		94.0	
Photographs of Measurement Location			
Paste here			
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))			
Deployed on the roof of Royal Buildings in a location not directly overlooking roads or tramlines.			
Description of sound environment (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			
Tram movements on Piccadilly Gardens below (albeit screened by Royal Buildings), general city centre type noise and distant car horns. Noise associated with operation of kitchen extract plant from the ground floor fast-food restaurant was noted as being audible at this location, although it was not considered to be dominant or intrusive.			



Sound Level Survey Record

Project Name and Number		Royal Buildings	
Location		Inside	
Purpose of Monitoring		Baseline	
Relevant Guidance / Standard		BS 4142:2014	
Sound Measurement System			
ID	Manufacturer / Model	Serial Number	Last Lab Verification
-	Rion NL-52	SLM1	27/12/2021
Microphone Height	Façade / Freefield	Measurement Interval	Filename
1.5	Freefield	125 ms	1
START		END	
Personnel		GR	
Date / time		08/06/2023 11:00	
Reference level		94.0	
Meter reading		94.0	
Photographs of Measurement Location			
Paste here			
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))			
Deployed inside Royal Buildings (LT2), in an unoccupied room overlooking Piccadilly Gardens, where external ambient noise levels would be reasonably expected to be highest, due to the proximity of the road and tram lines.			
Description of sound environment (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			
Tram movements on Piccadilly Gardens below, general city centre type noise and distant car horns. Noise associated with operation of kitchen extract plant was not noted as being audible in this room, or other rooms closer to the extract ductwork itself. No sources of internal noise were noted.			





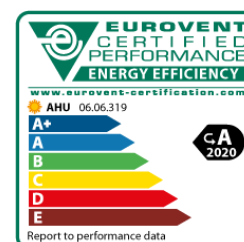
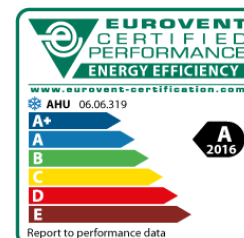
Appendix C: Plant Data

Project: Royal Buildings
Unit name: - Design data

Date: 08/06/2023
32 / 1.0.20230530.1100721
Unit ID: AD-10001465890

GOLD RX HC
Manufactured by Swegon, Kvänum, Sweden

Dimensioning data		
Unit size		060
Air density		1.200 kg/m ³
Supply air flow		4.500 m ³ /s
Static pressure drop	Outdoor air duct	50 Pa
	Supply air duct	250 Pa
Extract air flow		4.500 m ³ /s
Static pressure drop	Extract air duct	250 Pa
	Exhaust air duct	50 Pa
Climate data		Kvänum, Sweden
Weather station, reference		HALLUM, Sweden
Design outdoor temperature, summer		24.6 °C
Design outdoor humidity, summer		59 %
Design outdoor temperature, winter		-16.9 °C
Design outdoor humidity, winter		98 %
Supply air temperature, summer		17.0 °C
Supply air temperature, winter		20.9 °C



Key Performance Data		
Specific fan power SFPv	With clean filter and including effect of OACF & EATR	2.22 kW/(m ³ /s)
Dry temperature efficiency of supply air, winter		82.0 %
Eurovent Energy Efficiency Class	Summer: A cA 2020	Winter: A 2016
Eurovent; Fs_Pref:	Summer: 0.89	Winter: 0.89
ErP Commission Regulation (EU) No 1253/2014		Compliant 2018

Project: Royal Buildings
Unit name: - Design data

Date: 08/06/2023
32 / 1.0.20230530.1100721
Unit ID: AD-10001465890

Casing	
Construction	Frameless, double skinned panels with mineral wool insulation
Panels	52mm thick with 1mm thick steel sheet inside and out. Outer sheet with grey painted finish
Thermal insulation class	T2
Thermal bridging class	TB2
Casing leakage class	L1(M) / L2(R) according to EN 1886:2007 at -400 Pa and +700 Pa
Casing strength	D1(M)
Hygiene	Compliant with the requirements of VDI 6022

Electrical connections	
RX	3-phase, 5-wire, 400 V-10/+15%, 50 Hz, 32 A
RX/HC	3-phase, 5-wire, 400 V±10%, 50 Hz, 63 A

Functional sections viewed in the direction of air flow	Velocity m/s	Air Temperature in/out Winter °C	Air Temperature in/out Summer °C	Cooling power, summer kW	Design Pressure drop Pa	Noise Level dB(A)
Outdoor air duct					-50	66
End section					-8	
Silencer	2.10				-23	
Filter	1.78				-118	
Rotary heat exchanger	2.81	-16.9/15.0	24.6/24.6		-192	
Coil RX/HC	2.04	15.0/20.0	24.6/16.0		-31	
Fan				5.230	701	
Silencer	2.00				-21	
End section					-8	
Supply air duct					-250	75
Extract air duct					-250	67
End section					-7	
Silencer	2.00				-21	
Filter	1.70				-64	
Rotary heat exchanger	2.81	22.0/-10.3	25.0/25.0		-202	
Extra pressure drop					-31	
Coil RX/HC	2.07	-10.3/-12.7	25.0/38.8		-50	
Fan				5.510	707	
Silencer	2.10				-23	
End section					-9	
Exhaust air duct					-50	76

Sound power to duct, measured according to ISO 5136
Noise reduction for function section included to duct.
Sound power emitted to surroundings, measured according to ISO 3741

Project: Royal Buildings
Unit name: - Design data

Date: 08/06/2023
32 / 1.0.20230530.1100721
Unit ID: AD-10001465890

Frequency band	63	125	250	500	1k	2k	4k	8k	All		
To supply air duct	81	72	65	68	65	69	69	70	dB	75	dB(A)
To outdoor air duct	80	74	68	60	54	56	55	57	dB	66	dB(A)
To extract air duct	81	75	69	60	54	57	59	62	dB	67	dB(A)
To exhaust air duct	81	72	65	68	65	69	69	70	dB	76	dB(A)
To surroundings	76	68	61	65	50	49	46	49	dB	65	dB(A)

QAHV

Monobloc Air Source Heat Pump

ecodan[®]
Renewable Heating Technology

A Highly Efficient, Carbon Saving Solution for Commercial Sanitary Hot Water Production



QAHV Monobloc Air Source Heat Pump

Specifically designed for commercial sanitary hot water application, where gas boilers, combined heat and power systems (CHP) or electric water heating have been traditionally utilised, the QAHV provides a low carbon solution for hospitals, hotels, leisure centres and student accommodation.

Utilising the natural and stable refrigerant CO₂ (R744), the environmentally clean solution enables compliance to strict local planning laws and boosts BREEAM points. Compounded by the increasing decarbonisation of the electrical grid and the UK's commitment to Net Zero 2050, the QAHV provides a high efficiency, low carbon hot water delivery solution with leaving water temperature up to 90°C.



High efficiency
at high flow
temperatures



Utilises CO₂
refrigerant with
a GWP of 1



Uses a unique twisted
and spiral gas cooler
to enhance energy
efficiency



Full heating capacity
down to -3°C outdoor
temperature and
operates down to -25°C



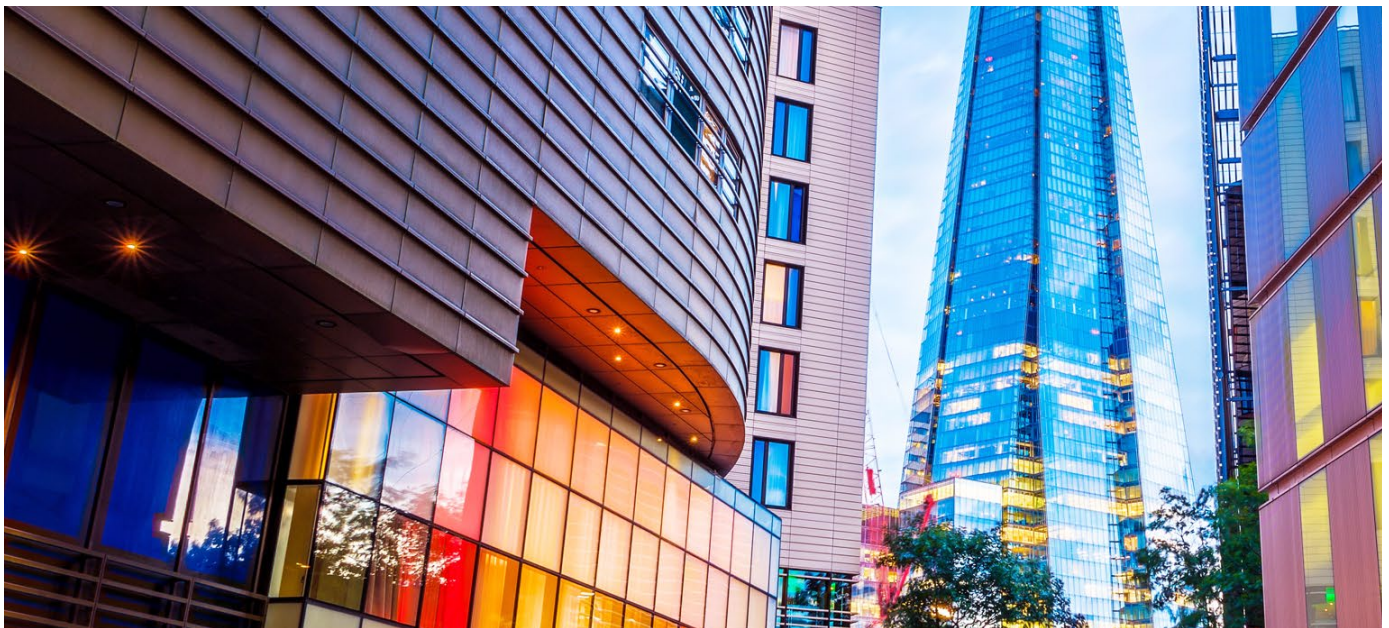
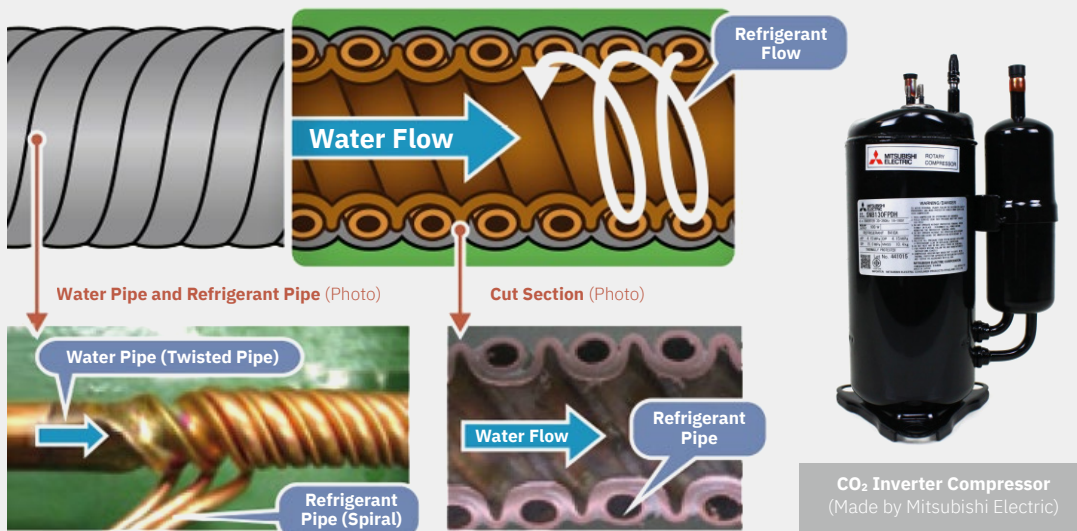
Super low
noise levels



Patented Technology

QAHV utilises a unique twisted and spiral gas cooler, the 3 connected refrigerant pipes are wound around the twisted water pipe which maximizes heat transfer.

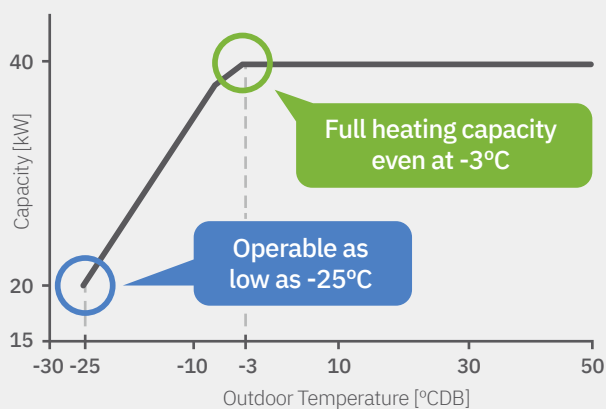
The continuous spiral grooves in the twisted pipe accelerates the turbulence effect of water and also helps to reduce pressure loss within the heat exchanger which contribute to enhance efficiency. Equipped with the latest inverter scroll compressor, QAHV can significantly increase the annual efficiency.



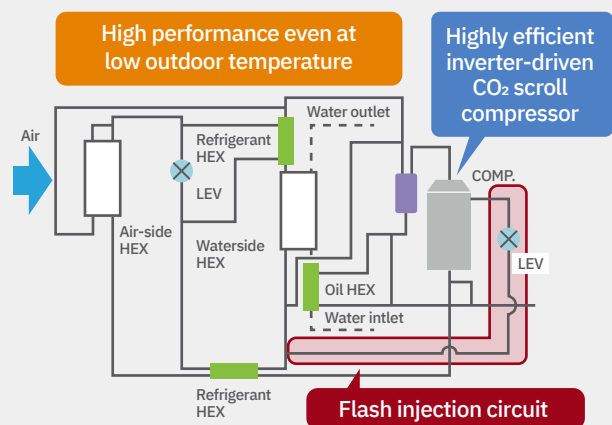
High Performance

High efficiency levels provide significant savings in running costs and carbon emissions against direct electric heating systems.

QAHV is able to provide full heating capacity even at ambient temperatures of -3°C . Furthermore, the unit can supply hot water in ambient temperatures as low as -25°C .



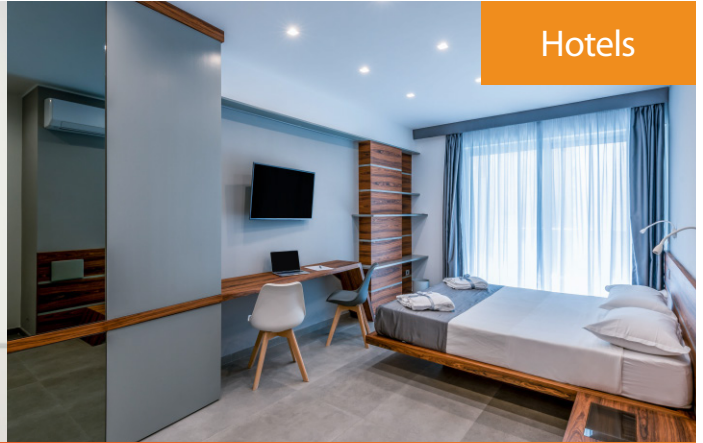
The technology behind this is an injection circuit which provides optimum amount of refrigerant to the system via a compressor through a specially designed injection port to ensure a particularly stable operation.



Healthcare



Hotels



QAHV is ideal for applications with demand for
Low Carbon High Temperature Hot Water

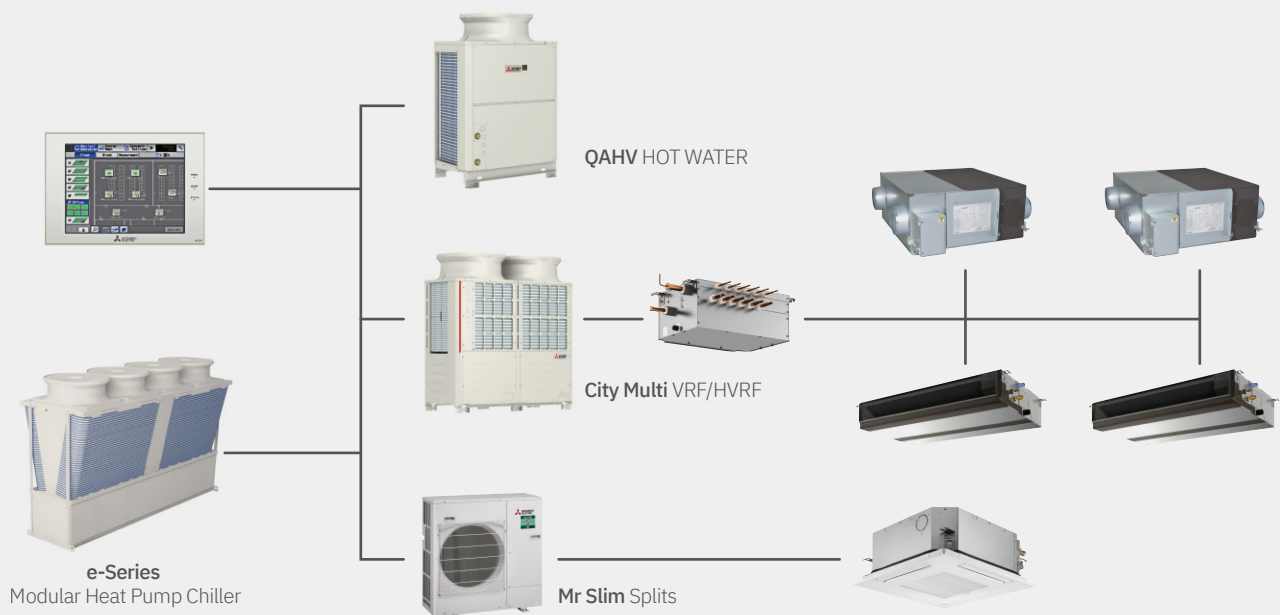
Leisure



Student Accommodation



With an M-NET ready connection, the QAHV solution can be controlled alongside Mitsubishi Electric's City Multi, Mr Slim, e-Series Chillers and others.





OUTDOOR UNIT		QAHV-N560YA-HPB	
WATER HEATING 65°C ¹	CAPACITY (kW)	40	
	POWER INPUT (kW)	10.31	
	CURRENT INPUT (A)	16.3	
	COP	3.88	
WATER HEATING 65°C ²	CAPACITY (kW)	40	
	POWER INPUT (kW)	10.97	
	CURRENT INPUT (A)	18.3	
	COP	3.65	
WATER HEATING 65°C ³	CAPACITY (kW)	40	
	POWER INPUT (kW)	11.6	
	CURRENT INPUT (A)	18.7	
	COP	3.44	
WATER HEATING ENERGY EFFICIENCY CLASS	FOR MEDIUM TEMPERATURE APPLICATION	A	
	INLET WATER TEMPERATURE (°C)	5 ~ 63	
	OUTLET WATER TEMPERATURE (°C)	55 ~ 90	
	OUTDOOR TEMPERATURE (°C)	-25 ~ -43	
ELECTRICAL	MAX CURRENT INPUT (A)	33.8	
	ELECTRICAL SUPPLY (V / Hz)	380-415v, 50Hz	
	PHASE	3	
	FUSE RATING - MCB SIZES (A) ⁵	40	
WATER DETAIL	INLET / OUTLET (mm (in.))	19.05 (Rc 3/4"), screw pipe / 19.05 (Rc 3/4"), screw pipe	
	ALLOWABLE EXTERNAL PUMP HEAD (kPa)	77	
DIMENSIONS (mm)	WIDTH	1220	
	DEPTH	760	
	HEIGHT	1837 (1777 without legs)	
WEIGHT (kg)		400	
NOISE LEVEL	SOUND PRESSURE ⁴ (dB(A))	56	
REFRIGERANT	TYPE	R744 (GWP 1)	
	REFRIGERANT CHARGE (kg) / CO ₂ EQUIVALENT (t)	6.5 / 0.0065	

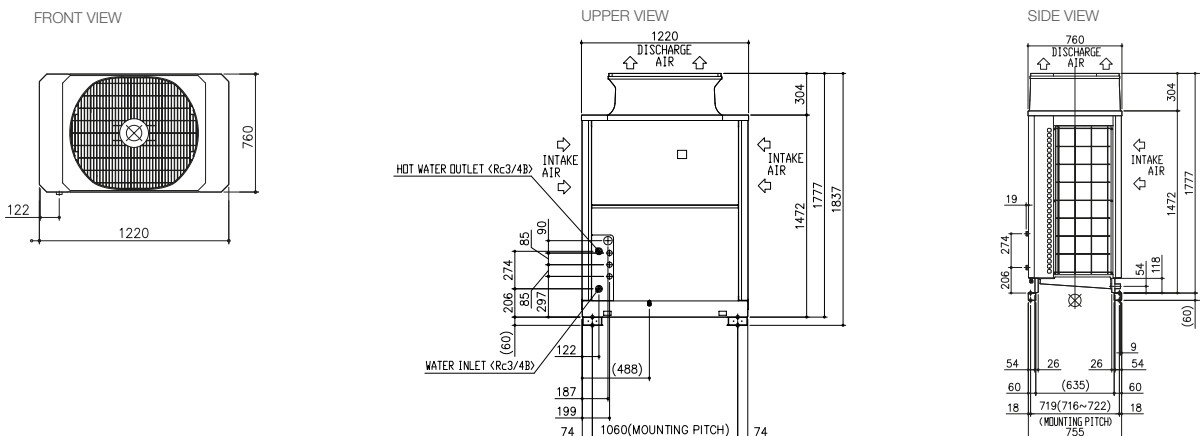
Notes: *1 Under Normal heating conditions at the outdoor temp, 16°CDB/12°CWB, the outlet water temperature 65°C, and the inlet water temperature 17°C.

*2 Under Normal heating conditions at the outdoor temp, 7°CDB/6°CWB, the outlet water temperature 65°C, and the inlet water temperature 9°C.

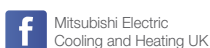
*3 Under Normal heating conditions at the outdoor temp, 7°CDB/6°CWB, the outlet water temperature 65°C, and the inlet water temperature 15°C.

*4 Measured 1m from the front of the unit in an anechoic room. *5 MCB Sizes BS EN60898-2 & BS EN60947-2

QAHV-N560YA-HPB DIMENSIONS



Telephone: 01707 282880
email: air.conditioning@meuk.mee.co.uk
les.mitsubishielectric.co.uk



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IRELAND Mitsubishi Electric Europe, Westgate Business Park, Ballymount, Dublin 24, Ireland. Telephone: (01) 419 8800 Fax: (01) 419 8890 International code: (003531)

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Notes: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774) or R134a (GWP:1430). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of May 2020



Air Conditioning

Product Information

R32 HVRF R2 Series Standard (22.4-56kW)
Simultaneous Heating and Cooling
with Heat Recovery Outdoor Unit

Making a
World of
Difference

CITY MULTI



Throughout the year, many buildings require cooling in some areas and heating in others - even in adjacent rooms. The outstanding City Multi R2 system meets these requirements by distributing surplus heat from cooling operations (and vice versa) to rooms where it is needed. This efficiency can result in energy savings up to 30% over conventional systems.

Key Features

- Highest specification, highest efficiency heat recovery system available
- Delivers the highest levels of comfort, both thermally and acoustically
- Flexible design, installation and maintenance

R32 | HybridVRF



Cooling | Heating | Ventilation | Controls

Air Conditioning

R32

Product Information

R32 HVRF R2 Series Standard (22.4-56kW)
Simultaneous Heating and Cooling
with Heat Recovery Outdoor Unit

Making a
World of
Difference



OUTDOOR UNITS		PURY-M200YNW-A1	PURY-M250YNW-A1	PURY-M300YNW-A1	PURY-M300YNW-A1 X 2HBC	PURY-M350YNW-A1	PURY-M350YNW-A1 X 2HBC	PURY-M400YNW-A1	PURY-M450YNW-A1	PURY-M500YNW-A1
CAPACITY (kW)	Heating (nominal)	25.0	31.5	37.5	37.5	45.0	45.0	45.0	56.0	58.0
	Cooling (nominal)	22.4	28.0	33.5	33.5	40.0	40.0	45.0	50.0	56.0
	High Performance Heating (UK)	25.0	31.5	37.5	37.5	42.8	42.8	42.8	50.4	52.2
	COP Priority Heating (UK)	22.8	28.7	32.3	32.3	38.7	38.7	38.7	49.3	51.0
	Cooling (UK)	20.1	25.1	30.0	30.0	35.8	35.8	40.3	44.8	50.1
POWER INPUT (kW)	Heating (nominal)	6.39	9.15	11.00	10.33	13.14	12.16	14.08	16.18	18.26
	Cooling (nominal)	5.53	8.40	11.65	9.88	14.93	12.15	15.15	15.47	22.25
	High Performance Heating (UK)	7.73	11.07	15.07	14.15	18.00	16.66	16.33	18.77	21.18
	COP Priority Heating (UK)	6.39	9.15	11.00	10.33	13.14	12.16	13.66	15.69	17.71
	Cooling (UK)	3.21	4.87	6.76	5.73	8.66	7.05	9.85	10.06	14.46
COP / EER (nominal)		3.91 / 4.05	3.44 / 3.33	3.40 / 2.87	3.63 / 3.39	3.42 / 2.67	3.70 / 3.29	3.55 / 2.97	3.46 / 3.23	3.45 / 2.51
SCOP / SEER ¹		-	-	-	-	-	-	-	-	-
MAX No. OF CONNECTABLE INDOOR UNITS		30	37	45	45	35	35	40	45	50
MAX CONNECTABLE CAPACITY		50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity	50-150% OU Capacity
AIRFLOW (m³/min)		170	185	240	240	250	250	315	315	295
PIPE SIZE mm (in)	Gas	19.05 (3/4")	22.2 (7/8")	22.2 (7/8")	22.2 (7/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")
	Liquid	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	19.05 (3/4")	19.05 (3/4")	19.05 (3/4")
SOUND PRESSURE LEVEL (dBA) Heating / Cooling		59.0 / 59.0	61.0 / 60.5	67.0 / 61.0	67.0 / 61.0	64.0 / 62.5	64.0 / 62.5	69.0 / 65.0	70.0 / 65.5	64.5 / 63.5
SOUND POWER LEVEL (dBA) Heating / Cooling		78.0 / 76.0	80.0 / 78.5	86.5 / 80.0	86.5 / 80.0	83.0 / 81.0	83.0 / 81.0	88.0 / 83.0	89.0 / 83.0	84.0 / 82.0
WEIGHT (kg)		227	227	227	227	270	270	273	293	337
DIMENSIONS (mm)	Width	920	920	920	920	1240	1240	1240	1240	1750
	Depth	740	740	740	740	740	740	740	740	740
	Height	1858	1858	1858	1858	1858	1858	1858	1858	1858
(1798mm without legs)										
ELECTRICAL SUPPLY ¹		380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz
PHASE ¹		Three	Three	Three	Three	Three	Three	Three	Three	Three
STARTING CURRENT (A) ¹		8	8	8	8	8	8	8	8	8
NOMINAL SYSTEM RUNNING CURRENT (A) ¹ Heating / Cooling [MAX]		10.2 / 8.8 [16.1]	14.6 / 13.4 [22.5]	17.6 / 18.6 [25.6]	16.5 / 15.8 [25.6]	21.0 / 23.9 [31.6]	19.5 / 19.4 [31.6]	22.5 / 24.2 [39.3]	25.9 / 24.8 [40.2]	29.2 / 35.6 [56.6]
GUARANTEED OPERATING RANGE (°C) Heating / Cooling		-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52	-20~-15.5 / -5~-52
FUSE RATING (MCB sizes BS EN 60947-2) - (A) ¹		1 x 20	1 x 25	1 x 32	1 x 32	1 x 32	1 x 32	1 x 40	1 x 50	1 x 63
MAINS CABLE No. Cores ¹		4	4	4	4	4	4	4	4	4
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) R32 (GWP 675)		5.2 / 3.5	5.2 / 3.5	5.2 / 3.5	5.2 / 3.5	8 / 5.4	8 / 5.4	8 / 5.4	10.8 / 7.3	10.8 / 7.3
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) R32 (GWP 675)		13.5 / 9.1	13.5 / 9.1	15.5 / 10.5	15.5 / 10.5	15.5 / 10.5	15.5 / 10.5	19.5 / 13.2	19.5 / 13.2	19.5 / 13.2

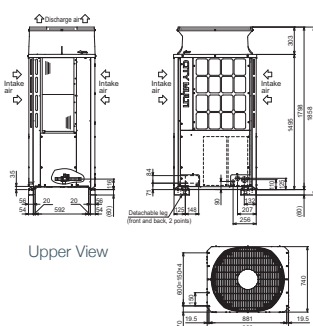
Notes: *SEER/SCOP available separately in the 'City Multi VRF Seasonal Efficiency' document. Based on Ecodesign Lot 21/6 to EN14825 standard. *1 A separate power supply is required for each module. Where more than one figure is quoted there are multiple modules. Specification subject to change. R410A equivalent systems are also available - please contact your local sales office for further information.

PRODUCT DIMENSIONS

PURY-EM200/250/300YNW-A1

Side View

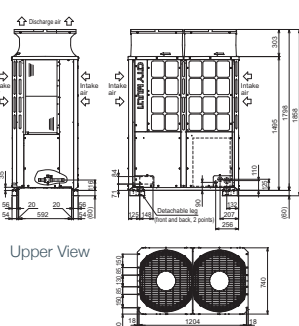
Front View



PURY-EM350/400/450YNW-A1

Side View

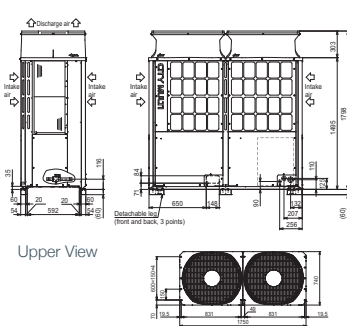
Front View



PURY-EM500YNW-A1

Side View

Front View



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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774) or R134a (GWP:1430). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows: R410A (GWP:1975), R32 (GWP: 550), R407C (GWP:1650) or R134a (GWP:1300).



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