



GMI CONSTRUCTION GROUP CHURCH INN STUDENT ACCOMMODATION

PLANNING NOISE REVIEW

R1964-REP04A-PC

24 March 2022

REPORT DETAILS

Project	Church Inn Student Accommodation, 84 Cambridge Street, Manchester
Client	GMI Construction Group Carvers Warehouse 77 Dale Street Manchester M1 2HG
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SUMMARY

Red Acoustics Ltd has been commissioned by GMI Construction Group to provide an assessment of mechanical services plant that will serve a new student residential development at Church Inn, Cambridge Street, Manchester.

This report presents the result of a CadnaA 3D noise propagation model to predict the impact of noise from the proposed installation of mechanical extraction systems and air handling/air conditioning equipment serving the new student residential development to the nearest noise sensitive residential dwellings which lie adjacent to the development.

This report makes use of, and reference to a previously undertaken noise impact assessment for the site on behalf of the client; Cundall - Noise Assessment Report, REF: 1014452-RPT-AS-002 dated 19 February 2021. This information has been provided to Red Acoustics by the client for the purpose of assessing noise impact for the proposed plant items against previously measured background noise data and subsequently determined plant noise targets.

An assessment of the impact from noise generating air handling plant at the Church Street student accommodation development has been undertaken. Based on the manufacturer's noise data for each plant item and associated noise attenuators, the assessment has concluded that the predicted noise level with all plant running simultaneously and a intermittency penalty applied in accordance with the guidance in BS4142:2019 will be 6dBA or greater below the measured background noise level at the site.

The report also provides a review of the proposed glazing and ventilation scheme for compliance with the approved scheme in accordance with Planning Condition 18.

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1.0 INTRODUCTION

Red Acoustics Ltd has been commissioned by GMI Construction Group to provide an assessment of mechanical services plant that will serve a new student residential development at Church Inn, Cambridge Street, Manchester.

This report presents the result of a CadnaA 3D noise propagation model to predict the impact of noise on the nearest noise sensitive residential receptors to the development from the proposed installation of mechanical extraction systems and air handling/air conditioning equipment serving the development.

The report also provides a review of the proposed glazing and ventilation scheme for compliance with the approved scheme in accordance with Planning Condition 18.

Related Planning Conditions - Manchester City Council

The planning permission application number:125654/FO/2019 makes reference to conditions relating to noise impacting the site and environment for the development. These are as follows:

18) The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

Reason - To secure a reduction in noise from Cambridge Street; in order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.

19) Prior to occupation of the development a scheme for the acoustic insulation of any externally mounted ancillary equipment to ensure that it achieves a background noise level of 5dB below the existing background (La90) in each octave band at the nearest noise sensitive location shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment. The approved scheme shall be implemented prior to occupancy and shall remain operational thereafter.

Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.

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Non-material amendments to planning permission reference 125654/FO/2019 to enable the inclusion of 2 louvre vents on each upper floor is as follows:

2) The noise from the louvres shall be within the limits set out in the noise report associated with planning permission 125654/FO/2019. Prior to occupation a verification report shall be submitted to and approved in writing by the local planning authority confirming that works are in accordance with specified limits.

Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.

With reference to Condition 19 and non-material amendment Condition 2, the purpose of this assessment is to determine if the proposed plant items which are externally located and/or vent to the environment via louvres are likely to achieve compliance.

Red Acoustics has been commissioned to conduct the following assessment:

- Make use of the supplied planning stage noise impact assessment report and drawn information to predict and assess noise impact from the proposed mechanical extraction systems and air handling/air conditioning plant items serving the development.
- Review the proposed glazing and ventilation scheme for compliance with the approved scheme in accordance with Planning Condition 18.

The above elements have been undertaken and the results presented within this report.

2.0 DESCRIPTION OF THE SITE

The development site is currently the former The Church Inn public house which is located at 84 Cambridge Street, Manchester. The site is bounded by Cambridge Street to the north-east, and the existing five-storey Cambridge House and Manchester House apartment buildings to the north-west and south-east, respectively. To the south west of the development lie existing three-storey terraced houses accessed off Chervil Close and Cavendish Street.

The proposed development is to construct a nine storey student residential block comprising of 64 studio flats. Figure 2.1 below details the site location which is outlined in red.

Figure 2.1: Site Layout Plan



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The nearest residential properties to the proposed plant items are the residential properties which lie directly adjacent to the proposed development. Existing student residential properties at Cambridge House to the north of the site and Cambridge Hall to the west are located adjacent along Cambridge Street. Directly adjacent to site to the south lies the Manchester House student residential property which is located on the corner of Cambridge Street and Cavendish Street.

This assessment makes use of a CadnaA 3D noise propagation model to determine the impact of mechanical services noise from air handling equipment and ducted plant items to the nearest relevant residential facades.

3.0 DETAILS OF THE PROPOSED DEVELOPMENT

Layout

The proposed scheme comprises the construction of a nine storey residential development with student ancillary spaces located at ground floor level. The assessment of the plant items serving the ground floor ancillary spaces, upper residential floors and the roof level plant is based on the M&E drawings provided by the client. These are available upon request.

Fixed Plant Items

The fixed plant items considered within this assessment relate to the supply and extract air handling systems serving the ground floor ancillary spaces and the breakout spaces located on all residential floors. In addition, the ground floor laundry supply and extract together with toilet and cleaners store extract systems have been assessed. Through-wall extraction fan units serving each residential studio and roof mounted air source heat pumps and condenser units are also considered. Table 3.1 below details the plant items assessed and the associated noise data provided by the client. This includes details of relevant in-line silencers/attenuators.

In-duct sound power data could not be obtained from Daikin for both the ground floor office AHU and the break-out space AHU which will be located on each residential level. For this assessment the acoustic data for a similar sized and powered Mitsubishi unit was obtained and assessed in place of this.

Table 3.1: Plant Noise Data

Plant Description	Plant Item	Data Type	Octave Band Centre Frequency							
			63	125	250	500	1k	2k	4k	8k
Ground Floor										
Office In - HRU	Daikin VAM1000J	In Duct L _w dB	-	-	-	-	-	-	-	-
	Mitsubishi LGH-100RVX-E	In Duct L _w dB	67	66	61	64	58	59	54	43
Office In - HRU Attenuator	ATT/00/002	Insetion Loss dB	2	3	7	18	25	19	17	13
Office Out - HRU	Daikin VAM1000J	In Duct L _w dB	-	-	-	-	-	-	-	-
	Mitsubishi LGH-100RVX-E	In Duct L _w dB	67	66	61	64	58	59	54	43
Office Out - HRU Attenuator	ATT/00/001	Insetion Loss dB	2	3	7	18	25	19	17	13
Cleaners Out	Vent Axia MVDC_MS	In Duct L _w dB	63	53	50	46	39	35	36	29
Toilet Out	Vent Axia MVDC_MS	In Duct L _w dB	63	53	50	46	39	35	36	29
Laundry In	Elta Jetflow SJMF200	In Duct L _w dB	46	46	56	53	56	57	53	50
Laundry In Attenuator	ATT/00/010	Insetion Loss dB	1	3	7	19	28	23	20	15
Laundry Out	Elta Jetflow SJMF200	In Duct L _w dB	46	46	56	53	56	57	53	50
Laundry Out Attenuator	ATT/00/009	Insetion Loss dB	1	3	7	19	28	23	20	15
Floor Levels 1 to 8										
Breakout Space In - HRU	Daikin VAM350J	In Duct L _w dB	-	-	-	-	-	-	-	-
	Mitsubishi LGH-35RVX-E	In Duct L _w dB	52	57	51	48	46	42	36	26
Breakout Space In - HRU Attenuator	ATT/00/003	Insetion Loss dB	9	13	20	28	33	30	24	16

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Plant Description	Plant Item	Data Type	Octave Band Centre Frequency							
			63	125	250	500	1k	2k	4k	8k
Breakout Space Out - HRU	Daikin VAM350J	In Duct L_w dB	-	-	-	-	-	-	-	-
	Mitsubishi LGH-35RVX-E	In Duct L_w dB	52	57	51	48	46	42	36	26
Breakout Space Out - HRU At- tenuator	ATT/00/003	Insetion Loss dB	9	13	20	28	33	30	24	16
Studio Extract	Vent Axia MVDC_MS	In Duct L_w dB	50.3	40.4	40.0	33.7	28.1	21.6	18.0	23.0
Rooftop										
Air Heat Source Pump 01	Daikin EMRQ12AB	Sound Power L_w dB	-	88	82	79	73	68	62	55
Air Heat Source Pump 02	Daikin EMRQ12AB	Sound Power L_w dB	-	88	82	79	73	68	62	55
Condensing Unit 3	Daikin RZAG50A	Sound Pressure @1m L_p dB	50	53	52	48	43	37	33	29

4.0 PROPOSED DESIGN CRITERION - PLANT NOISE

Planning Condition 19 for the approved development provides project specific design criteria for noise and is repeated below:

19) Prior to occupation of the development a scheme for the acoustic insulation of any externally mounted ancillary equipment to ensure that it achieves a background noise level of 5dB below the existing background (La90) in each octave band at the nearest noise sensitive location shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment. The approved scheme shall be implemented prior to occupancy and shall remain operational thereafter.

The condition refers to the guidance in BS4142:2019 and all noise from M&E equipment venting to the environment, as detailed in Table 3.1 above should cumulatively meet a target Rating Level of 5dBA below the background level as measured on site.

This report makes use of, and reference to a previously undertaken noise impact assessment for the site on behalf of the client; Cundall - Noise Assessment Report, REF: 1014452-RPT-AS-002 dated 19 February 2021. This information has been provided to Red Acoustics by the client for the purpose of assessing noise impact for the proposed plant items against previously measured background noise data and subsequently determined plant noise rating levels. Table 4.1 below summaries the existing background noise levels measured on site along with the limiting plant noise rating level (5dB below background), when measured 1m from the nearest noise sensitive receptor, as detailed in the Cundall's Noise Assessment Report.

Table 4.1: Measured Background Noise Levels & Associated Plant Noise Rating Levels

Time Period	Existing background noise level - L_{A90} (dB)	Plant noise rating level not to be exceeded at 1 m from nearest noise-sensitive receptor - $L_{Ar,Tr}$ (dB)
Daytime (07:00 - 23:00)	60	55
Night-time (23:00 - 07:00)	46	41

The above limit is applicable to the cumulative noise level from all new items of plant when running under normal operation. Where applicable, acoustic feature corrections should be applied to the specific plant noise level to account for any distinguishable acoustic characteristics (e.g. tonality, impulsivity, intermittency).

5.0 CADNAA NOISE PROPAGATION MODEL & PLANT NOISE IMPACT ASSESSMENT

CadnaA noise propagation modelling software has been used to predict the level of noise egress from the proposed plant items serving the development. The software implements the ISO 9613-2 prediction methodology and is considered to be the industry standard software to predict environmental noise propagation.

The building and its surroundings are modelled from drawn details provided by the client, google earth imagery as well as terrain data from DEFRA. Each plant item is modelled as a point source with the relevant plant noise source data, taking into consideration any losses due to in-line attenuators and duct losses. The model is then used to predict the resultant noise incident on the nearest noise sensitive residential facades. Two orders of reflection are set within the model and the ground absorption is set to 0.1 to account for mostly reflective, hard ground with some soft ground.

Plant Noise Assessment - Planning Condition 19 & Amendment Condition 2

The assessment for plant noise is presented with the relevant plant types all running simultaneously and taking into account attenuation due to distance and barriers. For the purpose of the prediction, the individual noise sources are inputted from the noise source data presented in Table 3.1 above. Attenuation for duct losses and bends is calculated for the relevant items using Sound Design 2 calculation software.

The assessment is based on a comparison of the the predicted $L_{Aeq,t}$ levels from CadnaA at the nearest residential noise sensitive facades and the proposed design criteria discussed in Section 4.0 above.

Figure 5.1 below shows a 3D view of the noise model created for the assessment.

Figure 5.2 shows the prediction of broadband, A-weighted noise impact onto the nearest noise sensitive residential facades with all plant running simultaneously and details the maximum dBA level impacting the individual facades.

Figure 5.1: CadnaA 3D Model View

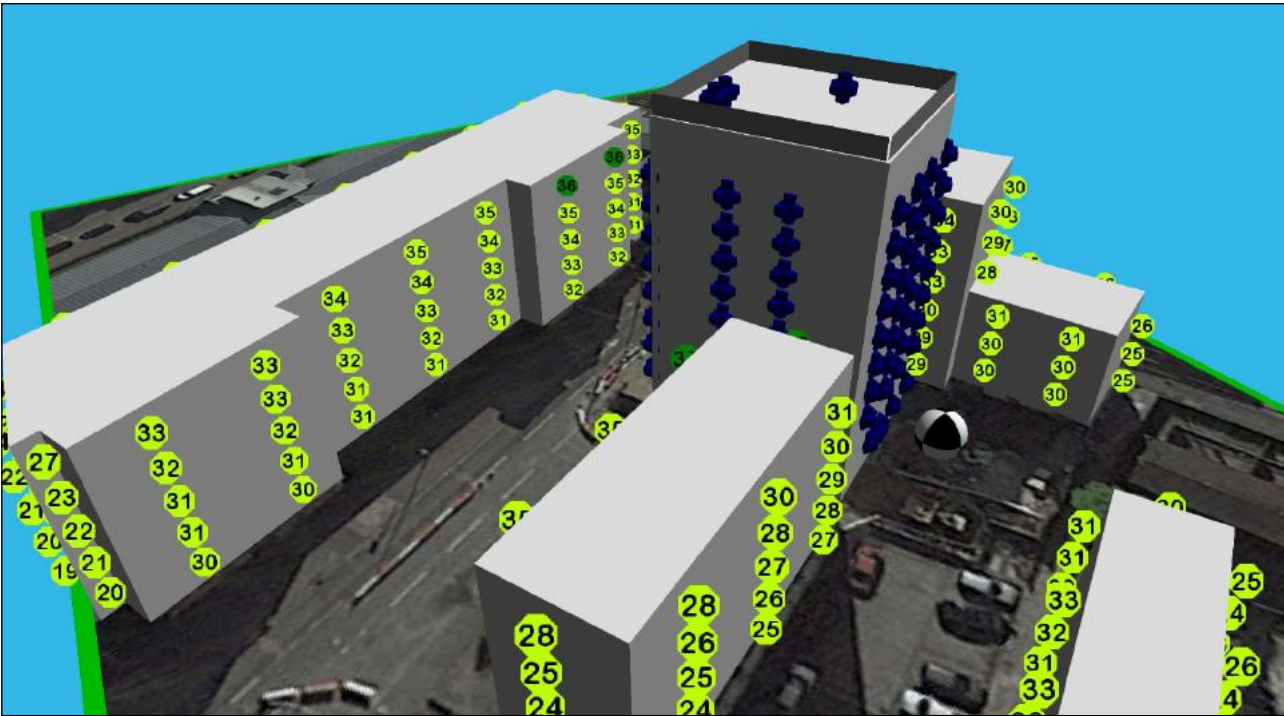
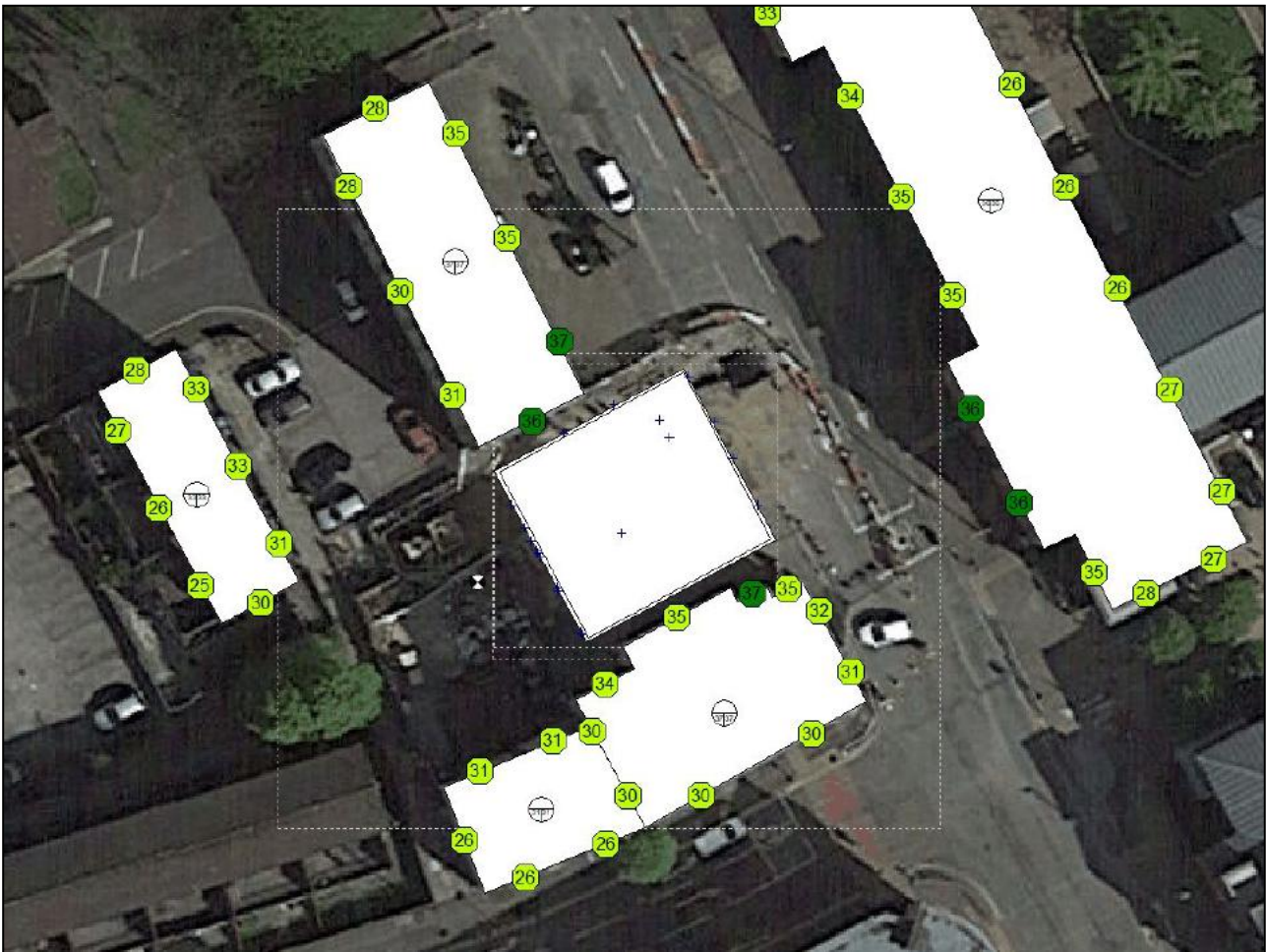


Figure 5.2: Residential Facades Plant Noise Impact $L_{Aeq,t}$ 

It can be seen in Figure 5.2 above that the highest predicted noise impacting the nearest noise sensitive residential facade with all plant items running simultaneously is 37dBA.

In accordance with the guidance in BS4142:2019, where appropriate, a rating penalty can be applied to the specific noise level to account for the character of the noise, namely: tonality, impulsivity and intermittency. From the obtained mechanical services plant acoustic data and subsequent Sound Design calculations, the resultant sound levels impacting the environment from the facade louvers or externally mounted rooftop plant show no tonal or impulsive characteristics.

An appropriate penalty for plant noise intermittency (+3dB penalty) will be applied due to the possible low level irregular change specific noise levels from study bedroom mechanical services plant.

BS4142:2019 Assessment

The BS4142 assessment assumes all mechanical services plant will be operating simultaneously for both the daytime and night-time period. Table 5.1 below presents the BS4142 assessment based on impact at the most affected noise sensitive facade.

Table 5.1: BS4142 Assessment Periods - Most Affected Noise Sensitive Property Facade

	Daytime Period	Night Time Period
Specific Noise Level (Predicted)	37dB	37dB
Corrections	Where intermittency is present, a +3dB penalty can be applied. Where the acoustic feature characteristics are neither tonal nor impulsive, but are clearly distinguishable against the residual noise, a +3dB penalty can be applied	Where intermittency is present, a +3dB penalty can be applied. Where the acoustic feature characteristics are neither tonal nor impulsive, but are clearly distinguishable against the residual noise, a +3dB penalty can be applied
Rating Level dB	40dB	40dB
Typical Background $L_{A90,t}$	60dB	46dB
Difference	-20dB	-6dB
Conclusion	Low Impact	Low Impact

The planning stage noise impact assessment prepared by Cundall sets plant noise rating level targets, as detailed in Table 4.1 above. From the conducted assessment the predicted daytime & night time noise levels due to all plant serving the development continuously running is 40dBA with penalties at the most affected noise sensitive facade. This is 15dBA below the daytime target and 1dBA below the night-time target.

It must be noted that the night time predicted noise levels include ancillary mechanical plant which will in most instances only operate in the day. It should also be noted that a +3dBA blanket penalty for intermittency has been applied for the purpose of a robust assessment of impact, though at the levels predicted this is not strictly necessary as this intermittency does not necessarily apply to all plant items and is not expected to be perceivable.

6.0 PROPOSED DESIGN CRITERION - FACADE

Planning Condition 18 for the approved development is repeated below:

18) The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

Reason - To secure a reduction in noise from Cambridge Street; in order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.

The condition refers to a previously undertaken noise impact assessment for the site on behalf of the client; Cundall - Noise Assessment Report, REF: 1014452-RPT-AS-002 dated 19 February 2021. The guidance in this report references target internal noise level criteria set by BS 8233: 2014 and Manchester City Council's planning guidance.

Manchester City Council's guidance on planning and noise are outlined in section 3.0 of Manchester City Council's Planning & Noise Technical Guidance document (December 2015).

Section 3.6.1.1 of the document relates to internal noise limits for residential properties and states:

"Manchester City Council has adopted the following internal noise limits for residential properties:

- Bedrooms (night-time 23.00–07.00) 30dB L_{Aeq}
- (individual noise events should not normally exceed 45dB $L_{Amax,F}$ by more than 15 times
- Living Rooms (daytime 07.00–23.00) 35dB L_{Aeq}

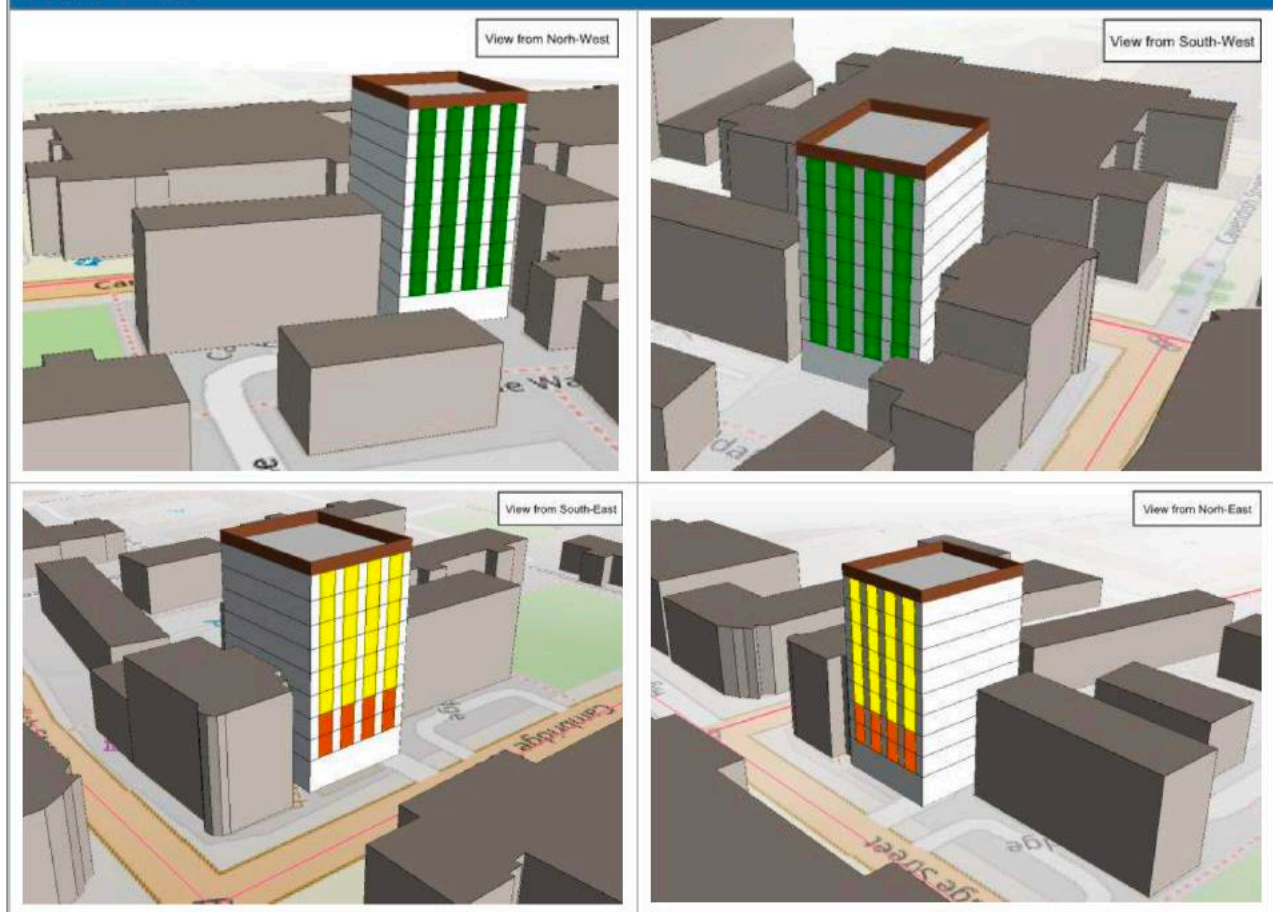
The report states:

It is considered that suitable glazing and ventilation attenuation can be provided to habitable rooms, such that internal average noise levels would be within acceptable limits, as per BS 8233.

The planning stage design report provided glazing configurations to achieve compliance with the design targets based on early stage noise survey data and noise ingress calculations undertaken in accordance with the "more rigorous calculation method" outlined in BS 8233:2014. Based on the varying noise impact across the site, three different acoustic performance 'conditions' for glazing were specified, as indicated in Table 6.1 below.

Table 6.1: Planning Stage Glazing Configurations

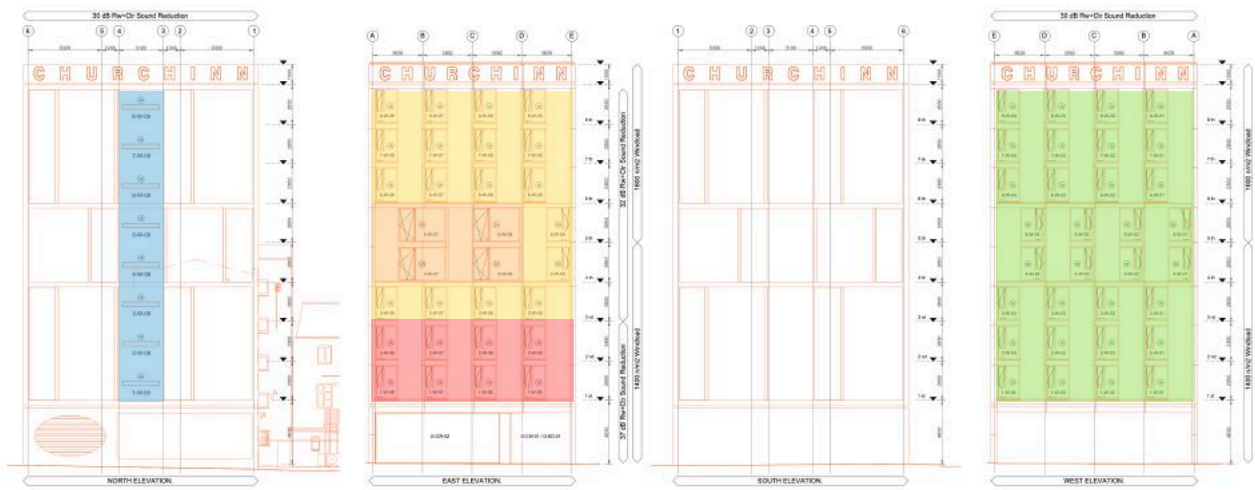
Glazing Condition Reference	Required Sound Insulation, (dB $R_w + C_{tr}$)	Assumed Ventilation Sound Insulation Rating (dB $D_{ne,w}$)	Example Glazing Configuration
Condition 1	30	39	10 mm pane 6 to 20mm air gap 4 mm pane This construction is rated at 30dB $R_w + C_{tr}$ by BS 12354
Condition 2	32	42	6 mm pane 12mm air gap 6.4 mm pane This construction is rated at 32dB $R_w + C_{tr}$ by BS 12354
Condition 3	37	42	10 mm pane 12mm air gap 8.44 mm pane This construction is rated at 37dB $R_w + C_{tr}$ by Pilkington

Façade Scenarios

7.0 FACADE PROPOSALS

For compliance with Planning Condition 18, the facade mitigation strategy as presented in Figure 7.1 and Table 7.1 below has been implemented.

Figure 7.1: Facade Mitigation Strategy



- G30o 
- G30 
- G32a 
- G32b 
- G37 

Table 7.1: Facade Mitigation Strategy

Sub Contractor Glazing Reference	Required Sound Insulation, (dB $R_w + C_{tr}$)	Required Ventilation Sound Insulation Rating (dB $D_{ne,w}$)	Installed Glazing & Vent Configuration	Compliant
G30o	30	39	6.8 mm Clear Soft Coat Low "E" Laminate 1.0 - outer 18 mm Black Warm Edge Spacer 90% Argon Filled - cavity 6 mm Obscure Toughened (Satin Deco) - inner 32dB $R_w + C_{tr}$ No Vent	Yes
G30	30	39	6 mm Soft Coat Low "E" Clear Toughened 1.0 - outer 16 mm Black Warm Edge Spacer 90% Argon Filled - cavity 6.8mm Clear Laminate - inner 32dB $R_w + C_{tr}$ Titon SFSA Xtra 25/50 Vent 39dB $D_{ne,w}$	Yes
G32a	32	42	6 mm Soft Coat Low "E" Clear Toughened 1.0 - outer 16 mm Black Warm Edge Spacer 90% Argon Filled - cavity 8.8 mm Clear Laminate - inner 33dB $R_w + C_{tr}$ Titon SFSA Xtra 50/75 Vent 42dB $D_{ne,w}$	Yes

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G32b	32	42	6 mm Soft Coat Low "E" Clear Toughened 1.0 - outer 14 mm Black Warm Edge Spacer 90% Argon Filled - cavity 10.8 mm Clear Laminate - inner 33dB $R_w + C_{tr}$ Titon SFSA Xtra 50/75 Vent 42dB $D_{ne,w}$	Yes
G37	37	42	8 mm Soft Coat Low "E" Clear Toughened 1.0 - outer 16 mm Black Warm Edge Spacer 90% Argon Filled - cavity 10 8 mm Clear Laminate - inner 38dB $R_w + C_{tr}$ Titon SFSA Xtra 50/75 Vent 42dB $D_{ne,w}$	Yes

The glazing and ventilation mitigation as presented in Figure 7.1 and Table 7.1 is compliant with the planning stage report and no further mitigation is required.

8.0 CONCLUSION

An assessment of the impact of noise generating air handling plant at the Church Street student accommodation development has been undertaken. Based on the manufacturer's noise data for each plant item and associated noise attenuators, the assessment has concluded that the predicted noise level with all plant running simultaneously and a intermittency penalty applied in accordance with the guidance in BS4142:2019 will be 6dBA or greater below the measured background noise level at the site.

The report also verifies that the proposed glazing and ventilation scheme is compliant with the approved scheme in accordance with Planning Condition 18.

No further mitigation measures are therefore proposed.