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LANCASTER GROVE

PLANT NOISE ASSESSMENT

Revision	Description	Issued by	Checked by	Issue Date
00	First Issue	Zoe Vernon	Chris Jones	04/11/2016

1.0 INTRODUCTION

Detailed assessments of noise transfer from plant equipment within the basement plant room and from the flues terminating on the roof to the residential areas within the building has been conducted. The purpose of these assessments has been to provide suitable constructions, and, or plant noise rating limits that minimise the risk of noise complaints from occupants of the building.

The following noise transfer paths have been considered:

- Through internal separating walls and floors between the basement plant room and adjacent apartments, including directly through the separating element and the flanking paths around it.
- Out through the ventilation path that exhausts/intakes through the façade underneath the entrance stairs that sits close to residential windows, ventilating both the plant room and the internal ducted MVHR unit.
- From the boiler flue and smoke shaft terminations on the roof to the top floor apartments.

2.0 NOISE LEVEL TARGETS

Internal noise level targets are based upon indoor ambient noise level guidance for bedroom and living spaces in accordance with BS 8233:2014, Table 2.1. Note, these targets are for ambient noise; from the sum of environmental noise outside and building services noise in an otherwise unoccupied living space. These guidelines fall in line with the WHO guidance and are standard targets when considering noise ingress to residential properties.

It is assumed that plant will run through the night time period, therefore it should be designed to not exceed 30 dB(A) L_{Aeq} for sleeping conditions as indicated in the table below.

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB $L_{Aeq, 16\ Hour}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16\ Hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq, 16\ Hour}$	30 dB $L_{Aeq, 8\ Hour}$

Table 2.1: - BS8233 Internal noise levels

It must be noted that designing to this target does not mean that the noise is completely inaudible. However, it is seen to be a sufficiently quiet target that means that the risk of disturbance to residents is low.

BS 4142 (a standard designed for assessing the impact of plant noise on residents) suggests that a penalty to the noise level should be applied if it is considered to have disturbing characteristics, i.e. it is perceived as being intermittent, impulsive or tonal. Typically, plant will run continuously and therefore is not deemed impulsive or intermittent, however it may occasionally have a tonal element. For the type of plant within this development, it is seen to be unlikely at this stage that it will have said tonal quality, therefore it is not considered at this stage that any noise rating penalties need be applied to the plant in this development.

3.0 NOISE SOURCES

3.1 Plant

The following is an indicative list of the machinery to be housed within the basement plant room;

- 2 no. Wall mounted gas boilers, conventional flue, 65kW
- 10 no. duty pumps canned rotor type permanent magnet motor circa 3000-4000 rpm
- 1 no. MVHR air handling unit 0.6m^3/sec double skin casing, plug fans
- 2 no. wall mounted mains fed pressurisation unit

As this in an indicative list, MACH Acoustics have based noise levels on data from similar plant units that have been used in previous assessments, or found on the manufacturers website. Manufacturer data is presented in a number of ways and hence spectral noise data for plant is not always readily available, therefore, where applicable, noise level data for similar plant units to that proposed within the basement plant room have been used within subsequent assessments.

The noise levels used for the assessments are shown in Table 3.1. As the design develops these should be replaced by data from manufacturer data for the exact units that are proposed.

	SWL @ 1m (dB)						
Octave Band, Hz	125	250	500	1000	2000	4000	dB(A)
Boiler (Quinta 65kW)	47	55	44	42	39	35	49
Pump (Grundfos)	72	80	69	67	64	60	74
MVHR (Topvex FC04) Surround	58	66	55	53	50	46	60
MVHR (Topvex FC04) Supply*	71	87	84	86	83	77	90

Table 3.1: Noise levels for machinery used for assessment

* Note, at this stage spectral noise data for the air intake and exhaust of the MVHR are not available, therefore, spectral data provided by the manufacturer for the supply will be used as a worst case scenario. The supply path typically exhibits a similar noise level to the exhaust path due to the location of the fans within the unit, whilst the air intake and extract paths are quieter.

The summation of noise levels within the plant room based upon Table 3.1 may be as high as 84 dB(A) within the plant room. It is considered that this is a high noise level on average for a plant room and should represent a worst case assessment. Noise levels in plant rooms that exceed 75 dB L_{Aeq} require staff to wear ear protection under Noise At Work regulations.

4.0 NOISE TRANSFER FROM PLANT TO OCCUPANTS

The following subsections detail the acoustic assessments carried out, such to assess noise transfer from the plant to the residential areas, and provide mitigation where necessary, in order to reduce the risk of noise complaints from the building's occupants.

4.1 Horizontal Transfer

4.1.1 Separating Walls

This section concerns the separating walls between the basement plant room and living rooms.

It is understood that the separating wall, following Robust Detail E-WS-2, is of the following construction:

- 2 x 12.5mm Soundbloc
- 2 x 60mm Independent I studs compressing 100mm Isover mineral wool (10 kg/m^3)
- 2 x 12.5mm Soundbloc

Noise break through calculations indicate that the predicted noise levels within the adjacent living spaces will be in the order of 26 dB(A), under the 30 dB(A) indoor ambient noise level target. This suggest

Octave Band, Hz	125	250	500	1000	2000	4000	dB(A)
Plant Noise Level within Lounge	39	32	14	4	-	-	26
Target	41	32	26	22	19	16	30

Table 4.1: Predicted Noise Break Through from Plant Room

4.1.2 Flanking Path - Floor Junction

Currently the basement floor is shown in drawings with the screed and floor finish running continuously underneath the wall. It is not clear from the section drawing which rooms this relates to, in any case it is recommended to follow the advice in this section for all party walls on the basement level including between the plant and adjacent living spaces. The area of concern here is the risk of noise transfer through the continuous screed under the separating walls.

To limit flanking through the floor, a floating screed should not be continuous underneath the wall partitions as shown in the options below. Breaking the screed can be as simple as putting a saw cut in the screed to break the continuous connection (which can be filled with a non-hardening acoustic mastic). Alternatively building the wall down past the screed and insulation to the top of the slab is the most effective (if less practical) method of breaking the connection.

It is advised that the separating walls around the plant room are constructed in a similar manner to Figure 4.1 below, in that there is no continuous floor covering between the plant room and adjacent residential areas. A saw cut should also be made in the screed, under each separating wall, such that there is no

continuation between the spaces. As per typical Robust Detail guidance, a resilient flanking strip should be placed between the floor finish and wall, with the plasterboard propped on the screed on top of a mastic sealant.

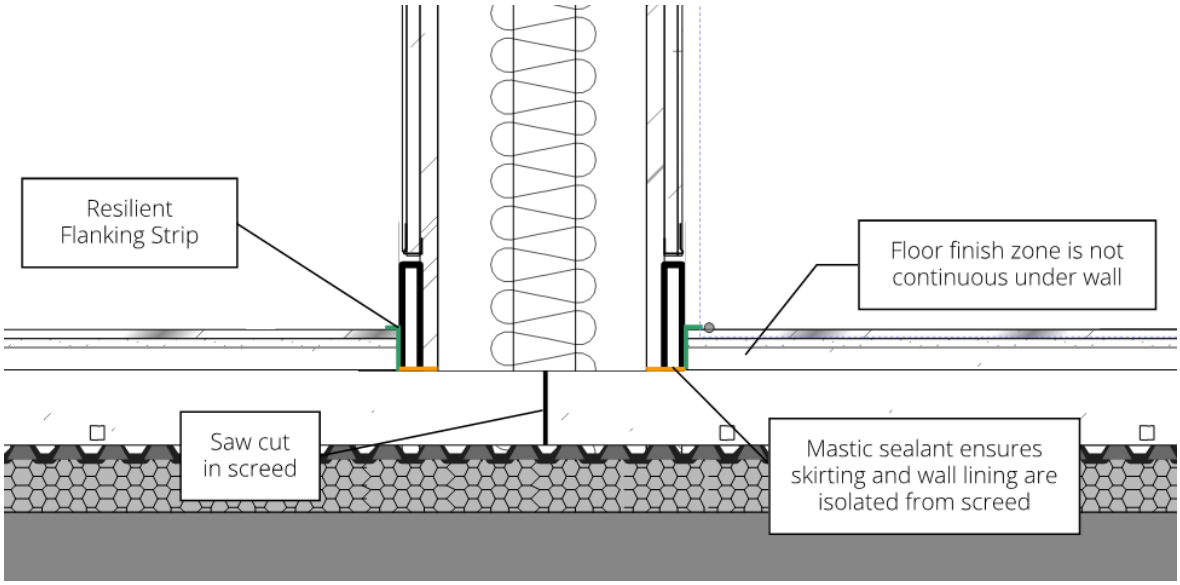

Figure 4.1: Basement Level Foot detail

Alternative foot details are provided within Figure 4.2 below.

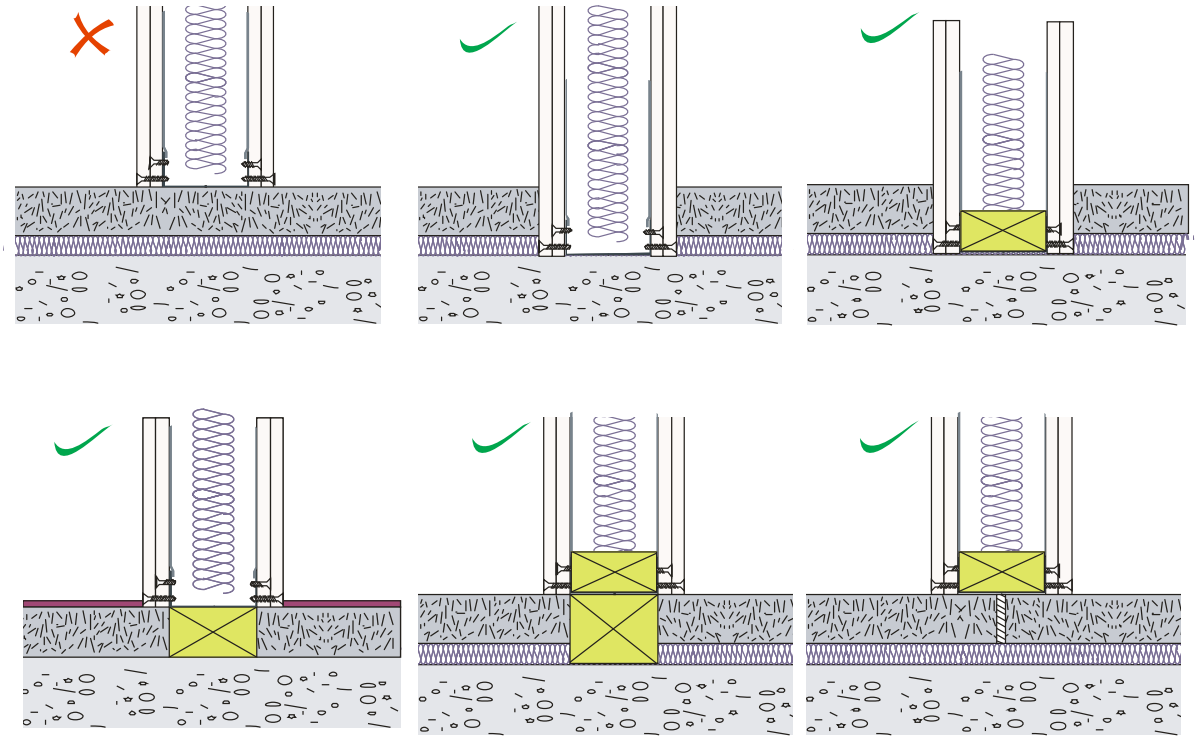

Figure 4.2: Floating screed detail (section view)

4.1.3 Flanking Path - Wall Junction

Figure 4.3 below illustrates the junction between separating wall (between plant and apartment) and the external wall. It is not clear from the drawing whether the white square drawn represents a concrete column, if so this detail is acceptable. If this is not the case, however, MACH Acoustics should be consulted to review proposals and comment.

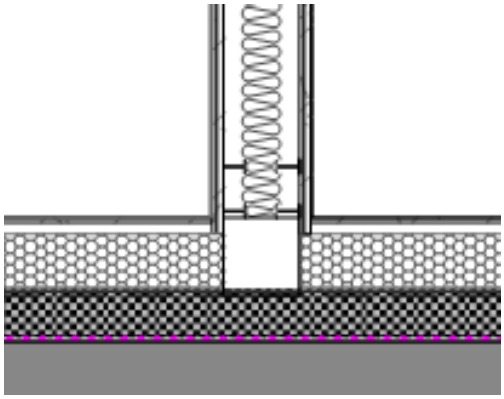

Figure 4.3: Plant Room Wall Junctions

4.2 Vertical Transfer

4.2.1 Separating Floor

It is understood that the separating floor, following Robust Detail E-FC-2, is of the following construction:

- 250mm in-situ concrete floor slab (2400 kg/m^3)
- Suspended (155mm) 12.5mm Soundbloc ceiling (25mm insulation in void)

Noise break through calculations indicate that the predicted noise levels within the above bedroom will be in the order of 21 dB(A) based on the noise levels in Section 3.1, therefore, the proposed floor construction, will provide sufficient sound insulation.

Octave Band, Hz	125	250	500	1000	2000	4000	dB(A)
Plant Noise Level within Bedroom	26	28	12	6	5	-	21
Target	41	32	26	22	19	16	30

Table 4.2: Predicted Noise Break Through from Plant Room

4.2.2 Riser

A review of the architectural drawings indicates that the riser from the plant room does not border any bedrooms, therefore, there is little risk of noise transfer from the plant room to a bedroom.

4.3 Façade Ventilation Path

This section concerns the level of noise breaking out through the MHVR supply and extract ducts, and the plant room ventilation, and back in through the open windows to the apartments. Due to the high levels of noise within the plant room it is anticipated that attenuation will be required to the ventilation ductwork

It is understood that plant room requires ventilation and as such will have an air path to a louvered section of the façade. The MVHR also requires paths for the intake and exhaust ducts to feed from.

Figure 4.4 below indicates the approximate location of the louvre, for which it is assumed that the all of the air paths above feed from.

Figure 4.4: 3D Views of Location of Plant Room Louvre

The weakest part of a façade in terms of sound transmission is typically the glazing, particularly if it is open. An open window typically provides between 10 to 15 dB(A) of sound attenuation as has been referenced within PPG24 and other documents. For the purposes of this assessment 13 dB(A) has been used as the sound attenuation provided by an open window ventilation strategy. In contrast a closed window will provide around 30 dB(A) of sound reduction. As part of a robust assessment it is recommended that the windows should be considered open, to minimise the risk of complaints.

Adding this figure to the indoor ambient noise level target for bedroom during night time periods, 30 dB, gives a target of 43 dB at 1 m outside windows to apartments for this development.

Figure 4.5 below illustrates the sound paths considered for this assessment.

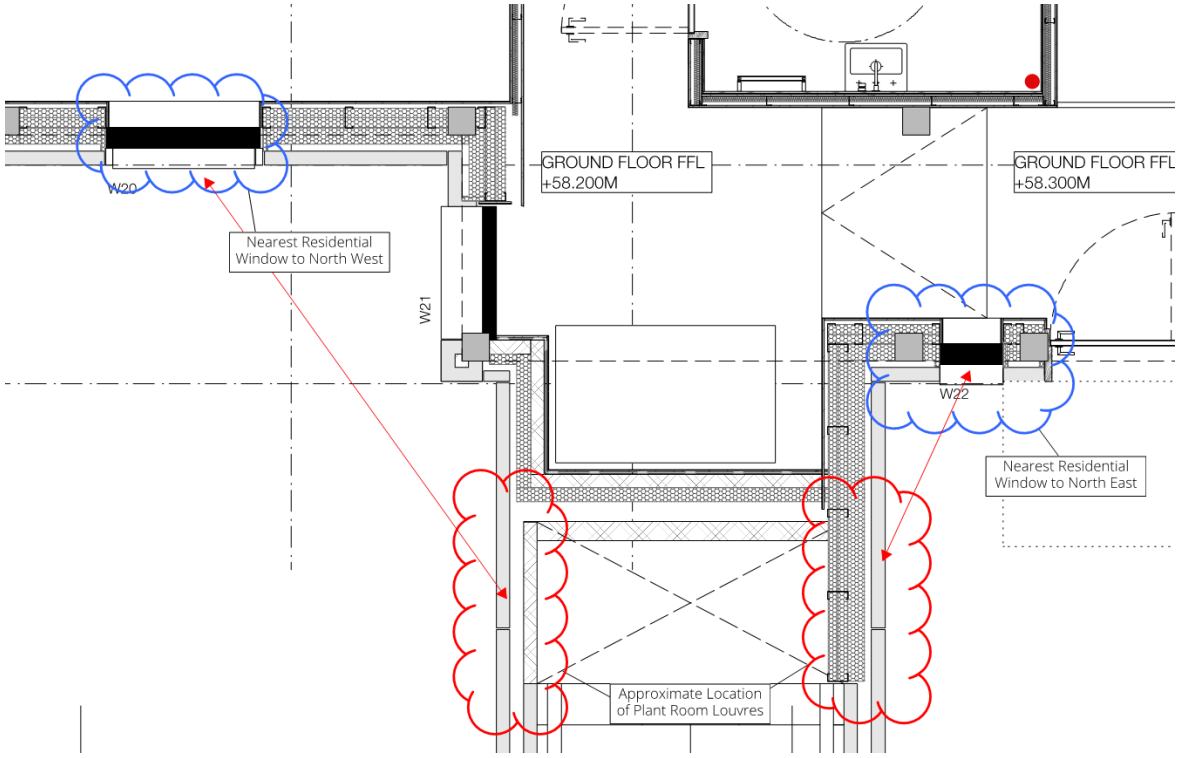

Figure 4.5: Nearest Residential Windows to Plant Room Louvres

It is understood that ventilation to the plant room itself will terminate both sides of the entrance stairwell, while the MVHR extract will terminate to the north west side, and the MVHR supply will terminate to the north east side. At this stage the choice of louvre from the plant room is unknown. Therefore, the following subsections look at two scenarios, one with acoustic louvres and the other with standard non-acoustic louvres. The louvres used within the assessments has the following sound reduction indices:

Octave Band, Hz	125	250	500	1000	2000	4000	R_w
Gilberts Series 45 (double bank) (acoustic)	10	14	20	30	33	32	25
Nendle Acoustic Company Sand Louvre (Non-acoustic)	3	4	5	8	17	16	10

Table 4.3: Louvre sound reduction used within the assessments

4.3.1 Nearest North West Residential Window

Noise break out assessments indicate that with a standard non-acoustic louvre, the sum of plant ventilation, and MVHR extract noise levels, at the nearest residential window is predicted to be 59 dB(A), without attenuation. An attenuator should be installed to the air paths that achieve the following insertion losses. Manufacturers such as Caice will be able to specify an attenuator that meets this requirement based on these insertion losses and the required dimensions.

	Insertion Loss (dB)					
Octave Band, Hz	125	250	500	1000	2000	4000
Attenuation required to Plant Ventilation	9	24	19	18	9	8
Attenuation required to MVHR Extract	-	9	11	14	5	2

Table 4.4: Attenuation required to North West duct terminations with non-acoustic louvres

Assessments including for an acoustic louvre indicate that with an acoustic louvre, the sum of plant ventilation, and MVHR extract noise levels, at the nearest residential window is predicted to be 48 dB(A). Therefore, the following attenuation would be required:

	Insertion Loss (dB)					
Octave Band, Hz	125	250	500	1000	2000	4000
Attenuation required to Plant Ventilation	2	14	4	-	-	-
Attenuation required to MVHR Extract	-	-	-	-	-	-

Table 4.5: Attenuation required to North West duct terminations with acoustic louvres

Note that attenuators will usually exhibit a performance that increases with frequency. The dashes in the tables above where no particular performance is required. With acoustic louvres no further attenuation is likely to be required to the MVHR Extract (though as explained earlier these are still based on indicative noise levels which require confirmation at a later stage).

4.3.2 Nearest North East Residential Window

Noise break out assessments indicate that with a standard non-acoustic louvre, the sum of plant ventilation, and MVHR extract noise levels, at the nearest residential window is predicted to be 70dB(A) without an attenuator. Therefore, the following levels of attenuation are required:

	Insertion Loss (dB)					
Octave Band, Hz	125	250	500	1000	2000	4000
Attenuation required to Plant Ventilation	19	34	29	28	19	18
Attenuation required to MVHR Extract	-	18	20	23	14	11

Table 4.6: Attenuation required to North East duct terminations with non-acoustic louvres

Assessments including for an acoustic louvre indicate that with an acoustic louvre, the sum of plant ventilation, and MVHR extract noise levels, at the nearest residential window is predicted to be 58dB(A). Therefore, the following attenuation would be required:

	Insertion Loss (dB)					
Octave Band, Hz	125	250	500	1000	2000	4000
Attenuation required to Plant Ventilation	12	24	14	6	3	2
Attenuation required to MVHR Extract	-	8	5	1	-	-

Table 4.7: Attenuation required to North East duct terminations with acoustic louvres

4.3.3 Smoke Shaft

It has been noted that there is a smoke shaft running the height of the building, terminating above the fourth floor balconies. There is a risk here of disruption to the occupants, therefore a noise limit of 48dB, NR42, has been set 1m from the duct termination.

	dB	NR
Noise Limit at 1m from Duct Termination	58	52

Table 4.8: Noise Limits at Smoke Shaft Duct Termination

4.3.4 Boiler Flue

Due to the location of the termination of the boiler flue and typical noise levels seen on past projects from such flues, this is not seen to be an issue.

4.4 Vibration

At this stage it is not known how plant will be mounted within the plant room, or the vibrational nature of the plant. Structure borne noise from vibration transmitted into the slab and subsequently supporting columns and walls provides a risk of reradiated noise into apartments, not only in the basement but also on floors above.

Therefore, an allowance should be made at this stage for all plant to fixed upon anti vibration mounts. This is typically in the form of a spring mount or a resilient pad placed on the bottom, the manufacturer should be able to provide this.