KP Acoustics Ltd.
info@kpacoustics.com
1 Galena Road, W6 0LT London, UK
+44 (0) 208 222 8778
www.kpacoustics.com

Northwood and Pinner Health Centre

Planning Compliance Report
Report 23005.NIA.02

Allies and Morrison
85 Southwark Street
London
SE1 0HX

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Written by:		**Checked by:**	
Jacob Tyler-White MIOA Senior Consultant		**Steven Leslie MIOA** Consultancy Manager	

KP acoustics

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1.0 INTRODUCTIONS

KP Acoustics Ltd has been commissioned to discharge Planning Condition 25 from the London Borough of Hillingdon (LBH) for the Northwood and Pinner Health Centre project.

A 24-hour environmental noise survey has been undertaken on site in order to prepare a noise impact assessment in accordance with the planning requirements of The Local Authority.

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels, the methodology and results of the assessment, and outlines any necessary mitigation measures.

2.0 SITE SURVEYS

2.1 Site Description

As shown in Figure 2.1, the site is bounded by residential properties to the north, east and west and Pinner Road (A404) to the south

Figure 2.1 Site Location Plan (Image Source: Google Maps)

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of an urban cityscape environment, with the dominant source being road traffic from the surrounding roads and train noise towards the rear of the site.

2.2 Environmental Noise Survey Procedure

Continuous automated monitoring was undertaken for the duration of the noise survey between 11:00 on 05 August 2021 and 11:00 on 06 August 2021.

The environmental noise measurement position, proposed plant installation locations, and the closest noise sensitive receiver relative to the plant installations are described within Table 2.1 and shown within Figure 2.2.

Icon	Descriptor	Location Description
1	Noise Measurement Position 1	The meter was installed adjacent to the southern site boundary at a height of approximately 1.5 metres above ground level.
2	Noise Measurement Position 2	The meter was installed adjacent to the northern site boundary at a height of approximately 1.5 metres above ground level.

Table 2.1 Measurement position and description

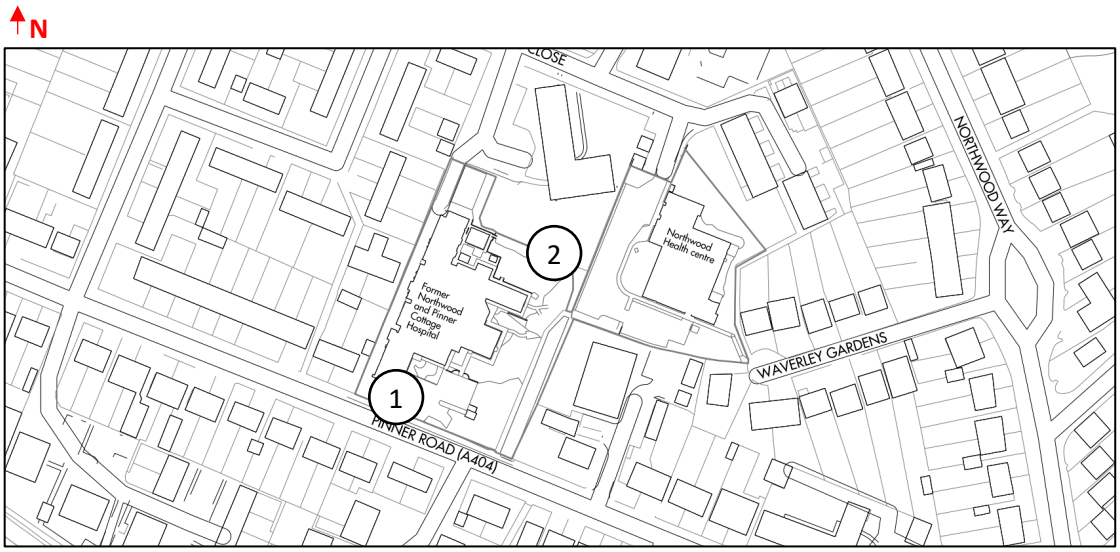


Figure 2.2 Site measurement position, identified receiver and proposed plant unit installation (Image Source: Allies and Morrison LLP)

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 10	Svantek Type 971 Sound Level Meter	55541	03/09/2020	14012949-01
	Aco Pacific 7052E Free-field microphone	70821		
	Preamp Svantek SV18	75770		
	Svantek External windshield	-	-	-
Noise Kit 12	Svantek Type 977C Sound Level Meter	97476	04/01/2021	Factory Calibrated
	Microtech type MK255	20070		
	Preamp Svantek SV12L	106915		
	Svantek Environmental Microphone Shroud	-	-	-
Larson Davis CAL200 Class 1 Calibrator		17148	27/04/2021	05223/1

Table 2.2 Measurement instrumentation

3.0 RESULTS

The $L_{Aeq,5min}$, $L_{Amax,5min}$, $L_{A10,5min}$ and $L_{A90,5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time histories in Figures 23005.TH1-2.

Representative background noise levels are shown in Table 3.1 for daytime and night-time.

It should be noted that the representative background noise levels have been derived from the most commonly occurring (modal) $L_{A90,5min}$ levels measured during the environmental noise survey undertaken on site.

Time Period	Representative background noise level L_{A90} dB(A)	
	Noise Measurement Position 1	Noise Measurement Position 2
Daytime (07:00-23:00)	62	50
Night-time (23:00-07:00)	30	36

Table 3.1 Representative background noise levels

Measured noise levels are representative of noise exposure levels expected to be experienced by all facades of the proposed development, and are shown in Table 3.2.

Time Period	Measured ambient $L_{Aeq,T}$ noise level (dBA)	
	Noise Measurement Position 1	Noise Measurement Position 2
Daytime $L_{Aeq,16hour}$	73	61
Night-time $L_{Aeq,8hour}$	66	46

Table 3.2 Site average noise levels for daytime and night time

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Planning Condition 25

The site is located within the London Borough of Hillingdon (LBH), who have imposed the following Planning Condition 25:

"The development (excluding demolition and site clearance) of the health care centre shall not begin until a detailed baseline noise survey and assessment has been undertaken for this element of the works to confirm the scheme to control plant noise emanating from the site, in accordance with the Noise SPD2 and BS 4142, has been submitted to, and approved in writing by the Local Planning Authority. Thereafter, the scheme shall be implemented and maintained in full compliance with the approved measures."

Noise SPD2 states the following with regards to assessing plant noise emissions:

"All industrial and commercial development with the potential to generate noise will be assessed and, where relevant, controlled by planning conditions in order to protect residential amenity. Conditions may be used, for example, to restrict noise levels and to control hours of operation. The most relevant standard for assessing new industrial and commercial development is BS4142:2014…

As a general rule, the Boroughs will seek to achieve the external noise standards detailed in [Table 4.1] below (all terms are as defined in BS4142)…"

Noise Impact From Relevant Proposed Industrial Or Commercial Premises Or Plant	Development Outcome
Rating Level (LAr,Tr) is at least 5 dB(A) below the Background Level LA90	Normally acceptable
Rating level (LAr,Tr) is no more than 5 dB(A) above the Background Level LA90	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating level (LAr,Tr) is more than 5 dB(A) above the Background Level LA90	Normally unacceptable

Table 4.1 Plant noise emissions criteria

4.2 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'

British Standard BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question ($L_{Aeq,\ Tr}$), including any relevant acoustic feature corrections, as follows:

- **Tonality** – '*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible'*
- **Impulsivity** – '*A correction of up to +9dB 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 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible'*
- **Intermittency** – '*If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied'*
- **Other sound characteristics** – '*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied'.*

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater 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 could be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

4.3 Health Technical Memorandum HTM 08-01: Acoustics

HTM08-01 sets criteria for internal noise intrusion from external sources in the following Table 4.2:

Room type	Example	External noise intrusion criteria
Ward – single person	Single-bed ward, single-bed recovery areas and on-call room, relatives' overnight stay	40 $L_{Aeq,1hr}$ daytime 35 $L_{Aeq,1hr}$ night 45 $L_{Amax,f}$ night
Ward – multi-bed	Multi-bed wards, recovery areas	45 $L_{Aeq,1hr}$ daytime 35 $L_{Aeq,1hr}$ night 45 $L_{Amax,f}$ night
Small office-type spaces	Private offices, small treatment rooms, interview rooms, consulting rooms	40 $L_{Aeq,1hr}$
Open clinical areas	A&E	45 $L_{Aeq,1hr}$
Circulation spaces	Corridors, hospital street, atria	55 $L_{Aeq,1hr}$
Public areas	Dining areas, waiting areas, playrooms	50 $L_{Aeq,1hr}$
Personal hygiene (en-suite)	Toilets, showers	45 $L_{Aeq,1hr}$
Personal hygiene (public and staff)	Toilets, showers	55 $L_{Aeq,1hr}$
Small food-preparation areas	Ward kitchens	50 $L_{Aeq,1hr}$
Large food-preparation areas	Main kitchens	55 $L_{Aeq,1hr}$
Large meeting rooms (>35 m2 floor area)	Lecture theatres, meeting rooms, board rooms, seminar rooms, classrooms	35 $L_{Aeq,1hr}$
Small meeting rooms (≤35 m2 floor area)	Meeting rooms, seminar rooms, classrooms, board rooms	40 $L_{Aeq,1hr}$
Operating theatres	Operating theatres	40 $L_{Aeq,1hr}$ 50 $L_{Amax,f}$
Laboratories	Laboratories	45 $L_{Aeq,1hr}$

Table 4.2 Internal noise criteria

5.0 PLANT NOISE IMPACT ASSESSMENT

5.1 Plant Noise Emissions Criteria

We understand that the plant is proposed to be operational during the daytime period (07:00-23:00 hours) only and therefore the criteria for this period is to be targeted.

As the proposed plant could be used at any time of the day or night, the criteria have been set as shown in Table 5.1 in order to comply with Planning Condition 25.

Description	External Plant Noise Emissions Criteria
	Daytime (07:00-23:00)
Noise sensitive receptors to the north	45
Noise sensitive receptors to the south	57

Table 5.1 Proposed noise emissions criteria

5.2 Proposed Plant Installations

It is understood that the proposed plant installation is comprised of the following units. The noise emission levels as provided by the manufacturer for the units are shown in Table 5.2.

Unit	Descriptor	Noise level (dB) at octave frequency band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
AHU01										
Intake	L_w	67	70	77	71	67	64	62	59	74
Exhaust	L_w	64	74	75	73	72	70	66	63	77
Breakout Supply	L_w	56	60	57	45	47	49	34	24	54
Breakout Exhaust	L_w	50	58	42	39	41	42	26	20	47
AHU02										
Intake	L_w	72	65	76	72	70	67	65	62	75
Exhaust	L_w	68	74	75	73	72	70	66	63	77
Breakout Supply	L_w	59	56	57	46	50	52	38	28	56
Breakout Exhaust	L_w	54	58	49	42	43	45	30	20	50
AHU03										
Intake	L_w	66	70	75	70	67	64	61	58	73
Exhaust	L_w	63	73	66	69	69	66	61	58	73
Breakout Supply	L_w	55	59	55	44	46	48	34	23	53
Breakout Exhaust	L_w	49	57	40	38	40	41	25	20	46
CU01 PUZ-ZM125-VKA	L_p at 1m	62	55	52	50	46	42	38	30	52
CU02 MUZ-HR25VF	L_p at 1m	48	48	48	42	48	40	33	28	50
CU03 PUZ-ZM125-VKA	L_p at 1m	62	55	52	50	46	42	38	30	52
ASHP01 CAHV-R450YA-HPB	COP Mode, L_p at 1m	64	66	67	60	54	52	52	47	63
ASHP02 CAHV-R450YA-HPB	COP Mode, L_p at 1m	64	66	67	60	54	52	52	47	63
ASHP03 QAHV ASHP	L_p at 1m	72	58	59	56	52	48	44	38	58

Unit	Descriptor	Noise level (dB) at octave frequency band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
ASHP04 QAHV ASHP	L_p at 1m	72	58	59	56	52	48	44	38	58

Table 5.2 Plant Units Noise Emission Levels as provided by the manufacturer

The detailed proposed plant layout drawings are enclosed within Appendix D.

The nearest noise sensitive receiver (NSR) to the proposed installation location has been identified as being a residential window of the location shown within the following figure:

Figure 5.1 Location of nearest noise sensitive receptors

5.3 Mitigation Measures

In order to achieve the specific sound level and subsequent rating level shown in the assessment above, the following noise control strategy has been proposed.

ACOUSTIC SCREENS

Acoustic screens have been proposed and will be installed to surround the plant areas as presented in Appendix D and the following figures. The screens are proposed to be solid (minimum mass 21kgm^{-2}), and at least an equal height to the plant (i.e. minimum 1450mm above roof level).

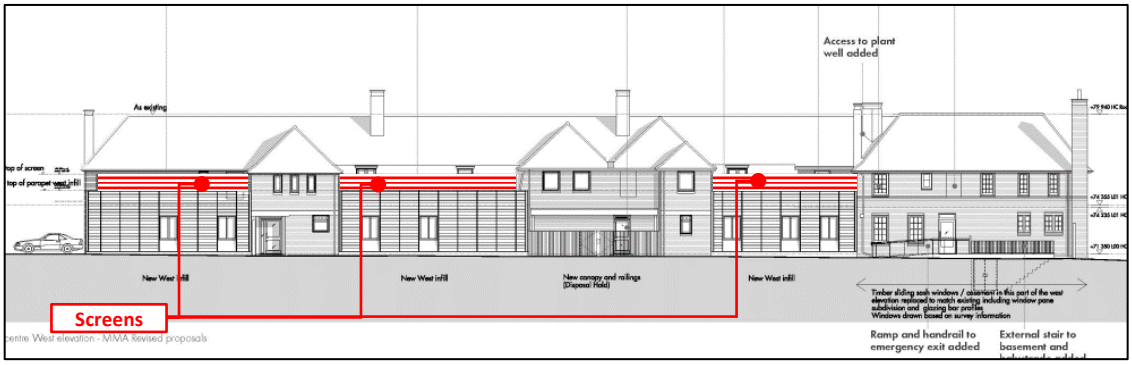


Figure 5.2 Elevations showing screen locations

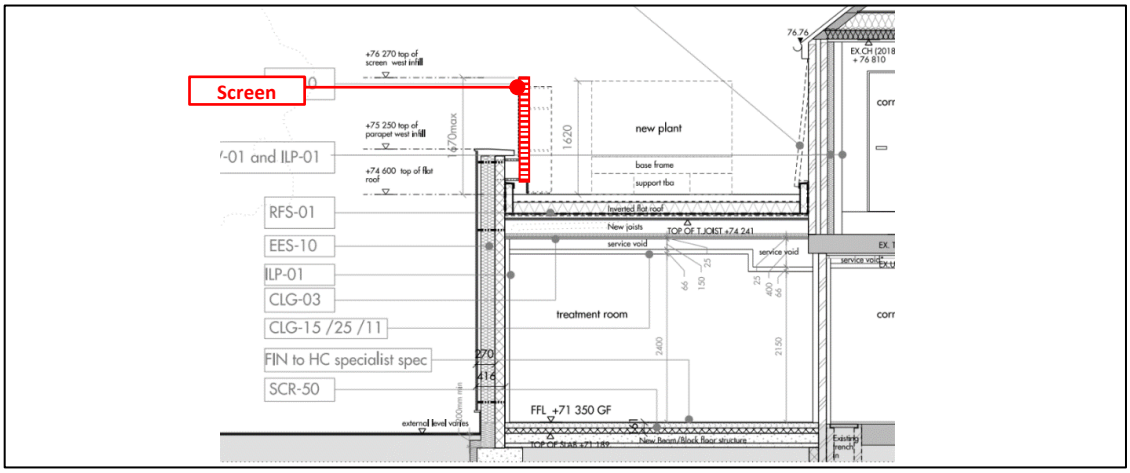


Figure 5.3 Section showing screen location

ATTENUATORS

Attenuators have been proposed and will be installed to the plant as according to the following specifications:

Unit	Attenuator insertion losses (dB) at octave frequency band (Hz)							
	63	125	250	500	1k	2k	4k	8k
AHU01								
Intake	6	9	13	23	29	28	19	12
Exhaust	7	10	15	26	37	32	22	15
AHU02								
Intake	6	9	13	23	29	28	19	12
Exhaust	8	13	19	34	43	40	26	20
AHU03								
Intake	6	9	13	23	29	28	19	12
Exhaust	7	10	15	26	37	32	22	15

Table 5.3 Proposed attenuators

5.4 Calculations

Taking all acoustic corrections into consideration, the noise level contribution expected at the nearest noise sensitive receptors from the proposed plant would be as shown in Table 5.4. Detailed calculations are shown in Appendix B.

Receivers	Criterion	Noise Level at 1m From the Closest Noise Sensitive Window
NSR *(presented within Figure 5.1)*	≤ 45 dBA *(Plant operational period 0700-2300 hours)*	31

Table 5.4 Predicted noise level and criterion at nearest noise sensitive location

As shown in Appendix B and Table 5.4, transmission of noise to the nearest sensitive windows due to the effects of the proposed plant installation and the proposed mitigation measures that will be installed (Section 5.3) satisfy the emissions criterion of the Local Authority.

5.5 Anti-Vibration Mounting Strategy

In the case of all plant units, appropriate anti-vibration mounts should be installed in order to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines detailed advice in order to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

6.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the recommended internal noise levels shown in Table 4.2.

Please note that the glazed and non-glazed element calculations would need to be finalised once all design proposals are finalised.

6.1 Non-Glazed Elements

At this project stage, the exact construction of the non-glazed external building fabric is unknown, however, it is understood that it would be based upon the construction proposed in Table 6.1 and would be expected to provide the minimum figures shown above when tested in accordance with BS EN ISO, 140-3:1995.

Element	SRI (dB) at octave band centre frequency (Hz)					
	125	250	500	1k	2k	4k
Blockwork Cavity Wall	41	43	48	50	55	55

Table 6.1 Assumed sound reduction performance for non-glazed elements

6.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 6.2.The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based on average measured night-time noise levels. The combined most robust results of these calculations are shown in Table 6.2.

Elevation	SRI (dB) at octave band centre frequency (Hz)						R_w (C;C_{tr}), dB
	125	250	500	1k	2k	4k	
All elevations	24	20	25	34	37	35	31 (-2;-4)

Table 6.2 Required glazing performance

The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band as shown in Table 6.2.

An example glazing type that would be expected achieve the above spectral values is 4/12/4mm double glazing.

All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an actual configuration.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 1-9 Sheldon House, by KP Acoustics Ltd between 15:00 on 21 July 2021 and 16:00 on 22 July 2021. The results of the survey have enabled a representative background noise level to be set.

Plant noise emissions criteria have been set based upon the results of the environmental noise survey and the requirements of the Local Authority.

Manufacturer's noise data of proposed plant units have been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receiver in accordance with British Standard BS4142:2014 for compliance with London Borough of Hillingdon requirements.

The rating level was compared with the representative background noise level to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of Planning Condition 25.

It has been concluded that noise emissions from the proposed plant units would not have an adverse impact on the nearest residential receivers due to the mitigation measures that have been implemented into the (Section 5.3).

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels commensurate to the design range of Health Technical Memorandum HTM 08-01: Acoustics.

APPENDIX A

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPENDIX A

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B

Northwood and Pinner Health Centre

PLANT NOISE EMISSIONS CALCULATIONS

Source: Plant installation Receiver: Nearest noise sensitive residential receiver	*Noise level (dB) at octave band frequency (Hz)*								*dB(A)*
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
AHU01 Intake (Sound Power Level), dB	67	70	77	71	67	64	62	59	74
Proposed Attenuator	-6	-9	-13	-23	-29	-28	-19	-12	
Attenuation due to duct length (0.9m), dB	-1	-1	0	0	0	0	0	0	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Sound power level at grille, dB	48	52	60	47	38	36	43	47	54
Breakout Supply (Sound Power Level), dB	56	60	57	45	47	49	34	24	54
Combined sound power level, dB	57	61	62	49	47	49	43	47	57
Conversion from Lw to Lp, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation provided by distance (1m to 20m), dB	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Correction due to directivity, dB	3	4	4	4	2	-11	-11	-11	
Resultant noise level at nearest noise sensitive receptor, dB	21	25	26	14	10	0	-6	-3	19
AHU01 Exhaust (Sound Power Level), dB	64	74	75	73	72	70	66	63	77
Proposed Attenuator	-7	-10	-15	-26	-37	-32	-22	-15	
Attenuation due to duct length (0.9m), dB	-1	-1	0	0	0	0	0	0	
Correction due to duct bends (1No.), dB	0	0	-6	-8	-4	-3	-3	-3	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Sound power level at grille, dB	44	55	50	38	31	35	41	45	48
Breakout Extract (Sound Power Level), dB	50	58	42	39	41	42	26	20	47
Combined sound power level, dB	51	60	50	41	41	43	41	45	51
Conversion from Lw to Lp, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation provided by distance (1m to 20m), dB	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Resultant noise level at nearest noise sensitive receptor, dB	12	21	11	2	2	4	2	6	12
AHU02 Intake (Sound Power Level), dB	72	65	76	72	70	67	65	62	75
Proposed Attenuator	-6	-9	-13	-23	-29	-28	-19	-12	
Attenuation due to duct length (0.9m), dB	-1	-1	0	0	0	0	0	0	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Sound power level at grille, dB	53	47	59	48	41	39	46	50	54
Breakout Supply (Sound Power Level), dB	59	56	57	46	50	52	38	28	56
Combined sound power level, dB	60	57	61	50	50	52	47	50	58
Conversion from Lw to Lp, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation provided by distance (1m to 8m), dB	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum attenuation provided by barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Correction due to directivity, dB	3	4	4	4	2	-11	-11	-11	
Resultant noise level at nearest noise sensitive receptor, dB	32	29	33	22	21	11	5	8	28
AHU02 Exhaust (Sound Power Level), dB	68	74	75	73	72	70	66	63	77
Proposed Attenuator	-8	-13	-19	-34	-43	-40	-26	-20	
Attenuation due to duct length (0.9m), dB	-1	-1	0	0	0	0	0	0	
Correction due to duct bends (1No.), dB	0	0	-6	-8	-4	-3	-3	-3	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Sound power level at grille, dB	47	52	46	30	25	27	37	40	44
Breakout Extract (Sound Power Level), dB	54	58	49	42	43	45	30	20	50
Combined sound power level, dB	55	59	51	42	43	45	38	40	51
Conversion from Lw to Lp, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation provided by distance (1m to 8m), dB	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum attenuation provided by barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Resultant noise level at nearest noise sensitive receptor, dB	24	28	20	11	12	14	7	9	20
AHU03 Intake (Sound Power Level), dB	66	70	75	70	67	64	61	58	73
Proposed Attenuator	-6	-9	-13	-23	-29	-28	-19	-12	
Attenuation due to duct length (0.9m), dB	-1	-1	0	0	0	0	0	0	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Sound power level at grille, dB	47	52	58	46	38	36	42	46	52
Breakout Supply (Sound Power Level), dB	55	59	55	44	46	48	34	23	53
Combined sound power level, dB	56	60	60	48	47	48	43	46	56

Continued on next page…

Conversion from Lw to Lp, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation provided by distance (1m to 20m), dB	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Correction due to building envelope, dB	-11	-13	-16	-21	-25	-25	-25	-25	
Correction due to directivity, dB	3	4	4	4	2	-11	-11	-11	
Resultant noise level at nearest noise sensitive receptor, dB	9	11	8	-8	-15	-26	-32	-29	1
AHU03 Exhaust (Sound Power Level), dB	63	73	66	69	69	66	61	58	73
Proposed Attenuator	-7	-10	-15	-26	-37	-32	-22	-15	
Attenuation due to duct length (0.9m), dB	-1	-1	0	0	0	0	0	0	
Correction due to duct bends (1No.), dB	0	0	-6	-8	-4	-3	-3	-3	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Sound power level at grille, dB	43	54	41	34	28	31	36	40	44
Breakout Extract (Sound Power Level), dB	49	57	40	38	40	41	25	20	46
Combined sound power level, dB	50	59	43	39	40	41	36	40	48
Conversion from Lw to Lp, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation provided by distance (1m to 20m), dB	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Correction due to building envelope, dB	-11	-13	-16	-21	-25	-25	-25	-25	
Resultant noise level at nearest noise sensitive receptor, dB	0	7	-12	-20	-24	-23	-28	-24	-8
CU01 (Sound Pressure Level at 1m), dB	62	55	52	50	46	42	38	30	52
Minimum attenuation provided by barrier, dB	-5	-5	-5	-6	-6	-8	-9	-11	
Minimum attenuation provided by distance (1m to 26m), dB	-28	-28	-28	-28	-28	-28	-28	-28	
Resultant noise level at nearest noise sensitive receptor, dB	29	22	18	16	11	6	0	-10	17
CU02 (Sound Pressure Level at 1m), dB	48	48	48	42	48	40	33	28	50
Minimum attenuation provided by barrier, dB	-5	-5	-5	-6	-6	-8	-9	-12	
Minimum attenuation provided by distance (1m to 12m), dB	-22	-22	-22	-22	-22	-22	-22	-22	
Resultant noise level at nearest noise sensitive receptor, dB	22	21	21	15	20	11	2	-5	22
CU03 (Sound Pressure Level at 1m), dB	62	55	52	50	46	42	38	30	52
Minimum attenuation provided by barrier, dB	-5	-5	-5	-6	-6	-8	-9	-11	
Minimum attenuation provided by distance (1m to 18m), dB	-25	-25	-25	-25	-25	-25	-25	-25	
Resultant noise level at nearest noise sensitive receptor, dB	32	25	22	19	14	9	4	-7	21
ASHP01 (Sound Pressure Level at 1m), dB	64	66	67	60	54	52	52	47	63
ASHP02 (Sound Pressure Level at 1m), dB	64	66	67	60	54	52	52	47	63
ASHP03 (Sound Pressure Level at 1m), dB	72	58	59	56	52	48	44	38	58
ASHP04 (Sound Pressure Level at 1m), dB	72	58	59	56	52	48	44	38	58
Comulative noise level, dB	76	70	71	64	59	56	56	51	67
Correction due to building envelope, dB	-11	-13	-17	-21	-25	-25	-25	-25	
Minimum attenuation provided by distance (1m to 31m), dB	-30	-30	-30	-30	-30	-30	-30	-30	
Resultant noise level at nearest noise sensitive receptor, dB	35	26	24	14	4	2	1	-4	19
Sound Pressure Level at Receiver due to Proposed Plant, dB	**39**	**35**	**35**	**26**	**25**	**18**	**12**	**13**	**31**

Design Criterion	**45**

APPENDIX C

ANTI-VIBRATION MOUNTING SPECIFICATION REFERENCE DOCUMENT

1.0 General

1.1 All mountings shall provide the static deflection, under the equipment weight, shown in the schedules. Mounting selection should allow for any eccentric load distribution or torque reaction, so that the design deflection is achieved on all mountings under the equipment, under operating conditions.

1.2 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.

1.3 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.

Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Service Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.1 Type A Mounting (Caged Spring Type)

2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principle isolation elements, and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.

2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height, and be selected to have at least 50% overload capacity before becoming coil-bound.

2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.

2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment as a result of vibration or accidental or unauthorised tampering.

2.2 Type B Mounting (Open Spring Type)

2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements, and shall incorporate a built-in levelling device.

2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.

2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.3 Type C Mounting (Rubber/Neoprene Type)

Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device, and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

3.0 Plant Bases

3.1 **Type A Bases (A.V. Rails)**

An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary should be checked by the Structural Engineer.

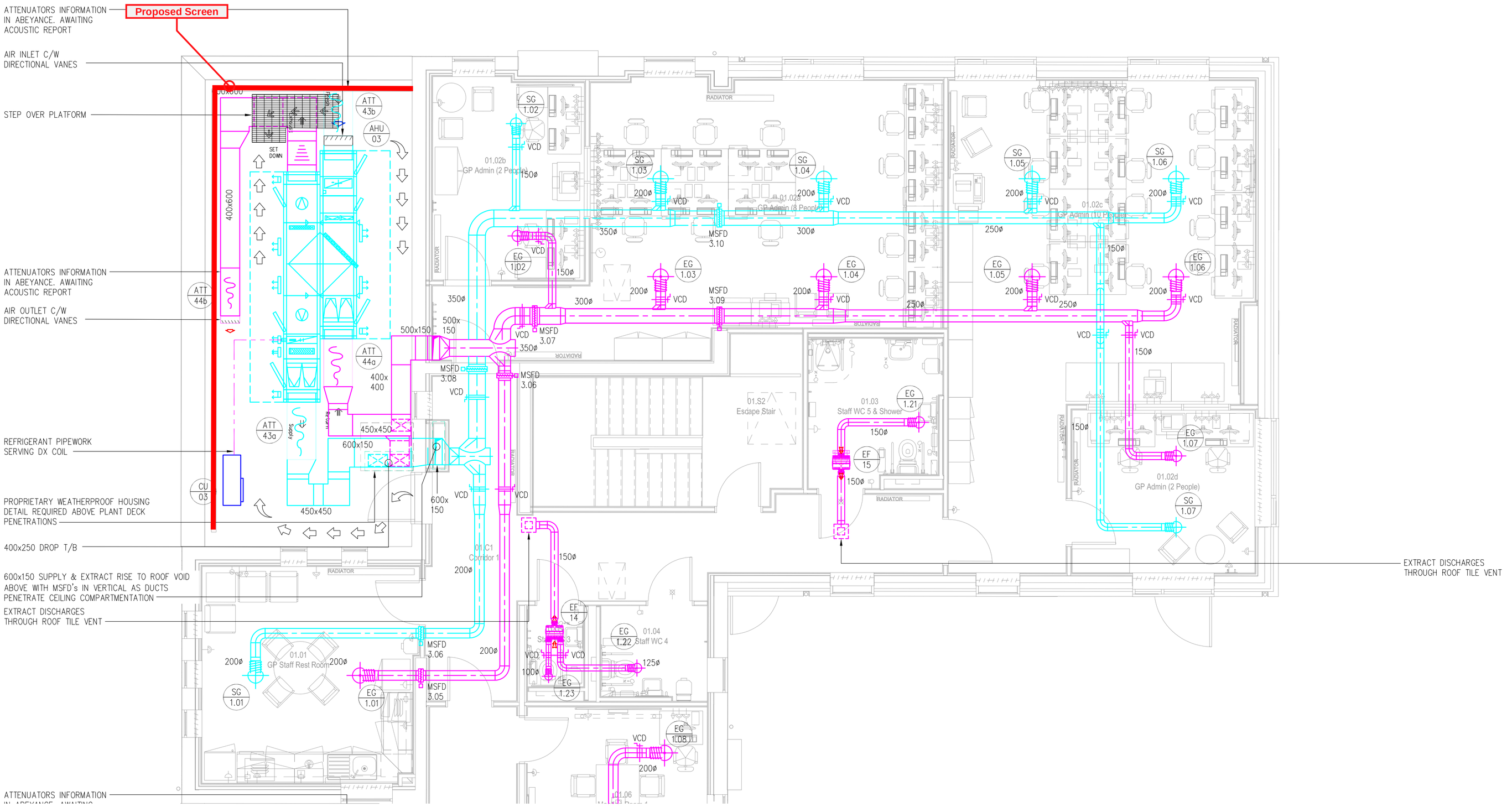
3.2 **Type B Bases (Steel Plant Bases)**

Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment, and fitted with isolator height saving brackets. The frame depth shall be approximately 1/10 of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 **Type C Bases (Concrete Inertia Base: for use with steel springs)**

These shall consist of an all-welded steel pouring frame-work with height saving brackets, and a frame depth of approximately 1/12 of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m^3) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.

KPA APPENDIX D(1) - PLANT LAYOUTS



NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE FOLLOWING:
   PRELIMINARIES SPECIFICATION.
   PARTICULAR SPECIFICATION AND SCOPE OF WORKS.
   MATERIALS AND WORKMANSHIP SPECIFICATION.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH RELEVANT SCHEMATIC DRAWINGS AND EQUIPMENT SCHEDULES.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER SERVICES DRAWINGS FOR THIS AREA.
4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ARCHITECTURAL AND STRUCTURAL DESIGN INFORMATION.

LEGEND:

- SG – SUPPLY GRILLE
- EG – EXTRACT GRILLE
- ATT – ATTENUATOR
- FD – FIRE DAMPER
- MSFD – MOTORISED SMOKE FIRE DAMPER
- VCD – VOLUME CONTROL DAMPER
- EF – EXTRACT FAN

Date	Description	Rev	By
06/08/24	PRELIMINARY ISSUE	P1	WS

Revision Description

hulley & kirkwood consulting engineers

London Office
Castle House Horizon Centre
28-38 Upper High Street
Epsom
Surrey
KT17 4RS

Tel No: 01372 747 047
E: hk.london@hulley.co.uk

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Project:
NORTHWOOD & PINNER HEALTH CENTRE P23

Drawing Title:
FIRST FLOOR
VENTILATION
NORTH

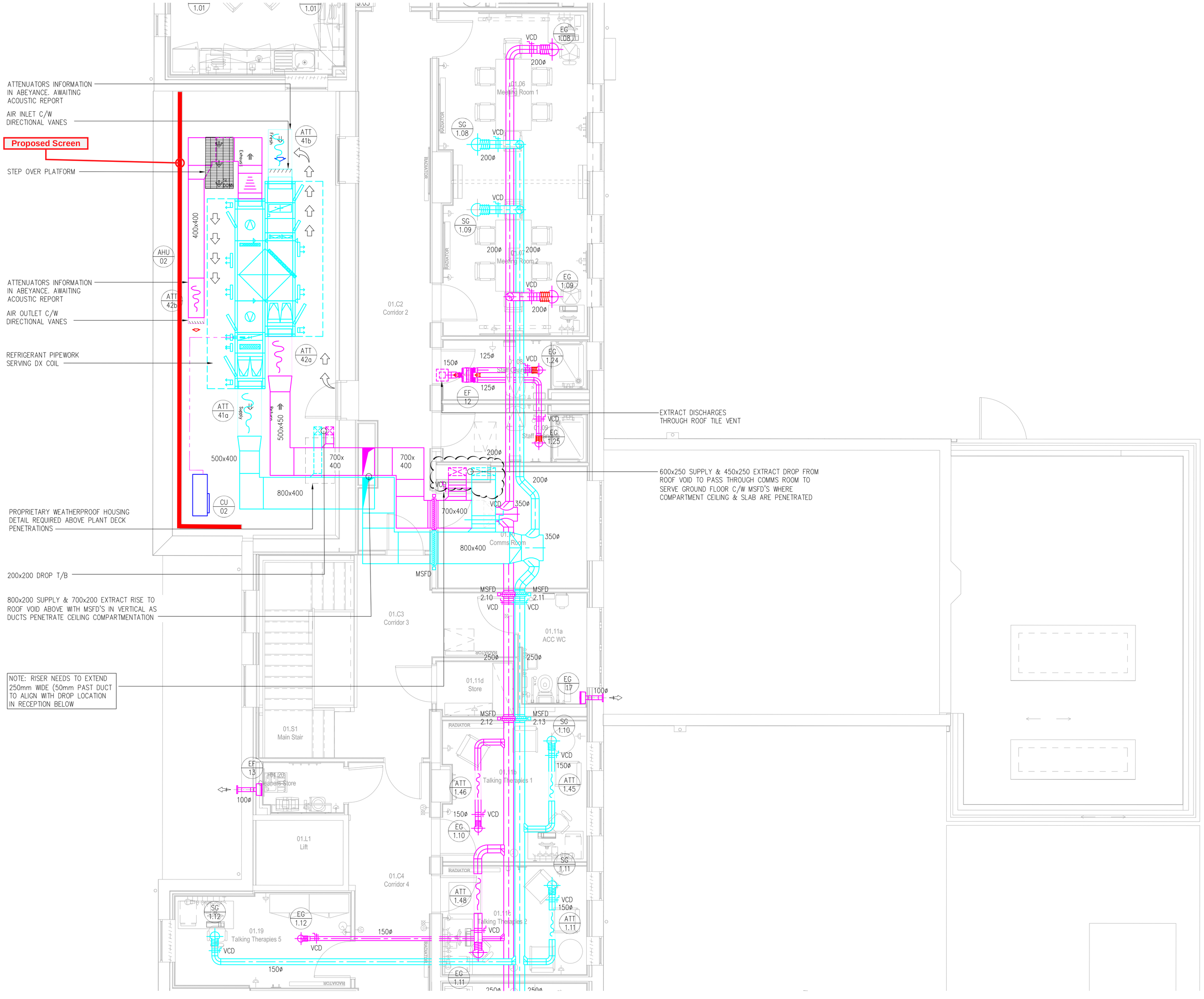
Drawing Number:
41935(57)101

Revision:	P1
Date:	24/05/2024
Scale:	1:50
Drawn By:	WS
CAD Dwg File:	41935(57)101.dwg
Arch. Base Dwg:	

Issue Status:
PRELIMINARY

A1

KPA APPENDIX D(2) - PLANT LAYOUTS



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Revision Description

hulley & kirkwood consulting engineers

London Office

Castle House Horizon Centre
28-38 Upper High Street
Epsom
Surrey
KT17 4RS

Tel No: 01372 747 047
E: hk.london@hulley.co.uk

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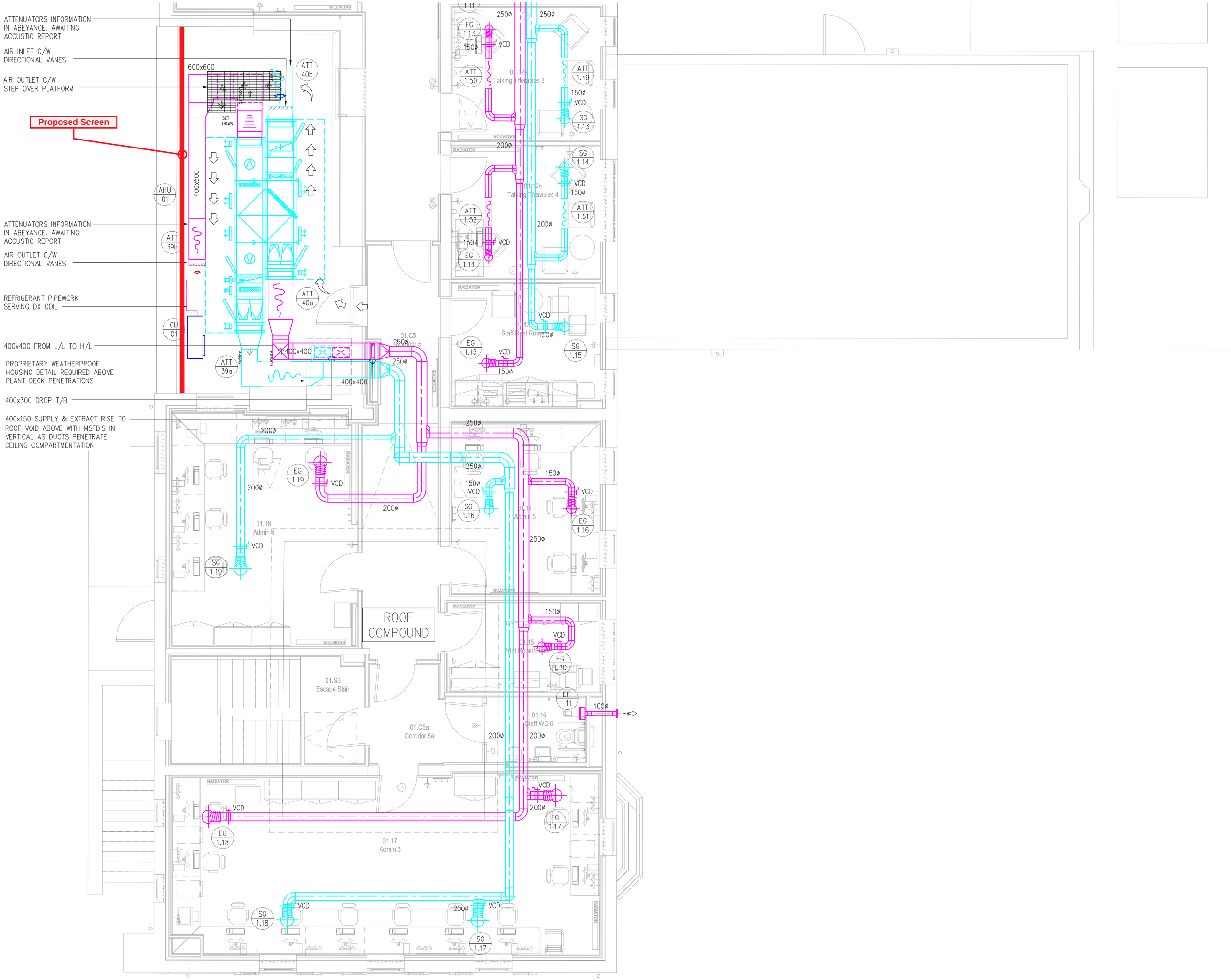
Drawing Title:
FIRST FLOOR
VENTILATION
CENTRAL

Drawing Number:
41935(57)102

Revision:	P1
Date:	24/05/2024
Scale:	1:50
Drawn By:	WS
CAD Dwg File:	41935(57)102.dwg
Arch. Base Dwg:	

Issue Status:
PRELIMINARY

A1



KPA APPENDIX D(3) - PLANT LAYOUTS

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   PRELIMINARIES SPECIFICATION.
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   MATERIALS AND WORKMANSHIP SPECIFICATION.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH RELEVANT SCHEMATIC DRAWINGS AND EQUIPMENT SCHEDULES.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER SERVICES DRAWINGS FOR THIS AREA.
4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ARCHITECTURAL AND STRUCTURAL DESIGN INFORMATION.

LEGEND:

- SG – SUPPLY GRILLE
- EG – EXTRACT GRILLE
- ATT – ATTENUATOR
- FD – FIRE DAMPER
- MSFD – MOTORISED SMOKE FIRE DAMPER
- VCD – VOLUME CONTROL DAMPER
- EF – EXTRACT FAN

Date	Description	Rev	By
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Revision Description

hulley & kirkwood consulting engineers

London Office
Castle House Horizon Centre
28-38 Upper High Street
Epsom
Surrey
KT17 4RS

Tel No: 01372 747 047
E: hk.london@hulley.co.uk

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Drawing Title:
FIRST FLOOR
VENTILATION
SOUTH

Drawing Number:
41935(57)103

Revision:	P1
Date:	24/05/2024
Scale:	1:50
Drawn By:	WS
CAD Dwg File:	41935(57)103.dwg
Arch. Base Dwg:	

Issue Status:
PRELIMINARY

A1

Northwood & Pinner Health Centre - Position 1
Environmental Noise Time History
From 05 August 2021 To 06 August 2021

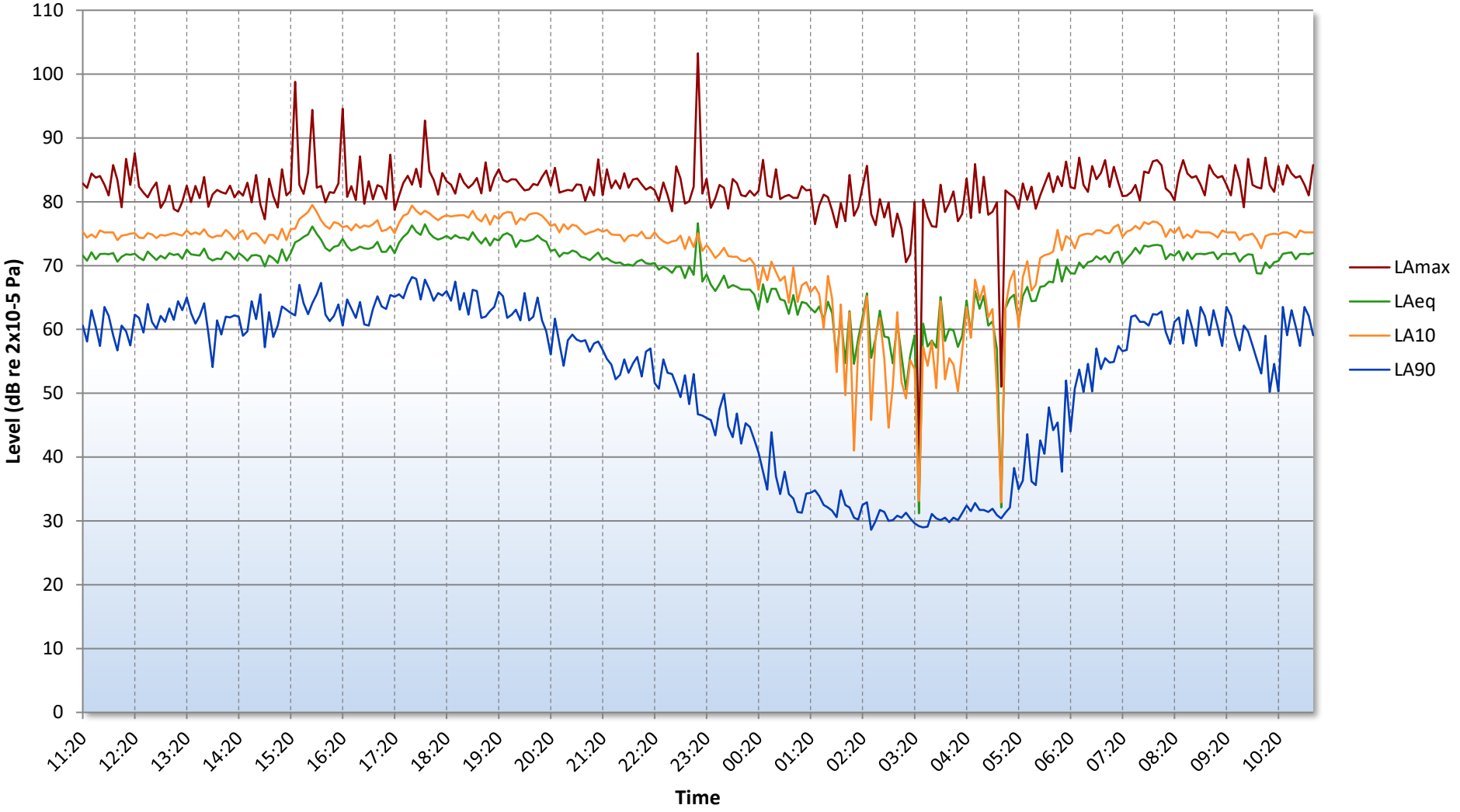

Figure 23005.TH1

Northwood & Pinner Health Centre - Position 2
Environmental Noise Time History
From 05 August 2021 To 06 August 2021

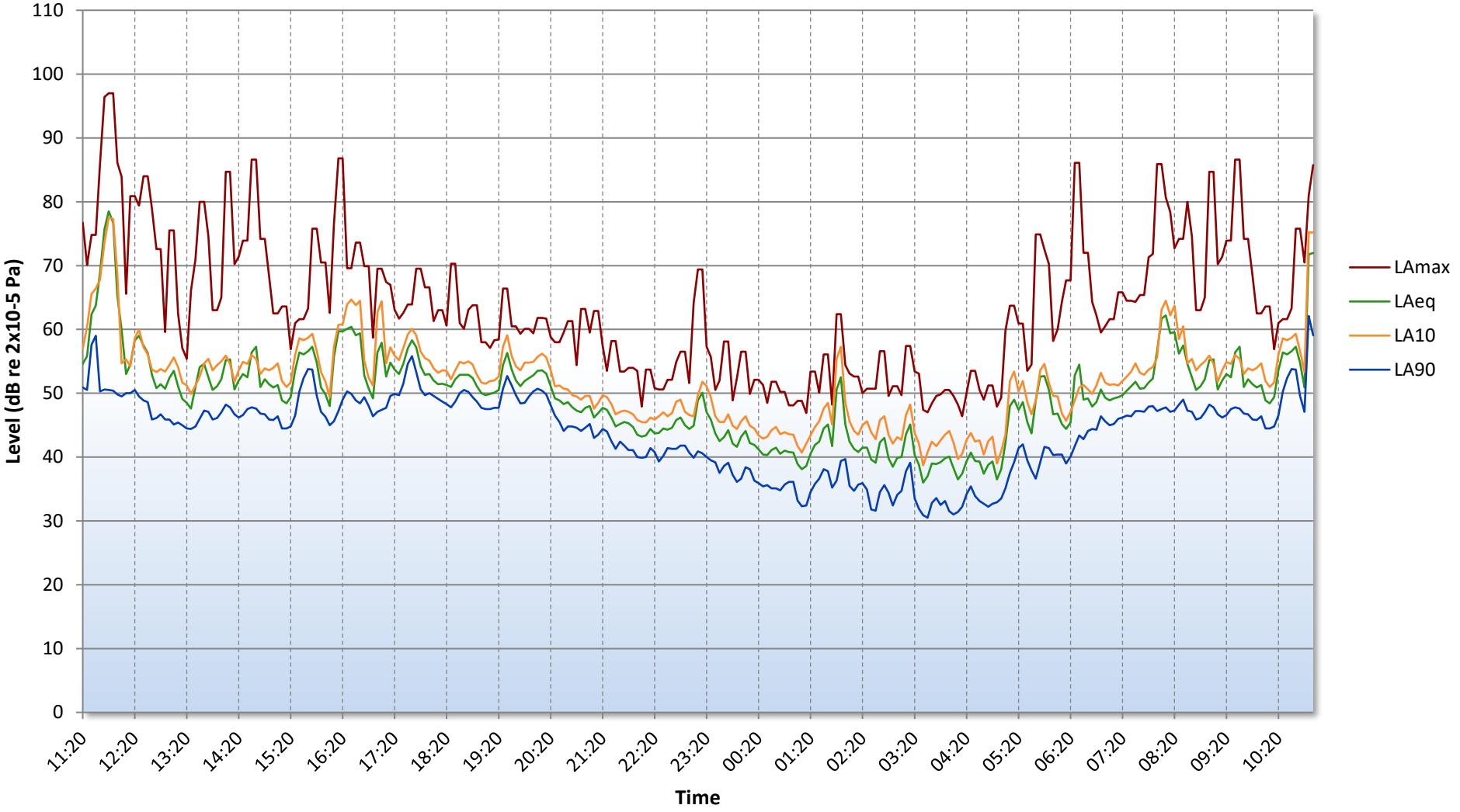

Figure 23005.TH2