



KIER CONSTRUCTION

11 YORK STREET, MANCHESTER

ACOUSTIC VERIFICATION REPORT

PLANNING APPLICATION NO: 126476/JO/2020

6 July 2021

AEC REPORT: P2643/R4/AGB

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DOCUMENT STATUS

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1.0 INTRODUCTION

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Kier Construction to prepare an acoustic verification report for the newly constructed office block with ground floor A3 units at 11 York Street, Manchester.
- 1.2 This report is required to assist with discharging of three planning conditions associated with noise. The application number is 126476/JO/2020 and each condition is presented in detail below however, they are associated with the following elements:
- Noise Breakout from the A3 uses;
 - Atmospheric noise from mechanical plant and ancillary equipment;
 - Noise break-out from the rooftop amenity space.
- 1.3 This report details the results of the original noise surveys undertaken, presents the relevant planning conditions, provides details of the finished constructions and mechanical plant installed and presents an assessment with regard to achieving the set criteria.
- 1.4 Acoustic terminology is discussed in brief in Appendix A.

2.0 DEVELOPMENT DESCRIPTION

- 2.1 The site is bound by Marble Street to the north-east, Fountain Street to the south-east, York Street to the south-west and Milk Street to the north-west.
- 2.2 The building is located in a commercial area and is surrounded by other office buildings. There are no private residential properties nearby with the nearest residential property being the Hotel Gotham, located at 100 King Street some 90m to the south west of the building as identified on Figure 2.1 below.

Figure 2.1 – Site Location and Nearest Residential Receiver



- 2.3 The building is 8 Storeys high with associated basement car parking, two ground floor retail units and a rooftop amenity/event space. This rooftop space will provide space for up to 60 people and will include an open terrace area.

3.0 NOISE MEASUREMENTS

- 3.1 Night-time noise levels were undertaken by AEC on Monday 5 August 2019, between approximately 2300 and 0100h on Tuesday 6 August, 2019. Night-time noise levels were only measured at Location E, external to 50 Spring Gardens, as identified on the attached Figure B1.
- 3.2 Due to ongoing construction work, daytime noise level measurements were not possible in 2019 and, as such, background noise levels measured in 2013 have been used in this assessment. This is considered a reasonable approach as in reality background noise levels are more likely to increase over time than decrease.
- 3.3 All measurements were undertaken in general accordance with BS7445-1: 2003 'Description and measurement of environmental noise. Guide to quantities and procedures'.
- 3.4 A full measurement procedure is presented in Appendix B for the daytime noise level measurements, and Appendix C for the night-time noise level measurements. The measured data is presented in Tables B1 and C1, respectively.
- 3.5 Noise levels at all locations were due to road traffic from the surrounding roads. Distant plant and building construction noise also impacted on the measured noise levels. In summary, the lowest measured background noise levels were 55dBL_{A90,T} during the daytime and 47dBL_{A90,T} during the night-time. These are typical background noise levels for Manchester City Centre.

4.0 ASSESSMENT

Condition 9

- 4.1 Condition 9 states:

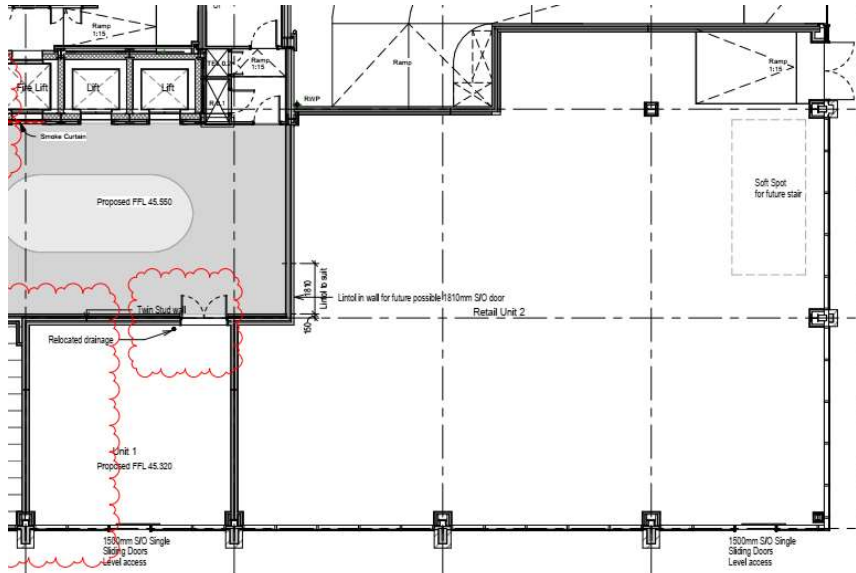
'Before any A3 uses hereby approved commence, the premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority.'

Where entertainment noise is proposed the L_{Aeq} (entertainment noise) shall be controlled to 10dB below the L_{A90} (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location.

Upon completion of the development a verification report to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report shall be submitted to and approved in writing by the City Council as local planning authority. The verification report shall also undertake post completion testing to confirm that acceptable criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria and timescales for the implementation of those measures.'

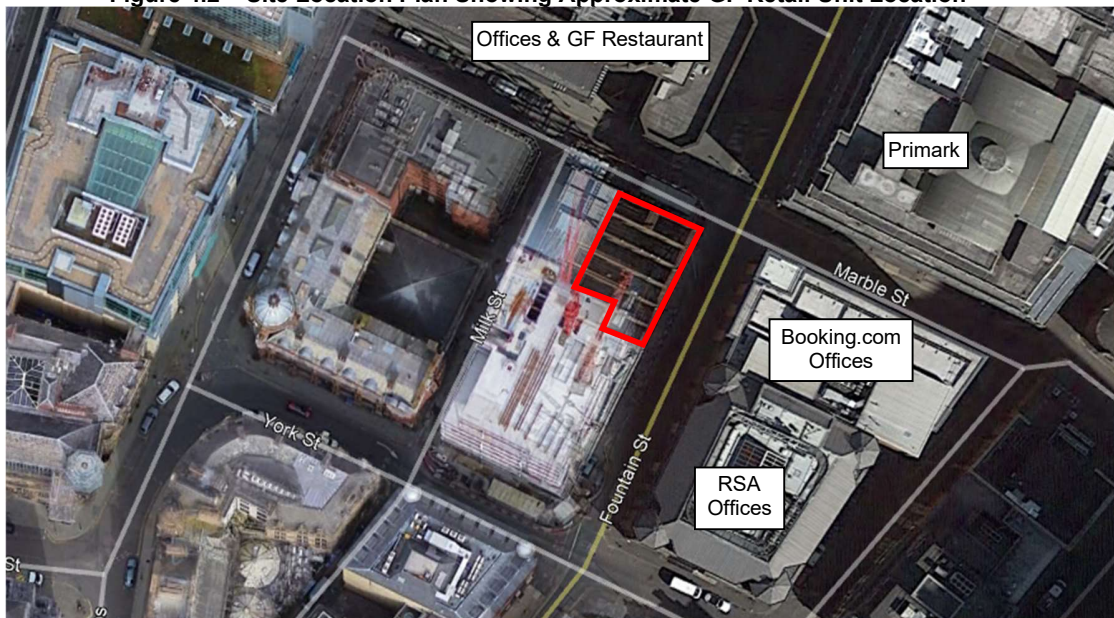
- 4.2 Condition 9 is concerned with noise break-out from the glazed facades of the 2 Retail units as identified on Figure 4.1 below.

Figure 4.1 – Plan Showing Ground Floor Retail Units



- 4.2 The location of the retail units is presented on Figure 4.2 below. As can be seen, all of the surrounding premises are offices or retail.

Figure 4.2 – Site Location Plan Showing Approximate GF Retail Unit Location



- 4.3 The uses of the proposed A3 spaces on the ground floor are currently unknown. However, it is understood that the end users could potentially operate in the evening until

around 2300h, and that the potential noisiest activity would be a restaurant. AEC has previously measured noise levels in very busy restaurants and bars with low level background music in Manchester city centre on weekend nights. Ambient noise levels did not exceed 84dB_{LAeq,5min} even with a noisy party occurring and this noise data has been used in the noise break-out calculation.

- 4.3 The glazing installed on-site has a sound insulation performance of 41dBR_w and the specification is attached as Appendix D.
- 4.4 The worst-case situation relating to noise break-out relates to the offices & ground floor restaurant directly opposite the site to the north on Marble Street some 13m from the building façade where night-time background noise levels were 47dB_{LA90}.
- 4.5 With reference to the above, the resultant noise break-out has been calculated and the full calculation details are included in Appendix E with a summary presented in Table 4.1 below.

Table 4.1 – Resultant Noise Break-out

Details	Octave Band Centre Frequency, Hz								Overall
	63	125	250	500	1k	2k	4k	8k	
Restaurant Noise Level, dB _{LAeq}	78	77	76	77	79	77	75	75	84dB(A)
Window Sound Insulation, SRI	25	28	35	39	41	53	64	60	41dBR _w
13m Distance Attenuation, dB	-22	-22	-22	-22	-22	-22	-22	-22	--
Resultant Noise Level, dB _{LAeq}	37	33	25	22	22	8	-5	-1	25dB(A)
Background Noise Level, dB _{LA90}	51	50	47	44	43	38	30	20	47dB(A)
Resultant Minus Background	-14	-17	-22	-22	-21	-30	-35	-21	--

- 4.6 As the above table identifies, breakout noise levels from the A3 units comfortably comply with MCC requirements even as a worst-case situation. Furthermore, it should be noted that noise at any residential properties would be inaudible and in reality, during the night-time, offices would not normally be operational.
- 4.7 It is considered that the above provides sufficient information to discharge condition 9.

Condition 11

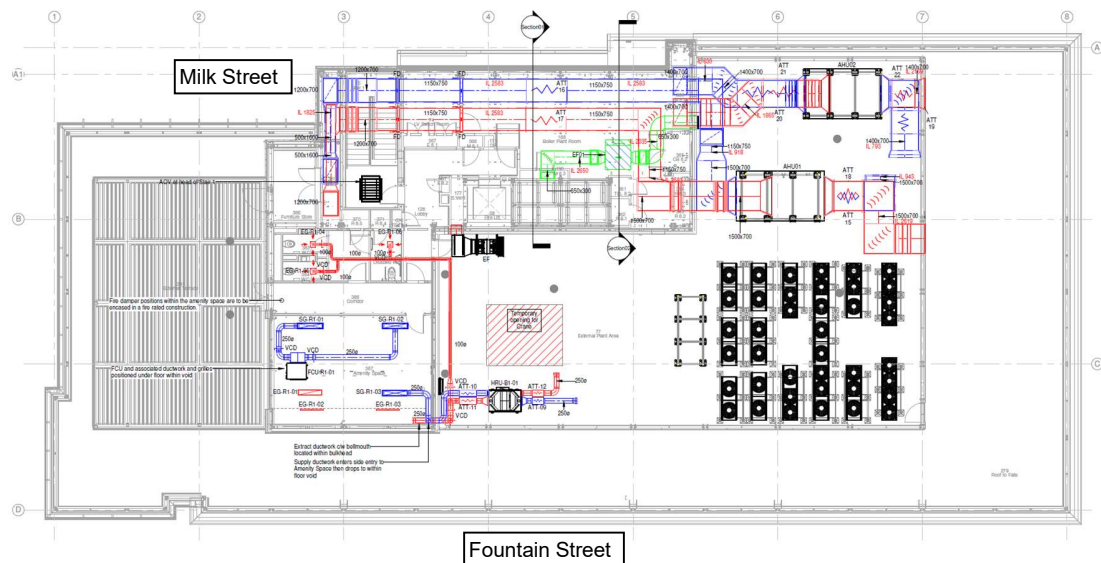
- 4.8 Condition 11 states:

‘11) Notwithstanding the approved details, before first occupation of the development the building, together with any externally mounted ancillary equipment, shall be acoustically insulated in accordance with a scheme 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 scheme shall be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.

Upon completion of the development a verification report to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report shall be submitted to and approved in writing by the City Council as local planning authority. The verification report shall also undertake post completion testing to confirm that acceptable criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria and timescales for the implementation of those measures.'

- 4.9 With regard to mechanical plant noise, AEC considers that the above noise limit would normally apply to residential receivers. With regard to commercial receivers, it is considered that an appropriate noise level limit for plant and ancillary equipment is 50dB(A). Based on this, assuming windows were open for ventilation purposes, noise levels within the commercial buildings would be no greater than 35-40dB(A) depending on how far the window was opened. As defined in BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' a noise limit of 35-40dBL_{Aeq,T} is appropriate for executive and cellular offices, which would represent a the most onerous receiver for an commercial / office building.
- 4.10 The rooftop plant layout as installed on-site is as per figure 4.3 below.

Figure 4.3 – Rooftop Plant Layout



- 4.11 The rooftop items identified above are as presented in Table 4.3 below. Noise data for the items installed has been provided. This is included as Appendix F and is summarised in Table 4.2, below.

Table 4.2 – Rooftop Plant Items and Noise Emission Levels

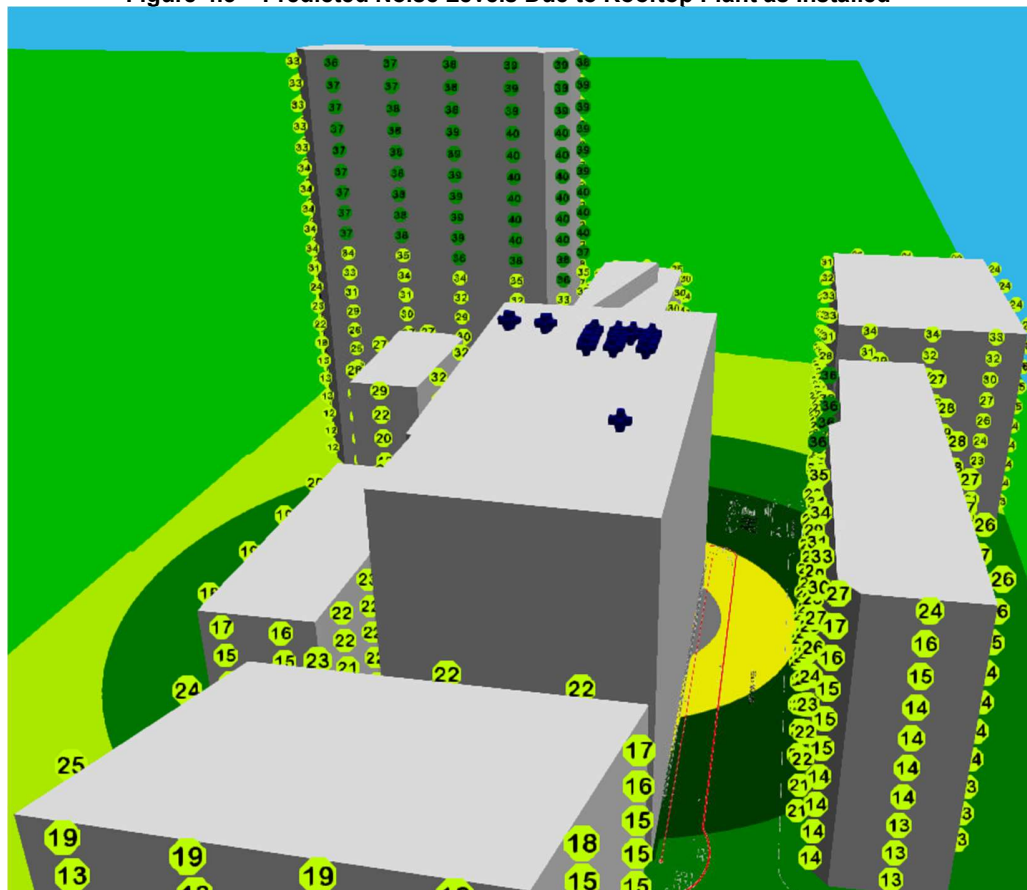
Item	Noise Level, dB @ 1m
VRF Toshiba MMY-MAP1406FT8P x 2	64dB(A) – per item
VRF Toshiba MMY-MAP1606FT8P x 11	64dB(A) – per item
VRF Toshiba MMY-MAP1806FT8P x 7	64dB(A) – per item
Office AHU 1 Exhaust (Attenuated)	57dB(A)
Office AHU 1 Inlet (Attenuated)	48dB(A)
Office AHU 1 Casing Breakout	50dB(A)
Office AHU 2 Exhaust (Attenuated)	58dB(A)
Office AHU 2 Inlet (Attenuated)	51dB(A)
Office AHU 2 Casing Breakout	50dB(A)
Rooftop Extract (Exhaust and Inlet Attenuated)	<55dB(A)

- 4.12 Using CadnaA® environmental noise prediction software the predicted noise levels at the facades of the nearest office buildings have been predicted using the above noise level data. Figure 4.4 shows the plan of the predicted noise levels and Figure 4.5 shows a 3D screen grab of the model showing the building heights used.

Figure 4.4 – Predicted Noise Levels Due to Rooftop Plant as Installed



Figure 4.5 – Predicted Noise Levels Due to Rooftop Plant as Installed



- 4.13 Based on the above even if all mechanical plant items were operating at full duty during the night-time period, MCC's plant noise limit of not greater than 42dB(A) (lowest measured background noise level minus 5dB) would be achieved.
- 4.14 It is important to note that in reality, it will be rare for all items of plant to operate at the same time and during the night-time the plant will operate at reduced capacity / duty, meaning that the above noise levels represent an over-prediction.
- 4.15 The above assessment demonstrates that for the atmospheric noise emissions for the items of mechanical plant installed at 11 York Street comply with MCC's requirements and, as such, condition 11 can be discharged.

Condition 12

- 4.16 Planning Condition 12 states:

'12) Before the use of the rooftop amenity space hereby approved commence, the premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that

has been submitted to and approved in writing by the City Council as local planning authority. Where entertainment noise is proposed the L_{Aeq} (entertainment noise) shall be controlled to 10dB below the L_{A90} (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location.

Upon completion of the development a verification report to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report shall be submitted to and approved in writing by the City Council as local planning authority. The verification report shall also undertake post completion testing to confirm that acceptable criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria and timescales for the implementation of those measures'.

- 4.17 As this is a rooftop amenity space where the main noise source will be noise due to people attending events, the only possible method of demonstrating compliance is to predict noise levels to the surrounding buildings. It is not possible to set up an event and then measure at the surrounding buildings at high level.
- 4.18 AEC understands that the rooftop amenity/event space may operate until possibly 0100h, with no access allowed for the general public. It is understood that there could be up to 60 people in the amenity/event space.
- 4.19 The lowest background and ambient noise levels measured, during the night-time period, were 47dBL_{A90, T} and 57dBL_{Aeq, T}, respectively.
- 4.20 With regard to event attendee noise, the anticipated sound power level within the rooftop amenity/event space has been calculated with reference to the method presented in the J.H. Rindel, C.I Christensen, A.C. Grade research paper: 'Dynamic sound source for simulating the Lombard effect in room acoustic modelling software' (Proceedings of Inter-Noise 2012, New York, USA, (2012)).
- 4.21 As the area is associated with an interior bar, it has been deemed appropriate to use a noise level representative of 'raised' speech conversation levels. The sound power level of a person speaking in a *raised* voice is equal to roughly 76dBL_{WA} (ref. ANSI 3.5).
- 4.22 To calculate the number of people speaking at any one time the following method presented in the above research paper was used.
- 4.23 The first step is to calculate the number of speaking persons (NS) at any one time, where N is the total number of persons (60) and G is the assumed group size (typically 3.5).

$$\text{Number of speaking persons (NS)} = N/G$$

- 4.24 In this scenario, this equates to around 17 people speaking at any one time (60/3.5) on the rooftop amenity space. Taking this into account, as well as the sound power level of 'raised' conversation (76dBL_{WA}) a 3D acoustic model has been produced of the above scenario using CadnaA® environmental noise prediction software and the predicted noise levels are presented in Figures 4.6 and 4.7 below.
- 4.25 Figures 4.6 and 4.7 show the predicted L_{Aeq} noise levels and includes the 1.1m high glass balustrade around the rooftop amenity space. The circled numbers on the building show the highest predicted level. It is not possible to show the noise spectrum data used in the

calculation and, as such, the predicted noise spectrum data at the worst-case affected property is included in table 4.3 below.

Figure 4.6 – Predicted Noise Levels Due to Rooftop Use (Plan)

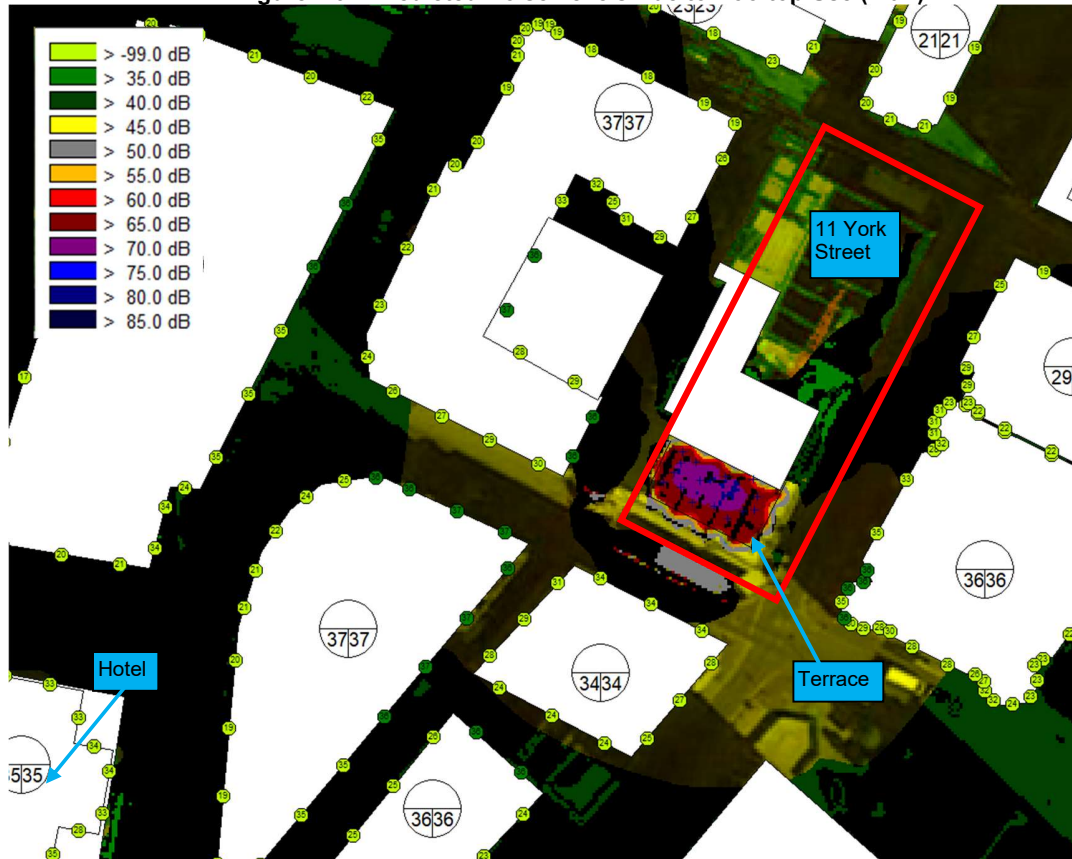


Figure 4.7 – Predicted Noise Levels Due to Rooftop Use (3D)

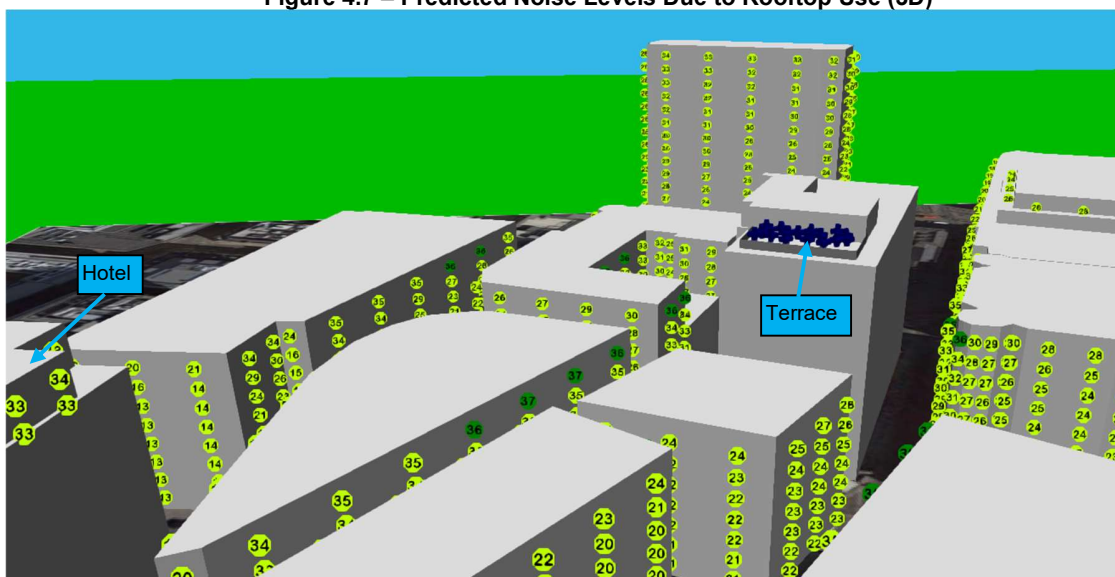


Table 4.3 – Rooftop Terrace Noise Compared to Background Noise

Details	Octave Band Centre Frequency, Hz								Overall
	63	125	250	500	1k	2k	4k	8k	
Restaurant Noise Level, dBL _{eq}	20	26	30	34	33	27	19	8	37dB(A)
Background Noise Level, dBL ₉₀	51	50	47	44	43	38	30	20	47dB(A)
Resultant Minus Background	-31	-24	-17	-10	-10	-11	-11	-12	--

- 4.26 As Table 4.3 demonstrates as a worst-case prediction the L_{Aeq} noise levels affecting the worst-case affected surrounding building will comply with the requirements of planning condition number 12. Furthermore, in reality, this prediction applies to surrounding offices in the night-time period which are not as noise sensitive as residential properties. The noise levels would be even lower at the Gotham Hotel, some 85m from the site.
- 4.27 The above provides sufficient information in order that condition 12 can be discharged.

FIGURE B1 – Existing Site Showing Monitoring Locations



Map data @2019 Google United Kingdom

APPENDIX A – Acoustic Terminology in Brief

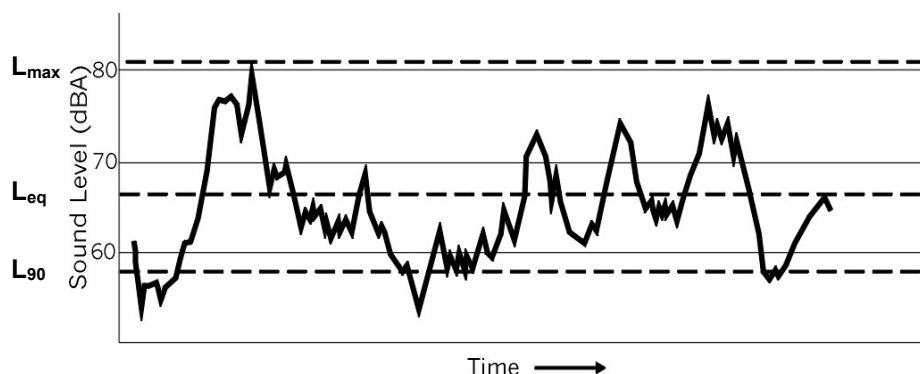
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most sound is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance of certain frequencies within the audible range.

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a *dB* descriptor in the report e.g. $L_{Aeq,T}$ could be written $dB_{L_{Aeq,T}}$.



Example of Sound Level Varying With Time

$L_{Aeq,T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, <i>T</i> . It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the "ambient" noise level.
$L_{A90,T}$	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
L_{Amax}	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.

Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.
NR	Noise Rating – a graphical method for assigning a single number rating to a noise spectrum and is often use to specify noise level limits for mechanical services.
R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.

APPENDIX B – Noise Survey Details – 2013 Details

Date & Time of Survey:	Friday 3 May, 2013, 1145 – 1345h.					
Personnel:	Ben Tomlin (AEC).					
Equipment Used:	B&K 2260 Real Time Analyser (Originally AEC Kit 1).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2003 ' <i>Electro acoustics – sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	03/05/13	Daytime	Dry	16-18°C	Negligible wind speed & direction	60%
Measurement Locations:	Measurements were undertaken at 5 locations around the development site. Identified as A to E on Figure 1 and described below. A – On Fountain Street, about 5m from the edge of the carriageway, and 3m from the façade. B – On Marble Street, about 3m from the façade. C – On Milk Street, about 3m from the façade. D – On York Street, about 2m from the façade. E – At residential properties on Spring Gardens, about 3m from the façade.					
Measurement Details:	Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	A, B, C, D, E - free-field					
	Full results for the attended measurements are given in Table B1.					
Measured Data:	Full octave band centre frequency data was obtained for all measurements.					

TABLE B1 – Measured Daytime Noise Levels (2013)

Location	Period, h	Noise Level, dB				Comments
		L _{Aeq}	L _{A10}	L _{A90}	L _{Amax, F}	
A	1146-1151	67.0	70.2	57.9	81.7	Noise levels due to local and distant traffic, distant plant, distant building work and pedestrian traffic.
	1151-1156	65.2	68.8	58.3	76.7	
	1157-1202	64.9	67.8	59.7	75.8	
	1248-1253	63.0	65.9	57.8	77.2	
	1254-1259	69.4	71.4	62.2	85.3	
B	1203-1208	63.1	66.0	57.9	77.9	Noise levels due to local and distant traffic, distant plant, distant building work and pedestrian traffic.
	1209-1214	60.9	63.1	55.4	78.8	
	1300-1305	60.8	63.5	56.1	72.6	
C	1216-1221	64.5	63.8	59.3	86.2	Noise levels due to local and distant traffic, distant plant, distant building work and pedestrian traffic (siren paused out in 2 nd measurement).
	1222-1227	62.2	64.2	58.5	75.7	
	1308-1313	61.9	64.1	58.5	76.9	
	1314-1319	60.3	61.7	57.7	73.2	
D	1229-1234	70.8	76.5	60.9	85.9	Noise levels due to local and distant traffic, distant plant, distant building work and pedestrian traffic (siren paused out in both 1 st and 2 nd measurement).
	1234-1239	65.4	68.5	59.1	78.7	
	1320-1325	69.8	72.7	60.3	85.7	
	1326-1331	70.2	73.4	60.3	87.1	
E	1241-1246	63.3	66.4	58.0	75.2	Noise levels due to local and distant traffic, distant plant, distant building work and pedestrian traffic.
	1333-1338	63.6	66.2	57.4	76.8	

APPENDIX C – Noise Survey Details – 2019 Details

Date & Time of Survey:	Monday 5 August 2019, 2300h to Tuesday 6 August 2019, 0100h.					
Personnel:	Ross Chamberlain (AEC).					
Equipment Used:	B&K 2250 Real Time Analyser (AEC Kit 1).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2003 ' <i>Electro acoustics – sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	05/08/19 – 06/08/19	Night	Dry	15°C	Negligible wind speed & direction	60%
Measurement Locations:	Measurements were undertaken at 1 location around the development site. Identified as E on Figure 1 and described below. E – At residential properties on Spring Gardens, about 3m from the façade.					
Measurement Details:	Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	E - free-field					
	Full results for the attended measurements are given in Table C1.					
Measured Data:	Full octave band centre frequency data was obtained for all measurements.					

TABLE C1 – Measured Night-Time Noise Levels (2019)

Location	Period, h	Noise Level, dB			Comments
		L _{Aeq}	L _{A90}	L _{Amax, F}	
E	2308 – 2320	60.1	48.5	76.6	The main contributing source of noise was road traffic along from where Spring Gardens road meets York Street. Maximum noise levels due to car pass-bys along these streets.
	2320 – 2334	58.6	50.0	68.8	
	2335 – 2348	57.9	48.4	70.2	
	2350 – 0005	60.3	47.1	75.7	
	0005 – 0020	57.7	47.4	74.4	
	0020 – 0034	57.2	46.5	69.2	
	0035 - 0047	60.0	48.9	75.0	

APPENDIX D – Glazing Specification



C397 York Street, Manchester

Glass specification document

YST-SCL-00-XX-SP-Y1-09001



REV	DATE	BY	DESCRIPTION	Issue Date
P1	16/12/2019	AS	First Issue	18/12/19
C1	22/01/2020	AS	Issued for Construction	22/01/2020
C2	14/02/2020	AS	G2 Specification Change (RAL colour and Insulation)	14/02/2020

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Tel: 0121 6679481

Speedclad Ltd Company No: 6492516 E: info@speedclad.co.uk www.speedclad.co.uk



Constructionline
Part of Capita plc



CN Specialists
Awards 2016
Winner





G1 - Glass Type 1 (as specification L40-370A & 372A)

For exact locations refer to Speedclad elevations

44mm overall insulating glass unit

Outer Pane: 13.5mm Coolite SKN176ii Heat Strengthened Laminate

Cavity: 20mm Black Warm Edge Spacer Bar; Argon Gas Filled Cavity

Inner Pane: 10mm Planiclear Toughened HST

Photometric Data

Transmission, reflexion, absorption

$\rho_v = 0,13$ (Light reflection factor outside)

$\rho'_v = 0,15$ (Light reflection factor inside)

$\rho_e = 0,23$ (direct radiation reflection factor outside)

$\rho'_e = 0,35$ (direct radiation reflection factor inside)

$\alpha_e = 1 = 0,44; 3 = 0,02$ (direct radiation absorption factor)

$T_{UV} = 0,00$ (ultraviolet transmittance)

$T_v = 0,67$ (Light transmission)

$T_e = 0,31$ (direct radiation transmission factor)

$R_a = 92$ (general color rendering index (CRI))

EN 410

SC = 0,40 (Shading Coefficient, g/0,87)

b-Faktor = 0,43 (VDI 2078, g/0,80)

$q_i = 0,03$ (secondary heat inside)

$g = 0,34$ (Total energy transmission factor)

EN 673 Installation angle = 90° vertikal

$U_g = 1,0 \text{ W/m}^2\text{K}$ (Heat transfer coefficient)

EN 13363-2 $T_e = 5,00 \text{ }^\circ\text{C}$ $T_i = 20,00 \text{ }^\circ\text{C}$

$g_{th} = 0,025$ (Thermal radiation factor)

$g_c = 0,018$ (Convection factor)

$g_v = 0,000$ (Ventilation factor)

$E_s = 300,00 \text{ W/m}^2$ System = 1,50 m

$h_{c,e} = 18,00 \text{ W/m}^2\text{K}$ $h_{c,i} = 3,60 \text{ W/m}^2\text{K}$

$q_i = 0,043$ (secondary heat inside)

$g = 0,35$ (Total energy transmission factor)

Acoustic Data

The acoustic performance data is determined by calculation, based on factors derived from certified data. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 140-3, some variation in the calculated performance can also be expected. As such, the weighted performance, R_w , and adaptation terms, C and Ctr, should typically be considered to be accurate within +2dB. However, wider deviations can occur.

Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	41	-1	-4	35	41
28	35	39	41	53	64					

Head Office

Thurston House
Thornfield Business Park
Standard Way, Northallerton
DL6 2XQ
Tel: 01609 768970

Divisional Office

Unit 11 Hayfield Bus.Park
Field Lane
Auckley, Doncaster
DN9 3FL
Tel: 01302 436400

Regional Office

Rock Farm Offices
Seckington
Tamworth
B79 0LA
Tel: 0121 6679481



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Speedclad Ltd Company No: 6492516 E: info@speedclad.co.uk www.speedclad.co.uk

APPENDIX E – Noise Break-out Calculation

	Contract No:	P2643		Date:	05-Jul						
	Client:	Kier									
	Project:	11 York Street		Consultant:	AGB						
NOISE BREAK OUT TO OUTSIDE											
Noise Source	City Centre Restaurant										
	Corrections to obtain Lp at element ? (eg distance/directivity)										
Building & Element	Glazing										
	Area (S)	52 m²	Width(a)=	13 m	Height(b)=	4 m					
	Position Directivity (Q)	4 (=4 for a wall, 2 for a roof)									
	Additional Directivity										
Receiver	Offices Opposite										
	Distance (R) from element	13 m									
	Propagation Corrections										
	Barrier	0									
	Façade	0									
Calculation											
Frequency, Hz	63	125	250	500	1k	2k	4k	8k	dBA		
Internal Level, dB	78	77	76	77	79	77	75	75	84		
Internal Corrections, dB											
Corrected Internal Level, Lin, dB	78	77	76	77	79	77	75	75	84		
SRI of Element, dB	25	28	35	39	41	53	64	60			
Additional Directivity, dB											
Propagation Corrections											
Barrier, dB											
Façade, dB											
Level (1) at Receiver	dB	37	33	25	22	22	8	-5	-1	25	
Level (2) at Receiver	dB	35	31	23	20	20	6	-7	-3	23	
Criterion	dB	51	50	47	44	43	38	30	20	47	Measured BG
Shortfall (1)	dB	-14	-17	-22	-22	-21	-30	-35	-21		
Shortfall (2)	dB	-16	-19	-24	-24	-23	-32	-37	-23		
Calculation Method	(1)	Lp = Lin - R - 6 + 10Log(S) - 20Log(R) - 11 + 10Log(Q)									
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi²R²)) + 10Log(Q/2)									

APPENDIX F – Rooftop Plant Items As Installed

TOSHIBA Leading Innovation >>>

Toshiba Air Conditioning - VRF Data Sheet

MMY-MAP1406FT8P

Three-pipe SHRMe - Super Heat Recovery Condensing Unit

Features

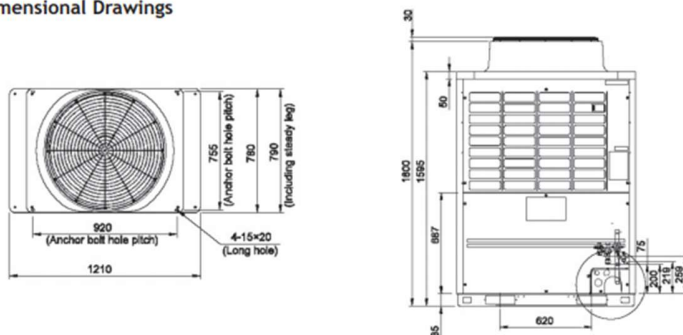
- Dual setpoint for more precision
- ESEER increased to >8
- UK-SEER achievable to >10
- New 4 series flow box with 50 m run
- New 4- and 6-port multi-flow boxes



Technical Data

Model reference		MMY-MAP1406FT8P
Nominal cooling	kW	40.0
Nominal heating	kW	45.0
Capacity code		14
Min./max. capacities connectable	kW	32.0/54.0
Power input (cool/heat)	kW	12.7/10.5
SEER/ESEER Value (Office Profile)		6.88/7.34
SCOP/ESCOP Value (Office Profile)		4.82/5.02
Starting current	A	1
Running current (cool/heat)	A	19.92/16.47
Suggested fuse size	A	32
Power supply	V-ph-Hz	380/415-3-50
Interconnecting cable		2-core screened 1.5 mm
Sound power (cool/heat)	dB(A)	81/83
Sound pressure (cool/heat)	dB(A)	62/64
Standard air flow	m ³ /h	12200
Standard air flow	l/s	3389
External static pressure	Pa	40
Maximum indoor units connectable		31
Dimensions (H x W x D)	mm	1830 x 1210 x 780
Unit weight	kg	316
R410A refrigerant base charge	kg	11

Dimensional Drawings



Cool Designs Ltd

Raising the Standards in Air Conditioning Distribution

www.cdlweb.info



All UK duties are based on Cooling Indoor air temperature 22°C DB/16°C WB Outdoor air temperature 28°C DB 50% RH, high fan speed, 5 m pipe run.
Heating Indoor air temperature 21°C DB Outdoor air temperature -4°C DB 100% RH, high fan speed, 5 m pipe run. Values are based on the maximum compressor output.
Data obtained from Toshiba Air Conditioning Web Data July 2019.

TOSHIBA Leading Innovation >>>

Toshiba Air Conditioning - VRF Data Sheet

MMY-MAP1606FT8P

Three-pipe SHRMe - Super Heat Recovery Condensing Unit

Features

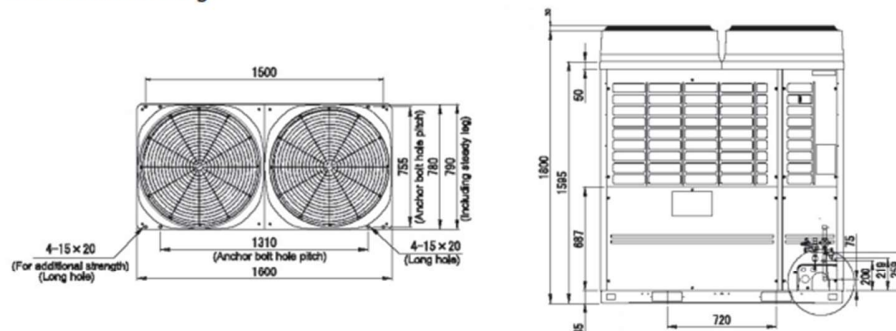
- Dual setpoint for more precision
- ESEER increased to >8
- UK-SEER achievable to >10
- New 4 series flow box with 50 m run
- New 4- and 6-port multi-flow boxes



Technical Data

Model reference		MMY-MAP1606FT8P
Nominal cooling	kW	45.0
Nominal heating	kW	50.0
Capacity code		16
Min./max. capacities connectable	kW	36.00/60.75
Power input (cool/heat)	kW	13.9/12.2
SEER/ESEER Value (Office Profile)		7.62/8.17
SCOP/ESCOP Value (Office Profile)		4.62/4.82
Starting current	A	1
Running current (cool/heat)	A	21.81/19.14
Suggested fuse size	A	40
Power supply	V-ph-Hz	380/415-3-50
Interconnecting cable		2-core screened 1.5 mm
Sound power (cool/heat)	dB(A)	83/84
Sound pressure (cool/heat)	dB(A)	61/62
Standard air flow	m ³ /h	17300
Standard air flow	l/s	4806
External static pressure	Pa	40
Maximum indoor units connectable		36
Dimensions (H x W x D)	mm	1830 x 1600 x 780
Unit weight	kg	377
R410A refrigerant base charge	kg	11

Dimensional Drawings



Cool Designs Ltd

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All UK duties are based on Cooling Indoor air temperature 22°C DB/16°C WB Outdoor air temperature 28°C DB 50% RH, high fan speed, 5 m pipe run.
Heating Indoor air temperature 21°C DB Outdoor air temperature -4°C DB 100% RH, high fan speed, 5 m pipe run. Values are based on the maximum compressor output.
Data obtained from Toshiba Air Conditioning Web Data July 2019.

TOSHIBA Leading Innovation >>>

Toshiba Air Conditioning - VRF Data Sheet

MMY-MAP1806FT8P

Three-pipe SHRMe - Super Heat Recovery Condensing Unit

Features

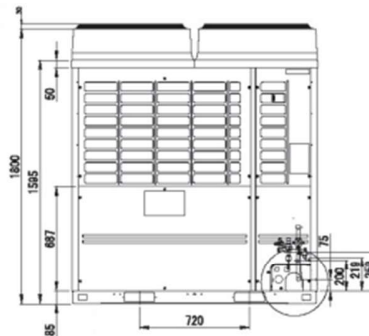
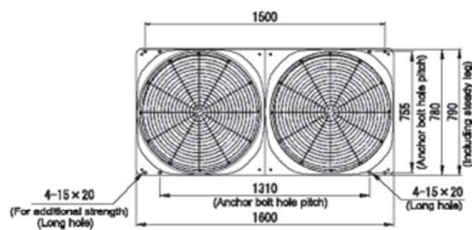
- Dual setpoint for more precision
- ESEER increased to >8
- UK-SEER achievable to >10
- New 4 series flow box with 50 m run
- New 4- and 6-port multi-flow boxes



Technical Data

Model reference		MMY-MAP1806FT8P
Nominal cooling	kW	50.4
Nominal heating	kW	56.5
Capacity code		18
Min./max. capacities connectable	kW	40.32/68.04
Power input (cool/heat)	kW	16.0/13.7
SEER/ESEER Value (Office Profile)		7.36/7.86
SCOP/ESCOP Value (Office Profile)		4.62/4.82
Starting current	A	1
Running current (cool/heat)	A	25.10/21.49
Suggested fuse size	A	40
Power supply	V-ph-Hz	380/415-3-50
Interconnecting cable		2-core screened 1.5 mm
Sound power (cool/heat)	dB(A)	83/84
Sound pressure (cool/heat)	dB(A)	61/62
Standard air flow	m³/h	17300
Standard air flow	l/s	4806
External static pressure	Pa	40
Maximum indoor units connectable		40
Dimensions (H x W x D)	mm	1830 x 1600 x 780
Unit weight	kg	377
R410A refrigerant base charge	kg	11

Dimensional Drawings



Cool Designs Ltd

Raising the Standards in Air Conditioning Distribution

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All UK duties are based on Cooling Indoor air temperature 22°C DB/16°C WB Outdoor air temperature 28°C DB 50% RH, high fan speed, 5 m pipe run.
Heating Indoor air temperature 21°C DB Outdoor air temperature -4°C DB 100% RH, high fan speed, 5 m pipe run. Values are based on the maximum compressor output.
Data obtained from Toshiba Air Conditioning Web Data July 2019.



AIR HANDLING UNIT eQ

Project	28618 (117122180B07) / 11 York Street Manchester AHU's	Acon 2.49.35593
AOC	ACON-02621496	
Unit	9 (A) / Office AHU1	2020-06-03
Size	063	Page 5/23
Customer	Dodd Group	
Customers ref.	Will Tatterton	
Our ref.	Andy Window	
Supply air volume flow rate	6600 l/s	Exhaust air volume flow rate 6100 l/s
External static pressure	350 Pa	External static pressure 350 Pa
Mains electricity	3x400VAC±10%+N+PE, 50Hz	Weight 2988 kg
Specific el. power demand (SFPv)	1.90 kW/(m³/s)	Dimensioned for wet condition
Ref. density	1.2 kg/m³	Ref. altitude above sea level 0 m

Filter cross section air velocity	2.4	2.3	m/s
Air flow	6600	6439	l/s
Total pressure rise	689	590	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	69.8	68.8	%
Fan system input power (absorbed electrical power) according to SFP	6.8	5.79	kW

Fan system effect is taken into account in fan performance

Fan power supply data

Voltage, supply flow	3x400VAC+PE, 50Hz	Voltage, extract flow	3x400VAC+PE, 50Hz
Power, supply flow	2 x 4.6 kW	Power, extract flow	2 x 4.6 kW
Current, full load, supply flow	2 x 7.4 A	Current, full load, extract flow	2 x 7.4 A

SOUND POWER LEVELS (standard: EN13053 ISO/CD 13347-2)

	Lw per octave band (dB)								LwA
Octave band (Hz)	63	125	250	500	1k	2k	4k	8k	dB(A)
Fresh air connection	77	77	70	65	61	59	54	56	69
Supply air connection	84	90	84	86	82	79	75	73	88
Extract connection	75	77	72	67	59	57	52	54	69
Exhaust connection	82	87	83	84	80	76	73	71	85
To surroundings	73	71	61	50	47	46	41	35	58



FläktGroup



AIR HANDLING UNIT eQ

Project	28618 (117122180B07) / 11 York Street Manchester AHU's	Acon 2.49.35593
AOC	ACON-02621507	
Unit	10 (C) / Office AHU2	2020-06-03
Size	063	Page 5/23
Customer	Dodd Group	
Customers ref.	Will Tatterton	
Our ref.	Andy Window	
Supply air volume flow rate	6000 l/s	Exhaust air volume flow rate 5500 l/s
External static pressure	300 Pa	External static pressure 300 Pa
Mains electricity	3x400VAC±10%+N+PE, 50Hz	Weight 2912 kg
Specific el. power demand (SFPv)	1.65 kW/(m³/s)	Dimensioned for wet condition
Ref. density	1.2 kg/m³	Ref. altitude above sea level 0 m

Filter cross section air velocity	2.1	2.1 m/s
Air flow	6000	5839 l/s
Total pressure rise	598	510 Pa
Fan fan system effect	0	0 Pa
Fan total efficiency	69.8	68.5 %
Fan system input power (absorbed electrical power) according to SFP	5.36	4.55 kW

Fan system effect is taken into account in fan performance

Fan power supply data

Voltage, supply flow	3x400VAC+PE, 50Hz	Voltage, extract flow	3x400VAC+PE, 50Hz
Power, supply flow	2 x 4.6 kW	Power, extract flow	2 x 4.6 kW
Current, full load, supply flow	2 x 7.4 A	Current, full load, extract flow	2 x 7.4 A

SOUND POWER LEVELS

(standard: EN13053 ISO/CD 13347-2)

Octave band (Hz)	Lw per octave band (dB)								LwA dB(A)
	63	125	250	500	1k	2k	4k	8k	
Fresh air connection	72	75	68	63	58	56	52	53	66
Supply air connection	80	87	82	83	80	76	73	70	85
Extract connection	71	76	70	64	56	54	49	51	66
Exhaust connection	78	86	80	81	77	74	70	68	83
To surroundings	68	69	59	47	44	43	39	32	56

Attenuator Schedule

Notes

1. All attenuators shall be supplied by Caice or equal and approved.
2. The Contractor shall order the attenuators scheduled below, and shall send finalised drawings and equipment noise levels to the attenuator supplier to check the selections prior to manufacture.
3. The attenuator supplier shall then undertake acoustic calculations to ensure that the attenuators achieve the specified noise criteria, based upon the finalised information.
4. A Technical Submittal comprising acoustic calculations and a finalised schedule of attenuators shall then be issued to the Consultant for final approval.
5. If an alternative attenuator supplier is proposed then the Contractor shall allow for them to undertake witnessed tests to prove their claimed insertion loss performance in a UKAS accredited BS EN ISO 7235: 2009 test facility, for two sample units. This shall be undertaken prior to order.
6. Pressure losses are stated in accordance with ISO 7235, which is based on laminar airflow conditions. The system designer shall make allowance for increased attenuator pressure losses where turbulent airflow conditions exist on the attenuator entry or exit.
7. Unless stated otherwise all attenuators shall be constructed as follows: Galvanised sheet steel casings with 30mm profile flanges that are fully compliant with DW/TM1 at a high pressure rating (+2000/-750Pa). Profile flanges shall be compatible with Doby, Mez & Metu flanging systems. Elements shall be installed in the vertical plane, with side elements provided as standard, and all elements shall have aerodynamic inlet and outlet fairings. Element facings shall be constructed from expanded galvanised steel mesh with fibre glass tissue bonded to the inner face. Mineral wool infill shall be overpacked to minimise voids due to settlement. Attenuator ends shall be protectively wrapped, and all attenuators shall be delivered to site on pallets and individually labelled.

Ref.	Description	Type and Model Code	Dimensions (mm)			Insertion Loss (dB)								Vol (m³/s)	PL (Pa)	Qty	Features
			W	H	L	63	125	250	500	1k	2k	4k	8k				
ATT 15	AHU 1 FAI Atmosphere side	Rectangular SG02H/3C/L/S	1500	700	1500	2	5	14	19	11	9	7	7	6.52	32	1	Unit delivered in 2 sections, split in length. Horizontal elements.
ATT 18	AHU 1 EXH Atmosphere side	Rectangular SG01V/3C/L/S	1500	700	1500	5	7	15	31	27	17	11	8	6.03	42	1	
ATT 19	AHU 2 FAI Atmosphere side	Rectangular SG01H/3C/L/S	1400	700	1200	1	5	11	15	10	8	6	6	6.02	30	1	Horizontal elements.
ATT 22	AHU 2 EXH Atmosphere side	Rectangular SG01V/3C/L/S	1400	700	1200	4	5	12	25	22	14	10	7	5.50	38	1	

