

### **REPORT TITLE:**

London School of Hygiene & Tropical Medicine TP2, Tavistock Place -Plant Noise Impact Assessment. Planning conditions 14 and 15

## **CLIENT DETAILS:**

8 Build

## DATE:

14<sup>th</sup> October 2021

# **REPORT REFERENCE:**

PC-20-0247-RP2 Rev C

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### **Document Status and Revision Schedule**

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Issue/Revision	Description/Comments	Date	Prepared by	Approved by
-	Checked and Authorised	23/04/21	JCB	MJ
Δ	Additional plant units included	6/00/21	ICB	N/L
~	Additional plant drifts included	0/03/21	300	1015
5		1.1/00/01	100	
В	Emergency attenuator noise assessment	14/09/21	JCB	MJ
	<b>3</b> <i>i</i>			
C	AHI Lattenuator noise assessment	1//10/21	ICB	N/ I
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## 1 Summary

Pace Consult Limited was commissioned by 8 Build to undertake a noise impact assessment from the proposed plant units located on the roof and on the courtyard of the new London School of Hygiene & Tropical Medicine TP2 building affecting the nearest noise sensitive receptors.

This report has been prepared in accordance with national acoustic guidelines and <u>Planning Conditions 14 and 15</u>.

The calculated noise emission from the proposed plant units to the nearest residential is more than 10 dBA below the measured background, and therefore the noise impact is compliant with the planning conditions 14 and 15 acoustic requirements.

## 2 Introduction

Pace Consult Limited was commissioned by 8build to undertake a noise impact assessment from the proposed plant units located on the roof and on the courtyard of the new London School of Hygiene & Tropical Medicine TP2 building affecting the nearest noise sensitive receptors.

This report has been prepared in accordance with national acoustic guidelines and Planning conditions 14 and 15.

Pace Consult Ltd completed a background noise survey and documented the findings in report PC-18-0072-RP2 dated 25<sup>th</sup> September 2018. Noise data representative of the nearest noise sensitive receptors was assessed against the criteria recommended by the most relevant acoustic guidelines.

The levels used in the calculations were extracted from the M&E technical submittals and plant manufacturer's data. To undertake the outdoor sound level calculations Part 2 of ISO 9613 Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation was used. This ISO standard is incorporated in the SoundPLAN v 8.1 software. This software was used to generate outdoor sound levels from the Plant units to the nearest noise sensitive receptors and to produce noise contour maps.

The sound pressure levels from the proposed plant units were assessed during the day and night-time with all plant items operating continuously.

It is understood that the 2 x chillers located in the plant room will operate during daytime only, the rest of plant units are proposed to operate during day and night-time.

# 3 Criteria

The external noise emission criteria at the nearest noise sensitive receptors, as taken from report PC-18-0072 RP2, are as follows: The environmental assessment was undertaken in accordance with the methodology described in BS 7445:1997.

Table 1. Noise measurement	Table 1. Noise measurements at R1.									
Time period	LAeq dB (Log average over	LA90 Lowest measured (1 hr day and 15 mir								
	15 minutes period)	night time period)								
Morning 07:00-18:00	61	52								
Evening 18:00-23:00	59	48								
Night 23:00-07:00	54	41								

Table 2. Noise measuremen	Table 2. Noise measurements at R2.									
Time period	LAeq dB (Log average over 15	LA90 Lowest measured (1 hr day and 15								
•	minutes period)	min night time period)								
Morning 07:00-18:00	54	46								
Evening 18:00-23:00	51	44								
Night 23:00-07:00	48	44								

The measurement locations are included below.



Figure 1. Measurements location.

#### 3.1 Nearest noise sensitive receptors.

The nearest residential properties which have the potential to be affected by the plant noise emission are included below.



Figure 2. Nearest noise sensitive receptors.

R1= No 57 Cartwright Gardens R2= No 81 Marchmont St R3= No 34 Tavistock PI.

3.2 Planning Conditions 14 and 15.

Planning condition 14 states the following:

Noise levels at a point 1 metre external to sensitive facades shall be at least 10 dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 15 dB(A) below the LA90 expressed in dB(A).

Planning condition 15 states the following.

Before the relevant part of the work is begun, details of all external roof plant shall be submitted to and approved by the Local Planning Authority. Such details shall include appropriate acoustic isolation, sound attenuation and anti-vibration measures in accordance with the recommendations of the acoustic report hereby approved. The plant shall be carried out in accordance with the approved details and shall thereafter be retained and maintained in accordance with the manufacturers' recommendations.

### 4 Calculation assumptions

4.1 Plant unit locations.

The noise data used for the calculations is as advised by Mechanical Services Ltd, the figure below shows the location of the plant items used in the calculations.



The figure below shows the plant area located on the roof,

Figure 3. Plant units.

#### Condensers



Figure 4. Condensers location.

### 4.2 Noise levels information.

### <u>2 x Chillers</u>

Acoustic infor	mation										
Sound pressure level at 1 m from the unit (rif. 2 x 10-5 Pa)											
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	db(A)			
62.3	67.2	66.5	64.1	63.3	61.0	58.4	52.7	68.3			

### Extract Fans

#### **EF01**

	Sou	nd Sp	ectru	m (Hz	Overall					
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	63	66	66	66	61	62	55	46	72	47
Outlet*	64	68	67	70	71	69	60	51	77	54
Breakout*	55	57	54	42	37	35	26	<20	60	28
* Lw dB re 10 <sup>-12</sup> W ** dBA re 2x10 <sup>-5</sup> Pa Sound data at requested duty.									a	

### <u>EF02</u>

	Sou	nd Sp	ectru	Overall						
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	80	60	54	51	48	41	36	30	80	36
Outlet*	100	65	68	74	67	64	58	51	100	56
Breakout*	76	58	53	47	40	33	28	24	76	32
* Lw dB re 10 <sup>-12</sup> W Sound data at requested duty.								A re 2x	10 <sup>5</sup> P	a

#### <u>AHU 01</u>

#### Supply Fan

Sound Power Lw	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	77	79	87	81	76	73	73	73
Fan Outlet (dB)	83	83	93	89	85	79	78	77

#### Exhaust Fan

Sound Power Lw	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	76	83	78	73	72	70	67	69
Fan Outlet (dB)	80	84	81	83	79	75	72	71

4.3 Proposed Noise Attenuation.

#### Chillers.

It is understood that the chiller heat rejection will be acoustically treated by 4 x ducts dividers 1000mm w x 500mm d (per chiller), as included in the figure below.



Figure 5. Chiller ducts dividers location.

The above duct dividers are treated acoustically by using a 100 mm mineral wool as shown in the figure below.

Glass wool CLIMLINER Slab Cleantec Resilient and robust acoustical and thermal internal insulation of metal of	ං <sup>ර</sup> Share air ducts

#### AHU unit noise attenuators

The AHU will include the following noise attenuators (FAI and Exhaust).

System Deference		Performance, dB								
System Reference	63	125	250	500	1k	2k	4k	8k		
AHU - FAI	10	17	23	32	42	38	30	23		
AHU - EXHAUST - OPTION 900L*	7	13	19	31	48	41	35	25		

### Weather Louvres

Weather louvres will be installed within the intake and exhaust areas located on the north and south elevation of the plant room

The proposed louvres are included below.



Figure 6. Weather louvres location.

#### 4.4 Emergency plant units.

### Level 02 smoke extract fan.

The smoke extract fan noise levels are included below.

	Sound Power Level Spectrum										
Frequency (Hz)	63	125	250	500	1K	2К	4К	8K	dB(A) @ 3m		
Inlet (dB)	92	90	98	98	96	92	87	82	80		
Outlet (dB)	99	93	98	97	95	91	86	81	79		

The location of the smoke extract fan is included below.



Figure 7. Smoke extract fan location.

#### **Basement Life Safety Generator**

The noise levels of the proposed life safety generator are included below.

7.4										
Frequency	Hz	63	125	250	500	1000	2000	4000	8000	Hz
Unsilenced Lp dB(A)		72	89	93	98	101	100	99	101	dB(A)
Multi Set Co	orrection	0	0	0	0	0	0	0	0	dB(A)
Combined L	_p dB(A)	72	89	93	98	101	100	99	101	dB(A)
Atten	uation									
RVS	Length									
100	1300	-7	-13	-24	-41	-51	-51	-42	-30	dB(A)
Lined Bend		-2	-3	-5	-5	-3	-3	-4	-2	dB(A)
Distance Lo	sses	-3	-3	-3	-3	-3	-3	-3	-3	dB(A)
Silenced SF	PL dB(A)	60	70	61	49	44	43	50	66	dB(A)
Resultan	t Silenced	70.0		4	Sets	Attenuator 1600		(H) mm	1200	(W)mm
Noise	e Level	12.2	dB(A)	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	Running	PV m/sec	8,68	BP	59,96	Pa
						Resistance	20,92	Pa		
AR OUTL	ET SYSTEM	Δ								
Frequency	Hz	63	125	250	500	1000	2000	4000	8000	Hz
Unsilenced	Lp dB(A)	70	80	03	98	101	100	00	404	Pa
Multi Set Correction		12	03				100	99	101	1.01
	orrection	0	0	0	0	0	0	0	0	dB(A)
Combined L	prrection p dB(A)	0 72	0	0 93	0 98	0	0	0 99	0	dB(A) dB(A)
Combined L Atten	prrection p dB(A) muation	0 72	0	0	0 98	0	0 100	99 0 99	0 101	dB(A) dB(A)
Combined L Atten RVS	Derrection Derrection Derrection Derrection Length	0 72	0	0	0 98	0	0 100	99 0 99	0 101	dB(A) dB(A)
Combined L Atten RVS 100	prrection p dB(A) nuation Length 1800	-9	-17	0 93 -30	0 98 -47	0 101 -55	0 100 -55	99 0 99 -49	-36	dB(A) dB(A) dB(A)
Combined L Atten RVS 100 Lined Bend	Length	-9 0	0 89 -17 0	0 93 -30 0	0 98 -47 0	0 101 -55 0	0 100 -55 0	99 0 99 -49 0	-36 0	dB(A) dB(A) dB(A) dB(A)
Combined L Atten RVS 100 Lined Bend Other Atten	uation	-9 0 0	-17 0 0	-30 0 0 93	0 98 -47 0 0	0 101 -55 0 0	-55 0 0	99 0 99 -49 0 0	-36 0 0	dB(A) dB(A) dB(A) dB(A) dB(A)
Combined L Atten RVS 100 Lined Bend Other Atten Silenced SF	uation Langth 1800 Length 1800 Length 1800 Length 1800 Length 1800	-9 0 0 -9 0 63	0 89 -17 0 0 72	0 93 -30 0 0 63	0 98 -47 0 0 51	0 101 -55 0 0 46	0 100 -55 0 0 45	99 0 99 49 0 0 50	-36 0 0 0 0	dB(A) dB(A) dB(A) dB(A) dB(A) dB(A)
Combined I Atten RVS 100 Lined Bend Other Atten Silenced SF Resultan	Length 1800 Length 1800 Length 1800 Length 1800 Length 1800 Length 1800 Length 1800	-9 0 0 0 63	0 89 -17 0 0 72	0 93 -30 0 0 63	0 98 -47 0 0 51 Sets	0 101 -55 0 0 46 Attenuator	-55 0 0 45 1600	99 0 99 	-36 0 0 0 65 1200	dB(A) dB(A) dB(A) dB(A) dB(A) dB(A) (W)mm
Combined I Atten RVS 100 Lined Bend Other Atten Silenced SI Resultan Noise	uation Length 1800 Length 180	-9 0 -9 0 0 63 73.7	0 89 -17 0 0 0 72 dB(A)	0 93 -30 0 0 63 1	0 98 -47 0 0 51 Sets Running	0 101 -55 0 0 46 Attenuator PV m/sec	-55 0 0 45 1600 8.13	99 0 99 	101 0 101 -36 0 0 65 1200 52.56	dB(A) dB(A) dB(A) dB(A) dB(A) dB(A) (W)mm Pa



The location of the life safety generator is included below.

Figure 8. Life safety generator location.

#### 4.5 Proposed Vibration Control.



It is understood that the chillers will be mounted on the following antivibration pads.

ANC registered Organisation No 167

The EF-01 and the AHU 01 will be mounted on a 10 mm thick tico pad.

The EF-02 will be hung from the roof structure with a flexible mount in order to mitigate vibration transfer.

The above anti vibration mounts are considered adequate to mitigate the vibration transfer to the building structure.

## 5 Calculation Summary

The table below includes the calculated sound levels at 1 metre of the nearest noise sensitive receptors compared against the lowest measured background during daytime.

Table 3. Noise Impact Day Time (07:00-23:00)											
Nearest	Calculated Noise	Excess over background sound									
residential	levels dBA	dBA	levels dBA								
R1	21	44	-23								
R2	30	48	-18								
R3	30	48	-18								

As can be seen from the assessment table the calculated noise levels are more than 10 below the lowest measured background, which is compliant with the noise criteria recommended by the planning condition 14.

The noise assessment during night-time is included in the table below. This assessment excludes the noise contribution from the chillers, which are operating during daytime only.

Table 4. Noise Impact Night Time (23:00-07:00)										
Nearest	Calculated Noise	Excess over background sound								
residential	levels dBA	time dBA	levels dBA							
R1	17	44	-27							
R2	24	44	-20							
R3	20	41	-21							

As can be seen from the assessment table the calculated noise levels are more than 10 below the lowest measured background, which is compliant with the noise criteria recommended by the planning condition 14.

The full calculated noise levels at each receiver, and the noise map of the study area is included in the Annex.

The table below includes the noise impact of the emergency plant, which is assessed against the measured background during day time

Table 5. Noise Impact Day Time (07:00-23:00)											
Nearest	Calculated Noise	Excess over background sound									
residential	levels dBA	dBA	levels dBA								
R1	27	44	-17								
R2	26	48	-22								
R3	29	48	-19								

As can be seen from the above table, the noise impact from the emergency plant units (smoke extract fans and life safety generator), are also more that 10 dB below the preexisting background at the nearest residential.

## 6 Conclusions

The calculated noise levels from the plant units proposed in the plant area are more than 10 dBA below the measured background during day and night-time, and therefore the planning conditions 14 and 15 are fully met.

## 7 Annex.

The table below includes the full calculated noise levels at each receiver during day time.

Source	Source	Level	Rated	Sound Power	Sound	Size of	Distance	Mean	Mean	Mean	Mean	Level	Assessment
	type	inside	Transmission	level per mm2	Power	Source	Source-	attenuation	attenuation	attenuation	attenuation due	increase to	level dB(A)
	900				1 01101	Couroo		L			, .		
		dB(A)	Loss dB	dB(A)	level	m,m²	Receiver	due to	due to	due to	to air	reflections	
					per unit		m	geometrical	ground effect	screening dB	absorption dB	dB	
					dB(A)			spreading	dB				
	ļ	ļ			uD(). ()	ļ		oproading					
R1													
Chiller Roof Acoustic	Area	69	11	59.8	63.2	2.2	45.49	-44.2	3	-11.4	-0.1	0	11
Chiller Roof Acoustic	Area	69	11	59.7	63.1	2.2	43.64	-43.8	3	-11.2	-0.1	0	11
East Chiller Louvre	Area	60	3	57.7	69.4	14.9	43.21	-43.7	3	-17.6	-0.2	0	12
Plant Room Louvre	Area	59	3	57	63.8	4.8	29.87	-40.5	3	-7.4	-0.2	0	17
Plant Room Louvre	Area	57	3	54.7	61.6	4.8	37.34	-42.4	3	-19.5	-0.1	0	2
REYQ10P8Y1B	Point			66.1	66.1		44.7	-44	3	-24.3	-0.1	2.4	3
Roof 01	Area	57	32	28.5	50.3	152	37.53	-42.5	3	-6.7	0	0	2
RXYQ10P7W1B	Point			66.1	66.1		44.8	-44	3	-23.9	-0.1	2.5	4
West Chiller Louvre	Area	60	3	57.7	67.4	9.2	44.91	-44	3	-15	-0.2	0	9
										Cum	ulative noise levels	dBA	21
							R2						
Chiller Roof Acoustic	Area	69	11	59.8	63.2	2.2	41.62	-43.4	3	-6.3	-0.1	0.1	16
Chiller Roof Acoustic	Area	69	11	59.7	63.1	2.2	41.08	-43.3	3	-6.3	-0.1	0	16
East Chiller Louvre	Area	60	3	57.7	69.4	14.9	37.77	-42.5	3	0	-0.4	0.6	28
Plant Room Louvre	Area	59	3	57	63.8	4.8	33.33	-41.4	3	-17.5	-0.1	0.8	7
Plant Room Louvre	Area	57	3	54.7	61.6	4.8	31.54	-41	3	0	-0.2	0	23
REYQ10P8Y1B	Point			66.1	66.1		27.67	-39.8	3	-21.6	-0.1	1.2	9
Roof 01	Area	57	32	28.5	50.3	152	37.62	-42.5	3	-5.6	-0.1	0.1	3
RXYQ10P7W1B	Point			66.1	66.1		28.22	-40	3	-20.8	0	0.9	9
West Chiller Louvre	Area	60	3	57.7	67.4	9.2	44.4	-43.9	3	-17	-0.1	0	7
										Cum	ulative noise levels	dBA	30
							R3						
Chiller Roof Acoustic	Area	69	11	59.8	63.2	2.2	36.4	-42.2	3	-7.8	-0.1	0.4	17
Chiller Roof Acoustic	Area	69	11	59.7	63.1	2.2	38.07	-42.6	3	-8.8	-0.1	1.1	16
East Chiller Louvre	Area	60	3	57.7	69.4	14.9	35.85	-42.1	3	-0.8	-0.4	0.4	28
Plant Room Louvre	Area	59	3	57	63.8	4.8	47.95	-44.6	3	-20.2	-0.2	0	0
Plant Room Louvre	Area	57	3	54.7	61.6	4.8	40.27	-43.1	3	-2.2	-0.4	0.6	20
REYQ10P8Y1B	Point			66.1	66.1		33.3	-41.4	3	-23.5	-0.1	2.6	7
Roof 01	Area	57	32	28.5	50.3	152	41.55	-43.4	3	-6.3	0	0.2	2
RXYQ10P7W1B	Point			66.1	66.1		33.09	-41.4	3	-23.2	-0.1	2.7	7
West Chiller Louvre	Area	59.7	3	57.7	67.4	9.2	38.5	-42.7	3	-17.4	-0.1	0.2	9
										Cum	ulative noise levels	dBA	30

The figure below shows the noise map of the study area. Day Time



Note. The noise map is calculated at 16 metres above ground level.

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Source	Source	Level	Rated	Sound Power	Sound	Size of	Distance	Mean	Mean	Mean	Mean	Level	Assessment
	type	inside	Transmission	level per m,m2	Power	Source	Source-	attenuation	attenuation	attenuation	attenuation due	increase to	level dB(A)
		dB(A)	Loss dB	dB(A)	level	m m²	Receiver	due to	due to	due to	to air	reflections	. ,
		ub(/ i)			10101	,					abaamatian dD		
					per unit		m	geometrical	ground effect	screening dB	absorption dB	aв	
					dB(A)			spreading	dB				
	ļ	ļ			ļ		R1		ł		Į	Į	Į
Chiller Roof Attenuation	Area	25	11	15.2	18.6	2.2	45.48	-44.1	3	-15.3	-0.2	0	-38
Chiller Roof Attenuation	Area	22	11	13.1	16.6	2.2	43.63	-43.8	3	-10.2	-0.1	0	-34
East Chiller Louvre	Area	25	3	22.6	34.3	14.9	43.21	-43.7	3	-17.4	-0.1	0	-22
Plant Room Acoustic	Area	57	3	54.7	61.5	4.8	37.41	-42.5	3	-19.7	-0.1	0	2
Plant Room Discharge	Area	58	3	56.4	63.3	4.8	29.87	-40.5	3	-7.4	-0.2	0	17
REYQ10P8Y1B	Point			66.1	66.1		44.7	-44	3	-24.3	-0.1	2.4	3
Roof 01	Area	54	32	25.4	47.2	152	37.53	-42.5	3	-6.8	0	0	-1
RXYQ10P7W1B	Point			66.1	66.1		44.8	-44	3	-23.9	-0.1	2.5	4
										Cum	ulative noise levels	dBA	17
							R2						
Chiller Roof Attenuation	Area	25	11	15.2	18.6	2.2	41.62	-43.4	3	-7.7	-0.3	0	-30
Chiller Roof Attenuation	Area	22	11	13.1	16.6	2.2	41.08	-43.3	3	-5.8	-0.1	0	-30
East Chiller Louvre	Area	25	3	22.6	34.3	14.9	37.77	-42.5	3	-0.1	-0.3	0.8	-7
Plant Room Acoustic	Area	57	3	54.7	61.5	4.8	31.77	-41	3	0	-0.3	0	23
Plant Room Discharge	Area	58	3	56.4	63.3	4.8	33.33	-41.4	3	-17.4	-0.1	0.8	6
REYQ10P8Y1B	Point			66.1	66.1		27.67	-39.8	3	-21.6	-0.1	1.2	9
Roof 01	Area	54	32	25.4	47.2	152	37.62	-42.5	3	-5.7	-0.1	0.1	0
RXYQ10P7W1B	Point			66.1	66.1		28.22	-40	3	-20.8	0	0.9	9
										Cum	ulative noise levels	dBA	24
	<b>x</b>	<b>x</b>	<b>-</b>	r		r	R3		<b>.</b>	r	<b>.</b>	•	•
Chiller Roof Attenuation	Area	25	11	15.2	18.6	2.2	36.4	-42.2	3	-10	-0.2	0.6	-30
Chiller Roof Attenuation	Area	22	11	13.1	16.6	2.2	38.07	-42.6	3	-8	-0.1	0.9	-30
East Chiller Louvre	Area	25	3	22.6	34.3	14.9	35.85	-42.1	3	-0.8	-0.3	0.1	-4
Plant Room Acoustic	Area	57	3	54.7	61.5	4.8	40.23	-43.1	3	-2.2	-0.4	0.6	19
Plant Room Discharge	Area	58	3	56.4	63.3	4.8	47.95	-44.6	3	-20	-0.2	0	0
REYQ10P8Y1B	Point			66.1	66.1		33.3	-41.4	3	-23.5	-0.1	2.6	7
Roof 01	Area	54	32	25.4	47.2	152	41.55	-43.4	3	-6.4	-0.1	0.2	-1
RXYQ10P7W1B	Point			66.1	66.1		33.09	-41.4	3	-23.2	-0.1	2.7	7
										Cum	ulative noise levels	dBA	20

The figure below shows the noise map of the study area. Night time.



Note. The noise map is calculated at 16 metres above ground level.