

The logo for Laing O'Rourke, featuring the company name in white capital letters between two horizontal lines, the top one yellow and the bottom one red.

LAING O'ROURKE

Report for planning condition 20: Atmospheric plant noise emissions

SUPPLIMENTARY INFORMATION

31 JANUARY 2019

Purpose of document

This document has been developed to supplement the Arup document "Report for planning: Atmospheric plant noise emissions – Revision B, 13/12/18" prepared for discharge of planning condition 20

Document content

Drawing TPB-CHT-SK-0238 in Appendix 1 shows the final positioning of roof plant on the roof.

The roof plant includes: fans, generator, and hybrid dry coolers.

Fans

TEF/OFF/10/001 – North WCs 1 Extract

TEF/OFF/10/003–BasementShowerAreasExtract

TEF/OFF/10/005 – North WCs 2 Extract

AHU/OFF/10/008 – Level 10 WCs

SEF/LLD/10/001–SouthSmokeExtract

SEF/LLD/10/002–NorthSmokeExtract

The noise data for the fans is based on the actual duty at their required flow rate.

The noise data for the **generator** and **hybrid dry coolers** are also summarized below.

1. Fans

TEF/OFF/10/001 – North WCs 1 Extract (Nuaire)

1.320 m³/s @ 757 Pa

Acoustic performance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	79	88	84	77	70	72	71	65	
Induct Outlet	80	81	81	82	74	74	73	62	
Open Inlet	71	85	83	77	70	72	71	65	
Open Outlet	73	78	80	81	74	74	73	62	
Breakout	73	72	71	58	43	44	50	38	44

TEF/OFF/10/003 – Basement Shower Areas Extract (Nuaire)

1.722 m³/s @ 385 Pa

Acoustic performance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	101	105	106	108	100	92	86	79	
Induct Outlet	103	107	111	112	101	93	85	79	
Open Inlet	92	100	104	107	100	92	86	79	
Open Outlet	94	102	110	111	101	93	85	79	
Breakout	83	87	97	89	77	79	74	60	71

TEF/OFF/10/005 – North WCs 2 Extract (Nuaire)

1.324 m³/s @ 755 Pa

Acoustic performance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	79	88	84	77	70	72	71	65	
Induct Outlet	80	81	81	82	74	74	73	62	
Open Inlet	71	85	83	77	70	72	71	65	
Open Outlet	73	78	80	81	74	74	73	62	
Breakout	73	72	71	58	43	44	50	38	44

AHU/OFF/10/008 – Level 10 WCs (Nuaire)

0.139 m³/s @ 799 Pa

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	59	58	45	48	35	34	34	26	27
Induct Intake	67	61	59	61	56	52	44	43	
Induct Supply	72	73	68	72	62	62	58	60	
Induct Discharge	73	74	68	71	62	62	60	61	
Induct Extract	66	60	58	61	55	52	44	44	

SEF/LLD/10/001 – South Smoke Extract (Elta Fans)

Please Note: Data shown is for a non-standard product.

Performance - Required

Air Flow : 4.13 m³/s
 Static Pressure : 1113 Pa
 Selection Pressure: 1297 Pa
 Installation Type: TYPE D
 Air Density: 1.20 kg/m³
 - Atmos. Temp: 20 °C
 - Altitude: 0 m
 - Humidity: 0.0 %

Actual

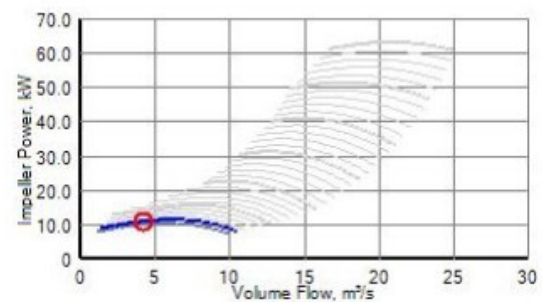
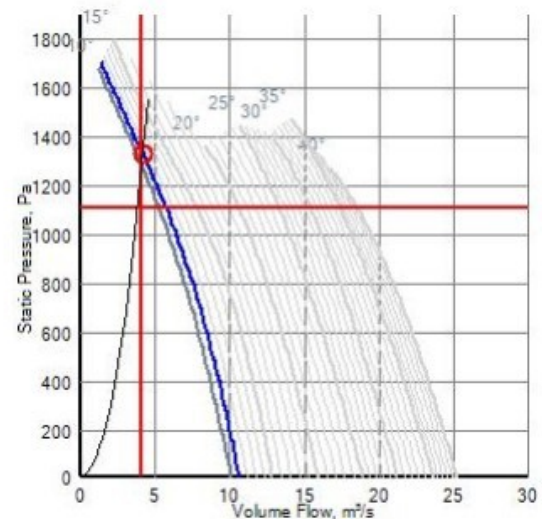
Air Flow: 4.17 m³/s
 Static Pressure: 1333 Pa
 Total Pressure: 1375 Pa

Fan Data

Catalogue Code: LCS080P2-A6/11 R&S Set
 (LCS080-717-IE2-132-11-2-255-38-RA6)
 Description: LCS - 2 x Long-Cased Smokevent
 Axial Fan
 Diameter: 800 mm Hub: 255 mm
 Impeller Type: Axial Pitch: 11°
 Blade Material: Aluminium Blades: 6
 Speed: 2935 r/min @50 Hz Form: B
 Power, Abs: 10.78 kW Peak: 11.31 kW
 Input Power: 12.09 kW
 Efficiency Total: 53.1% Static: 51.5%
 SFP: 2.93
 Fan Weight: 126.6 kg

Motor Data (at STP)

Motor Type: F300 (IE2) W
 Electrical Supply: 400V 3ph 50Hz
 Motor Frame: 132M
 Motor Power: 12.10kW (AOM) (11.00kW IEC)
 FLC/Start (DOL): 22.22A (AOM) / 144.43A (20.20A FL IEC)
 Motor Speed: 2 pole
 Motor Efficiency: 89.2%



Sound Data

Spectrum (Hz):	63	125	250	500	1K	2K	4K	8K	dBW	dB(A) @ 3m
Inlet (dB):	111	110	105	108	116	113	104	97	120	98
Outlet (dB):	113	108	104	107	115	114	105	96	120	98

Sound levels are quoted as in-duct values. dB(A) values are average spherical free-field for comparative use only.

SEF/LLD/10/002 –North Smoke Extract (Elta Fans)

Please Note: Data shown is for a non-standard product.

Performance - Required

Air Flow : 4.05 m³/s
 Static Pressure : 1086 Pa
 Selection Pressure: 1307 Pa
 Installation Type: TYPE D
 Air Density: 1.20 kg/m³
 - Atmos. Temp: 20 °C
 - Altitude: 0 m
 - Humidity: 0.0 %

Actual

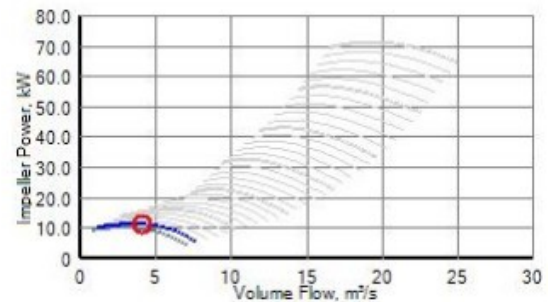
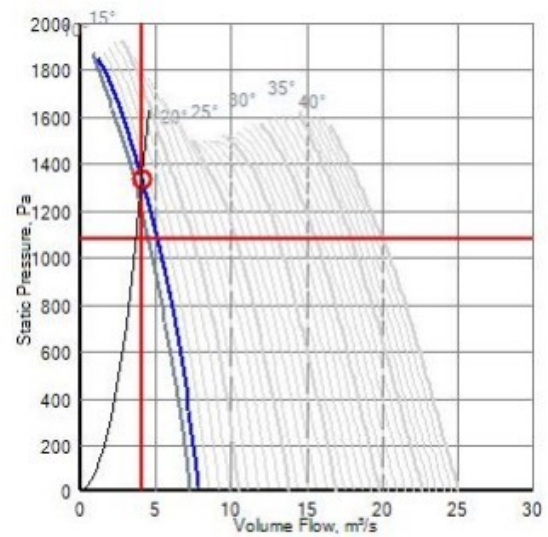
Air Flow: 4.08 m³/s
 Static Pressure: 1335 Pa
 Total Pressure: 1374 Pa

Fan Data

Catalogue Code: LCS080N2-A12/11 R&S Set
 (LCS080-717-IE2-132-11-2-251-38-RA12)
 Description: LCS - 2 x Long-Cased Smokevent
 Axial Fan
 Diameter: 800 mm Hub: 251 mm
 Impeller Type: Axial Pitch: 11°
 Blade Material: Aluminium Blades: 12
 Speed: 2935 r/min @50 Hz Form: B
 Power, Abs: 11.21 kW Peak: 11.27 kW
 Input Power: 12.55 kW
 Efficiency Total: 50.0% Static: 48.5%
 SFP: 3.10
 Fan Weight: 124.5 kg

Motor Data (at STP)

Motor Type: F300 (IE2) W
 Electrical Supply: 400V 3ph 50Hz
 Motor Frame: 132M
 Motor Power: 12.10kW (AOM) (11.00kW IEC)
 FLC/Start (DOL): 22.22A (AOM) / 144.43A (20.20A FL IEC)
 Motor Speed: 2 pole
 Motor Efficiency: 89.3%



Sound Data

Spectrum (Hz):	63	125	250	500	1K	2K	4K	8K	dBW	dB(A) @ 3m
Inlet (dB):	104	105	103	113	112	109	107	100	118	96
Outlet (dB):	105	106	103	112	110	108	106	99	117	94

Sound levels are quoted as in-duct values. dB(A) values are average spherical free-field for comparative use only.

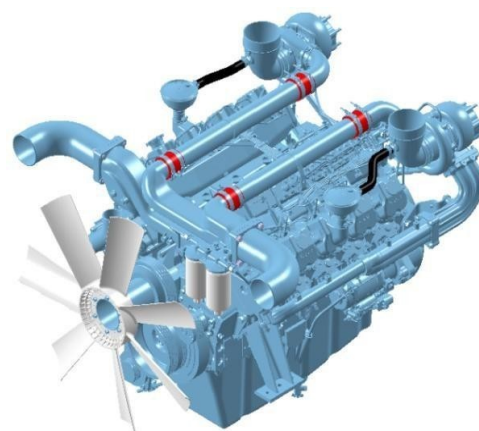
2. Generator

DOOSAN INFRACORE GENERATOR ENGINE

DP180LB

Ratings (kWm/PS)	Gross Engine Output - without Cooling Fan		Net Engine Output - with Cooling Fan	
	Standby	Prime	Standby	Prime
1500rpm(50Hz)	612/832	556/756	596/810	540/734
1800rpm(60Hz)	661/899	601/817	637/866	577/784

* 50Hz : DP180LBF, 60Hz : DP180LBS



Ratings Definitions

The power ratings of Emergency Standby and Prime are in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046.

Electric power(kWe) should be estimated by considering generator efficiency, cooling fan power loss and power derating due to altitude and ambient temperature.

STANDBY POWER RATING is applicable for supplying emergency power for the duration of the utility power outage.

No overload capability is available for this rating. A standby rated engine should be sized for a maximum of an 70% average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating.

PRIME POWER RATING is available for an unlimited of hours per year in variable load application. Variable load should not exceed a 70% average of the Prime Power rating during any operating period of 24 hours. The Total operating time at 100%

Prime Power shall not exceed 500 hours per year. A 10% overload capability is available for a period of 1 hour within a 12 hour period of operation. Total operating time at the 10% overload power shall not exceed 25 hours per year.

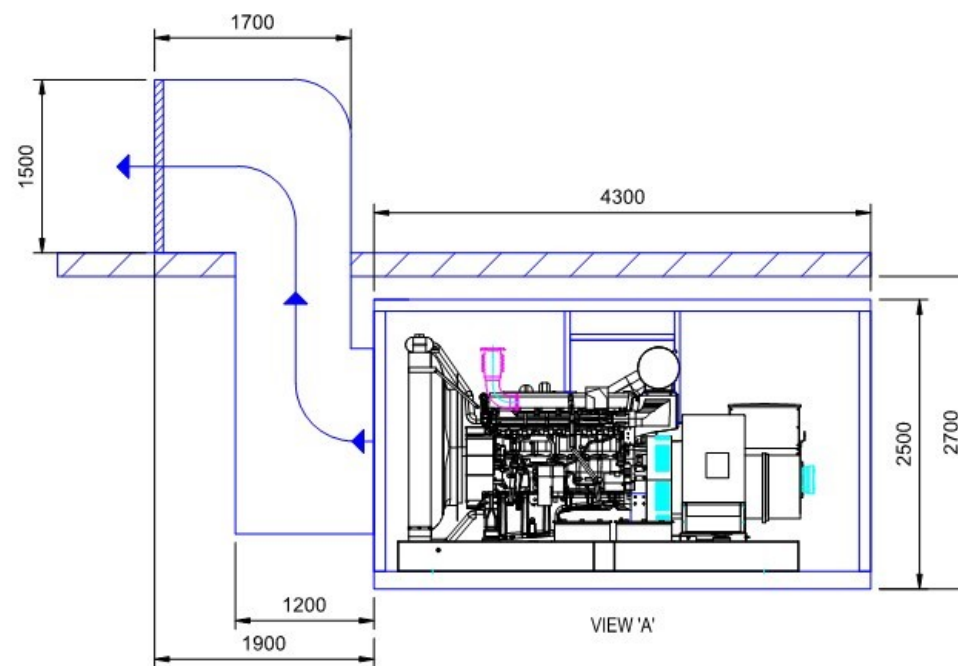
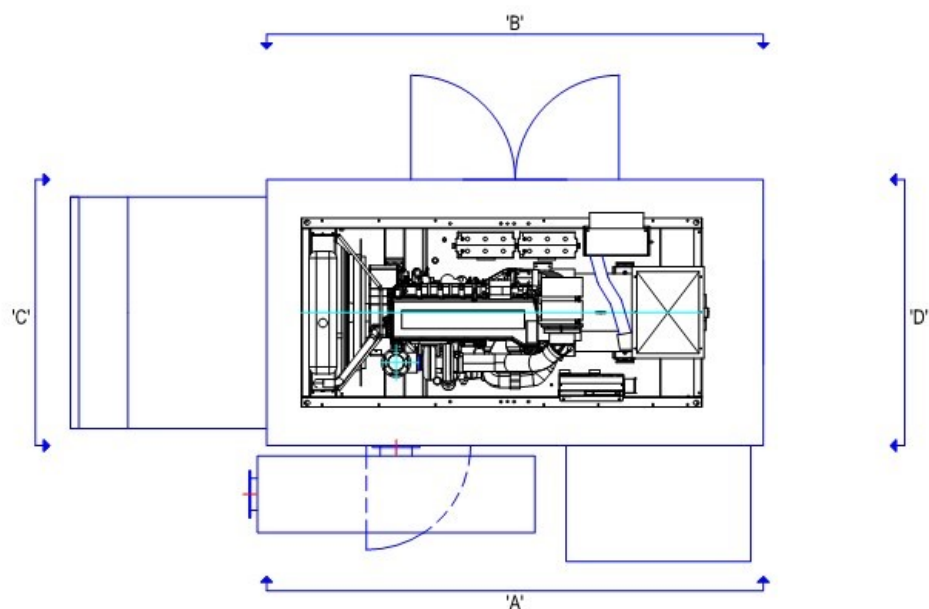


Condition 20: Atmospheric plant noise emissions

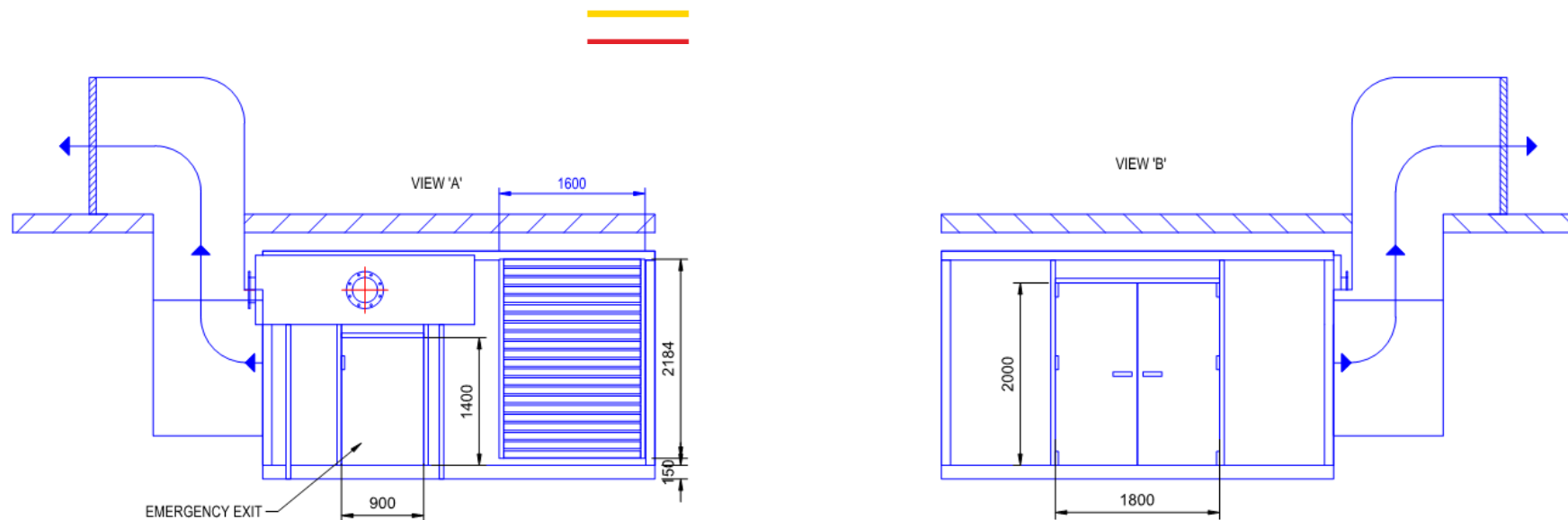


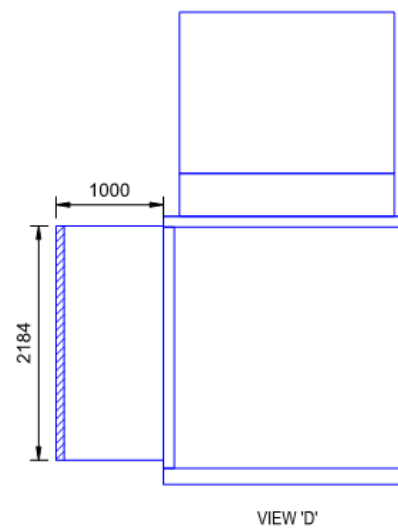
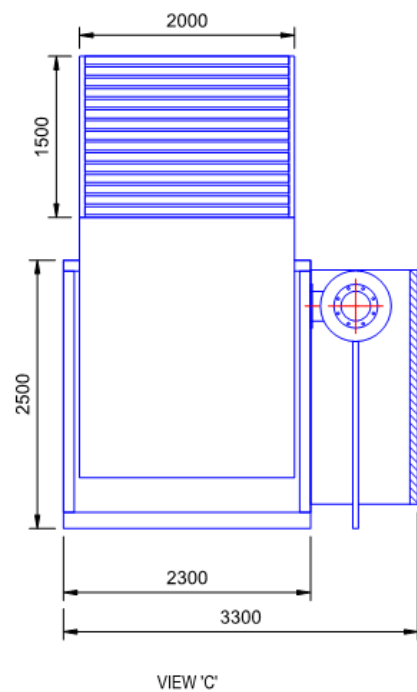
PERFORMANCE DATA		Prime Power		Standby Power	
o Sound Pressure at 1m from the each side of Cylinder Block					
(without Fan)	dB(A)	98.65	101.03	98.65	101.03

CONTAINER (80dBA@1m)



Condition 20: Atmospheric plant noise emissions





3. HYBRID DRY PUMP COOLERS

Section 1.01 **There are 3no. hybrid dry coolers.**

Fan	Number of fans for 1 cooler	2	No.
	Fan type	SLPF 31830	
	Absorbed fan shaft power max. ¹	2 x 1	kW
	Fan number of revolutions (100%)	258	1/min
	Sound power level per cooler wet/dry	72	dB(A) ⁵
	Sound pressure level per cooler at 10m	40	dB(A) ⁵
	Sound pressure level per cooler at 1m	50.5	dB(A) ⁵
<i>Mean sound pressure level at distance from cooler acc. to surface envelope EN 13487</i>			
	Tolerance	+/-2	dB(A)
Fan motor	Number of motors for 1 cooler	2	No.
	Rated output for each motor	1.50	kW
	Number of revolutions	1450	1/min
	Electrical Supply	400	V
	Rated current for each motor	3.1	A
	Frequency	50	Hz
	Enclosure	IP 55	
Transmission	Motor protection	Thermo contact	
	Belt/Pulley	low noise belts	
		Application factor	min. 2,5

Frequency band

Sound-power level per fan

63 Hz	72	dB
125 Hz	72.1	dB
250 Hz	68.6	dB
500 Hz	67.2	dB
1000 Hz	64.3	dB
2000 Hz	59	dB
4000 Hz	52.2	dB
8000 Hz	42.7	dB

tolerance at 63Hz: + - 5dB

tolerance at 125 and 250 Hz: + - 3dB

tolerance at > 250Hz: + - 2dB

- Frequency band for single fan under test conditions. Manufacturers data.
- After fans are fitted to the cooler, the frequency band may alter due to the influence of the cooler casing

Calculated acoustic performance from Fan Data:

PER FAN

n3~ 400V 50/60Hz		min^-								
		258		1						
Oktav frequency	Hz	63	125	250	500	1000	2000	4000	8000	
per fan	A-weighting	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1	
Sound Power [Lwa]	dB(A)	45.8	56.0	60.0	64.0	64.3	60.2	53.2	41.6	69.0
Sound Power [Lw]	dB	72.0	72.1	68.6	67.2	64.3	59.0	52.2	42.7	75.1
Tolerance +/- dB		5	3	3	2	2	2	2	2	2

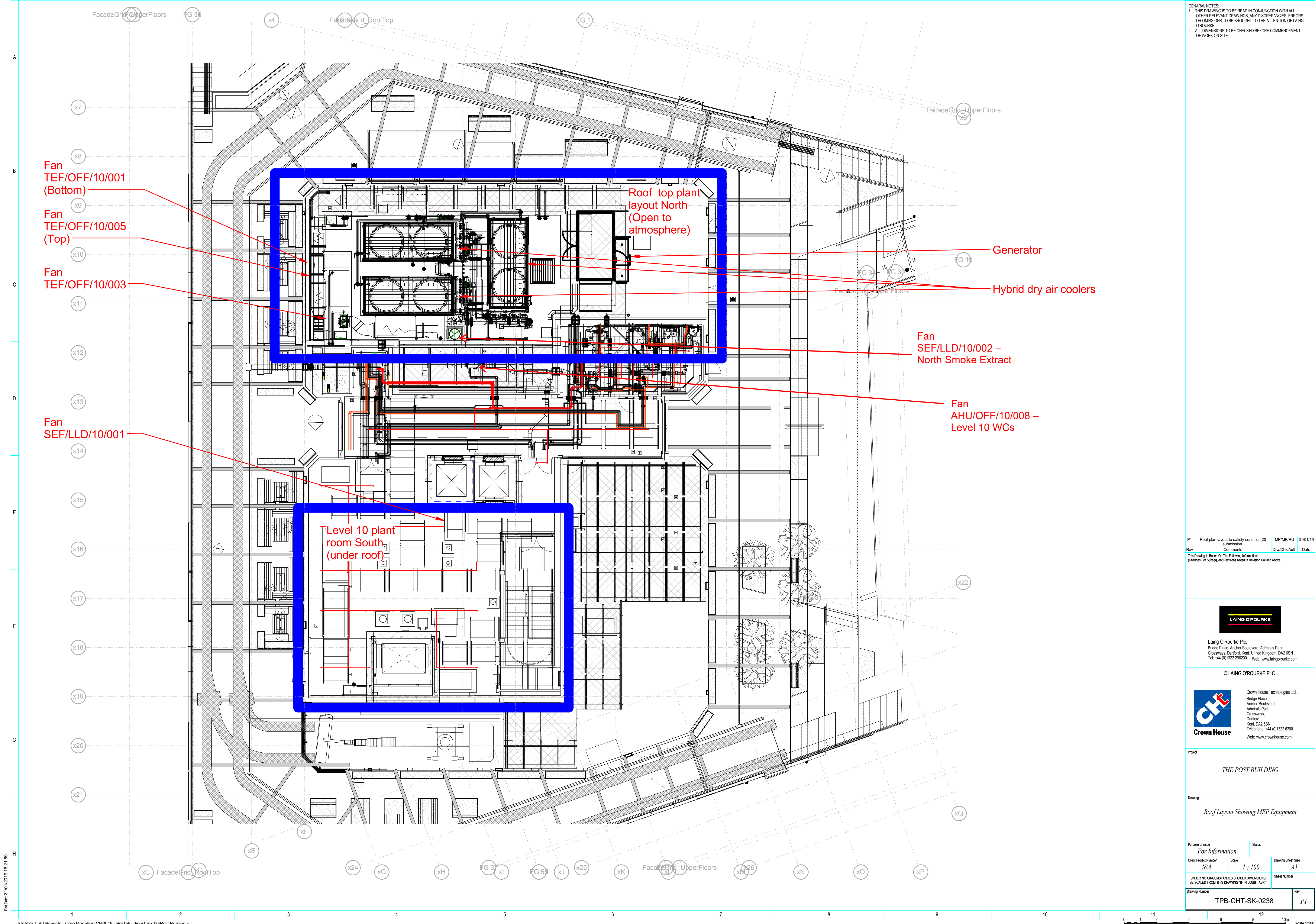
COOLER

		Sound Power (Lw)			
Tolerance +/- dB		Lw	dB		
	Hz	per fan	total fans		2
5	63	72.0	75.0		
3	125	72.1	75.1		
3	250	68.6	71.6		
2	500	67.2	70.2		
2	1000	64.3	67.3		
2	2000	59.0	62.0		
2	4000	52.2	55.2		
2	8000	42.7	45.7		
	Per Cooler	Total Lw	78.1	dB	

		Sound Power A-weighted (LwA)			
		LwA	dB(A)		
	Hz	per fan	total fans		2
	63	45.8	48.8		
	125	56	59.0		
	250	60	63.0		
	500	64	67.0		
	1000	64.3	67.3		
	2000	60.2	63.2		
	4000	53.2	56.2		
	8000	41.6	44.6		
	Per Cooler	Total LwA	72.0	dB(A)	



4. Roof Plant Drawing



GENERAL NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF LAING O'ROURKE.
2. ALL DIMENSIONS TO BE CHECKED BEFORE COMMENCEMENT OF WORK ON SITE.

P1	Roof plan layout to satisfy condition 20 submission.	MPIMP/PU	31/01/19
Rev	Comments	Drw/Chk/Auth	Date
This Drawing is Based On The Following Information: (Changes For Subsequent Revisions Noted In Revision Column Above).			



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Project
THE POST BUILDING

Drawing
Roof Layout Showing MEP Equipment

Purpose of issue For Information	Status
Client Project Number N/A	Scale 1 : 100
Client Project Number N/A	Drawing Sheet Size A1
UNDER NO CIRCUMSTANCES SHOULD DIMENSIONS BE SCALED FROM THIS DRAWING "IF IN DOUBT ASK".	Sheet Number
Drawing Number TPB-CHT-SK-0238	Rev. P1

Plot Date: 31/01/2019 16:21:59