Ref: 51-119-R1-2
Date: 12th February 2024

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BY Email

TECHNICAL NOTE – DISCHARGE OF PRE-COMMENCEMENT CONDITIONS WORTHINGTON HOUSE, DIDSBURY

1. BACKGROUND

E3P have been commissioned to provide evidence to discharge a pre-commencement condition set by Manchester City Council at Worthington House, Didsbury. This report seeks to discharge the following condition.

> *a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to installation of the equipment the scheme shall be 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 site. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.*

As such, E3P have undertaken a BS 4142:2014+A1:2019 assessment of fixed plant sound during daytime periods only due to the fixed plant items only being operational during normal office daytime hours, for the surrounding residential receptors. Consideration has also been given to existing office receptors which are assessed in accordance with BS 8233:2014+A1:2019 criterion. The assessment was undertaken by Scott Boughton, Senior Acoustic Consultant at E3P and a member of the Institute of Acoustics (MIOA).

2. NOISE SURVEY

2.1. BACKGROUND SOUND MEASUREMENTS

E3P has undertaken attended background sound measurements during worst case daytime hours. An unattended long-term measurement was not possible due to site constraints. As such, worst-case periods have been captured with the intention to use the lowest measured value to inform a worst-case assessment. The survey was carried out over the following time periods:

The survey was carried out over the following time periods:

- 07:00 to 09:00 Wednesday 31st January 2024; and
- 16:00 to 18:00 Wednesday 31st January 2024

The following Noise Measurement Position was used:

- Noise Measurement Position 1 (NMP1): Located on the northern boundary of the Worthington House site in free field conditions. The sound climate was dominated by road traffic sound on the surrounding road network. This position is representative of the closest noise sensitive receptor located to the north on Wilmslow Road.

Table 2.1 details the measured background sound levels.

TABLE 2.1 BACKGROUND SOUND MEASUREMENTS

MEASUREMENT PERIOD	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
07:00-08:00	56.6
08:00-09:00	55.9
16:00-17:00	**53.6**
17:00-18:00	55.2

The lowest measured hour was between 16:00 and 17:00, this will be used as the representative background sound level and can be considered worst case.

TABLE 2.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1	Sound Level Meter	Cirrus CR:171A	G303884	15/09/2025
	Pre-amplifier	Cirrus MV:200F	12731F	
	Microphone	Cirrus MK:224	215899D	
	Calibrator	Cirrus CR:515	99403	15/09/2024

The sound level meter was field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

3. BS 4142 ASSESSMENT

For the BS 4142:2014+A1:2019 assessments, penalties are applied to the specific sound level to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following objective and subjective features have been accounted for in the assessment, in accordance with the subjective method detailed in BS 4142:2014+A1:2019.

TABLE 3.1 ACOUSTIC FEATURES

ACOUSTIC FEATURE	APPLICABLE?	ATTRIBUTABLE PENALTY	COMMENT
Tonality	No	-	No tonality is expected from a brand-new unit
Impulsivity	No	-	Plant is expected to be steady state at the receptors when in operation
Intermittency	No	-	Plant is expected to be steady state at the receptors when in operation
Other Sound Characteristics	Yes	3 dB	It is thought that the ASHP has potential to be readily distinct against the background.

Table 3.2 below details the BS 4142 assessment for the closest receptors during the daytime.

The nearby office windows are assessed separately in Section 4.

E3P have been provided with sound power level data for the proposed Air Source Heat Pump (ASHP) to be installed at the site. The sound power level generated by the proposed unit is 83 dB L_{WA}. This will be used for the assessment and input within the model as a point source at the height of the top of the ASHP. The relevant product specification sheet can be found at the end of this technical note.

E3P have utilised 3D noise modelling software, CadnaA, to model noise from the fixed plant at nearby receptors. Regarding assumptions for the assessment, the following has been considered:

- Ground elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- Ground absorption is set at 0.
- A reflection order of 1 is used.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

3.1. DAYTIME ASSESSMENT

TABLE 3.2 WORST-CASE DAYTIME BS 4142 ASSESSMENT

RESULTS		RELEVANT CLAUSE	COMMENTARY
Sound Power Level of the ASHP	83 dB	7.1 7.3 7.3.6	Stated within the manufacturer's specification sheet. 'Mitsubishi Electric R32 e-series Modular Chiller Range: Cooling Only or Heat Pump (150/180kW)'
Residual sound level	N/A	7.3.3 7.3.5	N/A
Background sound level	54 dB $L_{A90,1hr}$	8.1.3 8.3 8.4 8.5	E3P have taken the lowest measured daytime background to inform a worst-case assessment.
Assessment made during the daytime, so reference time interval is 1 hour		7.2	
Specific sound level	37 dB $L_{Aeq,1hr}$	7.3.4 7.3.5 7.3.6 7.3.7	3D noise modelling used to calculate the specific sound level outside the façade of the closest residential receptor due to fixed plant sound.
Acoustic feature correction	3 dB	9.2	3 dB due for 'other' due to source likely being readily detective against the background
Rating level	40 dB $L_{A,r}$	9.2	Specific sound level + acoustic feature correction.
5 dB Below Background sound level	$L_{A90,1hr}$ = (54 – 5) = 49 dB	8	Manchester City Council require 5 dB below the background
Excess of rating over background sound level	(40 – 49) dB = -9 dB below	11	The closest façade to the plant would experience rating levels 9 dB below the background sound level criterion.
Assessment indicates likely indication of a significant adverse impact, depending on the context		11	The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.
Uncertainty of the assessment	Not significant	10	The consideration of uncertainty, likely to be approximately 1 dB does not alter the outcome of the assessment and the rating level is still unlikely to exceed the background sound level even when considering this.



4. BS 8233 OFFICE NOISE IMPACT ASSESSMENT

In order to assess the potential impact of fixed plant sound on the nearby office windows, E3P have considered the internal criteria stipulated in BS 8233:2014+A1:2019. Specifically, the following criterion will be applied:

- Open Plan Office – Design range of 45-50 dB.

Therefore, E3P have outputted the façade noise level from the noise model at the closest window, which is also noted in Figure 1.

The model has predicted a sound pressure level of 63 dB at the closest window. With windows open (13 dB attenuation), internal noise levels are expected to be approximately 50 dB which achieves the upper criterion of the design range above.

However, it should be noted that the closest and surrounding office buildings have no openable windows and, as such, internal noise levels would be dictated by the attenuation afforded by closed windows, 29 dB (R_w), if standard glazing is assumed. Given this, internal noise levels are expected to be 34 dB. This is 11 dB below the lower design range for open plan office spaces.

Furthermore, this is 1 dB below the lower design range criterion for executive office spaces where the design range is 35 dB to 40 dB.

As such, no adverse impact is predicted at existing surrounding office buildings as a result of the operation of the plant.

5. CONCLUSION

E3P have been commissioned to carry out an assessment to discharge pre-commencement conditions set by Manchester City Council in relation to noise generated from the proposed ASHP at the existing Worthington House office building in Didsbury.

As such, E3P have undertaken a BS 4142:2014+A1:2019 assessment of fixed plant sound during daytime period when the ASHP will be operational, for the nearby residential receptors. Assessment of internal noise levels at nearby office spaces has also been considered in accordance with BS 8233:2014+A1:2019 criterion.

It was found that the daytime rating level falls well below the background sound level criterion set by Manchester City Council. Given this, no adverse impact is predicted day at residential receptors when the ASHP is operational.

With regards to office space, internal noise levels are expected to achieve all relevant criterion. As such, no adverse impact is predicted at existing office spaces as a result of the operation of the plant.

I trust this provides sufficient information in order to discharge the pre-commencement condition but please do not hesitate to contact me should you require further information.

Yours sincerely,
For and on behalf of E3P Ltd

Scott Boughton
Senior Acoustic Consultant

APPENDIX I
FIGURES

Figure 1 - Noise Measurement Positions



Project:
Worthington House, Didsbury

Project-No:
51-119

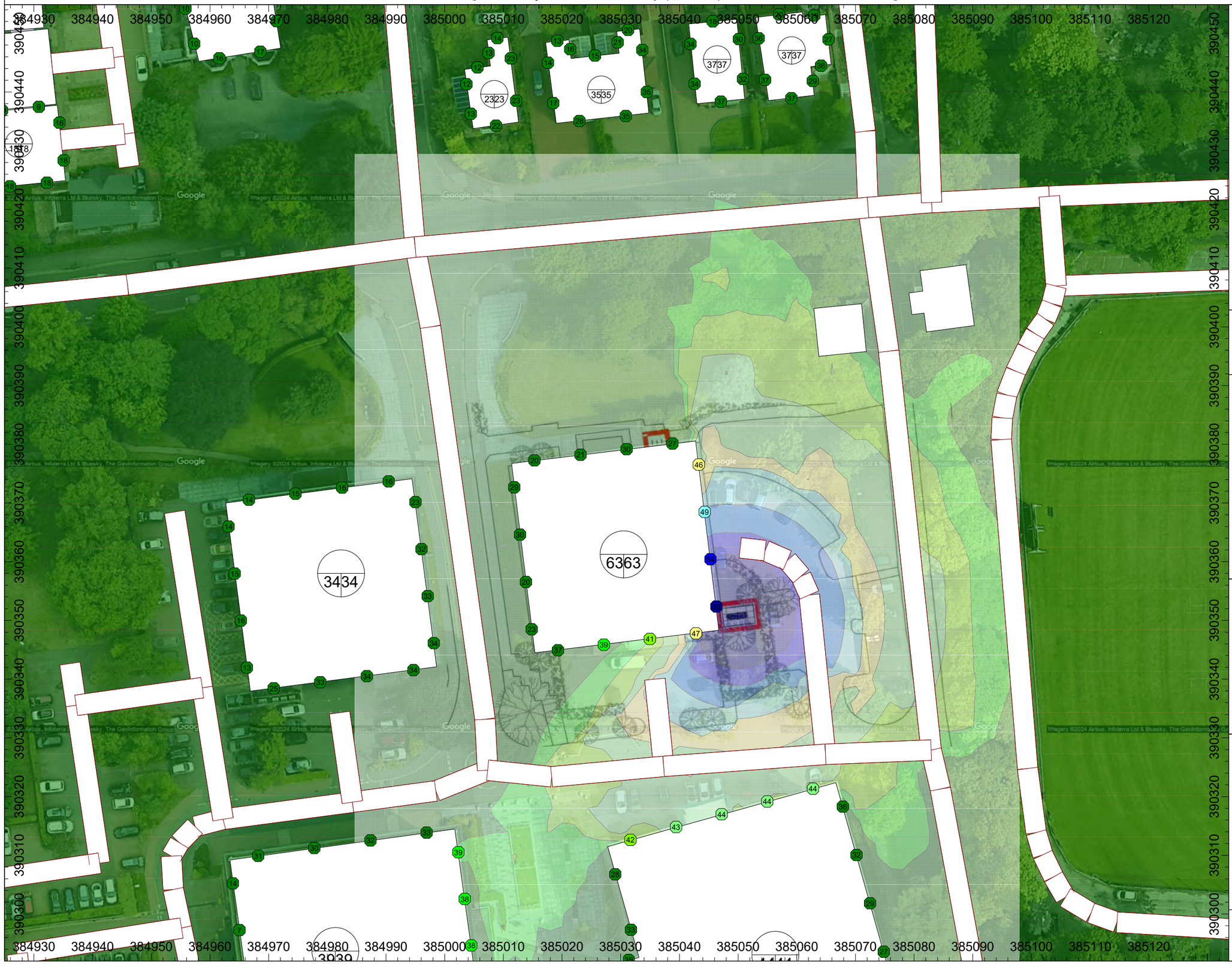
Client:
KW Towers Ltd

N

e3p

Project Engineer: Scott Boughton
Date: 31/01/2024

Figure 2 - Daytime Grid Noise Map (BS 4142) - Calculation at 1.5 m above ground level



Project:
Worthington House, Didsbury

Project-No:
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Client:
KW Towers Ltd

Daytime Specific Noise Level, LAeq, T (dB)

- ... <= 38
- 38 < ... <= 40
- 40 < ... <= 42
- 42 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ...

Noise Map Objects

- Point Source
- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: Scott Boughton
Date: 31/01/2024

1-1. Specifications

Model			EAHV-M1500YCL(-N)(-BS)
Power source			3-phase 4-wire 380-400-415V 50/60Hz
Cooling capacity *1		kW	150.00
		kcal/h	129,000
		BTU/h	511,800
	Power input	kW	44.73
	EER		3.35
	IPLV *6		6.42
	Water flow rate	m^3/h	25.8
Cooling capacity (EN14511) *2		kW	149.18
		kcal/h	128,295
		BTU/h	509,002
	Power input	kW	45.55
	EER		3.28
	Eurovent efficiency class		A
	SEER		5.52
	Water flow rate	m^3/h	25.8
Heating capacity *3		kW	150.00
		kcal/h	129,000
		BTU/h	511,800
	Power input	kW	42.61
	COP		3.52
	Water flow rate	m^3/h	25.8
Heating capacity (EN14511) *4		kW	150.82
		kcal/h	129,705
		BTU/h	514,598
	Power input	kW	43.43
	COP		3.47
	SCOP Low/Medium		3.31/2.88
	Water flow rate	m^3/h	25.8
Current input	Cooling current 380-400-415V *1	A	76 - 72 - 69
	Heating current 380-400-415V *3	A	72 - 68 - 66
	Maximum current	A	120
Water pressure drop *1		kPa	55
Temp range	Cooling	°C	Outlet water 4~30 *7
		°F	Outlet water 39.2~86 *7
	Heating	°C	Outlet water 25~55 *7
		°F	Outlet water 77~131 *7
	Outdoor (Cooling)	°C	-15~52 *7
		°F	5~125.6 *7
	Outdoor (Heating)	°C	-20~43 *7
		°F	-4~109.4 *7
Circulating water volume range		m^3/h	12.9~43.0
Sound pressure level (measured in anechoic room) at 1m *1		dB (A)	65
Sound power level (measured in anechoic room) *1		dB (A)	83
Diameter of water pipe (Standard piping)	Inlet	mm (in)	65A (2 1/2B) housing type joint
	Outlet	mm (in)	65A (2 1/2B) housing type joint
Diameter of water pipe (Inside header piping)	Inlet	mm (in)	150A (6B) housing type joint
	Outlet	mm (in)	150A (6B) housing type joint
External finish			Polyester powder coating steel plate
External dimension H × W × D		mm	2350 × 3400 × 1080
Net weight	Standard piping	kg (lbs)	1280 (2822)
	Inside header piping	kg (lbs)	1307 (2881)
Design pressure	R32	MPa	4.15
	Water	MPa	1.0
Heat exchanger	Water side		Stainless steel plate and copper brazing
	Air side		Salt-resistant cross fin & aluminium tube
Compressor	Type		Inverter scroll hermetic compressor
	Maker		MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter
	Quantity		4
	Motor output	kW	11.5 × 4
	Lubricant		MEL46EH
Fan	Air flow rate	m^3/min	270 × 4
		L/s	4500 × 4
		cfm	9534 × 4
	Type, Quantity		Propeller fan × 4
	Starting method		Inverter
	Motor output	kW	0.92 × 4
	External static press.	Pa	20
Protection	High pressure protection		High pres.Sensor & High pres.Switch at 4.15MPa (601psi)
	Inverter circuit		Over-heat protection, Over current protection
	Compressor		Over-heat protection
Refrigerant	Type × charge		R32 × 11.5 (kg) × 4 *5
	Control		LEV

Notes:

*1 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB (95°FDB / 75.2°FWB) outlet water temp 7°C (44.6°F) inlet water temp 12°C (53.6°F). Pump input is not included in cooling capacity and power input.
*2 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB (95°FDB/75.2°FWB) outlet water temp 7°C (44.6°F) inlet water temp 12°C (53.6°F). Pump input is included in cooling capacity and power input based on EN14511.
*3 Under normal heating conditions at outdoor temp 7°CDB/6°CWB (44.6°FDB/42.8°FWB) outlet water temp 45°C (113°F) inlet water temp 40°C (104°F). Pump input is not included in heating capacity and power input.
*4 Under normal heating conditions at outdoor temp 7°CDB/6°CWB (44.6°FDB/42.8°FWB) outlet water temp 45°C (113°F) inlet water temp 40°C (104°F). Pump input is included in heating capacity and power input based on EN14511.
*5 Amount of factory-charged refrigerant is 3 (kg) × 4. Please add the refrigerant at the field.
*6 IPLV is calculated in accordance with AHRI 550-590.
*Please don't use the steel material for the water piping.
*Please always make water circulate, or pull the circulation water out completely when not in use.
*Please do not use groundwater or well water in direct.
*The water circuit must be closed circuit.
*Due to continuous improvement, the above specifications may be subject to change without notice.
*This model doesn't equip with a pump.
*7 Please refer to 2-1-6. Operation temperature range.

Unit converter	
kcal/h	= kW × 860
BTU/h	= kW × 3,412
lbs	= kg/0.4536
cfm	= m^3/min × 35.31