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The Fitzrovia
London

Air Source Heat Pumps

Condition 39 Discharge: Issue 1

Applicant Name:	Prudential UK Real Estate Nominee 1 Limited and Prudential Real Estate Nominee 2 Limited
Property:	10 Fenchurch Avenue London EC3H 5AG
Project Reference:	4650
Issue:	Issue 1: Condition 39 discharge
Date:	December 2022
Prepared by:	JV
Checked by:	MDC
Validated by:	MDC

C O N T E N T S

1.00 INTRODUCTION

The purpose of this document is to be provide the air source heat pump information to be installed at the Fitzrovia development, Tottenham Court Road, London for the discharge of planning condition 39.

For clarity condition 39 is repeated below:

Prior to commencement of above ground works (excluding demolition and any site preparation works), details, drawings and data sheets showing the location, Seasonal Performance Factor of at least 2.5 and Be Green stage carbon saving of the air source heat pumps and associated equipment to be installed on the building, shall have been submitted to and approved by the Local Planning Authority in writing. The measures shall include the installation of a metering details including estimated costs to occupants and commitment to monitor performance of the system post construction. A site-specific lifetime maintenance schedule for each system, including safe access arrangements, shall be provided. The equipment shall be installed in full accordance with the details approved by the Local Planning Authority and permanently retained and maintained thereafter

The air source heat pumps (ASHPs) to be installed in the project provide three functions:

1. The heating and cooling medium to the underfloor AC heating and comfort cooling systems to the commercial office demise. The ASHPs to these systems are provided in their variable refrigerant flow (VRF) format. There is a separate VRF system (refrigerant circuit) to each underfloor air conditioning zone.
2. The heating medium to the commercial office domestic hot water calorifiers. These ASHPs generate low temperature hot water (LTHW) at a flow temperature of 65^{o}C. The LTHW is the heating medium piped to the calorifiers.
3. The heating, comfort cooling and domestic hot water to the residential apartments. There is a separate ASHP to each apartment that provides these three functions.

This Condition 39 discharge report is therefore split into three sections based on the three systems to be provided.

1. Commercial office underfloor AC heating and comfort cooling ASHPs
2. Commercial office domestic hot water ASHPs
3. Residential heating and comfort cooling ASHPs

For each system the following information is provided:

- Drawings showing the location of the ASHPs
- Manufacturer’s data sheets
- Seasonal Performance Factor
- Be Green stage carbon saving
- Metering details including estimated costs to occupiers
- Monitoring of the performance of the systems post construction.
- An ASHP maintenance schedule

2.00 COMMERCIAL OFFICE UNDERFLOOR HEATING & COMFORT COOLING ASHPS

The requested information for the ASHPs is summarised below with the full details, where applicable, included in the appendices.

Location

The external condenser component of the ASHPs are all located within the roof plant enclosure. The drawings that show the external condenser locations are included in appendix 1. The applicable drawings are listed below:

4650-M-222	Roof North Core Mechanical services layout
4650-M-223	Roof South Core Mechanical services layout

For clarity the ASHP external condensers are referenced as the floor they serve and the underfloor zone on that floor that they serve. As an example:

- External condenser CU-1A serves the first floor underfloor zone A

For clarity there are four underfloor zones per typical office floor, zones A to D. For the first floor there are five underfloor zones (A to E).

Manufacturer's Data Sheets

The equipment schedule and the associated manufacturer's data sheets are included in appendix 2

Seasonal Performance Factor

The seasonal performance factors for the commercial office underfloor ASHPs are as set out below:

SEER - cooling	= 5.8
SCOP - heating	= 4.0

Be Green Stage Carbon Saving

The predicted carbon emission savings have been taken from the project Part L thermal model that is progressively updated in stages throughout the project to match the project milestones. The values quoted below reflect the SEERs etc. noted in this report

Carbon emission saving	= 34.80 Tonnes CO_2 / year (SAP 2012)
	= 17.78 Tonnes CO_2 / year (SAP 10)

Metering Details

The underfloor AC systems and hence the associated heat pumps are provided on a notional tenancy by notional tenancy basis. A single underfloor AC system is provided to each notional tenancy. The power to the AC system is taken from the respective on-floor tenancy mechanical services distribution board. These mechanical services distribution boards are separately metered and the meters are connected the building wide energy monitoring system (EMS). The EMS schematic is included in appendix 1. The applicable drawing number is as follows:

4650-E-010	EMS Schematic

The annual cost to the occupiers for the ASHPs has been estimated by using electricity consumption figures for the ASHPs from the Design for Performance model. The unit rate

for electricity used is 0.51 £/kWh. The electrical consumption values stated are for the whole building.

Heating & comfort cooling	38633 kWh/year	£19,705.63 per year

Monitoring of the Performance of the Systems Post Construction

The project is registered for the NABERS UK scheme. The scheme is targeting a 5-star rating. Hence all energy use in the building will be monitored post completion. This includes the ASHPs.

ASHP Maintenance Schedule

The ASHP maintenance schedule is included in appendix 3

3.00 COMMERCIAL OFFICE DOMESTIC HOT WATER ASHPs

The requested information for the ASHPs is summarised below with the full details, where applicable, included in the appendices.

Location

The external condenser component of the ASHPs are all located within the roof plant enclosure. The drawings that show the external condenser locations are included in appendix 1 The applicable drawings are listed below:

4650-M-222 Roof South Core Mechanical services layout

For clarity there are three domestic hot water ASHP external condensers and these are referenced as CU-DHW

Manufacturer's Data Sheets

The equipment schedule and the associated manufacturer's data sheets are included in appendix 2

Seasonal Performance Factor

The seasonal performance factor for the commercial office domestic hot water ASHPs are as set out below:

SEER - cooling = Not applicable
SCOP - heating = 4.0

Be Green Stage Carbon Saving

The predicted carbon emission savings have been taken from the project thermal model that is progressively updated in stages throughout the project to match the project milestones. The values quoted below reflect the SEERs etc. noted in this report

Carbon emission saving = -2.31 Tonnes CO_2 / year (SAP 2012)
= 7.46 Tonnes CO_2 / year (SAP 10)

As can be seen the old SAP 2012 (Part L) carbon emission factors actually suggest that the use of ASHPs for the domestic hot water heating is an additional carbon emission for the project but the current SAP 10 carbon emission factors show it be a predicted saving.

Metering Details

The domestic hot water ASHPs are electrically served via the BMS motor control centre, MCC2. The power supply to each ASHP is separately check metered.

4650-E-010 EMS Schematic

The annual cost to the occupiers for the ASHPs has been estimated by using electricity consumption figures for the ASHPs from the Design for Performance model. The unit rate for electricity used is 0.51 £/kWh. The electrical consumption values stated are for the whole building.

Domestic hot water	12837 kWh/year	£6,547.08 per year

Monitoring of the Performance of the Systems Post Construction

The project is registered for the NABERS UK scheme. The scheme is targeting a 5-star rating. Hence all energy use in the building will be monitored post completion. This includes the ASHPs.

ASHP Maintenance Schedule

The ASHP maintenance schedule is included in appendix 3.

4.00 RESIDENTIAL HEATING AND COMFORT COOLING ASHPs

The requested information for the ASHPs is summarised below with the full details, where applicable, included in the appendices.

Location

The external condenser component of the ASHPs are all located within the roof plant enclosure. The drawings that show the external condenser locations are included in appendix 1. The applicable drawings are listed below:

4650-M-222 Roof South Core Mechanical services layout

For clarity there are eight residential ASHP external condensers, one per apartment and these are referenced as CU-Resi-1 through to CU-Resi-8

Manufacturer's Data Sheets

The equipment schedule and the associated manufacturer's data sheets are included in appendix 2.

Seasonal Performance Factors

The seasonal performance factor for the commercial residential apartment ASHPs are as set out below:

EER - cooling	= 3.00
COP - heating	= 1.99
COP – domestic hot water	= 1.99

Be Green Stage Carbon Saving

The predicted carbon emission savings have been taken from the project SAP calculations that are progressively updated in stages throughout the project to match the project milestones. The values quoted below reflect the EERs, COPs etc. noted in this report

Carbon emission saving = 1.58 Tonnes CO_2 / year (SAP 2012)

Metering Details

Each individual apartment is provided with a supply authority meter. The ASHPs are fed from the specific apartment's consumer unit. They are not separately sub-metered.

The annual cost to the occupiers for the ASHPs has been estimated by using electricity consumption figures for the ASHPs (space heating, water and comfort cooling) from the SAP calculations. The unit rate of electricity used is 0.34 £/kWh. The electrical consumption values stated are for the whole building and a typical apartment

Whole building	17034 kWh/year	£5,791.40 per year
Typical apartment	1854 kWh/year	£630.37 per year

Monitoring of the Performance of the Systems Post Construction

The residential apartment energy use is not proposed to be monitored post construction.

ASHP Maintenance Schedule

The ASHP maintenance schedule is included in appendix 3.

APPENDIX

Appendix 1 Layout Drawings

4650-M-222	Roof North Core Mechanical services layout
4650-M-223	Roof South Core Mechanical services layout
4650-E-010	EMS Schematic

Appendix 2 Manufacturer's Data Sheets

Daikin	Commercial Office Heating and Comfort Cooling
Mitsubishi	Commercial Office Domestic Hot Water
Panasonic	Residential Heating and Comfort Cooling & Domestic Hot Water

Appendix 3 ASHP Maintenance Schedule

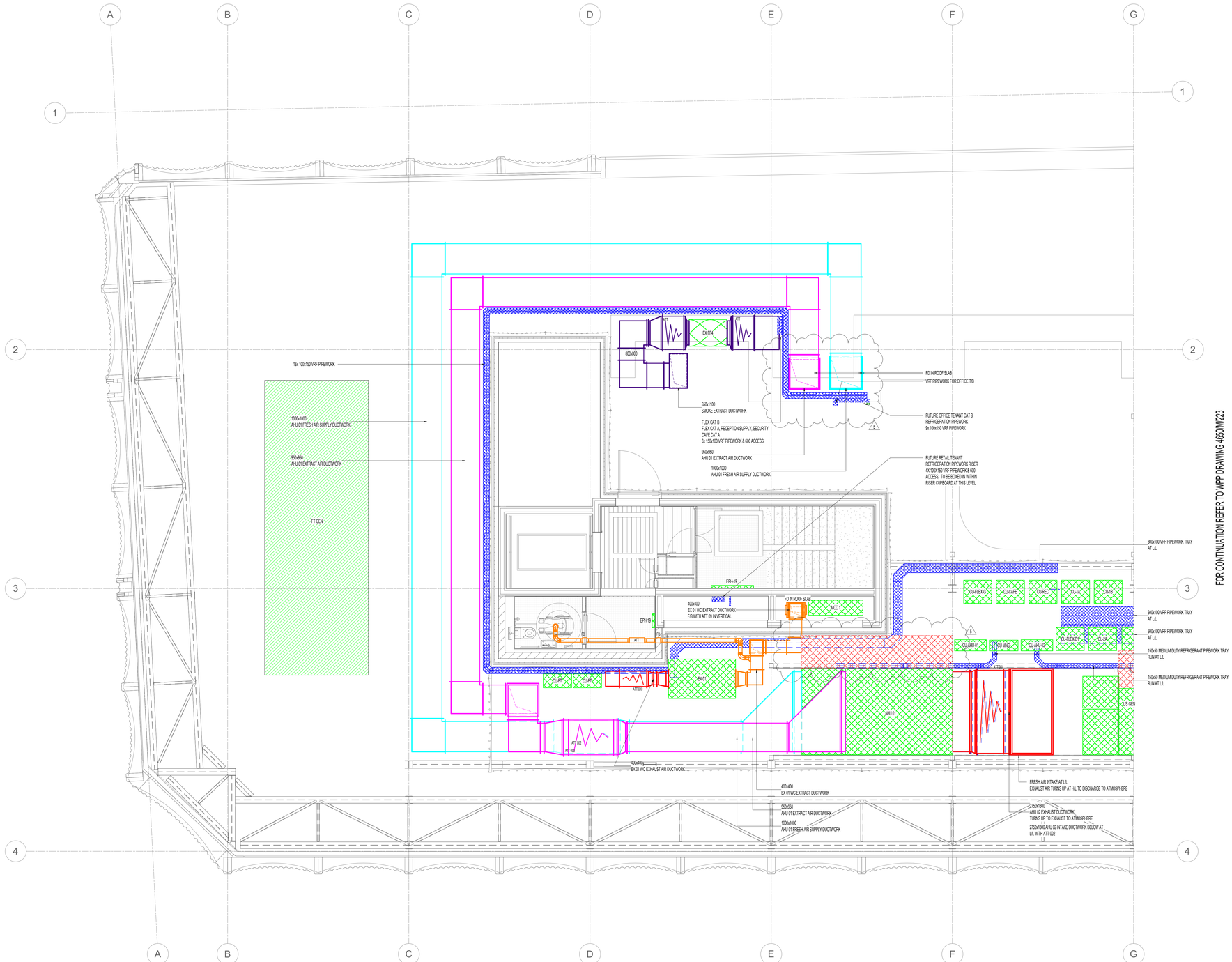
APPENDIX 1

Layout Drawings

4650-M-222	Roof North Core Mechanical services layout
4650-M-223	Roof South Core Mechanical services layout
4650-E-010	EMS Schematic

NOTES :-

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION AND LEGEND DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING.
3. REFER TO DRAWING 4650MEP605 FOR SECTIONS



FOR CONTINUATION REFER TO WPP DRAWING 4650/M/223

Ref	Revision	Date
5	STAGE 4 REDESIGN	SEP 2022
4	STAGE 4 REDESIGN	AUG 2022
3	STAGE 4 ISSUE	AUG 2021
2	STAGE 4 ISSUE	JUL 2021
1	DRAFT STAGE 4	JUL 2021

STAGE 4

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Client
CO-RE

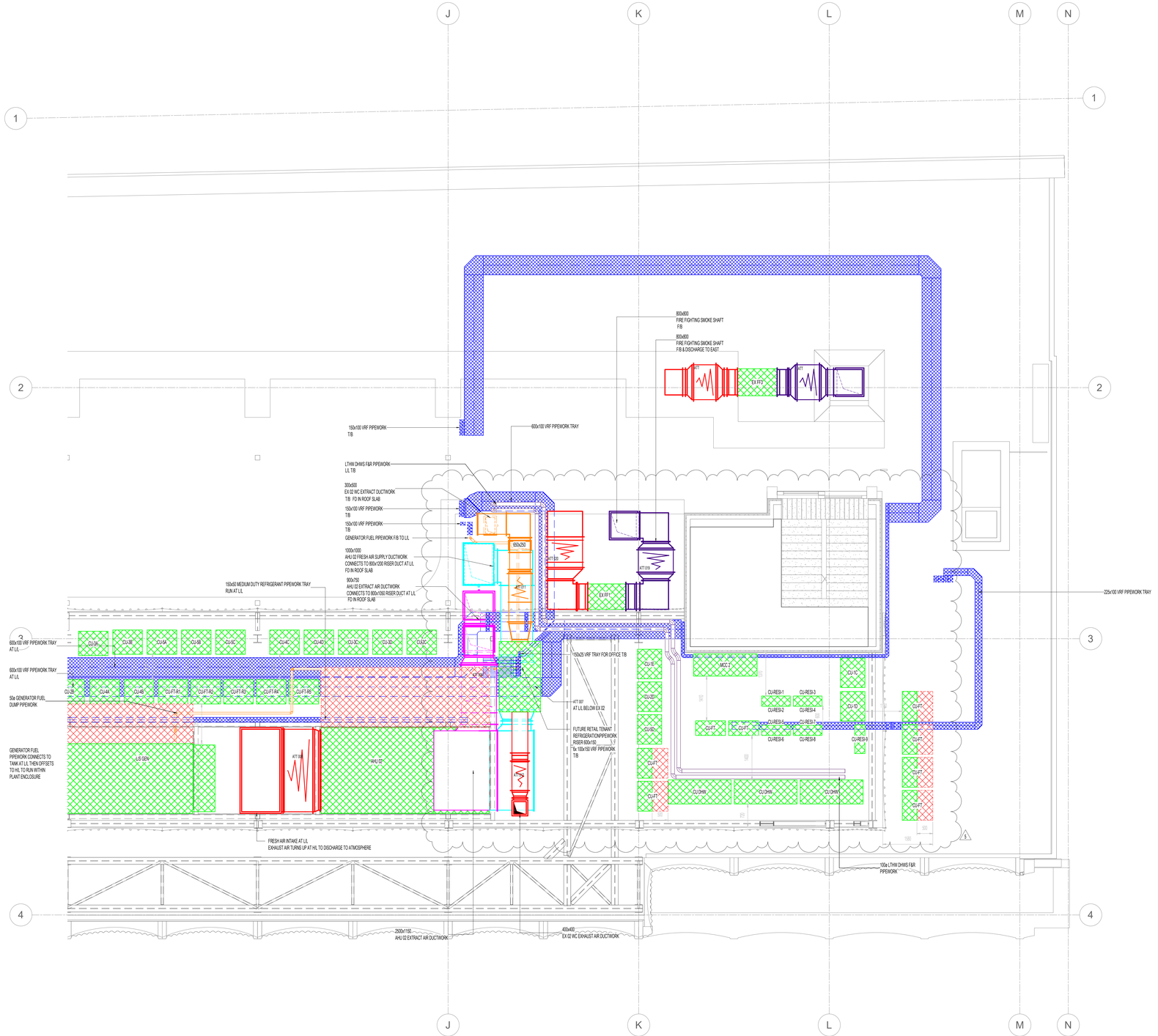
Project
THE FITZROVIA

Title
ROOF
NORTH CORE MECHANICAL SERVICES LAYOUT

Date	JULY 2021	Scale at A0	1 : 50
Drawn By	JB	Validated	
Checked			

Drawing Number: 4650/M/222
Revision: 5

FOR CONTINUATION REFER TO WPP DRAWING 4650/M/222



NOTES :-

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION AND LEGEND DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING.
3. REFER TO DRAWING 4650/MEP/605 FOR SECTIONS

Ref	Revision	Date
5	STAGE 4 REDESIGN	SEP 2022
4	STAGE 4 REDESIGN	AUG 2022
3	STAGE 4 ISSUE	AUG 2021
2	STAGE 4 ISSUE	JUL 2021
1	DRAFT STAGE 4	JUL 2021

STAGE 4

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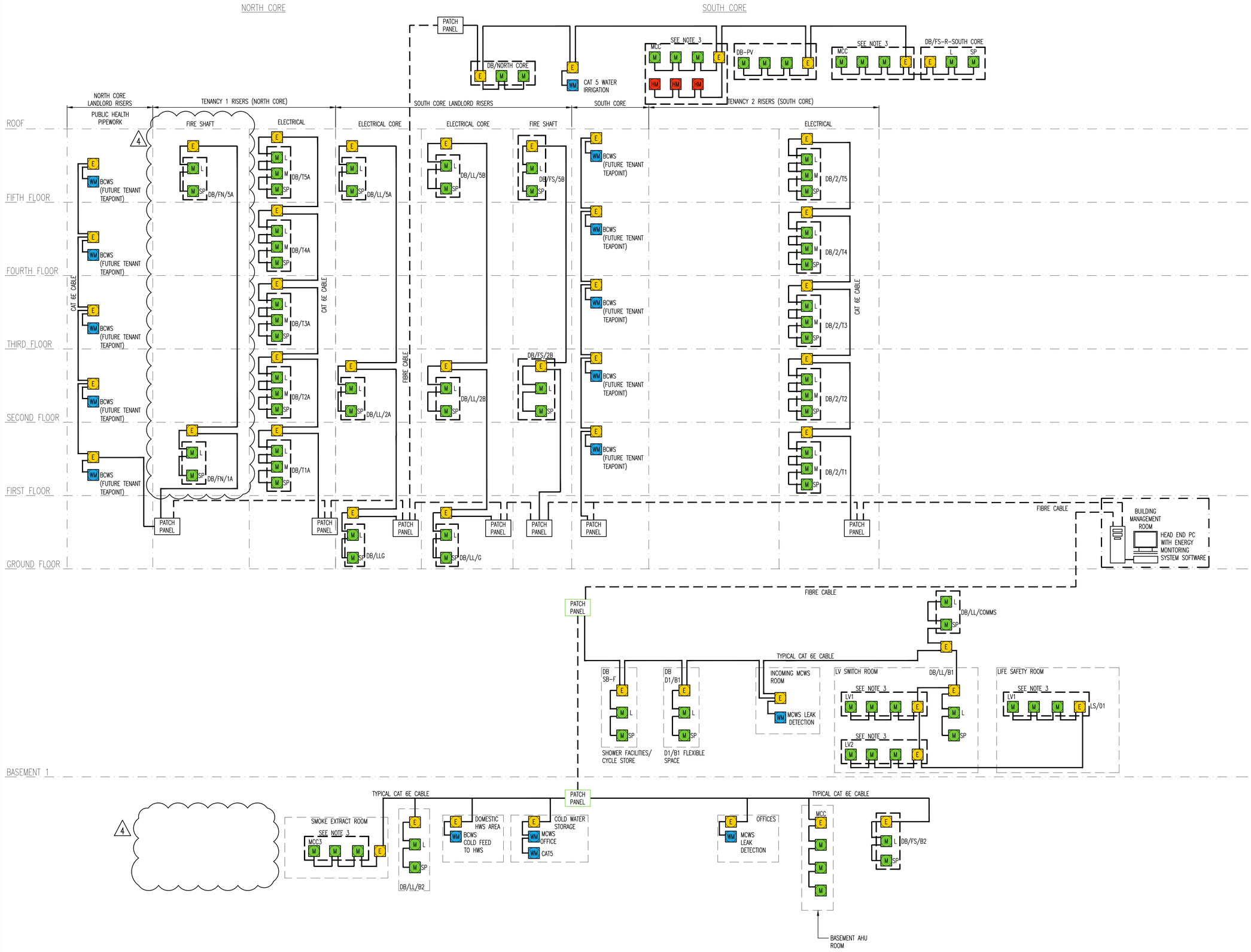
Client
CO-RE

Project
THE FITZROVIA

Title
ROOF
SOUTH CORE MECHANICAL SERVICES LAYOUT

Date	JULY 2021	Scale at A0	1 : 50
Drawn By	JB	Validated	
Checked			

Drawing Number: **4650/M/223**
Revision: **5**



NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE STAGE 4 SPECIFICATION AND LEGEND DRAWING.
2. DO NOT SCALE FROM THIS DRAWING.
3. REFER TO LV SCHEMATIC DRAWING No. 4650/E/003 FOR FURTHER DETAILS/NUMBER OF ELECTRICALLY METERED SUPPLIES.
4. PLEASE REFER TO DRAWING NUMBER 4650/M/106 FOR FURTHER DETAILS ON THE LOW TEMPERATURE HOT WATER (LTHW) HEAT METERS.
5. PLEASE REFER TO DRAWING NUMBER 4650/PH/101 FOR FURTHER DETAILS THE BCWS AND HCWS METERS.
6. PLEASE REFER TO DRAWING NUMBER 4650/M/107 FOR THE BMS SCHEMATIC.

LEGEND:

BCWS	–	BOOSTED COLD WATER SERVICES
BHWS	–	BOOSTED HOT WATER SERVICES
DHW	–	DOMESTIC HOT WATER
LTHW	–	LOW TEMPERATURE HOT WATER
SP	–	SMALL POWER
M	–	MECHANICAL POWER
FCU	–	FAN COIL UNIT
L	–	LIGHTING
PV	–	PHOTOVOLTAICS
WM	–	WATER METER
HM	–	HEAT METER
M	–	ELECTRICAL METER
E	–	ETHERNET GATEWAY LINK

Ref.	Revision	Date
4	STAGE 4 REDESIGN	SEP 2022
3	STAGE 4 ADDENDUM	AUG 2021
2	STAGE 4	JUL 2021
1	DRAFT STAGE 4	MAR 2021

STAGE 4

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Client
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Project
THE FITZROVIA

Title
EMS SCHEMATIC

Date	MARCH 2021	Scale at A1	N.T.S.
Drawn By	MT	Validated	
Checked			

Drawing Number **4650/E/010**

Revision **4**

APPENDIX 2

Manufacturer's Data Sheets

Daikin	Commercial Office Heating and Comfort Cooling
Mitsubishi	Commercial Office Domestic Hot Water
Panasonic	Residential Heating and Comfort Cooling & Domestic Hot Water

2 Specifications

2-1 Technical Specifications					RYYQ8U	RYYQ10U	RYYQ12U	RYYQ14U	RYYQ16U	RYYQ18U	RYYQ20U
Continuous heating					Yes						
Recommended combination					4 x FXFQ50AVEB	4 x FXFQ63AVEB	6 x FXFQ50AVEB	1 x FXFQ50AVEB + 5 x FXFQ63AVEB	4 x FXFQ63AVEB + 2 x FXFQ80AVEB	3 x FXFQ50AVEB + 5 x FXFQ63AVEB	2 x FXFQ50AVEB + 6 x FXFQ63AVEB
Recommended combination 2					4 x FXSQ50A2VEB	4 x FXSQ63A2VEB	6 x FXSQ50A2VEB	1 x FXSQ50A2VEB + 5 x FXSQ63A2VEB	4 x FXSQ63A2VEB + 2 x FXSQ80A2VEB	3 x FXSQ50A2VEB + 5 x FXSQ63A2VEB	2 x FXSQ50A2VEB + 6 x FXSQ63A2VEB
Recommended combination 3					4 x FXMQ50P7VEB	4 x FXMQ63P7VEB	6 x FXMQ50P7VEB	1 x FXMQ50P7VEB + 5 x FXMQ63P7VEB	4 x FXMQ63P7VEB + 2 x FXMQ80P7VEB	3 x FXMQ50P7VEB + 5 x FXMQ63P7VEB	2 x FXMQ50P7VEB + 6 x FXMQ63P7VEB
Cooling capacity	Prated,c			kW	22.4 (1)	28.0 (1)	33.5 (1)	40.0 (1)	45.0 (1)	50.4 (1)	52.0 (1)
Heating capacity	Prated,h			kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
	Max.	6°CWB		kW	25.0 (2)	31.5 (2)	37.5 (2)	45.0 (2)	50.0 (2)	56.5 (2)	63.0 (2)
SEER					7.6	6.8	6.3		6.0		5.9
SEER recommended combination 2					6.9	6.8	5.9	6.3	5.9	6.0	5.9
SEER recommended combination 3					7.5	6.8	6.2		5.8	6.0	5.9
SCOP					4.3		4.1	4.0		4.2	4.0
SCOP recommended combination 2					4.2	4.3	4.1	4.0	4.1	4.2	4.0
SCOP recommended combination 3					4.2	4.1		4.0		4.1	3.9
ηs,c				%	302.4	267.6	247.8	250.7	236.5	238.3	233.7
ηs,c recommended combination 2					273.6	270.5	233.5	250.0	234.2	236.8	233.9
ηs,c recommended combination 3					295.2	267.1	246.3	246.7	230.4	238.2	233.1
ηs,h				%	167.9	168.2	161.4	155.4	157.8	163.1	156.6
ηs,h recommended combination 2					165.4	170.6	161.3	157.2	159.5	164.8	158.2
ηs,h recommended combination 3					165.6	162.0	160.6	155.7	156.8	159.6	153.4
Capacity range				HP	8	10	12	14	16	18	20
Maximum number of connectable indoor units					64 (3)						
Indoor index connection	Min.				100.0	125.0	150.0	175.0	200.0	225.0	250.0
	Max.				260.0	325.0	390.0	455.0	520.0	585.0	650.0
Dimensions	Unit	Height		mm	1,685						
		Width		mm	930			1,240			
		Depth		mm	765						
	Packed unit	Height		mm	1,820						
		Width		mm	995			1,305			
		Depth		mm	860						
Weight	Unit			kg	252			319		378	
	Packed unit			kg	265			335		395	
Packing	Material				Carton						
	Weight			kg	1.8			2.2			
Packing 2	Material				Wood						
	Weight			kg	11.0			14.0			
Packing 3	Material				Plastic						
	Weight			kg	0.5			0.6			
Capacity control	Method				Inverter controlled						
Casing	Colour				Daikin White						
	Material				Painted galvanized steel plate						
Heat exchanger	Type				Cross fin coil						
	Indoor side				Air						
	Outdoor side				Air						
	Air flow rate	Cooling	Rated	m³/h	9,720	10,500	11,100	13,380	15,600	15,060	15,660
		Heating	Rated	m³/h	9,720	10,500	11,100	13,380	15,600	15,060	15,660
Compressor	Quantity				1			2			
	Type				Hermetically sealed scroll compressor						
	Crankcase heater			W	33						

2 Specifications

2-1 Technical Specifications					RYYQ8U	RYYQ10U	RYYQ12U	RYYQ14U	RYYQ16U	RYYQ18U	RYYQ20U
Fan	Quantity				1			2			
	External static pressure	Max.		Pa	78						
Fan motor	Quantity				1			2			
	Type				DC motor						
	Output			W	550			750			
Sound power level	Cooling	Nom.		dBA	78.0 (4)	79.1 (4)	83.4 (4)	80.9 (4)	85.6 (4)	83.8 (4)	87.9 (4)
	Heating	Nom.		dBA	62.7 (4)	64.8 (4)	64.9 (4)	68.3 (4)	68.6 (4)	66.3 (4)	67.0 (4)
Sound pressure level	Cooling	Nom.		dBA	57.0 (5)		61.0 (5)	60.0 (5)	63.0 (5)	62.0 (5)	65.0 (5)
Operation range	Cooling	Min.~Max.		°CDB	-5.0~43.0						
	Heating	Min.~Max.		°CWB	-20.0~15.5						
Refrigerant	Type				R-410A						
	GWP				2,087.5						
	Charge			TCO_2eq	12.3	12.5	13.2	21.5	21.7	24.4	24.6
				kg	5.9	6.0	6.3	10.3	10.4	11.7	11.8
Refrigerant oil	Type				Synthetic (ether) oil FVC68D						
Piping connections	Liquid	Type			Braze connection						
		OD		mm	9,52		12,7			15,9	
	Gas	Type			Braze connection						
		OD		mm	19.1	22.2	28.6				
	Total piping length	System	Actual	m	1,000 (6)						
Defrost method					Reversed cycle						
Safety devices	Item	01			High pressure switch						
		02			Fan driver overload protector						
		03			Inverter overload protector						
		04			PC board fuse						
		05			Leakage current detector						
PED	Category				Category II						
	Most critical part	Name			Accumulator						
		Ps*V		Bar*l	325			415		493	
Space cooling	A Condition (35°C - 27/19)	EERd			3.0	2.3	2.4	2.6	2.1	1.9	
		Pdc		kW	22.4	28.0	33.5	40.0	45.0	50.4	52.0
	B Condition (30°C - 27/19)	EERd			5.2	4.7	4.3	4.1	3.9	3.8	3.7
		Pdc		kW	16.5	20.6	24.7	29.5	33.2	37.1	38.3
	C Condition (25°C - 27/19)	EERd			9.5	8.3	7.7	7.8	7.7	7.5	7.3
		Pdc		kW	10.6	13.3	15.9	18.9	21.3	23.9	24.6
	D Condition (20°C - 27/19)	EERd			18.8	17.0	13.9	14.3	14.2	18.3	
		Pdc		kW	8.0	9.3	9.4	8.4	9.5	11.5	
Space cooling recommended combination 2	A Condition (35°C - 27/19)	EERd			2.6	2.4		2.6	2.1	1.9	
		Pdc		kW	22.4	28.0	33.5	40.0	45.0	50.4	52.0
	B Condition (30°C - 27/19)	EERd			4.9	4.7	4.0	4.1	3.8	3.7	3.6
		Pdc		kW	16.5	20.6	24.7	29.5	33.2	37.1	38.3
	C Condition (25°C - 27/19)	EERd			8.8	8.5	7.1	7.9	7.6	7.5	7.3
		Pdc		kW	10.6	13.3	15.9	18.9	21.3	23.9	24.6
	D Condition (20°C - 27/19)	EERd			15.1	17.2	13.1	14.0		18.1	18.9
		Pdc		kW	8.8	9.3	9.1	8.4	9.5	11.4	10.9
Space cooling recommended combination 3	A Condition (35°C - 27/19)	EERd			3.0	2.3	2.4	2.6	2.1	1.9	
		Pdc		kW	22.4	28.0	33.5	40.0	45.0	50.4	52.0
	B Condition (30°C - 27/19)	EERd			5.1	4.7	4.2	4.0	3.7		3.6
		Pdc		kW	16.5	20.6	24.7	29.5	33.2	37.1	38.3
	C Condition (25°C - 27/19)	EERd			9.6	8.4	7.7		7.4	7.6	7.3
		Pdc		kW	10.6	13.3	15.9	19.0	21.3	23.9	24.6
	D Condition (20°C - 27/19)	EERd			16.0	16.9	13.7	14.0	14.1	18.3	
		Pdc		kW	9.1	9.3	9.4	8.4	9.5	11.6	

2 Specifications

2-1 Technical Specifications				RYYQ8U	RYYQ10U	RYYQ12U	RYYQ14U	RYYQ16U	RYYQ18U	RYYQ20U
Space heating (Average climate)	TBivalent	COPd (declared COP)		2.5	2.4	2.0	2.3	2.2	1.9	1.8
		Pdh (declared heating cap)	kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
		Tbiv (bivalent temperature)	°C	-10						
	TOL	COPd (declared COP)		2.5	2.4	2.0	2.3	2.2	1.9	1.8
		Pdh (declared heating cap)	kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
		Tol (temperature operating limit)	°C	-10						
	A Condition (-7°C)	COPd (declared COP)		2.7	2.6	2.4	2.6		2.4	2.1
		Pdh (declared heating cap)	kW	12.1	14.2	16.3	18.2	20.5	24.7	27.4
	B Condition (2°C)	COPd (declared COP)		3.9			3.5		3.7	3.6
		Pdh (declared heating cap)	kW	7.4	8.6	9.9	11.1	12.5	15.0	16.7
	C Condition (7°C)	COPd (declared COP)		6.3	6.4	6.1		6.3	6.7	6.5
		Pdh (declared heating cap)	kW	5.0	5.5	6.4	7.1	8.0	9.7	10.7
	D Condition (12°C)	COPd (declared COP)		7.9	8.2	7.9	8.5	8.6	9.0	9.1
		Pdh (declared heating cap)	kW	5.9		6.3	4.9		7.1	
Space heating (Average climate) recommended combination 2	A Condition (-7°C)	COPd (declared COP)		2.7		2.4	2.6		2.4	2.2
		Pdh (declared heating cap)	kW	12.1	14.2	16.3	18.2	20.5	24.7	27.4
	B Condition (2°C)	COPd (declared COP)		3.9	4.0	3.9	3.5		3.8	3.7
		Pdh (declared heating cap)	kW	7.4	8.6	9.9	11.1	12.2	15.0	16.7
	C Condition (7°C)	COPd (declared COP)		6.3	6.5	6.1		6.3	6.8	6.5
		Pdh (declared heating cap)	kW	5.0	5.5	6.4	7.1	8.0	9.7	10.7
	D Condition (12°C)	COPd (declared COP)		7.8	8.3	7.9	8.6	8.7	9.1	9.2
		Pdh (declared heating cap)	kW	5.9	6.0	6.4	4.9	5.0	7.2	
	TBivalent	COPd (declared COP)		2.4		1.9	2.3	2.2	1.9	1.8
		Pdh (declared heating cap)	kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
		Tbiv (bivalent temperature)	°C	-10						
	TOL	COPd (declared COP)		2.4		1.9	2.3	2.2	1.9	1.8
		Pdh (declared heating cap)	kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
		Tol (temperature operating limit)	°C	-10						

2 Specifications

2-1 Technical Specifications					RYYQ8U	RYYQ10U	RYYQ12U	RYYQ14U	RYYQ16U	RYYQ18U	RYYQ20U
Space heating (Average climate) recommended combination 3	A Condition (-7°C)	COPd (declared COP)			2.7	2.6	2.4	2.6		2.4	2.1
		Pdh (declared heating cap)		kW	12.1	14.2	16.3	18.2	20.5	24.7	27.4
	B Condition (2°C)	COPd (declared COP)			3.9	3.7	3.9	3.5		3.7	3.6
		Pdh (declared heating cap)		kW	7.4	8.6	9.9	11.1	12.5	15.0	16.7
	C Condition (7°C)	COPd (declared COP)			6.2	6.4	6.0	6.1	6.2	6.5	6.3
		Pdh (declared heating cap)		kW	4.9	5.5	6.4	7.1	8.0	9.7	10.7
	D Condition (12°C)	COPd (declared COP)			7.8	8.1	7.8	8.5	8.6	8.7	
		Pdh (declared heating cap)		kW	5.8	5.9	6.2	4.9		6.9	
	TBivalent	COPd (declared COP)			2.5	2.4	2.0	2.3	2.2	1.9	1.8
		Pdh (declared heating cap)		kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
		Tbiv (bivalent temperature)		°C	-10						
	TOL	COPd (declared COP)			2.5	2.4	2.0	2.3	2.2	1.9	1.8
		Pdh (declared heating cap)		kW	13.7	16.0	18.4	20.6	23.2	27.9	31.0
		Tol (temperature operating limit)		°C	-10						
Cooling	Cdc (Degradation cooling)				0.25						
Heating	Cdh (Degradation heating)				0.25						
Power consumption in other than active mode	Crankcase heater mode	Cooling	PCK	kW	0.000						
		Heating	PCK	kW	0.052			0.077		0.089	
	Off mode	Cooling	POFF	kW	0.041			0.074		0.075	
		Heating	POFF	kW	0.052			0.077		0.089	
	Standby mode	Cooling	PSB	kW	0.041			0.074		0.075	
		Heating	PSB	kW	0.052			0.077		0.089	
	Thermostat-off mode	Cooling	PTO	kW	0.005			0.010			
		Heating	PTO	kW	0.056			0.097		0.098	
Indication if the heater is equipped with a supplementary heater					no						
Supplementary heater	Back-up capacity	Heating	elbu	kW	0.0						

Standard Accessories : Installation manual; Quantity : 1;

Standard Accessories : Operation manual; Quantity : 1;

Standard Accessories : Connection pipes; Quantity : 1;

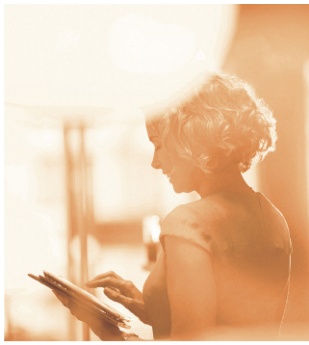
2-2 Electrical Specifications				RYYQ8U	RYYQ10U	RYYQ12U	RYYQ14U	RYYQ16U	RYYQ18U	RYYQ20U
Power supply	Name			Y1						
	Phase			3N~						
	Frequency		Hz	50						
	Voltage		V	380-415						
Voltage range	Min.		%	-10						
	Max.		%	10						
Current	Nominal running current (RLA) - 50Hz	Cooling	A	7.2 (7)	10.2 (7)	12.7 (7)	15.4 (7)	18.0 (7)	20.8 (7)	26.9 (7)
Current - 50Hz	Starting current (MSC) - remark			(8)						
	Zmax	List		No requirements						
	Minimum circuit amps (MCA)		A	16.1 (9)	22.0 (9)	24.0 (9)	27.0 (9)	31.0 (9)	35.0 (9)	39.0 (9)
	Maximum fuse amps (MFA)		A	20 (10)	25 (10)	32 (10)		40 (10)		50 (10)
	Full load amps (FLA)	Total	A	1.2 (11)	1.3 (11)	1.5 (11)	1.8 (11)	2.6 (11)		
Wiring connections - 50Hz	For power supply	Quantity		5G						
	For connection with indoor	Quantity		2						
		Remark		F1,F2						
Power supply intake				Both indoor and outdoor unit						

Heating

Product Information

CAHV-P500YA-HPB
Ecodan Air Source Heat Pump

Making a World of Difference



CAHV Monobloc Heat Pump System

The Ecodan CAHV air source heat pump monobloc system can operate singularly, or form part of a multiple unit system. The CAHV also comes equipped with a wide range of controller features as standard.

A multiple unit system has the ability to cascade available units on and off to meet the load from a building. As an example of this modulation, a 16 unit system allows 0.5kW increments of capacity, from 18kW all the way up to 688kW. This level of modulation is unprecedented within the heating industry and with cascade and rotation built in as standard, the Ecodan CAHV system is perfectly suited to a wide range of commercial applications.

ErP A++

Qualified for Energy Technology List

APPROVED PRODUCT

Certificate Number: MCS HP0002
Product Reference: CAHV-P500YA-HPB

Key Features

- Multiple unit cascade control of up to 688kW capacity
- Split refrigerant circuits within each CAHV provide 50% back up
- Ability to rotate units based on accumulated run hours
- Provides from 25°C up to 70°C water flow temperatures without boost heaters
- Low maintenance, hermetically-sealed monobloc design
- Low on-site refrigerant volume
- HIC (Zubadan) technology delivers 43kW at -3°C with minimal drop off down to -20°C

MITSUBISHI ELECTRIC

Air Conditioning | Heating
Ventilation | Controls

ecodan®
Renewable Heating Technology

Heating

Product Information

CAHV-P500YA-HPB

Ecodan Air Source Heat Pump

Making a World of Difference

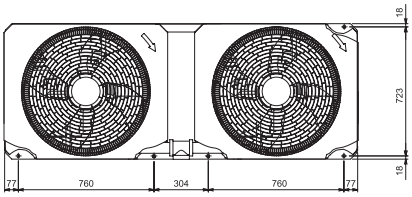
MODEL		CAHV-P500YA-HPB
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++
	η_s	125%
	SCOP	3.19
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A+
	η_s	139%
	SCOP	3.54
HEATING*1 (A-3/W35)	Capacity (kW)	42.6
	Power Input (kW)	15.2
	COP	2.80
OPERATING AMBIENT TEMPERATURE (°C DB)		-20~+40°C
SOUND PRESSURE LEVEL AT 1M (dBA)*2*3		59
LOW NOISE MODE (dBA)*2		Variable
FLOW RATE(l/min)		126
WATER PRESSURE DROP (kPa)		18
DIMENSIONS (mm)	Width	1978
	Depth	759
	Height	1710 (1650 without legs)
WEIGHT (kg)		526
ELECTRICAL SUPPLY		380-415v, 50Hz
PHASE		3
NOMINAL RUNNING CURRENT [MAX] (A)		17.6 [52.9]
FUSE RATING - MCB SIZES (A)*4		63

*1 Under normal heating conditions at outdoor temp: -3°CDB / -4°CWB, outlet water temp 35°C, inlet water temp 30°C
*2 Under normal heating conditions at outdoor temp: 7°CDB / 6°CWB, outlet water temp 35°C, inlet water temp 30°C as tested to BS EN14511
*3 Sound power level of the CAHV-P500YA-HPB is 70.7dBA. Tested to BS EN12102
*4 MCB Sizes BS EN60898-2 & BS EN60947-2

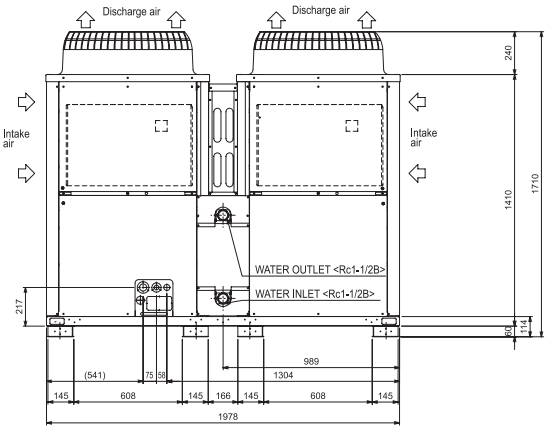
η_s is the seasonal space heating energy efficiency (SSHEE) η_{wh} is the water heating energy efficiency

DIMENSIONS

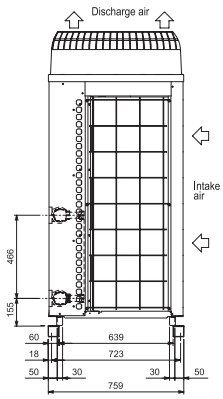
Upper View



Front View



Side View



MITSUBISHI ELECTRIC
Changes for the Better

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Printed in August 2015 SAP No. 246867

Aquarea High Performance All in One H Generation 3 Phase • R410A

Aquarea, an innovative new low-energy system based on Air to Water heat pump technology

Aquarea warms your home effectively and efficiently, even with extreme outdoor temperatures. Aquarea can also cool space in summer and bring hot water all year round.
Aquarea High Performance is the range for new installations and low consumption homes. Outstanding efficiency and energy savings with minimised CO2 emissions and minimum space.
Aquarea All in One: This range intelligently integrates the best Hydrokit technology with a premium quality stainless steel tank, which is maintenance-free.

• A+++ energy Class (average climate at 35°C water outlet)

• Stainless steel 185 L DHW tank
• U-Vacua? insulation panel for higher tank efficiency
• Anode free water tank, no maintenance
• Works at temperatures as low as -20°C
• Cloud control and service with CZ-TAW1
• Easy-to-use remote controller
• Built-in flow meter and automatic air purge valve
• Easy installation and maintenance, with electrical connections at the front

Aquarea Service Cloud. Control for today and for the future

FOR END USER

FOR INSTALLERS / MAINTENANCE

Range of fan coil units provide a higher level and performance

The fan coil range consists of a compact ducted range ideal for residential and commercial use and one model with high static pressure for commercial applications.

FIND OUT MORE

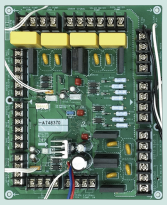
Aquarea High Performance All in One H Generation 3 Phase • R410A		Three Phase (Power to indoor)
		16 kW
Kit		KIT-ADC16HE8
Heating capacity (A +7°C, W 35°C)	kW	16,00
COP (A +7°C, W 35°C)		4,28
Heating capacity (A +7°C, W 55°C)	kW	14,50
COP (A +7°C, W 55°C)		2,68
Heating capacity (A +2°C, W 35°C)	kW	13,00
COP (A +2°C, W 35°C)		3,28
Heating capacity (A +2°C, W 55°C)	kW	9,80
COP (A +2°C, W 55°C)		2,17
Heating capacity (A -7°C, W 35°C)	kW	11,40
COP (A -7°C, W 35°C)		2,57
Heating capacity (A -7°C, W 55°C)	kW	9,00
COP (A -7°C, W 55°C)		1,82
Cooling capacity (A 35°C, W 7°C)	kW	12,20
EER (A 35°C, W 7°C)		2,56
Cooling capacity (A 35°C, W 18°C)	kW	12,20
EER (A 35°C, W 18°C)		4,12
Heating average climate. Seasonal energy efficiency (W 35°C / W 55°C)	ηs %	190 / 130
Heating average climate. Seasonal energy efficiency (W 35°C / W 55°C)	SCOP	4,83 / 3,33
Heating average climate. Energy class (W 35°C / W 55°C) (1)	A+++ to D	A+++ / A++
Heating warm climate. Seasonal energy efficiency (W 35°C / W 55°C)	ηs %	245 / 169
Heating warm climate. Seasonal energy efficiency (W 35°C / W 55°C)	SCOP	6,20 / 4,30
Heating warm climate. Energy class (W 35°C / W 55°C) (1)	A+++ to D	A+++ / A+++
Heating cold climate. Seasonal energy efficiency (W 35°C / W 55°C)	ηs %	168 / 121
Heating cold climate. Seasonal energy efficiency (W 35°C / W 55°C)	SCOP	4,28 / 3,10
Heating cold climate. Energy class (W 35°C / W 55°C) (1)	A+++ to D	A++ / A+
Indoor unit		WH-ADC0916H9E8
Indoor sound pressure (Heat)	dB(A)	33
Indoor sound pressure (Cool)	dB(A)	33
Indoor dimension (Height)	mm	1800
Indoor dimension (Width)	mm	598
Indoor dimension (Depth)	mm	717
Indoor net weight	kg	126
Water pipe connector	Inch	R 1¼
A class pump (Number of speeds)		Variable Speed
A class pump (Input power Min)	W	36
A class pump (Input power Max)	W	152
Heating water flow (ΔT=5 K. 35°C)	L/min	45,90
Capacity of integrated electric heater	kW	9,00
Indoor recommended fuse	A	16 / 16
Recommended cable size, supply 1	mm²	5 x 1,5
Recommended cable size, supply 2	mm²	5 x 1,5
Water volume	L	185
Maximum water temperature	°C	65
Material inside tank		Stainless steel
Tapping profile according EN16147		L
DHW tank ERP average climate efficiency rating (2)	A+ to F	A
DHW tank ERP warm climate efficiency rating (2)	A+ to F	A
DHW tank ERP cold climate efficiency rating (2)	A+ to F	B
DHW tank ERP average climate η	ηwh %	91
DHW tank ERP average climate SCOP		2,28
DHW tank ERP warm climate η	ηwh %	107
DHW tank ERP warm climate SCOP		2,68
DHW tank ERP cold climate η	ηwh %	72
DHW tank ERP cold climate SCOP		1,88
Outdoor unit		WH-UD16HE8
Outdoor sound power part load (Heat) (3)	dB(A)	65
Outdoor sound power full load (Heat)	dB(A)	72
Outdoor sound power full load (Cool)	dB(A)	72
Outdoor dimension (Height)	mm	1340
Outdoor dimension (Width)	mm	900
Outdoor dimension (Depth)	mm	320
Outdoor net weight	kg	107
Refrigerant (R410A) / CO2 Eq.	kg / T	2,55 / 5,324
Pipe diameter (Liquid)	Inch (mm)	3/8 (9,52)
Pipe diameter (Gas)	Inch (mm)	5/8 (15,88)
Pipe length range	m	3 ~ 30
Elevation difference (in/out)	m	20
Pipe length for additional gas	m	10
Additional gas amount	g/m	50
Operation range (Outdoor ambient)	°C	-20 ~ +35
Water outlet (Heat)	°C	20 ~ 55
Water outlet (Cool)	°C	5 ~ 20

(1) Scale from A+++ to D.
(2) Scale from A+ to F.
(3) Sound power in accordance to 8112013,81312013 and EN12102-1:2017 at +7°C.
EER and COP calculation is based in accordance to EN14511.
This product is designed to comply with the European Water Quality Directive 98/83/EC amended by 2015/1787/EU. The lifespan of the product is not guaranteed in the case of the use of groundwater, such as spring water or well water, the use of tap water when salt or other impurities are contained, nor in areas of acidic water quality. Maintenance and warranty costs related to these cases are the customer's responsibility.

Complementary products

PAW-A2W-RTWIRED

PAW-ADC-CV150



CZ-NS4P

CZ-TAW1

PAW-ADC-PREKIT-1

APPENDIX 3

ASHP Maintenance Schedule

Air Source Heat Pump Maintenance Schedule

Twice per quarter undertake the following:

General

- Inspect Heat pump control display, and connections.
- Check control operation, and interconnections between internal units and the heat pump
- Review programming and record setpoints in use if revised.
- Audible and visual examination of equipment in operation.
- Check coil for any signs of leaks or deterioration
- Check compressor/ water pump
- Inspect pipework and insulation
- Check water pressure and re-fill system if required
- Wipe clean.

Electrical / Control

- Check wiring terminations for tightness.
- Check all contactors and mcb's for operation and signs of wear.
- Check temperature sensor(s) are fixed correctly on valve assembly.
- Check control box wiring terminations for tightness in the internal units
- Check fan motors for correct and free rotation and review

Fans

- Wipe Casing Clean.
- Operate control board to fully open/closed to check cooling

Cooling

- Check chilled supply temperatures.
- Check hot supply temperatures.

Heating

- Operate control board to fully open/closed to check heating
- Inspect and brush Clean

Cleaning

- Clean unit