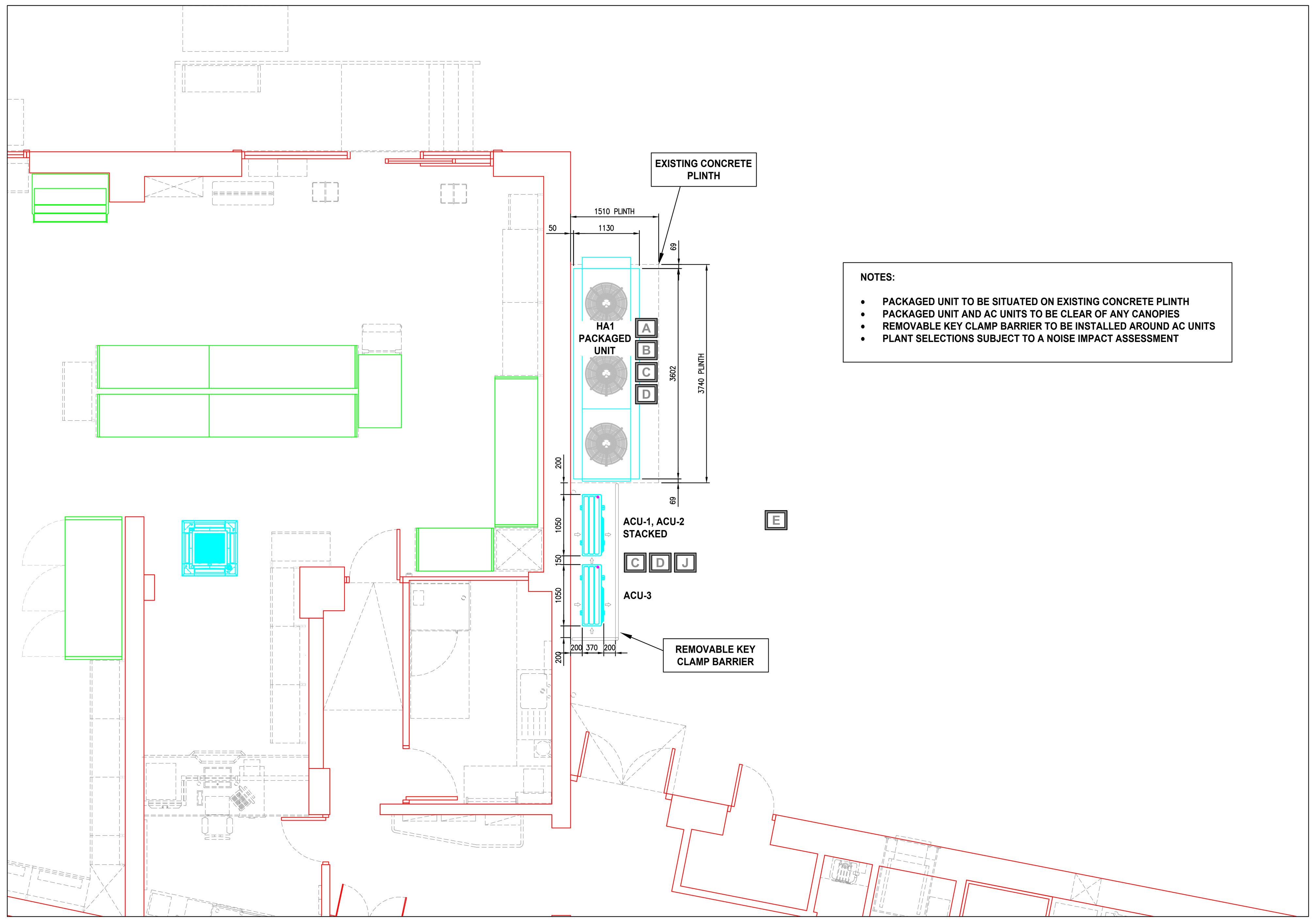
ALL RIGHTS RESERVED. THE COPYRIGHT OF THIS DRAWING IS WITH SPACE ENGINEERING SERVICES Ltd. NO PART OF THIS DRAWING MAY BE REPRODUCED, STORED WITHIN A RETRIEVAL SYSTEM, OR TRANSMITTED TO OTHER PARTIES, WITHOUT PRIOR WRITTEN CONFIRMATION FROM SPACE ENGINEERING SERVICES Ltd. THIS DRAWING IS OFFERED ONLY FOR THE PURPOSE OF THE SERVICES INTENDED.

ALL LEVELS AND DIMENSIONS ARE TO BE VERIFIED ON-SITE BEFORE COMMENCEMENT OF WORKS; PLEASE NOTIFY THE ORIGINATORS OF THIS DRAWING SHOULD DIFFERENCES BE NOTED. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS STATED OTHERWISE.

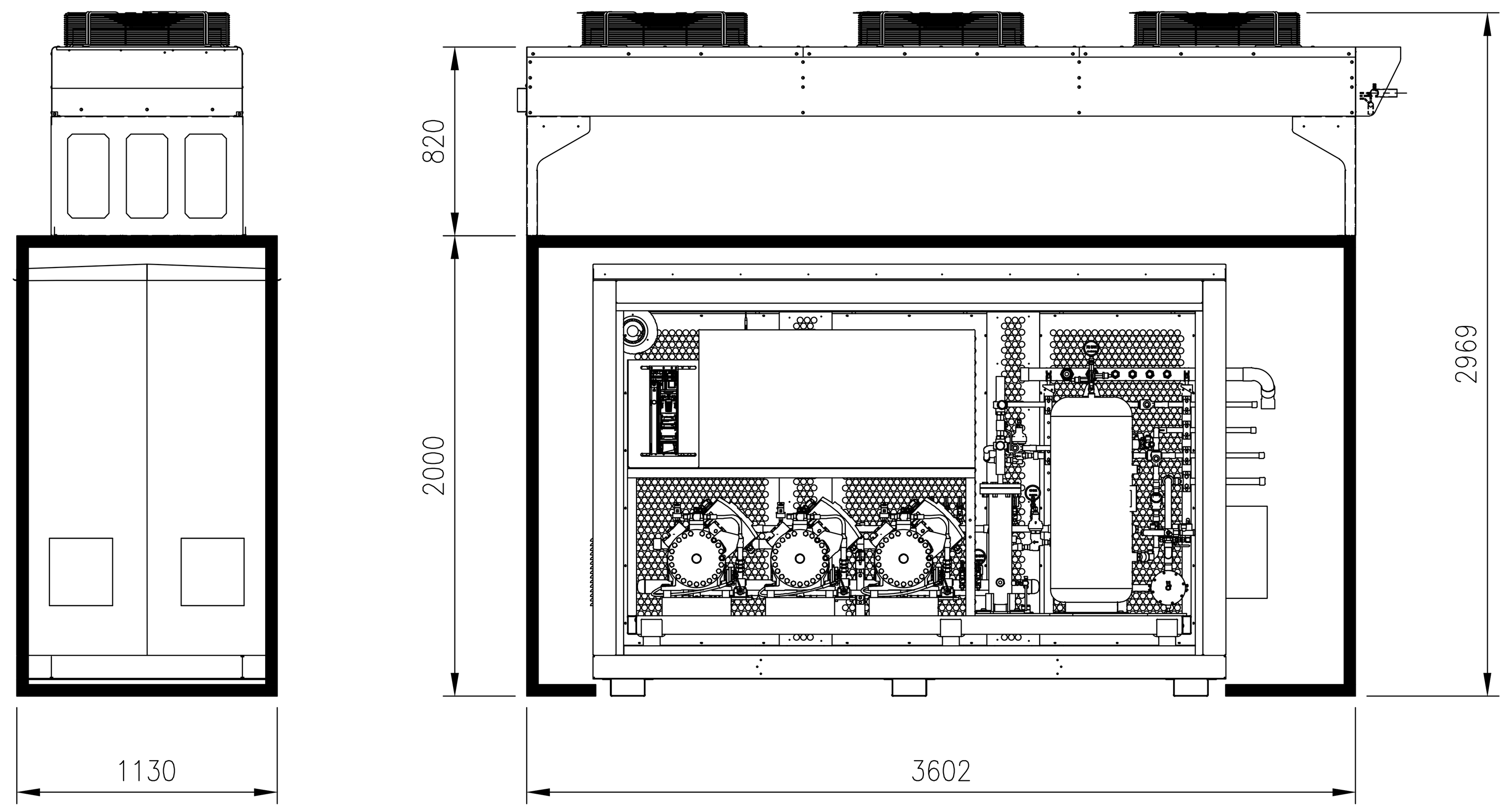
DO NOT SCALE FROM THIS DRAWING.



NOTES:

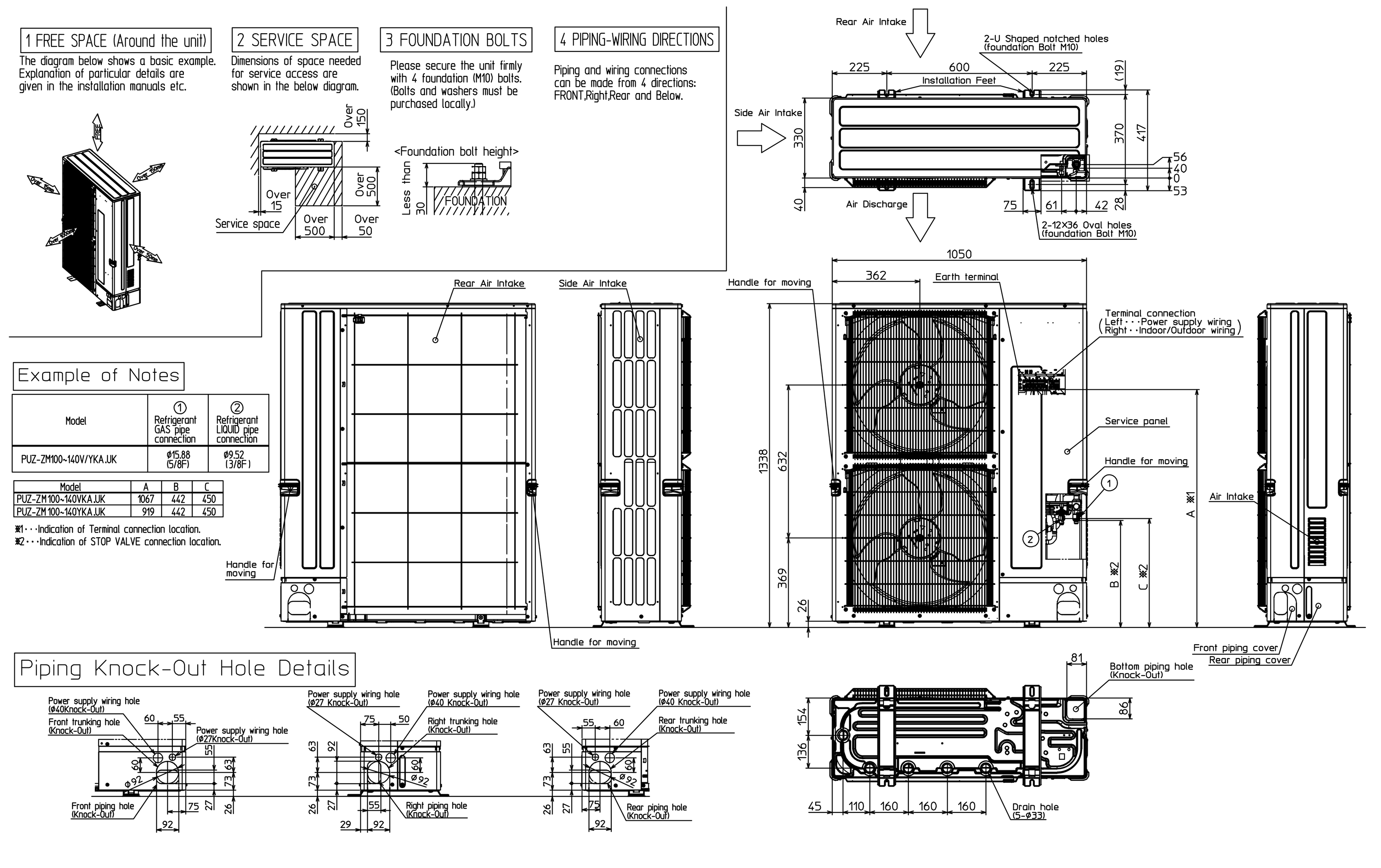
- PACKAGED UNIT TO BE SITUATED ON EXISTING CONCRETE PLINTH
- PACKAGED UNIT AND AC UNITS TO BE CLEAR OF ANY CANOPIES
- REMOVABLE KEY CLAMP BARRIER TO BE INSTALLED AROUND AC UNITS
- PLANT SELECTIONS SUBJECT TO A NOISE IMPACT ASSESSMENT

INDICATIVE HA1 PACKAGED UNIT DETAIL (NTS)



NOTE: SKETCH ONLY FOR ILLUSTRATION AND DIMENSION GUIDE

OUTDOOR AC UNIT DETAIL (NTS)



Item	Unit	Value	Item	Unit	Value
Plant Supplier	[-]	Space Engineering	**Pack Evaporator Capacity**	[kW]	35.9 (HT) / 0 (LT)
Pack Model Reference	[-]	ST-3A	**Refrigerant**	[-]	R744
Primary Pack controller	[-]	RDM -PR0650	**Total Refrigerant Charge**	[kg]	78.84
Full Back-Up Pack controller	[-]	RDM -PR0650	**PED Category**	[-]	IV

Item	Unit	Day Time HT	Day Time LT	Night Time HT	Night Time LT
Required evaporator capacity	[kW]	31.21	-	21.85	-
Lowest Evaporating Temperature	[°C]	-6	-	-	-
Suction Pressure Penalty	[K]	1	-	-	-
Suction Saturated Temperature	[°C]	-7	-	-	-
Suction Usefull Superheat	[K]	10	-	-	-
Suction Non-Usefull Superheat	[K]	10	-	-	-

Item	Unit	Day Time	Night Time
Gas Cooler Sound Pressure Level @10m	[dB(A)]	22	22
Pack Sound Level Pressure Level @ 10m	[dB(A)]	30	30

Item	Unit	Value
Design Low Pressure	[Bar]	60
Design Intermediate Pressure	[Bar]	60
Design High Pressure	[Bar]	120

Item	Unit	Day Time	Night Time
Ambient Temperature	[°C]	35	15
Intermediate Pressure (+5 °C)	[Bar]	39.69	39.69
Discharge Pressure Penalty	[K]	1	1
Gas Cooler Absolute Pressure	[Bar]	95.2	61.38
Gas Cooler Outlet Tempterature	[°C]	37	23
Total Heat Rejection	[kW]	60.91	42.64

Item	Unit	Value
Pack Type	[-]	Housed Standard
Pack Dimensions	[mm]	2750 (W) x 1130 (D) x 1877 (H)
Pack Weight	[kg]	1520
Pack Location	[-]	External plant Area
Receiver Capacity	[L]	60
Receiver Location	[-]	Pack

Item	Unit	Value	
Gas Cooler Manufacturer	[-]	Kelvion	
Gas Cooler Model	[-]	GF-SA103F5H-063M038	
Gas Cooler Location	[-]	External Plant Area (mounted on purpose built frame above pack)	
Number of Fans	[pc.]	3	
Fan Diameter	[mm]	630	
Start Current per Fan	[A]	0.3	
Full Load Current per Fan	[A]	0.3	
Electrical Connection	[V/ph/Hz]	400/3/50	
Refrigerant Charge	[kg]	14.62	
Length	[mm]	3924	
Width	[mm]	828	
Height	[mm]	1220	
Leg Height	[mm]	750	
Fin Material	[-]	CU/AlMg	
Pipe Connections	["]	1 x 1-1/8" - 1 x 1-1/8"	
Wet Weight	[kg]	227	
Maximum Rotation	[rpm]	1140	
External Static Pressure	[Pa]	0	
Nominal Capacity	[kW]	61.5	43.05
Required Rotation	[rpm]	380	380
Air Flow	[m3/s]	3	3
Control Voltage	[V]	3.4	3.4
RDM Reduction	[%]	66.9	66.9

Item	Unit	HT	LT
Application	[-]	HT	LT
Compressor	[-]	Emerson Stream	N/A
Lead Compressor	[-]	4MTL-07_[INV]	N/A
Quantity	[pc.]	1	N/A
Inverter Frequency	[Hz]	50	50
Compressor Capacity	[kW]	12.68	N/A
Evaporator Capacity	[kW]	12.02	N/A
Compressor Mass Flow	[kg/s]	0.0879	N/A
Power Input	[kW]	7.83	N/A
Running Current	[A]	14.77	N/A
Maximum Operating Current	[A]	17.5	N/A
Heat Rejection	[kW]	20.51	N/A
		24.61	N/A
Secondary Compressor(s)	[-]	4MTL-07	N/A
Quantity	[pc.]	2	N/A
Drive Frequency	[Hz]	50	N/A
Compressor Capacity	[kW]	12.6	N/A
Evaporator Capacity	[kW]	11.94	N/A
Compressor Mass Flow	[kg/s]	0.0873	N/A
Power Input	[kW]	7.6	N/A
Running Current	[A]	12.98	N/A
Maximum Operating Current	[A]	17.5	N/A
Heat Rejection	[kW]	20.2	N/A

PSSR Assessment

SYSTEM REF.	TOTAL COMPRESSOR POWER FROM HP (kW)	PSSR REQUIRED FOR THE WORKS?
HA1	14.5	NO

Assessment made in conjunction with The Pressure Systems Safety Regulations 2000.

Air Conditioning - Outdoor Units (Pipework to be pressure tested to 41.5Bar Tightness and 45.7Bar Strength)

System Ref	Model	Manufacturer	New/ Existing	Type	Position	Max Current (A)	Start Current (A)	Electrical Connections	Running Load (A)	FUSE RATING (A)	Refrigerant Charge (kg)	Minimal Room Area (m2)	Connections (S / L)	Maximum Working Pressure (Bar)	Length (mm)	Width (mm)	Height (mm)	Net Weight (kg)	Air Flow (m3/s)	External Maximum Static Pressure (Pa)	Noise Pressure Level (dBA @ 1m)	Refrigerant
ACU-1	PUZ-ZM125YKA	Mitsubishi Electric	New	Power Inverter 3ph	External Plant Area	10	6	380-415V / 50HZ / 3ph	4.91 (Cooling) 5.36 (Heating)	16	4	N/A	(5/8") / (3/8")	41.5	1050	370	1338	125	2	0	50 (Cooling) 52 (Heating)	R32
ACU-2	PUZ-ZM125YKA	Mitsubishi Electric	New	Power Inverter 3ph	External Plant Area	10	6	380-415V / 50HZ / 3ph	4.91 (Cooling) 5.36 (Heating)	16	4	N/A	(5/8") / (3/8")	41.5	1050	370	1338	125	2	0	50 (Cooling) 52 (Heating)	R32
ACU-3	PUZ-ZM100YKA	Mitsubishi Electric	New	Power Inverter 3ph	External Plant Area	8	6	380-415V / 50HZ / 3ph	3.08 (Cooling) 3.74 (Heating)	16	4	N/A	(5/8") / (3/8")	41.5	1050	370	1338	123	1.84	0	49 (Cooling) 51 (Heating)	R32

Refrigerant : R32

Note: **Only engineers who have been trained in the safe handling and use of mildly flammable A2L refrigerants should work on this system**

- Work on this system in a well ventilated area or outside
- Use a local leak detector to indicate if there is refrigerant in the air around the system before and during work on this system (place it at low level - R32 is heavier than air)
- Ensure there are no sources of ignition (flames or sparking electrical components) with 3M (10 ft) of your working area, however, this can be reduced should there be sufficient air movement
- If replacing components, use like for like replacements
- Take great care when brazing to ensure all refrigerant has been removed from the system

Use refrigerant grade R32

ALL WORK TO COMPLY WITH THE LATEST CO-OP REFRIGERATION SPECIFICATION

PLANT NOTES

A — PLANT - COMPRESSOR PACK AND LIQUID RECEIVER
- COMPRESSOR PACKS SHALL COMPRISE OF COMPRESSORS, LIQUID RECEIVER, OIL SEPARATOR AND CONTROL PANEL WITH INTEGRATED RDM CONTROL SYSTEM, DISCHARGE PIPE WORK, SUCTION PIPE WORK WITH SUCTION FILTER(S) AND ALL INTERCONNECTING PIPE WORK AND SHUT OFF VALVES REQUIRED FOR SAFE OPERATION.
- THE MAJOR PACK COMPONENTS SHALL BE SELECTED AND SIZED BY THE PACK MANUFACTURER TO ENSURE ENERGY EFFICIENT, LEAK FREE OPERATION.
- COMPRESSOR PACKS WILL BE SUPPLIED CHARGED WITH THE CORRECT OIL TO THE MIDDLE OF THE OIL RESERVOIR SIGHT GLASS.
- PACKS ARE TO BE DELIVERED WITH A HOLDING CHARGE OF OXY GEN FREE NITROGEN AT 2BAR.
- THE CONTROL PANEL WILL BE COMPLETE WITH ALL NECESSARY CONTROLS AND EQUIPMENT TO OPERATE THE PACK COMPONENTS AND GAS COOLER, HOUSED WITHIN SUITABLY IP RATED ENCLOSURE, COMPLETE WITH EXTRACT FAN (IF DEEMED NECESSARY BY MANUFACTURER) AND INTAKE FILTER, INTERLOCKING MAINS ISOLATOR AND WARNING LABELS.
- THE ELECTRICAL CONTRACTOR SHALL SUPPLY AND CONNECT ALL ELECTRICAL AND CONTROL WIRING TO THE COMPRESSOR PACKS.
- THE REFRIGERATION CONTRACTOR IS RESPONSIBLE FOR THE SUPPLY, POSITIONING AND CONNECTION OF THE REFRIGERATION EQUIPMENT AND REFRIGERATION SERVICES.
- ANY CHANGE TO EQUIPMENT SUPPLIER / DETAILS TO BE COMMUNICATED TO ORWELL DESIGN ASSOCIATES IMMEDIATELY TO AVOID CO-ORDINATION ISSUES ON SITE.

B — PLANT - GAS COOLER
- FANS / MOTORS ARE TO BE ENERGY EFFICIENT AND OF VARIABLE SPEED, E.G. EC OR INVERTOR CONTROLLED.
- PACK CONTROLLER MUST BE CAPABLE OF OPERATING THE EC FAN CONENSER VIA 0-10v SIGNAL.
- MANUFACTURERS STANDARD COLOUR FINISH IS ACCEPTABLE UNLESS SITE CONDITIONS DICTATE OTHERWISE.
- THE ELECTRICAL CONTRACTOR SHALL SUPPLY AND CONNECT ALL ELECTRICAL AND CONTROL WIRING TO THE CONDENSER.
- THE CONDENSER FAN SPEED FOR DAY AND NIGHT OPERATION MUST BE SET AND CHECKED BY THE REFRIGERATION CONTRACTOR. RUN SPEED AND CONTROL VOLTAGE ARE INDICATED ON THE CR3 LAYOUT. FOR EXAMPLE, SHOULD THE NIGHT SET POINT BE 4.3V, THIS WOULD BE 43% AND THE RDM CONTROL SET POINT SHOULD BE SET TO 57. 10V OR 100% WOULD REQUIRE THE RDM SET POINT TO BE 0.

C — PLANT - SUPPORT
- ALL REFRIGERATION PLANT SHALL BE INSTALLED ON A FLAT AND LEVEL BASE, PROVIDED BY OTHERS. ANTI-VIBRATION PADS TO BE SUPPLIED BY THE REFRIGERATION CONTRACTOR.
- A REINFORCED FLAT AND LEVEL WORKING AREA IS TO BE POSITIONED ADJACENT TO THE PLANT HOUSING FOR COMPRESSOR REMOVAL.
- SECONDARY SUPPORT STEEL WORK FOR NEW PLANT TO BE DETAILED AND SUPPLIED BY THE STRUCTURAL ENGINEER, WHERE NECESSARY.
- ALL PLANT IS TO BE FIXED TO ITS SUPPORTS.

D — PLANT - LABELS
- ALL REFRIGERATION EQUIPMENT WITH AN EQUIVALENT REFRIGERATION CHARGE OF 5 TONNES CO2 OR MORE MUST BE SHOWING THE FOLLOWING INFORMATION - **REFRIGERANT TYPE INSTALLED, ENTRAINED VOLUME, REFRIGERANT GWP.**
- PRESSURE EQUIPMENT DIRECTIVE LABELS - ALL APPLICABLE NEW REFRIGERATION SHALL CARRY A DECLARATION OF CONFORMITY AND AN ASSEMBLY LABEL SHOWING THE FOLLOWING INFORMATION - **HIGH/LOW SIDE MWP, HIGH/LOW SIDE TEST PRESSURES, REFRIGERANT TYPE AND CHARGE, REFRIGERANT GWP.**
- REFRIGERATION CONTRACTOR SHALL SUPPLY AND FIX PERMANENT 'TRAFFOLYTE' TYPE LABELS TO ALL ITEMS OF PLANT, EQUIPMENT, CONTROL PANELS AND COLD STORES CLEARLY IDENTIFYING THE ITEM AND INDICATING THE SYSTEM NUMBER, IF APPLICABLE.

E — PLANT - OPERATION AND MAINTENANCE ACCESS
- ACCESS SHOULD BE SUITABLE FOR AN ENGINEER CARRYING A TOOLBOX / HANDTOOLS.
- PROTECTED WALKWAYS TO BE PROVIDED AND DETAILED FOLLOWING CONFIRMATION OF ROOF ACCESS POSITION.
- ACCESS STAIRS AND STEEL WALKWAY TO BE SUPPLIED AND INSTALLED BY OTHERS.
- ADEQUATE TASK LIGHTING TO BE SUPPLIED AND INSTALLED BY OTHERS FOR MAINTENANCE AND ACCESS.
- EXTERNAL HOUSED REFRIGERATION PLANT TO BE PROVIDED WITH INTERNAL LIGHTING WITH GENERAL ROOF ACCESS ROUTE LIGHTING PROVIDED BY OTHERS.
- PLANT POSITIONS TO BE REVIEWED FOR FIRE ALARM REQUIREMENTS BY THE MAIN CONTRACTOR.

F — PLANT - MACHINERY ROOM VENTILATION
- VENTILATION SHOULD BE PROVIDED TO -

A) PREVENT THE PLANT FROM OVERHEATING. A THERMOSTAT SHOULD BE PROVIDED IN THE PLANTROOM TO REGULATE THE TEMPERATURE.

B) ENSURE THE PLANTROOM IS VENTILATED IN THE EVENT OF A REFRIGERANT LEAK, AND WHEN MAINTENANCE IS BEING PERFORMED. THE OPERATION SHOULD BE AUTOMATIC IN THE EVENT OF A LEAK CONTROLLED BY A SIGNAL FROM THE GAS DETECTION SYSTEM. MANUAL OVERRIDES SHOULD BE PROVIDED BOTH INTERNALLY AND EXTERNALLY OF THE AREA FOR SERVICE PERSONNEL AND SHOULD BE CLEARLY IDENTIFIED.

C) THE AIR VOLUME REQUIRED FOR REFRIGERANT REMOVAL WILL, AS A GUIDE, BE BETWEEN 10 AND 15 AIR EXCHANGES PER HOUR. PLEASE REFER TO SITE SPECIFIC CALCULATIONS AS THE VENTILATION REQUIREMENTS FOR HEAT EXTRACTION COULD BE HIGHER THAN THIS VALUE.

NOTES

1) VENTILATION FANS TO BE ELECTRICALLY FED FROM AN ESSENTIAL SERVICES SUPPLY. INTAKE FROM HIGH LEVEL, EXTRACT FROM LOW LEVEL, LOCATION TO ENSURE NO AIR RECIRCULATION.

2) FAN OPERATION CAN BE TWO SPEED TO PROVIDE VARIATION BETWEEN HEAT EXTRACT AND REFRIGERANT EXTRACT.

3) UTILISING ONE AIR CIRCULATION FAN WITH ON/OFF CONTROL MAY LEAD TO UNACCEPTABLE SWINGS IN TEMPERATURE WITHIN THE PLANT ROOM. NOT ALL EQUIPMENT WILL OPERATE AT THE SAME TIME DUE TO LOAD CHANGES AND THE VARYING AMBIENT TEMPERATURES. IT MAY BE ADVISABLE TO INSTALL A NUMBER OF AIR CIRCULATING FANS AND CONTROL VIA A MULTI-STEP THERMOSTAT OR ALTERNATIVELY TO USE SPEED CONTROL FAN(S).

G — PLANT - LEAK DETECTION
- LEAK DETECTION SENSORS SHALL BE POSITIONED IN CLOSE PROXIMITY TO THE MOST LIKELY SOURCE OF A LEAKS OF REFRIGERANT.
- ALARM THRESHOLDS SHALL BE SET IN LINE WITH CO-OP SPECIFICATION / BS EN378 FOR THE REFRIGERANT(S) WITHIN THE AREA. **NOTE** THIS COULD BE AN A1 OR A2L REFRIGERANT.
- SENSORS SHALL BE ACCESSIBLE FOR CALIBRATION / SERVICE AND PROTECTED FROM DAMAGE
- THERE SHOULD BE A FACILITY TO TEST THE ALARM. THE ALARM SHALL BE TESTED IN LINE WITH CO-OP MAINTENANCE STRATEGY AND F-GAS REGULATIONS.
- THE ALARM SYSTEM SHOULD WARN BOTH VISIBLY AND AUDIBLY WITH A SOUNDER AND BEACON APPROX 15dB(A) ABOVE THE BACKGROUND NOISE LEVEL BOTH INSIDE AND OUTSIDE THE SPACE
- WHERE LEAK DETECTION IS INSTALLED WITHIN A MACHINERY ROOM, SEE ANNOTATION 'G' TO LINK THE EMERGENCY VENTILATION SYSTEM ON DETECTION OF A LEAK OF REFRIGERANT.

H — PLANT - MACHINERY ROOM SIGNAGE
- AS A MINIMUM THE FOLLOWING TEXT SHALL BE INCLUDED IN A NOTICE ON ALL PLANTROOM DOORS -

AUTHORISED ACCESS ONLY
NO SMOKING, NAKED LIGHTS OR FLAMES
NO AUTHORISED OPERATION OF THE REFRIGERATING SYSTEM
IF THE BUZZER / SOUNDER ACTIVATES, EXIT THE SPACE IMMEDIATELY, CLOSE THE DOOR AND NOTIFY SUPERVISORY PERSONNEL
DO NOT ENTER OR RE-ENTER THE SPACE UNTIL THE BUZZER / SOUNDER HAS CEASED AND YOU HAVE BEEN AUTHORISED BY THE SENIOR MANAGER AND THE REFRIGERATION CONTRACTOR

AIR CONDITIONING PLANT

I — AIR CONDITIONING - CONDENSING UNITS - EXTERNAL HIGH LEVEL
- REFRIGERATION CONTRACTOR TO SUPPLY & INSTALL THE UNIT, FIXING BRACKETS AND ANY ANTI-VIBRATION MOUNTS REQUIRED.

J — AIR CONDITIONING - CONDENSING UNITS - EXTERNAL LOW LEVEL
- A FLAT AND LEVEL SURFACE SHALL BE PROVIDED BY OTHERS.
- REFRIGERATION CONTRACTOR TO SUPPLY & INSTALL THE UNIT WITH ANY ANTI-VIBRATION MOUNTS.

PLEASE NOTE

CO_2 (R744), R290, R1270 & R32

REFRIGERANTS USED ON THIS SITE

Rev	Details	Drawn	Date
00	FIRST ISSUE BASED ON CO-OP DEARNSIDE-P3-F4-M0 (25.10.19)	KT	15.11.19

space. engineering services

Space Engineering Services Ltd
Head Office
Causeway Central Pioneer Park Bristol BS4 3QB
[t] 0845 602 0670 [f] 0845 602 0671
space-engineering.co.uk

Site Address: PETROL DEARNSIDE (3415)

Drawing Title: PROPOSED REFRIGERATION PLANT LAYOUT

Project Manager: CLAIR PRESTIDGE

Date: 15.11.19 | Drawn By: KT

Signature 1: | Signature 2: | Signature 3:

Signatures indicate compliance with the latest version of the Check and Verification 00/00/00008 document

Drawing Origin:
Bristol : 01179 778833 ○
Ipswich : 01473 556700 ●
Plymouth : 01752 231680 ○

Revision: 00 | Scale: 1:50 @ A0

Drawing No: C22223-CR3 | Contract No: C22223