LADY HARDINGE MEDICAL COLLEGE & ASSOCIATED HOSPITALS NEW DELHI

(Ministry of Health & Family Welfare, Govt. of India)

Date: 18.01.2022

Amendment No. – II

Project Name: Supply Installation, Testing & Commissioning of independent Central air Conditioning system for the proposed additional works of OPD, IPD, Accidental & Emergency Block and Other Associated Services at Lady Hardinge Medical College & Associated Hospitals, New Delhi and their Maintenance during Defect Liability Period.

Tender no: HSCC/LHMC/HVAC/2021.

Dear Sir,

This has reference to the pre bid meeting held on 07.01.2022 at 15:00 hrs for the captioned subject works,

Please find enclosed the following as an AMENDMENT-II / CLARIFICATION-I :-

1. Annexure-I pertains to clarifications of pre bid queries.
2. Annexure-II list of approved makes and manufacturers
3. Annexure-III Data Point Summary for Plant Manager

The above shall be treated as a part of tender to be submitted online duly signed & stamp along with tender.

All other terms & conditions of tender shall remain unchanged.
Prospective bidders are advised to regularly scan through HSCC e-tender portal http://www.tenderwizard.com/HSCC as corrigendum/amendments etc., if any, will be notified on this portal only and separate advertisement will not be made for this.

(-Sd-)

General Manager (Projects), HSCC (I) Ltd.
For & on Behalf of Director, LHMC, New Delhi

HVAC Work for Lady Harding Medical college, NEW DELHI

Pre-Bid Points for HVAC works

SR. NO.	Page no.	Clause No.	Reference	Description	Specified in Tender	Clarifications Required	HSCC-Reply/ Ammendment
1			BOQ/Technical Specification	Make for centrifugal chiller	List of approved makes is not mentioned in NIT	Our offer will be based on **" Voltas"** make centrifugal Chillers. We are complying all the efficiency requirements of tender associated with centrifugal chillers. We had been manufacturing Chillers in India for last three decades. **Our Chillers** are **operational** for various govt. client for e.g. **CPWD, PWD, MES, Airport Authority of India/ISRO/DRDO** along with private sector.	List of approved makes is provided as Annexure-I
2	4 of BOQ	Item 1.2	BOQ	IO Summary for plant room manager.	Plant room manager make shall be same as the chiller make. Plant Room Manager for sequencing, remote monitoring, controlling and report generation of all equipment in AC plant room/high side. Selected controller shall have capacity to meet detailed IO summary mentioned under specifications.	IO summary is missing in NIT, request you to kindly provide the IO summary.	I/O summary for plant manager is provided as Annexure-III
3	4 of BOQ	Item 1.2	BOQ	Cable & conduit for plant room manager.	Workstation having latest configuration computer 3 GHz with 500 GB hard disk, 21" TFT monitor, 104 windows key board, mouse,serial and parallel ports laser printer. This must have software integration with IBMS for 3rd party interface available on Bacnet / Modbus. Cabling & Conduit work as required.	We request you to kindly provide the quantity/size of cable & conduit.	As per tender conditions
4	4 of BOQ	Item 2.2	BOQ	Secondary chilled water pumps	Supply, installation, testing and commissioning of split casing type centrifugal chilled water recirculation pumps mounted on a common base etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments.	Primary and condenser water pumps are end suction type, we understood that secondary pump will also be end suction type. Kindly confirm.	As per tender conditions
5	4 of BOQ	Item 2.2	BOQ	Secondary chilled water pumps	b. Suction guide , triple duty valve to be supplied by pump OEM.	Suction guide & triple duty asked for Secondary pumps only in BOQ. Please reconfirm whether we have to considered these with secondary pumps only or these valves also required for other pumps.	As per tender conditions
6	6 of BOQ	Item 5	BOQ	Air handling Units	Supply, installation, testing and commissioning of sectional construction draw through type Air Handling Units (double skin type) of horizontal /2-tier as specified & shown in schedule of equipment complete with the following :-	Schedule of equipment is missing in NIT, request you to provide the schedule of equipment's.	As per BOQ and Technical Specification.
7	6 of BOQ	Item 5	BOQ	Air handling Units	Supply, installation, testing and commissioning of sectional construction draw through type Air Handling Units (double skin type) of horizontal /2-tier as specified	In view of ongoing COVID-19 pandemic condition , we recommend you to consider incoporatating Duct /AHU mounted UVGI system to prevent airborne infection by eliminating infection causing microorganism species. UVGI System shall have below feature to provide maximum efficacy. * UVGI System shall be designed to provide log 2 kill rate by delivering dose of 3000uWsec/cm2. * Effective lamp life of the system is more than 16000 hours. * UV Lamp shall be inside Quartz sleeve equivalent to GE 214 for transmission of UV Light effectively and prevent lamp from wind-chill effect. * UVGI System shall be UL-1995 & UL-2043 Certified. * UVGI System shall be controlled through microprocessor based control panel for 24 X 7 Run hour monitoring, lamp health status, BMS Connectivity, schedule On/Off operation. Proposed Make of UV System **RUKS/American UV/Sterile Aire**	As per tender conditions
8	12 of BOQ	"C" Air distribution	BOQ/Technical Specification	Factory fabricated duct	As per CPWD specifications 2017 Chapter-9 'Ducting'	As per CPWD-2017 chapter-9, angle flanges are required to join the duct piece. We would like to inform you that, the current technology being used for duct is TDF / TDC which is advanced implementation of angle flanges. Hence flanges for the current ductwork shall be with TDF/TDC flanges. Kindly Confirm.	Flanges for the factory fabricated ducts shall be with TDF/TDC
9	13 of BOQ	Sub Head "D" Electrical works	BOQ	Electrical panels	Supply, installation, testing and commissioning of A/C Panel, as per IEC 61439-1&2 cubicle type, totally enclosed, free standing type, dust, damp and vermin proof panel, powder coated, made up of CRCA sheet, complete with aluminium bus bars, danger notice plate. Complete as per technical specifications and as required.	We understood that only main electrical panels item No.21.1 will be TTA type. Other starter panels item No. 21.2 shall be PTA type(Non TTA). Kindly confirm.	Yes, Main Air- Conditioning Panels (MCC Panel) shall be as per IEC-61439-I/II.

HVAC Work for Lady Harding Medical college, NEW DELHI

Pre-Bid Points for HVAC works

SR. NO.	Page no.	Clause No.	Reference	Description	Specified in Tender	Clarifications Required	HSCC-Reply/ Ammendment
10			BOQ/Technical Specification	List of approved makes	List of approved makes is not mentioned in NIT	Kindly provide the list of makes for the HVAC works.	List of approved makes is provided as Annexure-II
11					Assignment clause.	Voltas has transfer the project business to its wholly owned subsidiary viz. **Universal MEP Projects & Engineering Services Limited ('UMPESL')**, which is 100% subsidiary of Voltas Limited." Voltas (A Tata Enterprise) is proposing to restructure its B2B business comprising Domestic Projects Business relating to MEP/HVAC. In view of the same, after the award of contract, job will be executed by **"Universal MEP Projects & Engineering Services Limited".**	As per tender conditions
12						As per the Eligibility criteria of the NIT, we are satisfying the desired value of completed works under two similar works of value more than 60% of estimated cost. As per the definition of similar work, you have asked for individual chiller capacity more than 720 TR. We can submit one of our eligible works (value wise) with individual chiller capacity of 750 TR. Kindly confirm if we can be considered eligible.	As per tender conditions
13						Item no. 1 of Subhead A: Chilling Units a. The BOQ calls for a COP of 6.3. Better efficiency machines are available with much higher COPs. Request you to accept minimum COP 6.7 as per Super ECBC standard at AHRI Conditions. Similarly kindly accept max. IKW/TR of 0.64 at design conditions.	For item no. 1 of Subhead A: Chilling Units COP shall be ammended as 6.7 instead of 6.3.
14						The completion time of 6 months for this magnitude of work is not reasonable. The time required for this work should be atleast 10 months to complete the work in a proper manner. We request you to kindly amend the same to 10 months and oblige.	As per tender conditions
15						We could not find any make list in the NIT. Kindly provide the same.	List of approved makes is provided as Annexure-I
16						Better efficiency chilling machines are available to reduce power consumption. Hence, please accept minimum COP 6.7 as per Super ECBC standard at AHRI Condition.	For item no. 1 of Subhead A: Chilling Units COP shall be ammended as 6.7 instead of 6.3.
17						Better efficiency chilling machines are available for reduce power consumption at full load at design condition. Hence request you to please accept Max IKW/TR as 0.64	As per tender conditions
18						Part Load efficiency is not mentioned in the tender. Hence please accept IPLV at AHRI as 0.33 kW/TR and NPLV at design as 0.35 IKW/TR.	As per BOQ and Technical Specification.
19						Please accept ASME stamping for both Cooler and Condenser.	As per tender conditions
20						Please accept Marine Water box on cooler and condenser.	As per tender conditions
21						Since compressor is considered the heart of the Chiller, please ensure Chiller compressor shall be same make as Chiller OEM. Outsource compressors under OEM agreement shall not be acceptable.	As per tender conditions
22						"The ΔT should be 10°F instead of 7.5°F as the water flow rate is 3 times then the chiller capacity. If Selection done at 7.5°F then this would be for an undersized Cooling Tower. Kindly accept."	Item no. 3 (Cooling Tower) of BOQ: The ΔT for the Cooling Tower shall be ammended as 10°F instead of 7.5°F . Design shall match with requirement of chiller.
23						We request you to please provide us approved list of make.	List of approved makes is provided as Annexure-I
24						We request you to please provide also accept Net Worth and to be duly certified by C.A.	As per tender conditions

Annexure-II

LIST OF APPROVED MAKES AND MANUFACTURERS

The makes/brands of equipment listed below are approved for installation.

For all items to be used in the work samples, catalogues and specifications are to be submitted by the contractor for approval of the Engineer. Only approved makes shall be used in the works. Equivalent makes may be added with price adjustment with approval of Engineer In charge. The approved samples shall be kept in the custody of the Engineer for comparison.

Note: Approved Air- Conditioning Panels (MCC Panel) manufacture can use their own manufacture items for fabrication of panels. Authorised panel builder will not be accepted.

S.No	Material/Item	Approved Makes
	High Side Equipment	
1	Centrifugal Chilling Units with VFD (ARI Certified)	Carrier/ Trane/ York/ Voltas/ Bluestar/ Daikin/ Kirloskar
2	Primary CHW / Cond Pumps	Xylem/Grundfoss/Armstrong/wilo-Mather & Platt
3	Pumps Monoblock	Kirloskar/Beacon/Siemens/KSB/Greaves
4	Pumps Coupled with VFD	Xylem / Grundfoss/ Wilo-Mather Platt/ Armstrong
5	VFD with controls	Xylem/ Danfoss/ Grundfoss/ Wilo-Mather Platt/ Armstrong
6	Cooling Towers (CTI Approved)	Paharpur/Bell/Mihir/Marley/Advance
7	Electric hot water generator	Rapid cool/ Emerald/ Khokhar
	Air Handling Units	
8	Air Handling Units (High Static) with cooling coils	Caryaire/ Blue-star/ ZECO/ Voltas/ Flaktwood/ Waves/ Edgtech / Systemair
9	Centrifugal Fan for AHU's	Nicotra/ Comefri/ Flakt/ Kruger / Systemair
10	VFD for AHU	Danfoss/ Siemens/ Allen Bradley/ ABB/ Schneider
11	Ultra Violet Germicidal Irradiation/PHI	Ruks/Trimed/RGF
12	Fan Coil Units	Same as AHU
13	Air washer	Ambassador/Humidin/ Roots Cooling/ Ambiator
14	Scrubber (Wet/Dry)	**Wet :** same as AHU, **Dry:** Espair/Trion/Thermax/ Rydair
15	Humidifier	Rapid cool/Emerald/Khokar
16	Fan section	Same as AHU
17	Centrifugal /Axial Flow Fans/Tube Axial (AMCA Certified)	Flakt/ Nicotra/ Comefri/ Kruger /Greenheck/SystemAir
18	Propeller Fans	GEC(Alsthom)/ Crompton Greaves/ Khaitan/ Usha /Marathon
19	Precision AC units	Emerson/ Blue box/ Stulz/ Hiross
20	Window/split AC	Hitachi/ Daikin/ O-general/Carrier / Voltas/ Blue star
21	VRV/VRF	Carrier /Hitachi/Daikin/ Toshiba
22	Cassette Units-Chilled water based	Daikin/ETA/Media
23	Inline Fans	Flakt/ Nicotra/ Comefri/ Kruger/ Systemair/ Ostberg/ Greenheck

24	Heat recovery unit complete with Heat recovery wheel	Flaktwoods/ Novelaire/ DRI/ Greenheck/ Bryair
25	Heat recovery heat pipes	SPC
26	Heat Exchanger	Heat X/ Mark/ Alfa lavel
27	Thermal storage tank	Crystopia/ Dunhambush/ Calmac
	Electrical Equipment	
28	Main AC Panel	L&T/ Siemens / ABB/ Schneider/ Legrand
29	AHU/ventilation electrical panels	Tricolite/ Adlec/ Sterling & Wilson/ Control & Switchgear/ Nitya Electro Control Pvt. Ltd. / SPC Electrotech/ Neptune/ Risha Control Engineers Pvt. Ltd. /Milestone
30	Electric Motors	Siemens/ Kirloskar/ ABB/ Crompton Greaves.
31	ACB	L&T-U power(Omega)/ GE-Entelliguard/ Siemens-3WL/ ABB/ Legrand-DMS/ Schneider-NW master pact
32	MCCB	L&T-(D shine/DL) / GE-Record Plus / Siemens-VA/ ABB-TMA/ Schneider- compact NSX
33	MCB	L&T/ Legrand-DX3/ Hager / Seimens-VA/ ABB/ MDS Lexic
34	Earthing	JMV or equivalent
35	Push button starter	L&T/ GE / Siemens/ ABB/ Schneider
36	Auxiliary Relays/Contactors	L&T/GE/ Siemens/ ABB/ Schneider
37	Line Type Fuse	L&T/GE/ Siemens/ ABB/ Schneider
38	Timer	L&T/GE/ Siemens/ ABB/ Schneider/ Legrand
39	Terminal Block	Elmex or equivalant
40	Voltmeter/ Ammeter (Digital type)	L&T/ GE/ Siemens/ ABB/ Schneider/ Rishab/ AE
41	Indicating lamps	L&T/GE/ Siemens/ ABB/ Schneider
42	Selector Switches	L&T/GE/ Siemens/ ABB/ Schneider
43	Change Over Switch	L&T/GE/ Siemens/ ABB/ Schneider
44	CT/PT	L&T/GE/ Siemens/ ABB/ Schneider
	PVC Tape	Steelgrip or equivalent
	Cables	
45	Power Cables / Control Cables	CCI/Universal/ Finolex/ Rallison
46	Cable tray	OBO/ Legrand/ Cooper/ BEC
47	Cable lugs	Dowells/ Comet
	Dcting	
48	Factory fabricated duct	Ductofab/ Rolastar/ Technofab
49	G.I. Sheet	TATA/ SAIL/ Jindal
50	Spiral duct	Atco/ Seven Star/ Caryaire
51	Grilles/Diffusers/Volume Controller	Ravistar/ Caryaire/ Mapro
52	Fire Dampers UL listed	Caryaire/ Ravistar/ Ruskin
53	Sound Attenuator	Caryaire/ Ravistar/Trox
54	Aluminium Sheets	Balco/ Nalco/ Hindalco
	Pipes	
55	G.I.	Jindal Hissar/ Tata/ SAIL
56	M.S. upto 150 mm	Jindal Hissar/ Tata/ SAIL
57	M.S. 200 mm and above dia factory rolled	Jindal Hissar/ Tata/ SAIL
	Valves	
58	Butterfly Valves	Audco/ L&T/ Honeywell/Advance

59	Motorised butterfly valve(actuator)	Belimo/ Honeywell/ Siemens
60	Non Return Valve	Advance/ Kirloskar/ Audco
61	Balancing Valves	Advance/ Audco/ Danfoss/ Honeywell/L&T
62	Gate/Globe Valves	Leader/ Divine/ Sant/ Bankim Sarkar / Zoloto
63	GM valve upto 40mm	Leader/ Divine/ Sant/ Bankim Sarkar /Zoloto
64	Ball Valve with Y strainer	Rapid Control/ Sant/ Leader/ Zoloto
65	Pressure independent Balancing valve	Danfoss/ Flowcon/ TA
	Accessories	
66	Pot & Y-strainer	Emerald/ Sant/ Rapid cool
67	Pressure Gauge	Fiebig/ Emerald/ H Guru
68	Thermometer	Fiebig/ Emerald/ H Guru
69	Flow Switch	Rapid Control/ Anergy
70	Automatic Air Vent	Rapid Control/ Anergy
71	Suction Guide	Anergy/ Rapid Control/ Flowcon
72	Filters (pre,fine Hepa)	Thermadyne/ Spectrum/ Kirloskar /Anfilco/ Johnflower/ Dynafilter
	Insulation	
73	Expanded Polystyrene	Beardsell Ltd./ BASF / Lloyd/ Styrene packaging
74	Glass Wool	FGP Ltd./UP Twiga/ Kimmco /Owens corning
75	Crossed linked Polyethylene Foam	Trocellene / Superlon/ Paramount/Supreme
76	Closed Cell Elastomeric Insulation	K-flex /Vidoflex/ Armacell/ A-flex
77	Non woven fibre material	Mikron/ Du pont
78	Mineral wool	Rockwool India Pvt Ltd/ Lloyd
79	Pre-moulded PUF section for pipe & pipe supports	Malanpur/ Lloyd
80	Fibreglass rigid Board/ Pipe section	FGP Ltd./ UP Twiga/ Kimmco
81	Aluminium Tape	Johnson/ Birla 3M/ Garware
82	Expansion tank(pressurized) and Air Separator	Anergy/ Grundfoss/ ITT
83	Bellows	Dunlop/ Kanwal/ Resistoflex
84	2/3-Way motorized valve for AHU/FCU	Johnson control/ Danfoss/ Siemens/ Belimo
85	Thermostats	Honeywell/ Johnson controls/ Belimo/ Danfoss/ Siemens
86	Humidistat	Honeywell/ Johnson control/ Belimo/ Danfoss /Siemens
87	Electric Strip Heaters	Escorts/ Daspass
88	Safety Thermostat for Heaters	Honeywell/ Siemens/ Danfoss/ Belimo /Siemens
89	Cooling/heating Mode Changer	Honeywell/ Siemens/ Danfoss/ Belimo/ Siemens
	Paints	
90	Enamel	ICI/ Asian/ Nerolac/ Berger
91	Bituminus	Indian Oil / HP
92	Tarfelt (for underground chilled water pipe insulation)	Indian Oil / HP
93	IBMS Approved vendor	Siemens/ Honeywell/ Johnson controls/ ABB/Schneider

94	DDC Controllers	Siemens/ Honeywell/ Johnson controls/ ABB/Schneider
95	Sensors(Pressure/Temperature)	Siemens/ Honeywell/ Johnson controls/ ABB/Schneider
96	VAV	Trane/ Trox/ Johnson Controls/ Caryaire/ Belimo
97	Airflow Switch (Air & water)	Johnson control/ Honeywell/ Siemens
	Miscellaneous	
98	V Belt	Dunlop/ Fenner
99	Anchor fastners	Fischer/ Hilti
100	Dash fastner	Fischer/ Hilti
101	Welding rods	Advani/ L&T
102	Wire Rope duct supporting arrangement	Gripple or equivalent
103	Flexible pipe connection	Dunlop/ Kanwal/ Resistoflex
104	Hessian Cloth (fire rated)	Navair/ Pyrogaurd
105	Vibration isolator	Resistoflex/ Dunlup/ Kanwal
106	Air Ozone	Ruks/ Trimed/ RGF
107	Fire Sealant	Birla 3M/ Hilti/ Promat
108	Adhesive/ UV Coating	Star bond / Pidilite

ADDITIONAL WORKS AT HOSPITAL BLOCK AT "LADY HARDINGE MEDICAL COLLEGE (LHMC), NEW DELHI

Data Point Summary for Plant Manager

Sr. No	Description	Qty	Total Points					Required signal
			DI	DO	AI	AO	SW	
A	Chiller Plant (Water Cooled Chiller)	3						
1	Chiller On/Off command			0			3	Software Integration signal
2	Chiller Run status		0				3	Software Integration signal
3	Chiller Fault/Alarm status		0				3	Software Integration signal
4	Chiller CHW Temperature Reset Setpoint					0	3	Software Integration signal
5	Chiller Current Limit Setpoint					0	3	Software Integration signal
6	Chiller inlet isolation valve Open/Close command			3				NO/NC Relay Command to Valve
7	Chiller inlet isolation valve Open/Close status		3					NO/NC Potential free contact from Valve
8	CW inlet isolation valve Open/Close command			3				NO/NC Relay Command to Valve
9	CW inlet isolation valve Open/Close status		3					NO/NC Potential free contact from Valve
10	Common CHW supply header temperature				1			
11	Common CHW return header temperature				1			
12	Outside Air Temp/Humidity				2			0-10VDC from RH cum temp sensor

#	Total points for Chiller Plant		6	6	4	0	15	
B	Primary Chilled Water Pumps (PCHP)	3	DI	DO	AI	AO	SW	
1	Pump Auto/Manual status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump On/Off command			3			0	NO/NC Potential free contact from MCC Panel/Pump VFD
3	Pump run status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
4	Pump trip status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Chilled Water Pumps		9	3	0	0	0	
C	Hot Water Pumps (HWP)	3	DI	DO	AI	AO	SW	
1	Pump Auto/Manual status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump On/Off command			3			0	NO/NC Potential free contact from MCC Panel/Pump VFD
3	Pump run status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
4	Pump trip status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Condenser Water Pumps		9	3	0	0	0	
D	Condenser Water Pumps (CWP)	3	DI	DO	AI	AO	SW	

1	Pump Auto/Manual status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump On/Off command			3			0	NO/NC Potential free contact from MCC Panel/Pump VFD
3	Pump run status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
4	Pump trip status		3				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Condenser Water Pumps		9	3	0	0	0	
E	Cooling Tower (CT)	3	DI	DO	AI	AO	SW	
1	Fan Auto/Manual status		3				0	NO/NC Potential free contact from MCC Panel/CT VFD
2	Fan On/Off Command			3			0	NO/NC Potential free contact from MCC Panel/CT VFD
3	Fan Run status		3				0	NO/NC Potential free contact from MCC Panel/CT VFD
4	Fan Trip status		3				0	NO/NC Potential free contact from MCC Panel/CT VFD
5	CT inlet/outlet Isolation valve Open command			3				TE-632AM-1+WZ 1000-5
6	CT inlet/outlet Isolation valve Open/close status		3					TE-632AM-1+WZ 1000-5
7	Common CW supply header temperature				1			NO/NC Relay Command to Valve
8	Common CW return header Temperature				1			NO/NC Potential free contact from Valve
#	Total points for Cooling Tower		12	6	2	0	0	

F	Secondary Chilled Water Pumps (SCHWP)	4	DI	DO	AI	AO	SW	
1	Pump On/Off command			1			0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump run status		2				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Chilled Water Pumps		2	1	0	0	0	
G	Chiller Diagnostic Points (including VFD) from main chiller control panel	3	DI	DO	AI	AO	SW	
1	Leaving chilled liquid - setpoint						3	
2	Motor current limit - setpoint						3	
3	Leaving chilled liquid - temperature						3	
4	Entering chilled liquid - temperature						3	
5	Leaving condensor liquid - temperature						3	
6	Entering condensor liquid - temperature						3	
7	% Amps						3	
8	RLA						3	
9	VFD Frequency						3	

10	Evaporator pressure						3	
11	Condensor pressure						3	
12	Oil – low differential pressure						3	
13	Motor FLA current						3	
14	Discharge pressure						3	
15	Operating hours						3	
16	Unit safety fault code						3	
17	Unit cycling fault code						3	
18	Opreation code						3	
19	Evaporator – low pressure						3	
20	Evaporator – low-pressure – smart freeze						3	
21	Evaporator – transducer or leaving liquid probe						3	
22	Condenser – high pressure						3	
23	Condenser – pressure transducer out of range						3	
24	Discharge – low temperature						3	
25	Oil – high temperature						3	
26	Oil – low differential pressure						3	
27	Oil – clogged filter						3	
28	Motor controller – loss of current						3	
29	Oil – high pressure						3	

30	Oil – separator – low level						3	
31	Leaving chilled liquid - low temperature						3	
32	Motor controller – loss of current						3	
33	Sys Oil Temperature						3	
34	Sys Oil Pressure						3	
35	Sys Oil Filter Pressure						3	
36	Slide Valve Position						3	
37	Sys Discharge Temp						3	
38	SYS.EVAPORATOR SATURATION TEMPERATURE						3	
39	SYS.EVAPORATOR SUB TEMPERATURE						3	
40	SYS.CONDENSER SATURATION TEMPERATURE						3	
41	EVAPORATOR REFRIGERANT TEMPERATURE						3	
42	EVAPORATOR SMALL TEMPERATURE DIFFERENCE						3	
43	CONDENSER SMALL TEMPERATURE DIFFERENCE						3	
44	SYS. START TIMES						3	
	Total diagnostic points						132	