OPERATION & MAINTENANCE OF THE LEBANESE UNIVERSITY CAMPUS - HADATH

VOLUME 2: TECHNICAL DOCUMENTS

Section 2.2 – Work Package 1 – Mechanical Works

Lebanese University Campus - Hadath

Work Parcel 1: Mechanical Works

List of Contents

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Work Parcel 1: 1.1- Technical Description of the Work Parcel

Lebanese University Campus

HVAC System

- Central Air conditioning is achieved by Chilled/Hot water pipes received from thermal plant through utility tunnel, then connected to secondary pumps (located at the basement mechanical rooms inside the building) where Air Handling Units are fed by Chilled/Hot water.
- Cold/Hot air will distributed inside spaces from Air Handling Units through ducts and Variable Air Volume terminals (some spaces as amphitheaters are constant volume).
- Some small spaces as security rooms, garbage rooms,.. are air-conditioned by mean of Mini Splits or Fan Coil Units.
- Mechanical Ventilation is used for toilets, stores, archives and parking by mean of Fans (Roof, or centrifugal).
- Mechanical Smoke exhaust is used to extract fumes in case of fire for some critical spaces such as amphitheaters and parking.

PLUMBING System

- Domestic/Potable cold water will be achieved by water pipes received from the Water tower by gravity or by direct boosting from the main pumping station through utility tunnel, then ditributed inside the building to plumbing fixtures / drinking fountain.
- Domestic Hot water, ditributed inside the building to plumbing fixtures, will be heated by the hot water storage tanks loacted inside the mechanical rooms, where the Heating water will be generated by mean of the main hot water network, coming from the thermal plant.
- Liquified Petroleum Gas will be ditributed inside the building (to laboratories benches), coming from the external gas tanks located on site.
- Compressed air / vacuum will be generated by pumps located in the basement mechanical rooms, then ditributed inside the building (to laboratories benches).
- Waste water will be discharged to the external network by gravity or sump pumps located in pits.
- Fire fighting will be through fire hose cabinets, and fire extinguishers.

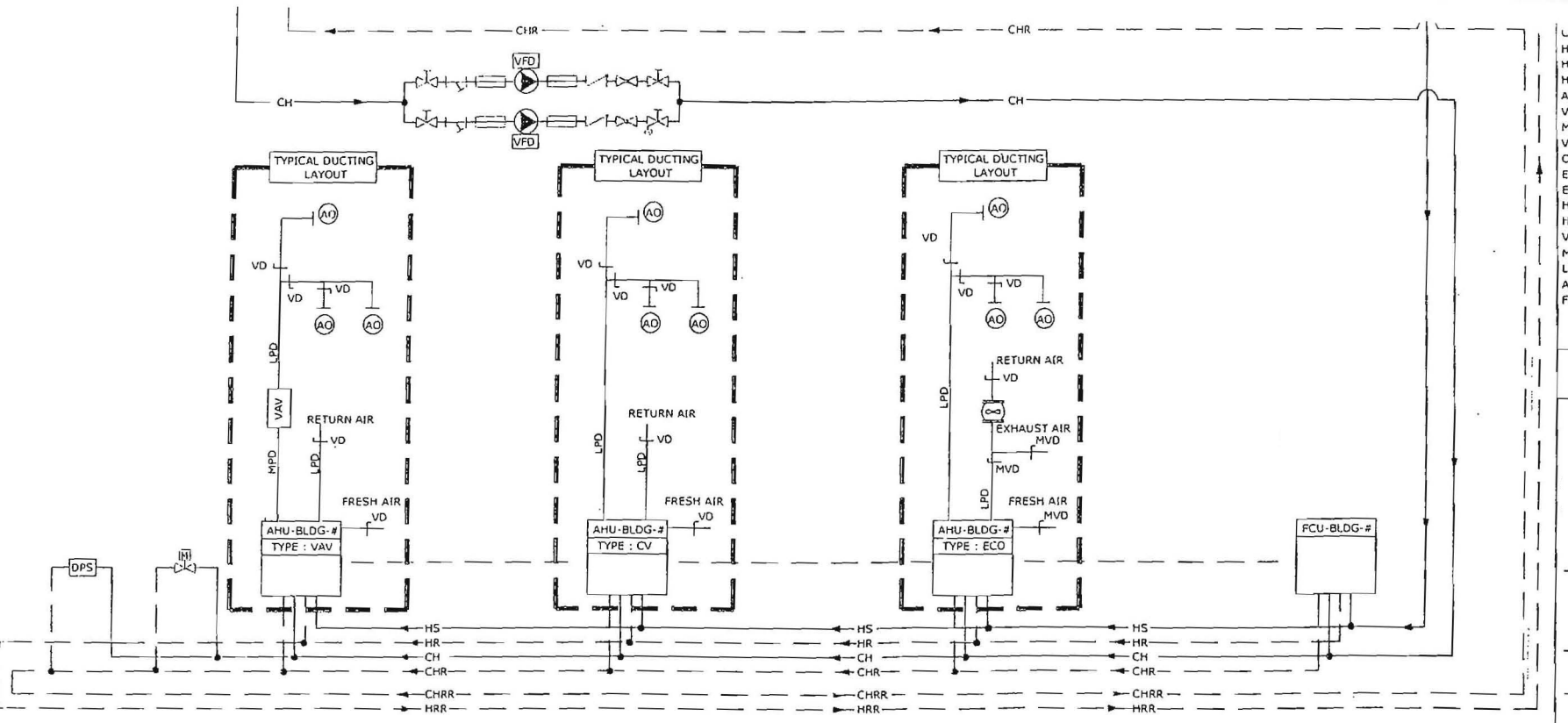
Faculty of Sciences

HVAC System

- Cold/hot air will distributed inside spaces through split and DX units.
- Mechanical ventilation is used for toilets, stores, and archives by mean of fans (roof, or centrifugal).

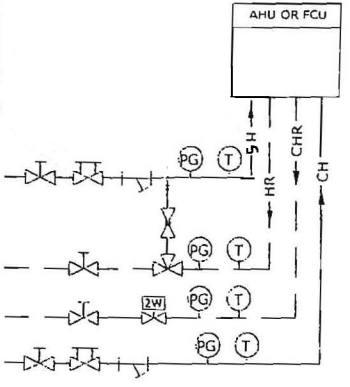
PLUMBING System

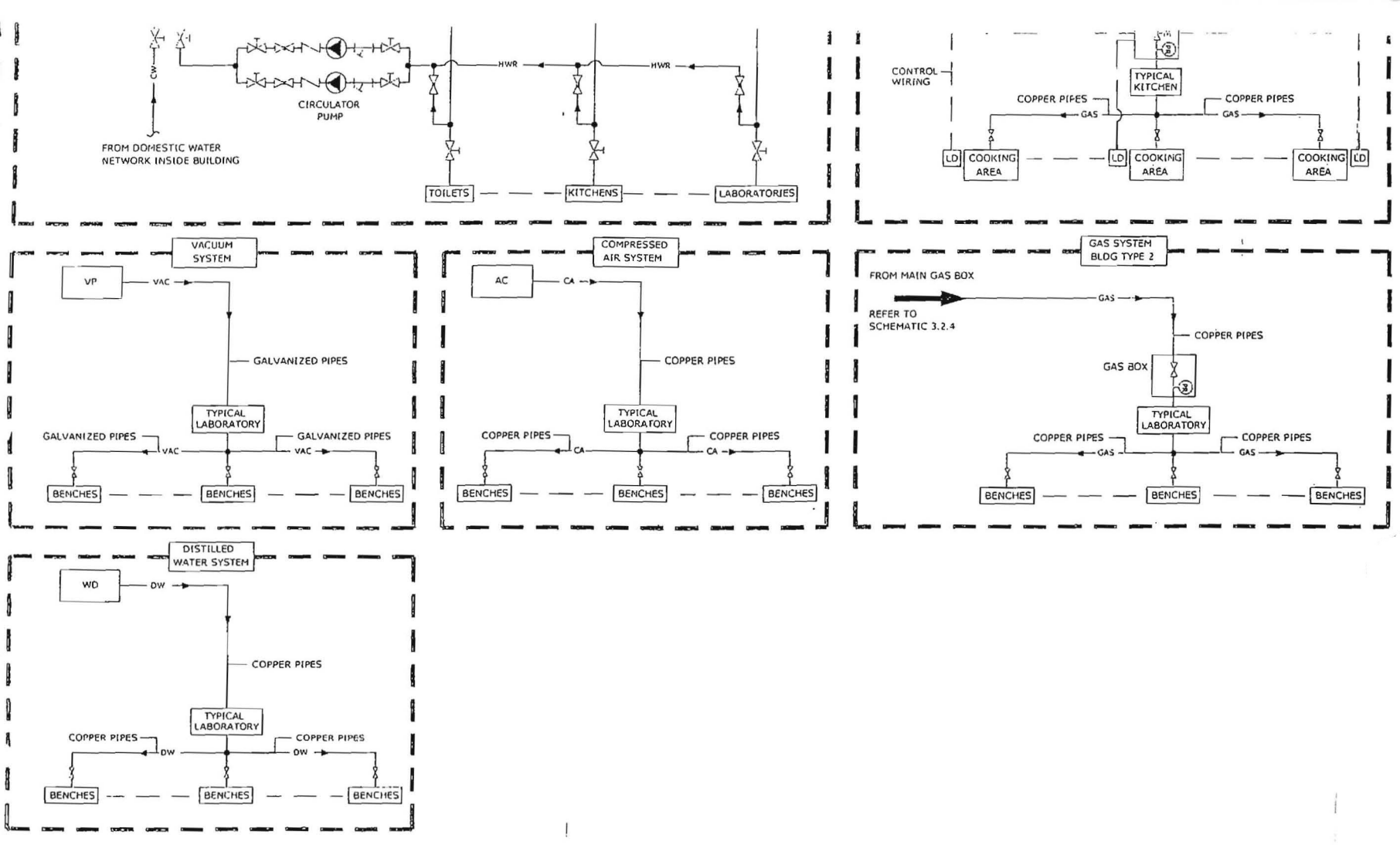
- Domestic water is achieved by water pipes received from the water tower by gravity or by direct boosting from the main pumping station through utility tunnel, then distributed inside the building to plumbing fixtures.
- Wastewater is discharged to the external network by gravity or sump pumps located in pits.
- Fire fighting ability is provided through fire hose cabinets, and fire extinguishers.



CHRR : CHILLED WATER REVERSE RETURN
HS : HOT WATER SUPPLY
HR : HOT WATER RETURN
HRR : HOT WATER REVERSE RETURN
AO : AIR OUTLET
VD : VOLUME DAMPER
MVD : MOTORIZED VOLUME DAMPER
VAV : VAARIABLE AIR VOLUME
CV : CONSTANT VOLUME
ECO : ECONOMIZER CYCLE
EXT : EXPANSION TANK
HWST : HOT WATER STORAGE TANK
HEX : HEAT EXCHANGER
VFD : VARIABLE FREQUENCY DRIVE
MPD : MEDIUM PRESSURE DUCT
LPD : LOW PRESSURE DUCT
AHU : AIR HANDLING UNIT
FCU : FAN COIL UNIT

TYPICAL PIPING CONNECTION FOR AHU'S OR FCU'S




CW
FROM DOMESTIC WATER NETWORK INSIDE BUILDING
CIRCULATOR PUMP
HWR
HWR
TOILETS
KITCHENS
LABORATORIES
CONTROL WIRING
TYPICAL KITCHEN
COPPER PIPES
GAS
COPPER PIPES
GAS
LD
COOKING AREA
LD
COOKING AREA
COOKING AREA
LD
VACUUM SYSTEM
VP
VAC
GALVANIZED PIPES
TYPICAL LABORATORY
GALVANIZED PIPES
VAC
VAC
GALVANIZED PIPES
BENCHES
BENCHES
BENCHES
COMPRESSED AIR SYSTEM
AC
CA
COPPER PIPES
TYPICAL LABORATORY
COPPER PIPES
CA
CA
COPPER PIPES
BENCHES
BENCHES
BENCHES
GAS SYSTEM BLDG TYPE 2
FROM MAIN GAS BOX
REFER TO SCHEMATIC 3.2.4
GAS
COPPER PIPES
GAS BOX
TYPICAL LABORATORY
COPPER PIPES
GAS
COPPER PIPES
GAS
BENCHES
BENCHES
BENCHES
DISTILLED WATER SYSTEM
WD
DW
COPPER PIPES
TYPICAL LABORATORY
COPPER PIPES
DW
DW
COPPER PIPES
BENCHES
BENCHES
BENCHES
AC : AIR COMPRESSOR
CA : COMPRESSED AIR PIPES
WD : WATER DISTILLER
DW : DISTILLED WATER
GAS : GAS PIPES
PR : SECOND STAGE PRESSURE REGULATOR
CW : DOMESTIC COLD WATER
HWS : DOMESTIC HOT WATER SUPPLY
HWR : DOMESTIC HOT WATER RETURN
HWST : HOT WATER STORAGE TANK
1/4 MANUAL SHUT OFF VALVE
AUTOMATIC SHUT OFF VALVE
SOLENOID VALVE
LD LEAK DETECTOR
GATE VALVE
CHECK VALVE
GLOBE VALVE
STRAINER

Lebanese University Campus - Hadath

1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-B-1)	15 T.R	1	Constant Air Volume AHU with Supply air flow 3200 lps, External Static pressure 270 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-2)	20.5 T.R	1	Constant Air Volume AHU with Supply air flow 4000 lps, External Static pressure 270 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-3)	15.5 T.R	1	Constant Air Volume AHU with Supply air flow 3330 lps, External Static pressure 315 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-4)	14 T.R	1	Constant Air Volume AHU with Supply air flow 2385 lps, External Static pressure 356 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-5)	13 T.R	1	Variable Air Volume AHU with Supply air flow 2100 lps, External Static pressure 569.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-5A)	13 T.R	1	Variable Air Volume AHU with Supply air flow 2100 lps, External Static pressure 569.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-6)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2520 lps, External Static pressure 357.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-6A)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2520 lps, External Static pressure 357.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-7)	17 T.R	1	Constant Air Volume AHU with Supply air flow 2680 lps, External Static pressure 350 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-8)	9 T.R	4	Constant Air Volume AHU with Supply air flow 880 lps, External Static pressure 100.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-9)	17 T.R	1	Constant Air Volume AHU with Supply air flow 1650 lps, External Static pressure 159.8 Pa, with 2 coils (heating / cooling)	✓

Lebanese University Campus - Hadath

1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Air Handling Unit (AHU-B-10)	17 T.R	3	Constant Air Volume AHU with Supply air flow 1700 lps, External Static pressure 166.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-11)	21 T.R	1	Variable Air Volume AHU with Supply air flow 3805 lps, External Static pressure 331.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-12)	11 T.R	1	Constant Air Volume AHU with Supply air flow 1530 lps, External Static pressure 140.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-13)	23 T.R	1	Variable Air Volume AHU with Supply air flow 5215 lps, External Static pressure 526.1 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-14)	15 T.R	5	Constant Air Volume AHU with Supply air flow 2820 lps, External Static pressure 258.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-15)	16 T.R	3	Constant Air Volume AHU with Supply air flow 2640 lps, External Static pressure 237 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-16)	14 T.R	2	Constant Air Volume AHU with Supply air flow 2340 lps, External Static pressure 263.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-17)	15 T.R	2	Constant Air Volume AHU with Supply air flow 2340 lps, External Static pressure 174.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-18)	14 T.R	5	Constant Air Volume AHU with Supply air flow 2280 lps, External Static pressure 264 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-19)	15 T.R	1	Constant Air Volume AHU with Supply air flow 2340 lps, External Static pressure 182.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-20)	16 T.R	1	Constant Air Volume AHU with Supply air flow 2363 lps, External Static pressure 244.1 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Air Handling Unit (AHU-B-21)	15 T.R	4	Constant Air Volume AHU with Supply air flow 2360 lps, External Static pressure 208.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-22)	16 T.R	2	Constant Air Volume AHU with Supply air flow 2305 lps, External Static pressure 226.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-23)	11.5 T.R	1	Constant Air Volume AHU with Supply air flow 2472 lps, External Static pressure 199.1 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-24)	11.7 T.R	5	Constant Air Volume AHU with Supply air flow 2310 lps, External Static pressure 243.3 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-25)	12 T.R	3	Constant Air Volume AHU with Supply air flow 2418 lps, External Static pressure 208.1 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-26)	12.7 T.R	1	Constant Air Volume AHU with Supply air flow 2472 lps, External Static pressure 221.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-27)	12 T.R	2	Constant Air Volume AHU with Supply air flow 2365 lps, External Static pressure 242.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-28)	12 T.R	2	Constant Air Volume AHU with Supply air flow 2472 lps, External Static pressure 283.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-29)	12 T.R	1	Constant Air Volume AHU with Supply air flow 2478 lps, External Static pressure 264.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-30)		1	Variable Air Volume AHU with Supply air flow 3870 lps, External Static pressure 586.6 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Air Handling Unit (AHU-B-31)	23.5 T.R	1	Variable Air Volume AHU with Supply air flow 3345 lps, External Static pressure 476.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-32)	26 T.R	1	Variable Air Volume AHU with Supply air flow 4380 lps, External Static pressure 578.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-33)	15 T.R	2	Constant Air Volume AHU with Supply air flow 1290 lps, External Static pressure 184.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-34)		1	Constant Air Volume AHU with Supply air flow 5260 lps, External Static pressure 233 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-35)	23 T.R	1	Constant Air Volume AHU with Supply air flow 4812 lps, External Static pressure 395 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-B-36)	20 T.R	1	Constant Air Volume AHU with Supply air flow 3670 lps, External Static pressure 740.5 Pa, with 2 coils (heating / cooling)	✓
	Fan Coil Unit (FCU-B-1)	1 T.R	57	Floor type FCU, 194 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-B-3)	1T.R	8	Floor type FCU, 235 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-B-5)	1 T.R	12	Floor type FCU, 175 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-B-7)	1 T.R	16	Floor type FCU, 145 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-B-8L)	1.5 T.R	2	Horizontal concealed type FCU, 371 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-B-8R)	1.5 T.R	2	Horizontal concealed type FCU, 371 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓

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1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Split Unit	12000 BTU/hr	1	York portable	✓
	Split Unit	24000 BTU/hr	3	York decorative wall type pump mode HLHA24FSA	✓
	Split Unit	28000 BTU/hr	4	York decorative wall type pump mode HLHA30FSA	✓
	Split Unit	30000 BTU/hr	3	MITSUBISHI	✓
	Split Unit	42000 BTU/hr	1	YORK ceiling decorative heat pump model MCH45/BOH45	✓
	Split Unit	48000 BTU/hr	1	MIDEA	✓
Ventilation	Dehumidifier	10L/day	2	Clima smart	✓
	Dehumidifier	500 W	2	Woods CO 2.4 A	✓

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1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-B-01)	530 Lps @ 147.7 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-03)	1120 Lps @ 111.6 Pa	1	Roof extractor type fan	✓
	Fan (F-B-04)	1210 Lps @ 165.4 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-05)	1350 Lps @ 122.8 Pa	1	Roof extractor type fan	✓
	Fan (F-B-06)	1320 Lps @ 140 Pa	1	Roof extractor type fan	✓
	Fan (F-B-07)	1560 Lps @ 139.2 Pa	1	Roof extractor type fan	✓
	Fan (F-B-09)	360 Lps @ 85.2 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-10)	335 Lps @ 72.1 Pa	1	Roof extractor type fan	✓
	Fan (F-B-11)	210 Lps @ 70.7 Pa	1	Roof extractor type fan	✓
	Fan (F-B-12)	125 Lps @ 72.3 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-15)	550 Lps @ 155 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-15A)	310 Lps @ 80.2 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-16)	110 Lps @ 78.5 Pa	2	In line Centrifugal Fan	✓
	Fan (F-B-17)	320 Lps @ 76 Pa	1	In line Centrifugal Fan	✓
	Fan (F-B-18)	1700 Lps @ 130 Pa	1	In line Centrifugal fire rated fan	✓
	Fan (F-B-19)	1700 Lps @ 130 Pa	3	In line Centrifugal fire rated fan	✓
	Fan (F-B-20)	1320 Lps @ 195 Pa	1	In line Centrifugal fire rated fan	✓
	Fan (F-B-20A)	1290 Lps @ 198 Pa	1	In line Centrifugal fire rated fan	✓
	Fan (F-B-21)	1000 Lps @ 105.5 Pa	2	Centrifugal fan	✓
	Fan (F-B-22)	2827 Lps @ 184.6 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-23)	2840 Lps @ 197.3 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-24)	920 Lps @ 178.6 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-25)	1100 Lps @ 190 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-26)	2236 Lps @ 257.2 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-27)	580 Lps @ 107.7 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-28)	265 Lps @ 90.8 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-29)	268 Lps @ 30 Pa	1	Propeller	✓

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1.3.1.1 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set 2 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-B-30)	300 Lps @ 125.3 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-32)	48 Lps @ 58 Pa	1	Roof extractor type fan	✓
	Fan (F-B-33)	200 Lps @ 55 Pa	1	In Line Centrifugal fan	✓
	Fan (F-B-34)	120 Lps @ 83.4 Pa	1	In Line Centrifugal fan	✓
Cooling	End Suction Pumps (P-B-1)	51.67 Lps @ 32.24 m	3	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-B-2)	16.5 Lps @ 26.8 m Head	3	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-B-3)	17.58 Lps @ 10.14 m	3	Circulators for Heat exchanger	✓
	Expansion Tank (EX-B-1)	1000 Lps	2	Expansion tank for heating system	✓
	Heat Exchanger (HEX-B-3)	611.75 Kw	3	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			16mm to 160mm DN	✓
	Galvanized Steel			16mm to 50mm DN	✓
	Fiber Glass insulation			15mm to 50 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	045-1320 Lps		With Thermostat	✓
Valves	Gate Valves				✓
	Balancing Valves				✓
	3 Way Valves				✓
	Globe Valves				✓

Lebanese University Campus - Hadath

1.3.1.1 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Fine Arts (Bldg. B) - O & M Ref:1.5.1 - Set2 / Div1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Soft Water	Water Softener (WS-B-1)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
Domestic Hot Water	Electric Water Heater (EWH B-1)	200 Lps	1	3 KW Electric water heater	✓
	Electric Water Heater (EWH B-2)	200 Lps	1	3 KW Electric water heater	✓
Drainage	Pump (P-B-51)	1.26 Lps @ 8 m Head	2	Submersible	✓
	Pump (P-B-52)	1.26 Lps @ 8 m Head	2	Submersible	✓
	Pump (P-B-53)	1.26 Lps @ 8 m Head	2	Submersible	✓
	Pump (P-B-54)	1.26 Lps @ 8 m Head	2	Submersible	✓
	Pump (P-B-55)	11.3 Lps @ 15 m Head	2	Submersible	✓
Piping System & Insulation	PVC			16mm to 110mm DN	✓
	Copper			15 mm DN	✓
	Cast Iron			75mm to 100mm DN	✓
	Galvanized Steel			20mm to 100mm DN	✓
	HDPE			50mm to 315mm DN	✓
	BSP			25mm to 80mm DN	✓
Valves	Ball Valves			15mm to 40mm	✓
	Gate Valves			50 mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

Lebanese University Campus - Hadath

1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-D-1)	30 T.R	1	Variable Air Volume AHU with Supply air flow 3200 lps, External Static pressure 270 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-2)	33 T.R	1	Variable Air Volume AHU with Supply air flow 6638 lps, External Static pressure 541 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-3)	24 T.R	1	Variable Air Volume AHU with Supply air flow 5900 lps, External Static pressure 514.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-4)	30 T.R	1	Variable Air Volume AHU with Supply air flow 6325 lps, External Static pressure 488.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-5)	19 T.R	1	Variable Air Volume AHU with Supply air flow 3900 lps, External Static pressure 702.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-6)	32 T.R	1	Variable Air Volume AHU with Supply air flow 6495 lps, External Static pressure 560.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-7)	35 T.R	1	Variable Air Volume AHU with Supply air flow 3720 lps, External Static pressure 456.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-8)	35 T.R	1	Variable Air Volume AHU with Supply air flow 3720 lps, External Static pressure 466.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-9)	35 T.R	1	Variable Air Volume AHU with Supply air flow 3720 lps, External Static pressure 529.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-10)	35 T.R	1	Variable Air Volume AHU with Supply air flow 3720 lps, External Static pressure 506.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-11)	22 T.R	1	Variable Air Volume AHU with Supply air flow 3964 lps, External Static pressure 538.5 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-D-12)	22 T.R	1	Variable Air Volume AHU with Supply air flow 3964 lps, External Static pressure 538.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-13)	34 T.R	1	Variable Air Volume AHU with Supply air flow 3900 lps, External Static pressure 418.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-14)	28 T.R	1	Constant Air Volume AHU with Supply air flow 4435 lps, External Static pressure 440.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-15)	27 T.R	1	Constant Air Volume AHU with Supply air flow 4330 lps, External Static pressure 444.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-16)	33 T.R	1	Constant Air Volume AHU with Supply air flow 5700 lps, External Static pressure 422.1 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-17)	43 T.R	1	Motorized damper,constant Air Volume AHU with Supply air flow 3424 lps with External Static pressure 221.3 Pa, with 2 coils (heating / cooling) & electrical reheat of 9 Kw	✓
	Air Handling Unit (AHU-D-18)	42 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 244.5 Pa, with 2 coils (heating / cooling) & electrical reheat of 7 Kw	✓
	Air Handling Unit (AHU-D-19)	41 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 244.5 Pa, with 2 coils (heating / cooling) & electrical reheat of 7 Kw	✓
	Air Handling Unit (AHU-D-20)	41 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 276.1 Pa, with 2 coils (heating / cooling) & electrical reheat of 7 Kw	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Air Handling Unit (AHU-D-21)	40 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 235.8 Pa, with 2 coils (heating / cooling) & electrical reheat of 7 Kw	✓
	Air Handling Unit (AHU-D-22)	40 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 272.2 Pa, with 2 coils (heating / cooling) & electrical reheat of 7 Kw	✓
	Air Handling Unit (AHU-D-23)	41.5 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 301.9 Pa, with 2 coils (heating / cooling) & electrical reheat of 8 Kw	✓
	Air Handling Unit (AHU-D-24)	42 T.R	1	Motorized damer constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 250.7 Pa, with 2 coils (heating / cooling) & electrical reheat of 10 Kw	✓
	Air Handling Unit (AHU-D-25)	41 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 256.3 Pa, with 2 coils (heating / cooling) & electrical reheat of 9 Kw	✓
	Air Handling Unit (AHU-D-26)	41 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 378.4 Pa, with 2 coils (heating / cooling) & electrical reheat of 8 Kw	✓
	Air Handling Unit (AHU-D-27)	42.5 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 249.6 Pa, with 2 coils (heating / cooling) & electrical reheat of 9 Kw	✓
	Air Handling Unit (AHU-D-28)	42 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 250 Pa, with 2 coils (heating / cooling) & electrical reheat of 10 Kw	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Air Handling Unit (AHU-D-29)	41 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 279.6 Pa, with 2 coils (heating / cooling) & electrical reheat of 9 Kw	✓
	Air Handling Unit (AHU-D-30)	41 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 3424 lps, External Static pressure 233 Pa, with 2 coils (heating / cooling) & electrical reheat of 7 Kw	✓
	Air Handling Unit (AHU-D-31)	65 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 6040 lps, External Static pressure 292.5 Pa, with 2 coils (heating / cooling) & electrical reheat of 20 Kw	✓
	Air Handling Unit (AHU-D-32)	31 T.R	1	Variable Air Volume AHU with Supply air flow 5141 lps, External Static pressure 389.3 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-33)	25 T.R	1	Variable Air Volume AHU with Supply air flow 3845 lps, External Static pressure 366.3 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-D-34)	34 T.R	1	Variable Air Volume AHU with Supply air flow 4702 lps, External Static pressure 342.3 Pa, with 2 coils (heating / cooling)	✓
	Fan Coil Unit (FCU-D1-1)	1 T.R	1	Horizontal concealed type FCU, 420 lps Supply air flow, External Static pressure 30 Pa, with 2 coils	✓
	Fan Coil Unit (FCU-D1-2)	0.75 T.R	1	Horizontal concealed type FCU, 185 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-D1-3)	0.75 T.R	1	Horizontal concealed type FCU, 185 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Split Unit	18000 BTU/hr	2	M D V	✓
	split unit	48000 btu/hr	1	YORK floor standing pump mode FLHA048	✓
	Split Unit	60000 BTU/hr	1	YORK floor standing pump mode FLHA060	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-D-01)	8092 Lps @ 254 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-02)	9248 Lps @ 293.5 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-03)	990 Lps @ 133.5 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-04)	880 Lps @ 36.9 Pa	1	In line Centrifugal fan	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-D-05)	5780 Lps @ 214.3 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-06)	5202 Lps @ 238.5 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-07)	3424 Lps @ 240 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-08)	3424 Lps @ 240 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-09)	3424 Lps @ 240 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-10)	3424 Lps @ 220 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-11)	3424 Lps @ 240 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-12)	3424 Lps @ 210 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-13)	3424 Lps @ 150 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-14)	3424 Lps @ 190 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-15)	3424 Lps @ 200 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-16)	3424 Lps @ 240 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-17)	3424 Lps @ 240 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-18)	3424 Lps @ 200 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-19)	3424 Lps @ 190 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-20)	6040 Lps @ 220 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-21)	3424 Lps @ 190 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-D-22)	5655 Lps @ 320.5 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-23)	5655 Lps @ 184.9 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-24)	2200 Lps @ 239.4 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-25)	300 Lps @ 76 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-26)	300 Lps @ 68 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-27)	560 Lps @ 71 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-28)	650 Lps @ 90.2 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-29)	550 Lps @ 166.9 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-30)	1700 Lps @169.3 Pa	2	In line Centrifugal fan	✓
	Fan (F-D-31)	4450 Lps @ 539.2 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-32)	4450 Lps @ 535.5 Pa	1	In line Centrifugal fan	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-D-33)	300 Lps @ 71.1 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-34)	100 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-D-35)	100 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-D-36)	150 Lps @ 40 Pa	1	Propeller	✓
	Fan (F-D-37)	100 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-D-38)	150 Lps @ 40 Pa	1	Propeller	✓
	Fan (F-D-39)	100 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-D-40)	150 Lps @ 40 Pa	1	Propeller	✓
	Fan (F-D-41)	1200 Lps @ 127.7 Pa	2	In line Centrifugal fan	✓
	Fan (F-D-42)	2109 Lps @ 106 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-43)	1490 Lps @ 88.1 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-44)	978 Lps @ 83.1 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-45)	1736 Lps @ 123 Pa	1	In line Centrifugal fan	✓
	Fan (F-D-46)	870 Lps @ 136 Pa	1	Roof Supply type fan	✓
	Fan (F-D-47)	1761 Lps @ 162.2 Pa	1	Roof Supply type fan	✓
	Fan (F-D-48)	500 Lps @ 74.3 Pa	1	Roof extractor type fan	✓
	Fan (F-D-49)	900 Lps @ 102.8 Pa	1	Roof extractor type fan	✓
	Fan (F-D-50)	2687 Lps @ 303.4 Pa	1	Centrifugal fan	✓
	Dehumidifier	500 W	1	Woods CO 220/240 V AC	✓
	Dehumidifier	231 W 10 litr/day	1	clima smart	✓
Cooling	End Suction Pumps (P-D-1)	57.63 Lps @ 26 m Head	3	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-D-2)	22.31 Lps @ 34.72 m Head	3	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-D-3)	20 Lps @ 15.32 m Head	2	Circulators for Heat exchanger	✓
	Expansion Tank (EX-D-1)	1500 Lps	2	Expansion tank for heating system	✓
	Heat Exchanger (HEX-D-1)	1033.26 Kw	2	Heat Exchanger Primary temperature	✓

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1.3.1.2 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Law & Political Sciences - (Bldg.D) - O & M Ref:1.5.1 - Set3 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Piping System & Insulation	Black Steel			20mm to 300mm DN	✓
	Galvanized Steel			16mm to 50mm DN	✓
	Fiber Glass insulation			15mm to 50 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
Ducting System & Insulation	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves			50mm to 100mm DN	✓
	Balancing Valves			50 mm to 100mm DN	✓
	3 Way Valves				✓
	Globe Valves				✓

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1.3.1.2 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Law & Political Sciences (Bldg. D) - O & M Ref:1.5.1 - Set3 / Div1

System	Equipment	Capacity	Qty	Technical Description	Level	Room No.	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Soft Water	Water Softener (WS-D-1)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	Basement	Pump room	✓
Domestic Hot Water	Electric Water Heater (EWH-D1-1)	100	1	3 KW Electric water heater	Ground	Cafeteria	✓
	Electric Water Heater (EWH-D2-1)	100	2	3 KW Electric water heater	Ground	Cafeteria	✓
Drainage	Pump (P-D-51)	1.6 Lps @ 10 m Head	2	Submersible	Basement	37	✓
	Pump (P-D-52)	2 Lps @ 10 m Head	2	Submersible	Basement	Mech.room	✓
Piping System & Insulation	PVC			20mm to 75mm DN			✓
	Copper			15 mm DN			✓
	Galvanized Steel			65mm to 100mm DN			✓
	HDPE			50mm to 250mm DN			✓
	BSP			25mm to 80mm DN			✓
Valves	Ball Valves			15mm to 40mm			✓
	Gate Valves			50 mm			✓
Sanitary Fixtures & Accessories	Drinking Fountain						✓
	Lavatory Mixer LAV-1						✓
	Lavatory Tap LAV-2						✓
	Lavatory Mixer LAV-3						✓
	Sink Tap						✓
	Mop Sink Tap						✓
	Bib Cock Perineal Hose						✓
	Angle Valves/Flexibles						✓
	WC Flush Valves						✓
	Urinal Flush Valves						✓
	Flush Tanks						✓
	Hand Dryers						✓
	Liquid Soap Dispensers						✓
	Paper Towel Dispenser						✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-G-1)	33 T.R	1	Variable Air Volume AHU with Supply air flow 5135 lps, External Static pressure 405 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-2)	23 T.R	1	Variable Air Volume AHU with Supply air flow 3365 lps, External Static pressure 316 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-3)	10 T.R	1	Constant Air Volume AHU with Supply air flow 1600 lps, External Static pressure 118 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-4)	17 T.R	1	Constant Air Volume AHU with Supply air flow 3055 lps, External Static pressure 104 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-5)	18 T.R	2	Constant Air Volume AHU with Supply air flow 1540 lps, External Static pressure 101 Pa, with 2 coils (heating / cooling) & electrical reheat of 2 Kw	✓
	Air Handling Unit (AHU-G-6)	20 T.R	1	Constant Air Volume AHU with Supply air flow 1980 lps, External Static pressure 101 Pa, with 2 coils (heating / cooling) & electrical reheat of 5.5 Kw	✓
	Air Handling Unit (AHU-G-7)	19 T.R	3	Constant Air Volume AHU with Supply air flow 1610 lps, External Static pressure 101 Pa, with 2 coils (heating / cooling) & electrical reheat of 3.5 Kw	✓
	Air Handling Unit (AHU-G-8)	18 T.R	1	Constant Air Volume AHU with Supply air flow 1575 lps, External Static pressure 102 Pa, with 2 coils (heating / cooling) & electrical reheat of 4 Kw	✓
	Air Handling Unit (AHU-G-9)	18 T.R	1	Constant Air Volume AHU with Supply air flow 1540 lps, External Static pressure 102 Pa, with 2 coils (heating / cooling) & electrical reheat of 3.5 Kw	✓
	Air Handling Unit (AHU-G-10)	23 T.R	2	Constant Air Volume AHU with Supply air flow 1980 lps, External Static pressure 103 Pa, with 2 coils (heating / cooling) & electrical reheat of 7.5 Kw	✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-G-11)	31 T.R	1	Variable Air Volume AHU with Supply air flow 3330 lps, External Static pressure 368 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-12)	11 T.R	2	Variable Air Volume AHU with Supply air flow 1170 lps, External Static pressure 331 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-13)	9 T.R	1	Constant Air Volume AHU with Supply air flow 1260 lps, External Static pressure 104 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-14)	9 T.R	1	Constant Air Volume AHU with Supply air flow 1380 lps, External Static pressure 106 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-15)	13 T.R	1	Variable Air Volume AHU with Supply air flow 2200 lps, External Static pressure 338 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-16)	13 T.R	1	Variable Air Volume AHU with Supply air flow 1905 lps, External Static pressure 366 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-17)	17 T.R	1	Variable Air Volume AHU with Supply air flow 2735 lps, External Static pressure 372 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-18)	22 T.R	1	Variable Air Volume AHU with Supply air flow 4425 lps, External Static pressure 343 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-19)	11 T.R	1	Variable Air Volume AHU with Supply air flow 2200 lps, External Static pressure 448 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-20)	11 T.R	1	Variable Air Volume AHU with Supply air flow 1640 lps, External Static pressure 402 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-21)	16 T.R	1	Variable Air Volume AHU with Supply air flow 3175 lps, External Static pressure 355 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-22)	7 T.R	1	Variable Air Volume AHU with Supply air flow 1605 lps, External Static pressure 371 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-G-23)	13 T.R	1	Variable Air Volume AHU with Supply air flow 2895 lps, External Static pressure 426 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-24)	10.5 T.R	1	Variable Air Volume AHU with Supply air flow 2440 lps, External Static pressure 371 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-25)	6 T.R	1	Constant Air Volume AHU with Supply air flow 1050 lps, External Static pressure 134 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-26)	16.5T.R	1	Variable Air Volume AHU with Supply air flow 3770 lps, External Static pressure 402 Pa, with 2 coils (heating / cooling) & electrical reheat of 3.5 Kw	✓
	Air Handling Unit (AHU-G-27)	21 T.R	1	Variable Air Volume AHU with Supply air flow 3910 lps, External Static pressure 335 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-28)	19 T.R	1	Variable Air Volume AHU with Supply air flow 4130 lps, External Static pressure 589 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-29)	19.5 T.R	1	Variable Air Volume AHU with Supply air flow 3290 lps, External Static pressure 338 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-30)	15 T.R	2	Variable Air Volume AHU with Supply air flow 2865 lps, External Static pressure 375 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-31)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2890 lps, External Static pressure 384 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-32)	15 T.R	1	Variable Air Volume AHU with Supply air flow 1575 lps, External Static pressure 394 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-33)	21T.R	1	Variable Air Volume AHU with Supply air flow 2115 lps, External Static pressure 458 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-G-34)	16 T.R	1	Variable Air Volume AHU with Supply air flow 1800 lps, External Static pressure 435 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-35)	10 T.R	1	Variable Air Volume AHU with Supply air flow 1050 lps, External Static pressure 411 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-36)	16 T.R	1	Variable Air Volume AHU with Supply air flow 2835 lps, External Static pressure 385 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-37)	24 T.R	1	Variable Air Volume AHU with Supply air flow 4370 lps, External Static pressure 423 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-38)	17 T.R	1	Variable Air Volume AHU with Supply air flow 2130 lps, External Static pressure 432 Pa, with 2 coils (heating / cooling) & electrical reheat of 5 Kw	✓
	Air Handling Unit (AHU-G-39)	22 T.R	1	Variable Air Volume AHU with Supply air flow 3725 lps, External Static pressure 467 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-G-40)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2785 lps, External Static pressure 489 Pa, with 2 coils (heating / cooling)	✓
	Split System A/C(SSAC-G-1)	3 T.R	2	Split system air conditionning of the electronic heat pump type with supply air flow 575 Lps .	✓
	Split System A/C(SSAC-G-2)	1 T.R	1	Split system air conditionning of the electronic heat pump type with supply air flow 290 Lps .	✓
	split unit	18000 BTU/hr	1	TROPICAL	✓
	split unit	24000 BTU/hr	9	TROPICAL	✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-G-01)	1235 Lps @ 73 Pa	1	Centrifugal type exhaust fan	✓
	Fan (F-G-02)	2910 Lps @ 87 Pa	1	Centrifugal type exhaust fan	✓
	Fan (F-G-03)	755 Lps @ 70 Pa	1	Roof extractor type fan	✓
	Fan (F-G-04)	855 Lps @ 67 Pa	1	Roof extractor type fan	✓
Ventilation	Fan (F-G-05)	975 Lps @ 60 Pa	1	Roof extractor type fan	✓
	Fan (F-G-06)	1525 Lps @ 69 Pa	2	Centrifugal type exhaust fan	✓
	Fan (F-G-07)	2620 Lps @ 85 Pa	1	Centrifugal type exhaust fan	✓
	Fan (F-G-08)	2620 Lps @ 77 Pa	1	Centrifugal type supply fan	✓
	Fan (F-G-09)	350 Lps @ 50 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-10)	375 Lps @ 127 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-11)	185 Lps @ 49 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-12)	1525 Lps @ 69 Pa	1	Roof extractor type fan	✓
	Fan (F-G-13)	210 Lps @ 56 Pa	2	In line centrifugal type exhaust fan	✓
	Fan (F-G-14)	770 Lps @ 55 Pa	1	Roof extractor type fan	✓
	Fan (F-G-15)	175 Lps @ 47 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-16)	240 Lps @ 52 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-17)	100 Lps @ 41 Pa	1	Roof extractor type fan	✓
	Fan (F-G-18)	2350 Lps @ 92 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-19)	620 Lps @ 50 Pa	2	In line centrifugal type exhaust fan	✓
	Fan (F-G-20)	310 Lps @ 45 Pa	1	Roof extractor type fan	✓
	Fan (F-G-21)	1560 Lps @ 56 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-22)	780 Lps @ 56 Pa	3	In line centrifugal type exhaust fan	✓
	Fan (F-G-23)	320 Lps @ 47 Pa	2	Roof extractor type fan	✓
	Fan (F-G-24)	6765 Lps @ 93 Pa	1	Roof extractor type fan	✓
	Fan (F-G-25)	5775 Lps @ 85 Pa	1	Roof extractor type fan	✓
	Fan (F-G-26)	120 Lps @ 40 Pa	1	Roof extractor type fan	✓
	Fan (F-G-27)	2100 Lps @ 77 Pa	2	In line centrifugal type exhaust fan	✓
	Fan (F-G-28)	390 Lps @ 46 Pa	1	Roof extractor type fan	✓
	Fan (F-G-29)	130 Lps @ 40 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-30)	800 Lps @ 60 Pa	1	Roof extractor type fan	✓
	Fan (F-G-31)	1610 Lps @ 50 Pa	7	Roof extractor type fan	✓
	Fan (F-G-31)	1610 Lps @ 50 Pa	7	In line centrifugal type exhaust fan	✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-G-32)	1980 Lps @ 50 Pa	1	In line centrifugal type exhaust fan	✓
	Fan (F-G-33)	525 Lps @ 65 Pa	1	In line centrifugal type exhaust fan	✓
	Dehumidifier	500 W	1	Woods CO 2.4 A	✓
Cooling	End Suction Pumps (P-G-2)	25.1 Lps @ 29.6 m Head	3	End suction centrifugal secondary chilled water pump	✓
	End Suction Pumps (P-G-4)	23.1 Lps @ 22.25 m Head	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-G-1)	19.2 Lps @ 26.5 m Head	2	End suction centrifugal secondary heating water pump	✓
	End Suction Pumps (P-G-3)	8.5 Lps @ 21 m Head	2	End suction centrifugal secondary heating water pump	✓
	End Suction Pumps (P-G-5)	3.76 Lps @ 6.1 m Head	2	End suction centrifugal secondary heating water pump for heat exchangers	✓
	End Suction Pumps (P-G-6)	8.06 Lps @ 7.3 m Head	2	End suction centrifugal secondary heating water pump for heat exchangers	✓
	Circulator Pumps (P-G-8)	0.13 Lps @ 4.6 m Head	2	Circulators for hot water storage tank	✓
	Expansion Tank (EX-G-1)	750 L	1	Expansion tank for heating system	✓
	Expansion Tank (EX-G-2)	750 L	1	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST-G-1)	820 L	1	Vertical Type Hot Water Storage Tank of 0.5 Lps flow	✓
	Heat Exchanger (HEX-G-1)	446.7 Kw	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
	Heat Exchanger (HEX-G-2)	196.9 Kw	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Galvanized Steel			Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation			15mm to 65 mm thickness	✓

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1.3.1.3 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 /Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
Ducting System & Insulation	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓

Valves	Gate Valves			20mm to 125mm	✓
	Balancing Valves			20mm to 50mm	✓
	3 Way Valves			20mm	✓
	Globe Valves			20mm	✓

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1.3.1.3 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 / Div1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Laboratory Services	Air Compressor (AC-G-1)	9.4 Lps @ 6.8 Kpa	1	Duplex type air compressor	✓
	Air Compressor (AC-G-2)	14.2 Lps @ 6.8 Kpa	1	Duplex type air compressor	✓
	Vacuum pump (VAC-G-1)	12 lps @ 380 mm Hg	1	Duplex type vacuum pump	✓
	Water Still (WD-G-1)	5 KW	1	Electric type water still	✓
Soft Water	Water Softener (WS-G-2)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
Drainage	Pump (SP 1/2)	1.75 Lps @ 5 m Head	2	Submersible pump	✓
	Pump (SP 3/4)	3.48 Lps @ 4.8 m Head	2	Submersible pump	✓
	Pump (SP 5/6)	1.3 Lps @ 4.25 m Head	2	Submersible pump	✓
	Pump (SP 7/8)	3.3 Lps @ 5.25 m Head	2	Submersible pump	✓
	Pump (SP 9/10)	3.3 Lps @ 5.25 m Head	2	Submersible pump	✓
	Pump (SP 12/13)	4.4 Lps @ 11 m Head	2	Submersible pump	✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓
Valves	Ball Valves			15mm to 40mm	✓
	Globe Valves			15mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Mop Sink Tap				✓
	Shower Mixers				✓

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1.3.1.3 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Engineering (Bldg. G) - O & M Ref:1.5.1 - Set18 / Div1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Sanitary Fixtures & Accessories	Emergency shower				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.1.4 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Pharmacy (Bldg. H) - O & M Ref:1.5.1 - Set5 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-H-1)	24 T.R	1	Variable Air Volume AHU with Supply air flow 3895 lps, External Static pressure 535 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-2)	39 T.R	1	Variable Air Volume AHU with Supply air flow 6385 lps, External Static pressure 558 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-3)	23 T.R	1	Variable Air Volume AHU with Supply air flow 3835 lps, External Static pressure 1359 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-4)	22.5 T.R	1	Variable Air Volume AHU with Supply air flow 4055 lps, External Static pressure 417 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-5)	20 T.R	1	Variable Air Volume AHU with Supply air flow 2580 lps, External Static pressure 770 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-6)	11.5 T.R	1	Variable Air Volume AHU with Supply air flow 1350 lps, External Static pressure 1073 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-7)	20 T.R	1	Variable Air Volume AHU with Supply air flow 3150 lps, External Static pressure 673 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-8)	13.5 T.R	1	Variable Air Volume AHU with Supply air flow 1910 lps, External Static pressure 1028 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-9)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2505 lps, External Static pressure 464 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-10)	16 T.R	1	Variable Air Volume AHU with Supply air flow 2785 lps, External Static pressure 513 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-11)	14 T.R	1	Variable Air Volume AHU with Supply air flow 2260 lps, External Static pressure 512 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.4 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Pharmacy (Bldg. H) - O & M Ref:1.5.1 - Set5 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-H-12)	17 T.R	1	Variable Air Volume AHU with Supply air flow 2485 lps, External Static pressure 642 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-13)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2180 lps, External Static pressure 647 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-14)	23 T.R	1	Variable Air Volume AHU with Supply air flow 3618 lps, External Static pressure 578 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-15)	25.5 T.R	1	Variable Air Volume AHU with Supply air flow 3325 lps, External Static pressure 726 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-H-16)	12 T.R	2	Constant Air Volume AHU with Supply air flow 1150 lps, External Static pressure 105 Pa, with 2 coils (heating / cooling)	✓
	Fan Coil Unit (FCU-H-Garbage)	2 T.R	1	Ceiling type FCU, 378 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-H-CT)	1.5 T.R	2	Ceiling type FCU, 273 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Mini Split unit (SRAC-H-1)	-	1	Split Unit for L.C room	✓
Cooling / Heating	Split Unit	9000 BTU/hr	1	Carrier	✓
	Split Unit	12000 BTU/hr	2	York decorative wall type pump mode HLHA24FSA	✓
	Split Unit	18000 BTU/hr	1	M D V	✓
	Split Unit	18000 BTU/hr	5	O General	✓
	Split Unit	24000 BTU/hr	5	O General	✓
	Split Unit	32000 BTU/hr	1	York high wall decorative heat pump model MCH35/ BOH35	✓
	Split Unit	50000 BTU/hr	1	York high ceiling decorative heat pump model MCH55/BOH55	✓

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1.3.1.4 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Pharmacy (Bldg. H) - O & M Ref:1.5.1 - Set5 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-H-01)	3100 Lps @ 280 Pa	1	Roof extractor type fan	✓
	Fan (F-H-02)	705 Lps @ 115 Pa	1	Roof extractor type fan	✓
	Fan (F-H-03)	2985 Lps @ 214 Pa	1	Roof extractor type fan	✓
	Fan (F-H-04)	3650 Lps @ 166 Pa	1	Roof supply type fan	✓
	Fan (F-H-05)	2220 Lps @ 125 Pa	1	Roof extractor type fan	✓
	Fan (F-H-06)	440 Lps @ 140 Pa	1	Roof extractor type fan	✓
	Fan (F-H-07)	865 Lps @ 178 Pa	1	Roof extractor type fan	✓
	Fan (F-H-08)	1040 Lps @ 89 Pa	1	Roof extractor type fan	✓
	Fan (F-H-09)	1080 Lps @ 126 Pa	1	Roof extractor type fan	✓
	Fan (F-H-10)	1800 Lps @ 174 Pa	1	Roof extractor type fan	✓
Ventilation	Fan (F-H-11)	1280 Lps @ 132 Pa	1	Roof extractor type fan	✓
	Fan (F-H-12)	165 Lps @ 91 Pa	1	Roof extractor type fan	✓
	Fan (F-H-13)	3925 Lps @ 213 Pa	1	Roof extractor type fan	✓
	Fan (F-H-14)	765 Lps @ 113 Pa	1	Roof extractor type fan	✓
	Fan (F-H-15)	2665 Lps @ 172 Pa	1	Roof supply type fan	✓
	Fan (F-H-16)	180 Lps @ 79 Pa	1	Roof extractor type fan	✓
	Fan (F-H-17)	2040 Lps @ 130 Pa	1	Roof supply type fan	✓
	Fan (F-H-18)	770 Lps @ 110 Pa	1	Roof extractor type fan	✓
	Fan (F-H-19)	3320 Lps @ 127 Pa	1	Roof supply type fan	✓
	Fan (F-H-21)	2451 Lps @ 111 Pa	1	In Line Centrifugal fan	✓
	Fan (F-H-22)	1927 Lps @ 123 Pa	1	Roof supply type fan	✓
	Fan (F-H-23)	5852 Lps @ 286 Pa	1	Centrifugal fire rated fan	✓
	Fan (F-H-B)	4165 Lps @ 336 Pa	1	In Line Centrifugal fan	✓
	Fan (F-H-T)	3860 Lps @ 298 Pa	1	Centrifugal fan	✓

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1.3.1.4 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Pharmacy (Bldg. H) - O & M Ref:1.5.1 - Set5 / Div2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling	End Suction Pumps (P-H-2)	28.26 Lps @ 18.77 m Head	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-H-1)	9.85 Lps @ 26.8 m Head	2	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-H-3)	4.38 Lps @ 6.9 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-H-4)	1.7 Lps @ 7.2 m Head	2	Circulators for Hot water storage tank	✓
	Expansion Tank (EX-H-1)	440.86 Lps	1	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST H-1)	2790 Liter	1	Vertical Type Hot Water Storage Tank of 1.71 Lps flow	✓
	Heat Exchanger (HEX-H-1)	457.89 Kw	1	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Galvanized Steel			Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation			15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves			20mm to 125mm	✓
	Balancing Valves			20mm to 50mm	✓
	3 Way Valves			20mm	✓
	Globe Valves			20mm	✓

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1.3.1.4 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Pharmacy (Bldg. H) - O & M Ref:1.5.1 - Set5 / Div1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Laboratory Services	Air Compressor (AC-H-1)	51.5 Lps @ 7 bar	1	Duplex type air compressor	✓
	Vacuum pump (VAC-H-1)	54 lps @ 610 mm HG	1	Duplex type vacuum pump	✓
	Distilled Water Booster pumps	25 Gpm, 41.5 m Head	1	Booster pumps for distilled water system	✓
	Water Still (WD-H-1)	14 KW	1	Electric type water still	✓
Soft Water	Water Softener (WS-H-1)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
	Water Softener (WS-H-2)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
Domestic Hot Water	Circulator pumps (P-H-51)	0.21 lps @ 9 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓
Valves	Ball Valves			15mm to 40mm	✓
	Globe Valves			15mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
	Emergency shower				✓

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1.3.1.4 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Pharmacy (Bldg. H) - O & M Ref:1.5.1 - Set5 / Div1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Sanitary Fixtures & Accessories	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.1.5 - Work Parcel 1 - List of HVAC Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-J-1)	36 T.R	1	Motorized damper variable Air Volume AHU with Supply air flow 5000 lps, External Static pressure 412.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-4)	30 T.R	1	Variable Air Volume AHU with Supply air flow 2610 lps, External Static pressure 822 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-5)	17 T.R	2	Variable Air Volume AHU with Supply air flow 2160 lps, External Static pressure 535 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-6)	21 T.R	1	Variable Air Volume AHU with Supply air flow 2184 lps, External Static pressure 594 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-7)	35 T.R	1	Variable Air Volume AHU with Supply air flow 5700 lps, External Static pressure 474 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-9)	28 T.R	1	Variable Air Volume AHU with Supply air flow 4630 lps, External Static pressure 313 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-10)	12.5 T.R	1	Variable Air Volume AHU with Supply air flow 1490 lps, External Static pressure 508 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-11)	20.5 T.R	1	Variable Air Volume AHU with Supply air flow 1680 lps, External Static pressure 532 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-12)	15.5 T.R	1	Variable Air Volume AHU with Supply air flow 1300 lps, External Static pressure 211 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-13)	8.5 T.R	1	Constant Volume AHU with Supply air flow 1020 lps, External Static pressure 148 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.5 - Work Parcel 1 - List of HVAC Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-J-14L)	33 T.R	1	Motorized damper constant Volume AHU with Supply air flow 2406 lps, External Static pressure 386 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-14R)	33 T.R	1	Motorized damper constant Volume AHU with Supply air flow 2406 lps, External Static pressure 386 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-15)	19 T.R	1	Motorized damper constant Volume AHU with Supply air flow 1535 lps, External Static pressure 143 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-16)	18 T.R	1	Motorized damper constant Volume AHU with Supply air flow 1985 lps, External Static pressure 189 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-17)	19 T.R	1	Motorized damper constant Volume AHU with Supply air flow 2125 lps, External Static pressure 126 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-18)	18.4 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 2125 lps, External Static pressure 149 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-19L)	14 T.R	1	Motorized damper constant Air Volume AHU with Supply air flow 1220 lps, External Static pressure 119 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-J-19R)	14 T.R	2	Motorized damper constant Air Volume AHU with Supply air flow 1220 lps, External Static pressure 119 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.5 - Work Parcel 1 - List of HVAC Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	split unit	8500 BTU/hr	2	AIR GENERAL	✓
	split unit	18000 BTU/hr	1	climasmart	✓
	split unit	24000 btu/hr	2	YORK decorative wall type pump mode HLHA24FSA	✓
	Split Unit	24000 BTU/hr	1	MDV	✓
	Split Unit	32000 BTU/hr	1	York	✓
Ventilation	Fan (F-J-01)	1240 Lps @ 104 Pa	1	Roof extractor type fan	✓
	Fan (F-J-02)	1340 Lps @ 105 Pa	1	Roof extractor type fan	✓
	Fan (F-J-03)	354 Lps @ 103 Pa	1	Roof extractor type fan	✓
	Fan (F-J-04)	50 Lps @ 86 Pa	1	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-05)	2125 Lps @ 129 Pa	1	Fire rated axial type return Fan	✓
	Fan (F-J-06)	2125 Lps @ 121.7 Pa	1	Fire rated axial type exhaust Fan	✓
	Fan (F-J-07)	1800Lps @ 91.2 Pa	1	Fire rated axial type return Fan	✓
	Fan (F-J-08)	1985 Lps @ 114.6 Pa	1	Fire rated axial type return Fan	✓
	Fan (F-J-09)	650 Lps @ 97 Pa	1	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-10)	552 Lps @ 94 Pa	2	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-11)	1210 Lps @ 119 Pa	2	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-12)	6900 Lps @ 173 Pa	1	Centrifugal type supply fan	✓
	Air Fan (F-J-13)	2450 Lps @ 293 Pa	2	Fire rated in line centrifugal type return fan	✓

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1.3.1.5 - Work Parcel 1 - List of HVAC Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-J-14)	675 Lps @ 106 Pa	1	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-16)	1700 Lps @186 Pa	1	In Line Centrifugal type exhaus fan	✓
	Fan (F-J-17)	3340 Lps @ 136 Pa	1	In Line Centrifugal type supply fan	✓
	Fan (F-J-18)	1040 Lps @ 116 Pa	1	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-19)	1320 Lps @ 77 Pa	1	Roof extractor type fan	✓
	Fan (F-J-20)	6650 Lps @ 165 Pa	1	In Line Centrifugal type supply fan	✓
	Fan (F-J-21)	1350 Lps @ 90 Pa	1	In Line Centrifugal type supply fan	✓
	Fan (F-J-22)	1345 Lps @ 129 Pa	1	In Line Centrifugal type supply fan	✓
	Fan (F-J-23)	501 Lps @140 Pa	1	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-24)	115 Lps @ 23 Pa	1	Propeller type exhaust Fan	✓
	Fan (F-J-25)	115 Lps @ 23 Pa	1	Propeller type exhaust Fan	✓
	Fan (F-J-26)	115 Lps @ 23 Pa	1	Propeller type exhaust Fan	✓
	Fan (F-J-27)	115 Lps @ 23 Pa	1	Propeller type exhaust Fan	✓
	Fan (F-J-28)	115 Lps @ 23 Pa	1	Propeller type exhaust Fan	✓
	Fan (F-J-29)	420 Lps @ 108 Pa	1	Roof extractor type fan	✓
	Fan (F-J-30)	80 Lps @ 85.7 Pa	1	In Line Centrifugal type exhaust fan	✓
	Fan (F-J-31)	539 Lps @ 30 Pa	1	Propeller type Fan	✓
	Fan (F-J-32)	104 Lps @ 25 Pa	1	Propeller type Fan	✓
	Fan (F-J-33)	2000 Lps @ 95.2 Pa	1	Roof type supply fan	✓
	Fan (F-J-34)	2000 Lps @ 95.2 Pa	1	Roof type supply fan	✓
	Fan (F-J-39)	1500 Lps @ 80 Pa	1	In Line Centrifugal type supply fan	✓
	Fan (F-J-40)	1800 Lps @ 100 Pa	1	Fire rated axial type smoke exhaust fan	✓
	Fan (F-J-41)	4400 Lps @ 105 Pa	1	Fire rated axial type exhaust Fan	✓

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1.3.1.5 - Work Parcel 1 - List of HVAC Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling	End Suction Pumps (P-J-1)	24.6 Lps @ 28.7 m	2	End suction centrifugal secondary chilled water pump	✓
	End Suction Pumps (P-J-3)	18.6 Lps @ 21.5 m	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-J-2)	7.14 Lps @ 28.6 m	2	End suction centrifugal secondary hot water pump	✓
	End Suction Pumps (P-J-4)	4.87 Lps @ 21.03 m	2	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-J-5)	3.17 Lps @ 4.5 m	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-J-6)	2.18 Lps @ 6.33 m	2	Circulators for Heat exchanger	✓
	Expansion Tank (EX-J-1)	500 Lps	1	Expansion tank for heating system	✓
	Expansion Tank (EX-J-2)	500 Lps	1	Expansion tank for heating system	✓
	Heat Exchanger (HEX-J-1)	165.97 KW	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Heating	Heat Exchanger (HEX-J-2)	114.2 KW	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Fiber Glass insulation			40mm thickness to50 mm	✓

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1.3.1.5 - Work Parcel 1 - List of HVAC Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
Valves	Gate Valves		76	25mm to65mm	✓
	Double Regulating Valves		38	20mm to 65mm	✓
	Globe Valves		38	20mm	✓

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1.3.1.5 - Work Parcel 1 - List of Plumbing Equipment

Extension of the Faculty of Sciences(Bldg.J) - O & M Ref:1.5.1 - Set 6 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Soft Water	Water Softener (WS-J-1)	0.5 Lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
	Water Softener (WS-J-2)	0.5 Lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
Domestic Hot Water	Electric Water Heater EWH-J-1	100 Ltr	1	Electric Water Heater 3 KW	✓
Piping System & Insulation	PVC			16mm to 110mm DN	✓
	Copper			15mm DN	✓
	Galvanized Steel			75 mm To 100 DN	✓
	HDPE			50mm to 200mm DN	✓
Valves	Ball Valves			15mm to 50mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.1.6-Work Parcel 1- List of HVAC Equipment

Faculty Of Medicine-(Bldg.M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-M1-1)	30 T.R	1	Variable Air Volume AHU with Supply air flow 5478 lps, External Static pressure 877.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-2)	7 T.R	1	Constant Air Volume AHU with Supply air flow 1080 lps, External Static pressure 193.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-3)	26 T.R	1	Constant Air Volume AHU with Supply air flow 2240 lps, External Static pressure 174.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-4)	23 T.R	1	Variable Air Volume AHU with Supply air flow 3610 lps, External Static pressure 504.1 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-5)	15.5 T.R	1	Constant Air Volume AHU with Supply air flow 1440 lps, External Static pressure 169.4 Pa, with 2 coils (heating / cooling) & electric reheat of 1Kw capacity	✓
	Air Handling Unit (AHU-M1-6)	20 T.R	1	Variable Air Volume AHU with Supply air flow 3888 lps, External Static pressure 566.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-7)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2382 lps, External Static pressure 549.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-8)	26 T.R	1	Variable Air Volume AHU with Supply air flow 3468 lps, External Static pressure 492.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-9)	14 T.R	1	Variable Air Volume AHU with Supply air flow 2165 lps, External Static pressure 285.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-10)	25 T.R	1	Variable Air Volume AHU with Supply air flow 5610 lps, External Static pressure 602.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-11)	15 T.R	1	Constant Air Volume AHU with Supply air flow 2550 lps, External Static pressure 248 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.6-Work Parcel 1- List of HVAC Equipment

Faculty Of Medicine-(Bldg.M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-M1-12)	11 T.R	1	Variable Air Volume AHU with Supply air flow 2058 lps, External Static pressure 674.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-13)	12 T.R	1	Variable Air Volume AHU with Supply air flow 2495 lps, External Static pressure 595.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-14)	21 T.R	4	Constant Air Volume AHU with Supply air flow 1980 lps, External Static pressure 182.9 Pa, with 2 coils (heating / cooling) & electrical reheat of 5 Kw	✓
	Air Handling Unit (AHU-M1-15)	19 T.R	2	Constant Air Volume AHU with Supply air flow 1640 lps, External Static pressure 137.9 Pa, with 2 coils (heating / cooling) & electrical reheat of 5 Kw	✓
	Air Handling Unit (AHU-M1-16)	22 T.R	1	Variable Air Volume AHU with Supply air flow 4777 lps, External Static pressure 717.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-17)	18 T.R	1	Variable Air Volume AHU with Supply air flow 4110 lps, External Static pressure 678.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-25)	15 T.R	1	Constant Air Volume AHU with Supply air flow 2976 lps, External Static pressure 247.5 Pa, with 2 coils (heating / cooling)	✓
	Fan Coil Unit (FCU-M1-1)	1 T.R	1	Horizontal concealed type, 220 Lps @ 30 Pa, with 2 coils (cooling/Heating)	✓
	Fan Coil Unit (FCU-M1-2)	3 T.R	1	Horizontal concealed type, 660 Lps @ 30 Pa, with 2 coils (cooling/Heating)	✓
	Fan Coil Unit (FCU-M1-GR)	2 T.R	1	Horizontal concealed type, 350 Lps @ 30 Pa, with 1 coils (cooling/Heating)	✓

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1.3.1.6-Work Parcel 1- List of HVAC Equipment

Faculty Of Medicine-(Bldg.M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	split unit	12000 btu/hr	2	York	✓
	split unit	12000 btu/hr	1	Climatech	✓
	split unit	18000 btu/hr	1	YORK decorative wall type pump mode HLHA18FSp	✓
	split unit	18000 btu/hr	3	CLIMA SMART	✓
	split unit	18000 btu/hr	1	CHALLENGE AIR	✓
	split unit	24000 btu/hr	7	YORK decorative wall type pump mode HLHA24FSA	✓
	split unit	24000 btu/hr	1	MDV	✓
	split unit	24000 btu/hr	1	PETRA	✓
	split unit	24000 btu/hr	1	CLIMA SMART	✓
	split unit	32000 BTU/hr	3	YORK	✓
	split unit	48000 BTU/hr	2	CLIMA SMART	✓
Ventilation	Fan (F-M1-1)	1640 Lps @ 111 Pa	3	Fire rated centrifugal fan	✓
	Fan (F-M1-2)	1980 Lps @ 133.3 Pa	3	Fire rated centrifugal fan	✓
	Fan (F-M1-3A)	11730 Lps @ 277.3 Pa	1	Centrifugal fan	✓
	Fan (F-M1-3B)	10661 Lps @ 403.7 Pa	1		✓

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1.3.1.6-Work Parcel 1- List of HVAC Equipment

Faculty Of Medicine-(Bldg.M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-M1-5)	7468 Lps @ 344 Pa	1	Centrifugal fan	✓
	Fan (F-M1-7)	5856 Lps @ 273.6 Pa	1	Centrifugal fan	✓
	Fan (F-M1-9)	157 Lps @ 62.8 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-27)	1590 Lps @ 152.2 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-35)	210 Lps @ 83.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-36)	2142 Lps @ 179.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-37)	390 Lps @ 93.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-38A)	137 Lps @ 61.9 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-38B)	137 Lps @ 60.3 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-38C)	130 Lps @ 59.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-39)	350 Lps @ 89.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-41)	2000 Lps @ 204.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-47A)	135 Lps @ 77.3 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-48)	130 Lps @ 30 Pa	1	Propeller	✓
	Fan (F-M1-48A)	1500 Lps @ 116.8 Pa	1	Fire rated smoke exhaust fan	✓
	Fan (F-M1-57)	390 Lps @ 65.9 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-58)	390 Lps @ 64.8 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-59)	390 Lps @ 58.5 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-60)	2025 Lps @ 130.5 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-61)	2471 Lps @ 158.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-63)	143 Lps @ 72.9 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-64)	400 CFM	1	In line Centrifugal fan	✓
	Fan(F-M1-65)	500 CFM	2	In line centrifugal type exhaust fan	✓

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1.3.1.6-Work Parcel 1- List of HVAC Equipment

Faculty Of Medicine-(Bldg.M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling	End Suction Pumps (P-M1-3)	39.41 Lps @ 32.66 m Head	3	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-M1-1)	15.75 Lps @ 33.77 m Head	3	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-M1-2)	14.1 Lps @ 13.59 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-M1-4)	15.72 Lps @ 9.36 m Head	2	Circulators for Hot Water Storage Tank	✓
	Hot Water Storage Tank (HWST M1-1)	4900 L	4	Vertical type hot water storage tank with 3.93 Lps flow	✓
	Expansion Tank (EX-M1-1)	1000 L	1	Expansion tank for heating system	✓
	Heat Exchanger (HEX-M1-1)	1465.57 Kw	1	Heat Exchanger Primary temperature	✓
Piping System & Insulation	Black Steel			20mm to 300mm DN	✓
	Galvanized Steel			16mm to 50mm DN	✓
	Fiber Glass insulation			15mm to 50 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves			50mm to 100mm DN	✓
	Balancing Valves			50 mm to 100mm DN	✓
	3 Way Valves				✓
	Globe Valves				✓

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1.3.1.6-Work Parcel 1- List of Plumbing Equipment

Faculty Of Medicine (Bldg. M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Laboratory Services	Air Compressors (AC-M1-1)	55 Lps @ 6.75 bar	1	Duplex type air compressors	✓
	Air Compressors (AC-M1-2)	46.7 Lps @ 6.55 bar	1	Duplex type air compressors	✓
	Vacuum Pump (VAC-M1-1)	65 Lps @ 716 mmHg	1	Duplex type vacuum pump	✓
	Vacuum Pump (VAC-M1-2)	40 Lps @ 549 mmHg	1	Duplex type vacuum pump	✓
Soft Water	Water Softener (WS-M1-1)	1 Lps	2	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L, serving water still	✓
	Water Softener (WS-M1-2-2)	0.5 Lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L, serving heating water system	✓
Domestic Hot Water	Water still (WD-M1.1-1)	14 Kw	1	Electric type water still	✓
	Circulator Pumps (P-M1-51)	2.1 Lps @ 16.7 m Head	2	Circulators for Hot Water Storage Tank	✓
Drainage	Pump (P-M1-52)	2.4 Lps @ 13 m Head	2	Submersible	✓
	Pump (P-M1-53)	2.4 Lps @ 13 m Head	2	Submersible	✓
Piping System & Insulation	PVC			20mm to 75mm DN	✓
	Copper			15 mm DN	✓
	Galvanized Steel			65mm to 100mm DN	✓
	HDPE			50mm to 250mm DN	✓
	BSP			25mm to 80mm DN	✓
Valves	Ball Valves			15mm to 40mm	✓
	Gate Valves			50 mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓

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1.3.1.6-Work Parcel 1- List of Plumbing Equipment

Faculty Of Medicine (Bldg. M1.1 & M1.2) - O & M Ref: 1.5.1 - Set 8 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Sanitary Fixtures & Accessories	Emergency Shower				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.1.7 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Dentistry (Bldg. M1.3 & M1.4) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-M1-17)	18 T.R	1	Variable Air Volume AHU with Supply air flow 4110 lps, External Static pressure 678.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-18)	44 T.R	1	Variable Air Volume AHU with Supply air flow 3075 lps, External Static pressure 393.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-19)	25 T.R	1	Constant Air Volume AHU with Supply air flow 5900 lps, External Static pressure 514.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-20)	17.5 T.R	1	Variable Air Volume AHU with Supply air flow 3000 lps, External Static pressure 352.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-21)	27 T.R	1	Variable Air Volume AHU with Supply air flow 6080 lps, External Static pressure 651.3 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-22)	19 T.R	1	Variable Air Volume AHU with Supply air flow 5150 lps, External Static pressure 547.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-25)	15 T.R	1	Constant Air Volume AHU with Supply air flow 2976 lps, External Static pressure 247.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-26)	27.5 T.R	1	Variable Air Volume AHU with Supply air flow 5800 lps, External Static pressure 658.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-27)	43 T.R	1	Variable Air Volume AHU with Supply air flow 11845 lps, External Static pressure 1014 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-28)	46 T.R	1	Variable Air Volume AHU with Supply air flow 10830 lps, External Static pressure 787.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-29)	9 T.R	1	Variable Air Volume AHU with Supply air flow 1554 lps, External Static pressure 760.9 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.7 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Dentistry (Bldg. M1.3 & M1.4) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-M1-30)	39 T.R	1	Variable Air Volume AHU with Supply air flow 8335 lps, External Static pressure 808.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-31)	17 T.R	1	Variable Air Volume AHU with Supply air flow 3000 lps, External Static pressure 401.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-32)	15 T.R	1	Constant Air Volume AHU with Supply air flow 3470 lps, External Static pressure 418.7 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-33)	12 T.R	1	Constant Air Volume AHU with Supply air flow 4330 lps, External Static pressure 444.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-33A)	6 T.R	1	Constant Air Volume AHU with Supply air flow 1605 lps, External Static pressure 216.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-34)		1	Constant Air Volume AHU with Supply air flow 2300 lps, External Static pressure 203.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-36)		1	Constant Air Volume AHU with Supply air flow 1830 lps, External Static pressure 177.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-37)	12 T.R	1	Constant Air Volume AHU with Supply air flow 1300 lps, External Static pressure 213.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-38)	28.5 T.R	1	Variable Air Volume AHU with Supply air flow 6195 lps, External Static pressure 727.1 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M1-39)	27 T.R	1	Constant Air Volume AHU with Supply air flow 5960 lps, External Static pressure 647.9 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.7 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Dentistry (Bldg. M1.3 & M1.4) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	split unit	24000 btu/hr	2	YORK decorative wall type pump mode HLHA24FSA	✓
Ventilation	Fan (F-M1-1A)	3016 Lps @ 171.7 Pa	1	Centrifugal	✓
	Fan (F-M1-6)	14018 Lps @ 717.8 Pa	1	Centrifugal	✓
	Fan (F-M1-7A)	5478 Lps @ 282.5 Pa	1	Centrifugal	✓
	Fan (F-M1-8)	3468 Lps @ 197.8 Pa	1	Centrifugal	✓
	Fan (F-M1-10)	291 Lps @ 96.8 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-12)	870 Lps @ 132.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-13)	960 Lps @ 114.1 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-14)	270 Lps @ 87.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-15)	134 Lps @ 56 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-16)	3360 Lps @ 267.4 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-17)	716 Lps @ 92.1 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-18)	600 Lps @ 93.9 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-20)	1430 Lps @ 163.3 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-22)	1430 Lps @ 156.5 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-25)	488 Lps @ 82.2 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-25A)	870 Lps @ 131.2 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-27A)	1580 Lps @ 177.9 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-29)	166 Lps @ 56.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-30)	860 Lps @ 118.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-32)	600 Lps @ 84.7 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-33)	660 Lps @ 194.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-42)	1840 Lps @ 156 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-43)	1780 Lps @ 164.6 Pa	1	Roof supply type fan	✓
	Fan (F-M1-46)	565 Lps @ 96.2 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-47B)	900 Lps @ 144.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-54)	3000 Lps @ 822.4 Pa	1	Fire rated smoke exhaust fan	✓
	Fan (F-M1-55)	3000 Lps @ 545.9 Pa	1	Fire rated smoke exhaust fan	✓
	Fan (F-M-62)	151 Lps @ 67.6 Pa	1	Roof extractor type fan	✓
	Fan (F-M1-64)	3000 Lps @ 591.3 Pa	1	Fire rated smoke exhaust fan	✓
	Fan (F-M1-65)	1500 Lps @103.2 Pa	1	Fire rated smoke exhaust fan	✓
	Fan	250 CFM 0.5" of water head	1	Centrifugal	✓

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1.3.1.7 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Dentistry (Bldg. M1.3 & M1.4) - O & M Ref: 1.5.1 - Set 8 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Piping System & Insulation	Black Steel			20mm to 300mm DN	✓
	Galvanized Steel			16mm to 50mm DN	✓
	Fiber Glass insulation			15mm to 50 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
Ducting System & Insulation	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves			50mm to 100mm DN	✓
	Balancing Valves			50 mm to 100mm DN	✓
	3 Way Valves				✓
	Globe Valves				✓

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1.3.1.7-Work Parcel 1- List of Plumbing Equipment

Faculty Of Dentistry (Bldg. M1.3 & M1.4) - O & M Ref: 1.5.1 - Set 8 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Soft Water	Water Softener (WS-D-1)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
Domestic Hot Water	Electric Water Heater (EWH-D1-1)	100	1	3 KW Electric water heater	✓
	Electric Water Heater (EWH-D2-1)	100	2	3 KW Electric water heater	✓
Drainage	Pump (P-D-51)	1.6 Lps @ 10 m Head	2	Submersible	✓
	Pump (P-D-52)	2 Lps @ 10 m Head	2	Submersible	✓
Piping System & Insulation	PVC			20mm to 75mm DN	✓
	Copper			15 mm DN	✓
	Galvanized Steel			65mm to 100mm DN	✓
	HDPE			50mm to 250mm DN	✓
	BSP			25mm to 80mm DN	✓
Valves	Ball Valves			15mm to 40mm	✓
	Gate Valves			50 mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
	Emergency Shower				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.1.8 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set 10 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-Q-1)	13 T.R	1	Variable Air Volume AHU with Supply air flow 2390 lps, External Static pressure 1106 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-2)	19 T.R	1	Variable Air Volume AHU with Supply air flow 2300 lps, External Static pressure 858.9 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-3)	26 T.R	1	Variable Air Volume AHU with Supply air flow 4590 lps, External Static pressure 537 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-4)	18 T.R	1	Variable Air Volume AHU with Supply air flow 1875 lps, External Static pressure 747.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-5)	17.5 T.R	1	Variable Air Volume AHU with Supply air flow 1449 lps, External Static pressure 524.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-6)	26 T.R	1	Variable Air Volume AHU with Supply air flow 2165 lps, External Static pressure 529 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-7)	31 T.R	1	Variable Air Volume AHU with Supply air flow 3060 lps, External Static pressure 841.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-8)	36 T.R	1	Variable Air Volume AHU with Supply air flow 3590 lps, External Static pressure 701.2 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-9)	24 T.R	1	Variable Air Volume AHU with Supply air flow 2574 lps, External Static pressure 732.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-10)	21 T.R	1	Variable Air Volume AHU with Supply air flow 3420 lps, External Static pressure 1010 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-11)	20 T.R	1	Variable Air Volume AHU with Supply air flow 3655 lps, External Static pressure 713 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-12)	15 T.R	1	Variable Air Volume AHU with Supply air flow 3120 lps, External Static pressure 1308 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.8 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set 10 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-Q-13)	15.5 T.R	1	Variable Air Volume AHU with Supply air flow 2800 lps, External Static pressure 1127 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-14)	11.5 T.R	1	Variable Air Volume AHU with Supply air flow 1810 lps, External Static pressure 1066 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-15)	14.5 T.R	1	Variable Air Volume AHU with Supply air flow 2915 lps, External Static pressure 850.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-16)	22 T.R	1	Variable Air Volume AHU with Supply air flow 2330 lps, External Static pressure 983.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-17)	18 T.R	1	Variable Air Volume AHU with Supply air flow 2050 lps, External Static pressure 1137 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-18)	8 T.R	1	Variable Air Volume AHU with Supply air flow 1620 lps, External Static pressure 1077 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-19)	6 T.R	1	Variable Air Volume AHU with Supply air flow 815 lps, External Static pressure 960.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-20)	15 T.R	1	Variable Air Volume AHU with Supply air flow2205 lps, External Static pressure 713.3 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-21)	11.5 T.R	1	Constant Air Volume AHU with Supply air flow 2840 lps, External Static pressure 350.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-22)	22 T.R	1	Variable Air Volume AHU with Supply air flow 4380 lps, External Static pressure 750.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-23)	43 T.R	1	Variable Air Volume AHU with Supply air flow 8130 lps, External Static pressure 692 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-24)	33 T.R	1	Constant Air Volume AHU with Supply air flow 5100 lps, External Static pressure 1159 Pa, with 2 coils (heating / cooling)	✓

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1.3.1.8 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set 10 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-Q-26)	15 T.R	1	Variable Air Volume AHU with Supply air flow 2520 lps, External Static pressure 890.5 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-27)	17 T.R	1	Variable Air Volume AHU with Supply air flow 3135 lps, External Static pressure 1145 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-28)	17 T.R	1	Variable Air Volume AHU with Supply air flow 3285 lps, External Static pressure 1178 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-29)	9 T.R	1	Variable Air Volume AHU with Supply air flow 1600 lps, External Static pressure 786.8 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-30)	19 T.R	1	Variable Air Volume AHU with Supply air flow 3250 lps, External Static pressure 739.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-31)	16 T.R	1	Variable Air Volume AHU with Supply air flow 1355 lps, External Static pressure 510 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-Q-32)		1	Constant Air Volume AHU with Supply air flow 500 lps, External Static pressure 33.1 Pa, with 2 coils (heating / cooling)	✓
	Fan Coil Unit FCU-Q-3	3 T.R	1	Constant Air Volume FCU, Horizontal Type,with Supply air flow 610 Lps, External Static pressure 75 Pa, with 2 coils (heating/cooling)	✓
	Fan Coil Unit FCU-Q-4	1.5 T.R	1	Constant Air Volume FCU, Horizontal Type,with Supply air flow 371 Lps, External Static pressure 75 Pa, with 1 coil (heating/cooling)	✓
	split unit	1.86 KW R22	1	HAULING	✓
	split unit	3.5 KW	1	HAULING	✓
	split unit	5 KW	2	HAULING	✓
	split unit	12000 BTU/hr	1	YORK decorative wall type pump mode HLHA12FSA	✓
	split unit	18000 BTU/hr	11	O GENERAL	✓
	split unit	24000 BTU/hr	2	YORK decorative wall type pump mode HLHA24FSA	✓
	split unit	26000 BTU/hr	2	LG	✓
	split unit	26000 BTU/hr	1	MITSUBISHI	✓

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1.3.1.8 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set 10 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	split unit	35000 BTU/hr	1	MDV	✓
	split unit	36000 BTU/hr	1	YORK high wall decorative heat pump MCH36/BO0H36	✓
	split unit	60000 BTU/hr	2	MDV	✓
	FCU	4 Ton	3	Petra FCU 2 pipe , concealed duct type model CP18C3	✓
	FCU	3 Ton	1	Petra FCU 2 pipe , ceiling decorative type model RAC12GCC3	✓
	FCU	1.6 Ton	2	Petra FCU 2 pipe , ceiling decorative type model RAC5GCC3	✓
Ventilation	Fan (F-Q-01)	765 Lps @ 117 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-02)	1500 Lps @ 129 Pa	1	Smoke Exhaust fan	✓
	Fan (F-Q-03)	100 Lps @ 59 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-04)	620 Lps @ 93 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-05)	2550 Lps @ 122 Pa	1	Roof supply type fan	✓
	Fan (F-Q-06)	10215 Lps @ 279 Pa	1	Centrifugal type exhaust fan	✓
	Fan (F-Q-07)	780 Lps @ 144 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-08)	900 Lps @ 97 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-09)	3000 Lps @ 360 Pa	1	Smoke Exhaust fan	✓
	Fan (F-Q-10)	620 Lps @ 113.4 Pa	1	Roof extractor type exhaust fan	✓
	Fan (F-Q-11)	620 Lps @ 107 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-12)	3630 Lps @ 166 Pa	1	Roof supply type fan	✓
	Fan (F-Q-13)	3440 Lps @ 189 Pa	1	Roof supply type fan	✓
	Fan (F-Q-14)	920 Lps @ 119 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-15)	3052 Lps @ 178 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-16)	560 Lps @ 101 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-17)	160 Lps @ 68 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-18)	160 Lps @ 73 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-19)	4140 Lps @ 57 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-20)	320 Lps @ 82 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-21)	350 Lps @ 86 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-22)	1920 Lps @ 129 Pa	2	Roof extractor type fan	✓
	Fan (F-Q-23)	5000 Lps @ 234 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-24)	1310 Lps @ 109 Pa	1	Roof extractor type fan	✓

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1.3.1.8 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set 10 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan (F-Q-25)	1045 Lps @ 109 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-26)	1240 Lps @ 92 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-27)	1190 Lps @ 129 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-28)	1780 Lps @ 180 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-29)	990 Lps @ 85 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-30)	560 Lps @ 84 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-31)	710 Lps @ 83 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-32)	2925 Lps @156 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-33)	1275 Lps @ 100 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-34)	615 Lps @ 102 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-35)	875 Lps @ 125 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-35S)	1500 Lps @ 180 Pa	1	Smoke Exhaust fan	✓
	Fan (F-Q-36)	288 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-Q-37)	288 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-Q-38)	288 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-Q-39)	3000 Lps @ 446 Pa	1	Smoke Exhaust fan	✓
	Fan (F-Q-40)	444 Lps @ 53 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-41)	3000 Lps @ 382 Pa	1	Smoke Exhaust fan	✓
	Fan (F-Q-42)	960 Lps @ 77 Pa	1	Roof extractor type fan	✓
	Fan (F-Q-43)	288 Lps @ 25 Pa	1	Propeller	✓
	Fan (F-Q-2TP)	497 Lps @ 40 Pa	1	Propeller	✓
Cooling	End Suction Pumps (P-Q-1)	53.8 Lps @ 20.5 m Head	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-Q-2)	21 Lps @ 20.5 m Head	2	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-Q-3)	9.35 Lps @ 14.4 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-Q-4)	8.25 Lps @11.7 m	2	Circulators for Hot water storage tank	✓
	Expansion Tank (EX-Q-1)	750 Lps	1	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST-Q-1)	4500 L	3	Vertical Type Hot Water Storage Tank of 2.75 Lps flow	✓
	Heat Exchanger (HEX-Q-1)	488.3 KW	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			16mm to 200mm DN	✓
	Galvanized Steel			32 mm DN	✓
	Fiber Glass insulation			15mm to 50 mm thickness	✓

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1.3.1.8 - Work Parcel 1 - List of HVAC Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set 10 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓

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1.3.1.8 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set: 10 / Div: 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Laboratory Services	Air Compressor (AC-PH-1)	46.7 Lps @ 8 bar	1	Duplex type air compressor	✓
	Vacuum pump (VAC-PH-1)	44.7 lps @ 635 mm HG	1	Duplex type vacuum pump	✓
Soft Water	Water Softener (WS-PH-1)	0.5 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
	Water Softener (WS-PH-2)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
Domestic Hot Water	Circulator pumps (P-PH-52)	0.65 lps @ 14 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Distilled Water	Water Still (WD-PH-1)	14 KW	1	Electric type water still	✓
	Booster pumps	25 Gpm, 41.5 m Head	1	Booster pumps for distilled water system	✓
Drainage	P-H-53	1.26 Lps @6.1 Mwg	2	Submersible Pumps	✓
	P-H-54	1.26 Lps @6.1 Mwg	2	Submersible Pumps	✓
	P-H-55	1.26 Lps @6.1 Mwg	2	Submersible Pumps	✓
	P-H-56	1.96 Lps @ 8.5 Mwg	2	Submersible Pumps	✓
Piping System & Insulation	PVC			16mm to 75mm DN	✓
	Copper			15mm to 42 mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 50mm DN	✓
	HDPE			50mm to 315mm DN	✓
	BSP			15mm to 80mm DN	✓
	Fiber Glass Insulation			25mm thickness	✓
Valves	Ball Valves		76	15mm to 50mm	✓
	Globe Valves		12	15mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓

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1.3.1.8 - Work Parcel 1 - List of Plumbing Equipment

Faculty Of Public Health (Bldg. Q) - O & M Ref: 1.5.1 - Set: 10 / Div: 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Sanitary Fixtures & Accessories	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
	Emergency Shower				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.1.9 Work Parcel 1 - List of HVAC Equipment

Faculty of Science/Library/Old Cafeteria

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling / Heating	Split Unit	22000 BTU/hr	2	Haier	✓
	Split Unit	12000 BTU/hr	40	Mitsuko	✓
	Split Unit	12000 BTU/hr	4	LG	✓
	Split Unit	9000 BTU/hr	2	Haier	✓
	Split Unit	12000 BTU/hr	44	Goblen	✓
	Split Unit	24000 BTU/hr	1	Ameri-cool	✓
	Split Unit	30000 BTU/hr	2	Ameri-cool	✓
	Split Unit	24000 BTU/hr	1	O-General	✓
	Split Unit	18000 BTU/hr	1	Air Cool	✓
	Split Unit	12000 BTU/hr	1	Hanover	✓
	Split Unit	12000 BTU/hr	5	Air Cool	✓
	Split Unit	12000 BTU/hr	1	Hi-General	✓
	Split Unit	12000 BTU/hr	3	Haier	✓
	Split Unit	12000 BTU/hr	25	Samsung	✓
	Split Unit	12000 BTU/hr	5	O-General	✓
	Split Unit	24000 BTU/hr	17	LG	✓
	Split Unit	12000 BTU/hr	4	Galanz	✓
	Split Unit	12000 BTU/hr	2	Maytag	✓
	Split Unit	44000 BTU/hr	8	Goblen	✓
	Split Unit	18000 BTU/hr	2	Clima Smart	✓
	Split Unit	18000 BTU/hr	8	Ameri-cool	✓
	Split Unit	30000 BTU/hr	4	Air Cool	✓
	Split Unit	24000 BTU/hr	1	Air Cool	✓
	Split Unit	24000 BTU/hr	33	A-General	✓
	Split Unit	24000 BTU/hr	4	O-General	✓
	Split Unit	12000 BTU/hr	1	A-General	✓

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1.3.1.9 Work Parcel 1 - List of HVAC Equipment

Faculty of Science/Library/Old Cafeteria

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Cooling/ Heating	Split Unit	24000 BTU/hr	4	Rolls	✓
	Split Unit	18000 BTU/hr	20	Rolls	✓
	Split Unit	12000 BTU/hr	4	Rolls	✓
	Split Unit	12000 BTU/hr	2	Carrier	✓
	Dx-Split Unit	180000 Btu/hr	8	Ameri-cool	✓
	Cold ROOM/block A-5F-2 Coils	3 Hp/2.2 Kw	1	Dorin model:K30GS-01-R-22	✘
	Air Handling Unit (AHU)/Library-Roof	1000000 BTU/hr	1	Weather-Mate Constant Air Volume AHU with one coil (Cooling/Heating)	✓
	Air Cooled Chiller/Library-Roof	80 TR	1	Weather-Mate	✓

Ventilation	Fan block A & C	900 m3/hr	8	Propeller Wall Axial Fan	✓
	Fan block A Attic	400 CFM	66	Centrifugal Exhaust Fan	✓
	Fan block A Attic	900 CFM	30	Centrifugal Exhaust Fan	✓
	Fan block A & B Roof	600 CFM	3	Roof Exhaust type Fan	✓
	Fan Library-GF	600 CFM	3	Propeller Wall Axial Fan	✓
	Fan # 1 Library-4 BAS	15230 m3/hr	1	Centrifugal Fan	✓
	Fan # 2 Library-4 BAS	22542 m3/hr	1	Centrifugal Fan	✓
	Fan # 3 Library-4 BAS	123733 m3/hr	1	Centrifugal Fan	✓
	Fan # 4 Library-2R	13500 m3/hr	1	Centrifugal Fan	✓
	Fan # 8 block A-2R	11000 m3/hr	1	Centrifugal Fan	✓
	Fan # 6 block A-2R	900 CFM	1	Centrifugal Fan	✓
	Fan # 7 block A-2R	2400 CFM	1	Tubeaxial Fan	✓
	Fan # 9 block A-2R	2900 CFM	1	Axial Fan	✓
	Fan # 2 block A-2R	7000 CFM	1	Centrifugal Fan	✓
	Fan # 3 block A-1Bas	6000 CFM	1	Centrifugal Fan	✓

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1.3.1.9 Work Parcel 1 - List of HVAC Equipment

Faculty of Science/Library/Old Cafeteria

System	Equipment	Capacity	Qty	Technical Description	Maintenance Instruction Provided in O&M Manuals Listed in Appendix 1.5.1
Ventilation	Fan # 1&2 block A-1Bas-Kn	900 CFM	4	Propeller Wall Axial Fan	✓
	Fan # 10 block A-Attic-Lift Room	9000 CFM	1	Centrifugal Fan	✓
	Fan #1,2,& 3-block B-GF	600 CFM	3	Exhaust Wall Axial Fan	✓
	Fan # 4-block C-5BAS	600 CFM	1	Exhaust Wall Axial Fan	✓
	Fan # 1-Cafeteria-Attic	4000 CFM	1	Exhaust Inline Fan	✓
	Fan # 2-Cafeteria-Attic	35000 CFM	1	Fresh Inline Fan	✓
	Fan # 3-Cafeteria-Attic	40000 CFM	1	Exhaust Inline Fan	✓
	Fan # 4-Cafeteria-Attic	6000 CFM	1	Exhaust Inline Fan	✓
	Fan # 5 block A-2R	11500 CFM	1	Centrifugal Fan	✓
	Fan # 3 block A-2R	11500 CFM	1	Centrifugal Fan	✓
	Fan # 11 block A-GF-EX	2500 CFM	1	Roof Exhaust type Fan	✓
	Fan # DSPN block A-GF-EX	2500 CFM	1	Roof Exhaust type Fan	✓
	Fan # 10 block A-3BAS	11500 CFM	1	Centrifugal Fan	✓
	Hood # 1 block A1-4F	2000 CFM	1	Exhaust Fan	✓

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1.3.1.9 - Work Parcel 1 - List of Plumbing Equipment

Faculty of Science , old cafeteria & Library

System	Equipment	Capacity	Qty	Technical Description	Level	Room No.	Maintenance Instruction Provided in Section 1.4.2
Soft Water				Not Applicable			N/A
Domestic Hot Water							N/A
				Not Applicable			N/A
Drainage	Pump	0.5 HP 3 AM	2	Submersible	Basement	Cafeteria	✓
Piping System & Insulation	Galvanized Steel			1/2" to 4" DM			✓
	Copper			15 mm DM			✓
	Cast Iron			2" to 12" DM			✓
	HDPE			50mm to 110mm DM			✓
Valves	Ball Valve			1/2" to 2" DM			✓
	Gate valve			1/2" to 5" DM			✓
Sanitary Fixtures & Accessories	Drinking Fountains			Not Applicable			N/A
	Lavatories*		239				✓
	EWC(European Water Closet)**		193				✓
	AWC(Asiatic Water Closet)**		9				✓
	Urinals**		110				✓
	6KG Powder Fire Extinguishers		196				✓
	4.5KG CO2 Fire Extinguishers		11				✓
	9Liter H2O Fire Extinguishers		3				✓
	Showers*			Not Applicable			N/A
	Hand Dryers			Not Applicable			N/A
	Liquid Soap Dispensers			Not Applicable			N/A
	Paper Towel Dispensers			Not Applicable			N/A
	Fire Hose Real		33				✓
	Mixer for Sink		10				✓
	Mixer for Sink in Laboratory		220				✓

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Work Parcel 1: Mechanical Works

1.3.1.10 Variable Air Volumes Schedule

Bldg		VAV-1	VAV-2	VAV-3	VAV-4	VAV-5	VAV-6	Total
Fine arts institute	**B**	0	2	5	15	11	0	**33**
Faculty of law, political sciences and adminitratio	**D**	0	19	64	12	15	4	**114**
Faculty of pharmacy	**H**	1	22	16	12	4	9	**64**
Extention of the faculty of sciences	**J**	0	14	0	23	5	0	**42**
Faculty of medical sciences	**M1**	0	16	38	54	13	15	**136**
Faculty of dentistry	**M2**	0	1	5	3	11	0	**20**
Faculty of public	**Q**	3	12	15	52	13	6	**101**
Technical building	**T2-T3**	0	0	0	10	1	0	**11**
Industrial research institute	**Y**	0	8	5	16	5	0	**34**
Total		**4**	**94**	**148**	**197**	**78**	**34**	**555**

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Work Parcel 1: Mechanical Works

1.3.1.11 Table of Sanitary Fixtures and Fire Extinguishers

Description	Qty.
Drinking Fountains	**166**
Lavatories*	**857**
EWC(European Water Closet)**	**531**
AWC(Asiatic Water Closet)**	**250**
Urinals**	**341**
Fire Extinguishers FE-1	**1289**
Fire Extinguishers FE-2	**492**
Fire Extinguishers FE-3	**109**
Showers*	**143**
Hand Dryers	**330**
Liquid Soap Dispensers	**314**
Paper Towel Dispensers	**360**

*:Complete with all related accessories,angle valves,mixers and taps

**:Complete with all related accessories,flush valves/tanks

N.B: This list exludes FOS sanitary fixtures and fire extinguishers

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1.3.2.1 - Work Parcel 1 - List of HVAC Equipment

Conference Center (Bldg.F) - O & M Ref:1.5.1 - Set 4 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-F-1)	58 T.R	1	Constant Air Volume AHU with Supply air flow 10380 lps, External Static pressure 208 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-F-2)	57 T.R	2	Constant Air Volume AHU with Supply air flow 6780 lps, External Static pressure 200 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-F-3)	48 T.R	1	Constant Air Volume AHU with Supply air flow 9150 lps, External Static pressure 248 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-F-4)	31 T.R	1	Constant Air Volume AHU with Supply air flow 4970 lps, External Static pressure 216 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-F-5)	58 T.R	1	Constant Air Volume AHU with Supply air flow 10577 lps, External Static pressure 214 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-F-6)	62 T.R	1	Constant Air Volume AHU with Supply air flow 9696 lps, External Static pressure 285 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-F-7)	60 T.R	1	Constant Air Volume AHU with Supply air flow 9900 lps, External Static pressure 252 Pa, with 2 coils (heating / cooling)	✓
	split unit	24000 BTU/hr	1	York decorative wall type pump mode HLHA24FSA	✓
Ventilation	F-F-1	11830 Lps @ 235 Pa	1	Centrifugal fan	✓
	F-F-2	3600 Lps @ 134 Pa	1	In Line Centrifugal fan	✓
	F-F-3	2470 Lps @ 137 Pa	1	In Line Centrifugal fan	✓
	F-F-4	2080 Lps @ 125 Pa	1	In Line Centrifugal fan	✓
	F-F-5	2080 Lps @ 101 Pa	1	In Line Centrifugal fan	✓
	F-F-6	4085 Lps @ 202 Pa	1	In Line Centrifugal fan	✓
	F-F-7	357 Lps @ 40 Pa	1	Propeller Fan	✓
	F-F-8	63 Lps @ 45 Pa	1	Propeller Fan	✓
	F-F-9	855 Lps @ 71 Pa	1	Roof type fan	✓
	F-F-10	90 Lps @ 57 Pa	1	Roof type fan	✓

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1.3.2.1 - Work Parcel 1 - List of HVAC Equipment

Conference Center (Bldg.F) - O & M Ref:1.5.1 - Set 4 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-F-11	1655 Lps @ 118 Pa	1	Roof type fan	✓
	F-F-12	1110 Lps @ 101 Pa	1	Roof type fan	✓
	F-F-13	939 Lps @ 100 Pa	1	Roof type fan	✓
	F-F-14	1287 Lps @ 109 Pa	1	Roof type fan	✓
	F-F-15	2400 Lps @ 150 Pa	1	Centrifugal fan	✓
	F-F-16	1252 Lps @ 143 Pa	1	Roof type fan	✓
	F-F-17	5915 Lps @ 111 Pa	1	Fire rated centrifugal fan	✓
	F-F-18	2000 Lps @ 137 Pa	1	Centrifugal fan	✓
	F-F-19	2250 Lps @ 118 Pa	1	Centrifugal fan	✓
	F-F-20	850 Lps @ 99 Pa	1	Centrifugal fan	✓
	F-F-21	380 Lps @ 110 Pa	1	Centrifugal fan	✓
	F-F-22	5915 Lps @ 134 Pa	1	Fire rated centrifugal fan	✓
	F-F-23	2250 Lps @ 137 Pa	1	Centrifugal fan	✓
	F-F-24	6597 Lps @ 169 Pa	1	Centrifugal fan	✓
	F-F-25	660 Lps @ 119 Pa	1	Roof type fan	✓
	F-F-26	350 Lps @ 76 Pa	1	Roof type fan	✓
	F-F-27	70 Lps @ 40 Pa	1	Propeller Fan	✓
	F-F-28	70 Lps @ 40 Pa	1	Propeller Fan	✓

Cooling	End Suction Pumps (P-F-1)	42.8 Lps @ 21 m Head	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-F-2)	18.5 Lps @ 18	2	End suction centrifugal secondary hot	✓
	Circulator Pumps (P-F-3)	8.24 Lps @ 16 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-F-4)	0.5 Lps @ 10 m Head	2	Circulators for Hot water storage tank	✓
	Expansion Tank (EX-F-1)	300 Lps	1	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST-F-1)	1500 Liter	1	Horizontal Type Hot Water Storage Tank of 0.5 Lps flow	✓
	Heat Exchanger (HEX-F-1)	862 Kw	1	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60	✓

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1.3.2.1 - Work Parcel 1 - List of HVAC Equipment

Conference Center (Bldg.F) - O & M Ref:1.5.1 - Set 4 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Piping System & Insulation	Black Steel	–	–	25mm to 160mm DN	✓
	Galvanized Steel	–	–	20mm to 50mm DN	✓
	Fiber Glass insulation	_	_	15mm to 65 mm thickness	✓
Ducting System & Insulation	Galvanized steel ducts- Medium Pressure	–	–	Gauge thickness-	✓
	Galvanized steel ducts- Low Pressure	–	–	Gauge thickness-	✓
	Fiber Glass insulation	_	_	Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	
	VAV-4	665-1040 Lps		With Thermostat	
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	
Valves	Gate Valves	_	_	125mm	✓
	Balancing Valves (Double regulating valve)	_	_	40mm to 50mm	✓
	Ball Valves	_	_	50mm	✓

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1.3.2.1-Work Parcel 1- List of Plumbing Equipment

Conference Center (Bldg.F) - O & M Ref: 1.5.1 - Set 4 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Soft Water	Water Softener (WS-F-1)	0.5 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
Hot Water	Circulator pumps (P-F-51)	0.13 lps @ 20 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Drainage	Submersible Pump (P-F-52)	3.5 lps @ 8 m head	2	One acting as standby	✓
	Submersible Pump (P-F-53)	2.3 lps @ 9 m head	2	One acting as standby	✓
	Submersible Pump (P-F-54)	0.3 lps @ 7 m head	2	One acting as standby	✓
Piping System & Insulation	PVC	_	_	16mm to 50mm DN	✓
	Copper	_	_	15mm to 54 mm DN	✓
	Cast Iron	_	_	75mm to 110mm DN	✓
	Polypropylene	_	_	50mm to 110mm DN	✓
	Galvanized Steel	_	_	20mm to 80mm DN	✓
	HDPE	_	_	50mm to 200mm DN	✓
	BSP	_	_	15mm to 42mm DN	✓
	Fiber Glass Insulation	_	_	25mm to 67mm thickness	✓
Valves	Ball Valves	_	21	15mm to 50mm	✓
	Gate Valves	_	5	65mm to 110mm	✓
	Globe Valves	_	2	15mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain	_	3	_	✓
	Lavatory Mixer LAV-1	_	13	_	✓
	Lavatory Tap LAV-2	_	33	_	✓
	Lavatory Mixer LAV-3	_	2	_	✓
	Sink Mixer	_	_	_	✓
	Sink Tap	_	_	_	✓
	Mop Sink Tap	_	2	_	✓
	Shower Mixers (SH-1)	_	7	_	✓
	Bib Cock Perineal Hose	_	6	_	✓
	Angle Valves/Flexibles	_	63	_	✓
	WC Flush Valves	_	41	_	✓
	Urinal Flush Valves	_	10	_	✓
	Flush Tanks	_	2	_	✓
	Hand Dryers	_	16	S/S Hand Dryers	✓
	Liquid Soap Dispensers	_	30	S/S Liquid Soap Dispensers with lock key	✓
	Paper Towel Dispenser	_	18	S/S Paper Towel Dispenser with lock key	✓

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1.3.2.2 - Work Parcel 1 - List of HVAC Equipment

Sport Complex (Bldg K) - O & M Ref: 1.5.1 - Set 7 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-K1-1	550 Lps @ 92 Pa	2	In Line Centrifugal fan	✓
	F-K1-2	288 Lps @ 25 Pa	2	Propeller	✓
	F-K1-3	1310 Lps @ 126 Pa	1	In Line Centrifugal fan	✓
	F-K1-4	1250 Lps @ 165 Pa	1	In Line Centrifugal fan	✓
	F-K1-5	288 Lps @ 25 Pa	1	Propeller Fan	✓
	F-K1-6	180 Lps @ 64 Pa	1	In Line Centrifugal fan	✓
	F-K1-7	126 Lps @ 20 Pa	1	Propeller	✓
	F-K1-8	687 Lps @ 30 Pa	1	Propeller	✓
	F-K1-9	126 Lps @ 20 Pa	1	Propeller	✓
	F-K1-10	288 Lps @ 25 Pa	1	Propeller	✓
	F-K1-11	167 Lps @ 20 Pa	1	Propeller	✓
	F-K2-1A	720 Lps @ 96 Pa	1	In Line Centrifugal fan	✓
	F-K2-1B	960 Lps @ 98 Pa	1	In Line Centrifugal fan	✓
	F-K2-2	167 Lps @ 20 Pa	1	Propeller	✓
	F-K2-3	1175 Lps @ 102 Pa	1	In Line Centrifugal fan	✓
	F-K2-4	1075 Lps @ 106 Pa	1	In Line Centrifugal fan	✓
	F-K2-5	555 Lps @ 25 Pa	1	Propeller	✓
	F-K2-6	687 Lps @ 30 Pa	1	Propeller	✓
	F-K2-7	81 Lps @ 20 Pa	1	Propeller	✓
	F-K2-8	126 Lps @ 20 Pa	1	Propeller	✓
	F-K2-9	288 Lps @ 25 Pa	1	Propeller	✓
	F-K3-1	4800 Lps @ 104 Pa	1	In Line Centrifugal fan	✓
	F-K3-2	4400 Lps @ 108 Pa	1	In Line Centrifugal fan	✓
	F-K3-3	400 Lps @ 66 Pa	1	In Line Centrifugal fan	✓
	F-K3-4	1260 Lps @ 140 Pa	1	In Line Centrifugal fan	✓
	F-K3-5	630 Lps @ 78 Pa	1	Roof type fan	✓
	F-K3-6	1530 Lps @ 100 Pa	1	Roof type fan	✓
	F-K3-7	630 Lps @ 78 Pa	1	Roof type fan	✓

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1.3.2.2 - Work Parcel 1 - List of HVAC Equipment

Sport Complex (Bldg K) - O & M Ref: 1.5.1 - Set 7 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-K3-8	1530 Lps @ 100 Pa	1	Roof type fan	✓
	F-K3-9	222 Lps @ 62 Pa	1	Roof type fan	✓
Cooling/Heating	Split Unit-K1	24000 BTU/hr	1	MDV	✓
	Split Unit-K2	24000 BTU/hr	1	YORK decorative wall type pump mode HLHA24FSA	✓
	Split Unit-K2	18000 BTU/hr	1	MDV	✓
	Split Unit-K3	24000 BTU/hr	1	MITSUBISHI	✓
	DX Unit-K3	12000 BTU/hr	1	O-GENERAL	✓
Heating	Circulator Pumps (P-K1-1)	1.4 Lps @ 10 m Head	2	Circulators for Hot water storage tank	✓
	Circulator Pumps (P-K2-1)	1.4 Lps @ 8 m Head	2	Circulators for Hot water storage tank	✓
	Circulator Pumps (P-K3-1)	2.8 Lps @ 12 m Head	2	Circulators for Hot water storage tank	✓
	Hot Water Storage Tank (HWST-K1-1)	1900 Liter	1	Vertical Type Hot Water Storage Tank of 1.4 Lps flow	✓
	Hot Water Storage Tank (HWST-K2-1)	1900 Liter	1	Horizontal Type Hot Water Storage Tank of 1.4 Lps flow	✓
	Hot Water Storage Tank (HWST-K3-1)	3800 Liter	1	Vertical Type Hot Water Storage Tank of 2.8 Lps flow	✓
Piping System & Insulation	Black Steel	_	_	Dia 25mm to Dia 160mm	✓
	Galvanized Steel	_	_	Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation	_	_	15mm to 65 mm thickness	✓
Ducting System & Insulation	Galvanized steel ducts- Medium Pressure	_	_	Gauge thickness-	✓
	Galvanized steel ducts- Low Pressure	_	_	Gauge thickness-	✓
Valves	Gate Valves	_	_	50mm	✓
	Balancing Valves (Double regulating valve)	_	_	40mm to 50mm	✓
	Globe Valves	_	_		✓
	Ball Valves	_	_	40mm	✓

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1.3.2.2-Work Parcel 1- List of Plumbing Equipment

Sport Complex (Bldg K) - O & M Ref: 1.5.1 - Set 7 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Domestic Hot Water	EWH-K32-1	100 Liter	1	Electric Water heater 3000 W	✓
Hot Water	Circulator pumps (P-K1-51)	0.26 lps @ 11 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
	Circulator pumps (P-K2-52)	0.26 lps @ 11 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
	Circulator pumps (P-K32-54)	0.38 lps @ 11 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Drainage	Submersible Pump (P-K32-51)	6.3 lps @ 9 m head	2	One acting as standby	✓
	Submersible Pump (P-K32-52)	6.3 lps @ 9 m head	2	One acting as standby	✓
	Submersible Pump (P-K32-53)	6.3 lps @ 9 m head	2	One acting as standby	✓
	Submersible Pump (P-K31-56)	4.5 lps @ 9 m head	2	One acting as standby	✓
Piping System & Insulation	PVC	_	_	16mm to 50mm DN	✓
	Copper	_	_	15mm to 54 mm DN	✓
	Cast Iron	_	_	75mm to 110mm DN	✓
	Polypropylene	_	_	50mm to 110mm DN	✓
	Galvanized Steel	_	_	20mm to 80mm DN	✓
	HDPE	_	_	50mm to 200mm DN	✓
	Black steel pipes	_	_	15mm to 42mm DN	✓
	Fiber Glass Insulation	_	_	25mm to 67mm thickness	✓
Valves	Ball Valves	–	–	15mm to 40mm	✓
	Gate Valves	–	–	50mm to 250mm	✓
	Globe Valves	–	–	20mm to 25mm	✓
	Pressure Reducing Valve (PRV-K3)	62 L/s	1	4" pressure reducing valve	✓
Sanitary Fixtures & Accessories	Drinking Fountain	_	7	_	✓
	Lavatory Mixer LAV-1	_	15	_	✓
	Lavatory Tap LAV-2	_	55	_	✓
	Lavatory Mixer LAV-3	_	10	_	✓
	Mop Sink Tap	_	5	_	✓
	Shower Mixers (SH-1)	_	11	_	✓
	Shower Mixers (SH-2)	_	61	_	✓
	Bib Cock Perineal Hose	_	14	_	✓
	Angle Valves/Flexibles	_	105	_	✓
	WC Flush Valves	_	57	_	✓
	Urinal Flush Valves	_	23	_	✓
	Flush Tanks	_	10	_	✓

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1.3.2.2-Work Parcel 1- List of Plumbing Equipment

Sport Complex (Bldg K) - O & M Ref: 1.5.1 - Set 7 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
	Hand Dryers	_	14	S/S Hand Dryers	✓
	Liquid Soap Dispensers	_	57	Liquid Soap Dispensers with lock	✓
	Paper Towel Dispenser	_	25	Paper Towel Dispenser with lock	✓

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1.3.2.3 - Work Parcel 1 - List of HVAC Equipment

Library of Medical Sciences-(Bldg.M2) - O & M Ref: 1.5.1 - Set 9 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-M2-1)	23 T.R	1	Variable Air Volume AHU with Supply air flow 3580 lps, External Static pressure 811.3 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M2-2)	21 T.R	1	Variable Air Volume AHU with Supply air flow 2920 lps, External Static pressure 656 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M2-3)	51 T.R	1	Variable Air Volume AHU with Supply air flow 6372 lps, External Static pressure 993.6 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-M2-4)	43 T.R	1	Variable Air Volume AHU with Supply air flow 5016 lps, External Static pressure 928.5 Pa, with 2 coils (heating / cooling)	✓
Ventilation	Fan (F-M2-1)	450 Lps @ 100.1 Pa	1	Roof exhaust fan	✓
	Fan (F-M2-2)	6370 Lps @ 198.1 Pa	1	Exhaust centrifugal fan	✓
	Fan (F-M2-3)	910 Lps @ 103.6 Pa	1	Roof exhaust fan	✓
	Fan (F-M2-4)	105 Lps @ 59.5 Pa	1	Roof exhaust fan	✓
	Fan (F-M2-5)	247 Lps @ 69.1 Pa	2	Propeller	✓
	Fan (F-M2-6)	2495 Lps @ 392.6 Pa	1	Smoke exhaust fan	✓
Cooling	End Suction Pumps (P-M2-2)	13.37 Lps @ 21.04 m Head	2	End suction centrifugal secondary chilled water pump	✓

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1.3.2.3 - Work Parcel 1 - List of HVAC Equipment

Library of Medical Sciences-(Bldg.M2) - O & M Ref: 1.5.1 - Set 9 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Heating	End Suction Pumps (P-M2-1)	5 Lps @ 18.07 m Head	2	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-M2-3)	2.22 Lps @ 13.91 m Head	2	Circulators for Heat exchanger	✓
	Expansion Tank (EX-M2-1)	250 L	1	Expansion tank for heating system	✓
	Heat Exchanger (HEX-M2-1)	234.47 Kw	1	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			20mm to 300mm DN	✓
	Galvanized Steel			16mm to 50mm DN	✓
	Fiber Glass insulation			15mm to 50 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
Ducting System & Insulation	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves			50mm to 100mm DN	✓
	Balancing Valves			50 mm to 100mm DN	✓
	3 Way Valves				✓
	Globe Valves				✓

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1.3.2.3 - Work Parcel 1 - List of Plumbing Equipment

Library of Medical Sciences-(Bldg.M2) - O & M Ref: 1.5.1 - Set 9 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Soft Water	Water Softener (WS-M2-1)	0.5 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
Drainage	Pump (P-M2-51)	1.1 Lps @ 10 m Head	2	Submersible	✓
Piping System & Insulation	PVC			20mm to 75mm DN	✓
	Galvanized Steel			65mm to 100mm DN	✓
	HDPE			50mm to 250mm DN	✓
	BSP			25mm to 80mm DN	✓
Valves	Ball Valves			15mm to 40mm	✓
	Gate Valves			50 mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Mop Sink Tap				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Water Hammer Arrestor				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-R1-01)	42 T.R	1	Constant Air Volume AHU with Supply air flow 5707 lps, External Static pressure 242 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-02)	18.7 T.R	1	Constant Air Volume AHU with Supply air flow 3721 lps, External Static pressure 384 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-03)	25 T.R	1	Constant Air Volume AHU with Supply air flow 2332 lps, External Static pressure 183 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-03A)	40 T.R	1	Constant Air Volume AHU with Supply air flow 5479 lps, External Static pressure 426 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-03B)	10 T.R	1	Constant Air Volume AHU with Supply air flow 1431 lps, External Static pressure 188 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-03C)	28 T.R	1	Constant Air Volume AHU with Supply air flow 3775 lps, External Static pressure 175 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-04A)	25 T.R	1	Constant Air Volume AHU with Supply air flow 3350 lps, External Static pressure 315 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-05)	12 T.R	1	Constant Air Volume AHU with Supply air flow 2000 lps, External Static pressure 129 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-07)	12 T.R	1	Constant Air Volume AHU with Supply air flow 1638 lps, External Static pressure 258 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-08)	21 T.R	1	Constant Air Volume AHU with Supply air flow 2823 lps, External Static pressure 246 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R1-09)	37 T.R	1	Constant Air Volume AHU with Supply air flow 4982 lps, External Static pressure 300 Pa, with 1 coil	✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Split Unit	10000 BTU/hr	2	CLIMA SMART	✓
	Split Unit	19000 BTU/hr	1	PETRA	✓
	Split Unit	24000 BTU/hr	1	PETRA	✓
	Split Unit	24000 BTU/hr	1	York high wall decorative heat pump model HLHA24FSA	✓
	Split Unit	32000 BTU/hr	1	York high wall decorative heat pump model MCH35/BOH35	✓
Ventilation	Air Handling Unit (AHU-R1-10)	48 T.R	1	Constant Air Volume AHU with Supply air flow 6538 lps, External Static pressure 290 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R2-9)	35 T.R	1	Constant Air Volume AHU with Supply air flow 4277 lps, External Static pressure 249.8 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R2-10)	56 T.R	1	Constant Air Volume AHU with Supply air flow 7116 lps, External Static pressure 395.7 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R2-11)	20 T.R	1	Constant Air Volume AHU with Supply air flow 2684 lps, External Static pressure 295.7 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-04)	0.75 T.R	61	Ceiling type FCU, 185 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-06)	1 T.R	523	Ceiling type FCU, 247 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-08)	1.5 T.R	93	Ceiling type FCU, 371 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-10)	2 T.R	20	Ceiling type FCU, 494 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
Ventilation	F-R1-1	250 Lps @ 74 Pa	1	Roof type fan	✓
	F-R1-2	204 Lps @ 75 Pa	1	Roof type fan	✓
	F-R1-3	670 Lps @ 96 Pa	1	Roof type fan	✓
	F-R1-4	385 Lps @ 65 Pa	1	Roof type fan	✓
	F-R1-5	560 Lps @ 175 Pa	1	Roof type fan	✓
	F-R1-11	225 Lps @ 100 Pa	1	Roof type fan	✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
	F-R1-12	114 Lps @ 90 Pa	1	Roof type fan	✓
	F-R1-14	1117 Lps @ 251 Pa	1	Inline Centrifugal fan	✓
	F-R1-15	2265 Lps @ 210 Pa	1	Inline Centrifugal fan	✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-R1-18	760 Lps @ 65 Pa	1	Upblast	✓
	F-R1-19	725 Lps @ 134 Pa	1	Roof type fan	✓
	F-R1-20	788 Lps @ 110 Pa	1	Roof type fan	✓
	F-R1-21	467 Lps @ 90 Pa	1	Roof type fan	✓
	F-R1-26	2155 Lps @ 111 Pa	1	Inline Centrifugal fan	✓
	F-R1-27	2575 Lps @ 147 Pa	1	Inline Centrifugal fan	✓
	F-R1-28	190 Lps @ 100 Pa	1	Roof type fan	✓
	F-R1-29	77 Lps @ 35 Pa	1	Propeller Fan	✓
	F-R1-32	548 Lps @ 100 Pa	1	Inline Centrifugal fan	✓
	F-R1-33	685 Lps @ 140 Pa	1	Roof type fan	✓
	F-R1-34	771 Lps @ 130 Pa	1	Roof type fan	✓
	F-R1-35	1298 Lps @ 180 Pa	1	Roof type fan	✓
	F-R1-36	1281 Lps @ 176 Pa	1	Roof type fan	✓
	F-R1-37	174 Lps @ 50 Pa	1	Roof type fan	✓
	F-R1-38	990 Lps @ 100 Pa	1	Roof type fan	✓
	F-R1-40	8044 Lps @ 152 Pa	1	Centrifugal fan	✓
	F-R1-41	4876 Lps @ 140 Pa	1	Centrifugal fan	✓
	F-R1-42	9024 Lps @ 365 Pa	1	Centrifugal fan	✓
	F-R1-43	10340 Lps @ 329 Pa	1	Centrifugal fan	✓
	F-R1-44	990 Lps @ 100 Pa	1	Inline Centrifugal fan	✓
	F-R1-U58	206 Lps @ 40 Pa	1	Propeller Fan	✓
	F-R1-LR62	206 Lps @ 40 Pa	1	Propeller Fan	✓
	F-R2-1	1098 Lps @ 170 Pa	1	Roof type fan	✓
	F-R2-2	475 Lps @ 90 Pa	1	Roof type fan	✓
	F-R2-3	560 Lps @ 71 Pa	1	Upblast	✓
	F-R2-4	926 Lps @ 136 Pa	1	Roof type fan	✓
	F-R2-5	1276 Lps @ 120 Pa	1	Roof type fan	✓
	F-R2-6	3070 Lps @ 80 Pa	1	Roof type fan	✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-R2-7	620 Lps @ 95 Pa	1	Roof type fan	✓
	F-R2-8	1500 Lps @ 130 Pa	1	Roof type fan	✓
	F-R2-10	250 Lps @ 50 Pa	1	Upblast	✓
	F-R2-11	78 Lps @ 35 Pa	1	Roof type fan	✓
	F-R2-12	495 Lps @ 150 Pa	1	Inline Centrifugal fan	✓
	F-R2-13	1855 Lps @ 160 Pa	1	Inline Centrifugal fan	✓
	F-R2-14	4070 Lps @ 115 Pa	1	Inline Centrifugal fan	✓
	F-R2-15	1575 Lps @ 140 Pa	1	Inline Centrifugal fan	✓
	F-R2-17	520 Lps @ 160 Pa	1	Inline Centrifugal fan	✓
	F-R2-18	1000 Lps @ 110 Pa	1	Inline Centrifugal fan	✓
	F-R2-19	625 Lps @ 100 Pa	1	Roof type fan	✓
	F-R2-20	206 Lps @ 40 Pa	1	Propeller Fan	✓
	F-R2-21	206 Lps @ 40 Pa	1	Propeller Fan	✓
	F-R3-1	2430 Lps @ 245 Pa	1	Roof type fan	✓
	F-R3-2	480 Lps @ 93 Pa	1	Roof type fan	✓
	F-R3-3	465 Lps @ 111 Pa	1	Roof type fan	✓
	F-R3-4	800 Lps @ 139 Pa	2	Upblast	✓
	F-R3-6	135 Lps @ 54 Pa	1	Upblast	✓
	F-R3-7	1310 Lps @ 130 Pa	1	Roof type fan	✓
	F-R3-8	475 Lps @ 97 Pa	1	Roof type fan	✓
	F-R3-9	1836 Lps @ 186 Pa	1	Roof type fan	✓
	F-R3-10	42 Lps @ 47 Pa	1	Roof type fan	✓
	F-R3-LR	154 Lps @ 50 Pa	1	Inline Centrifugal fan	✓
	F-R4-1	1060 Lps @ 140 Pa	1	Upblast	✓
	F-R4-2	1120 Lps @ 140 Pa	1	Roof type fan	✓
	F-R4-3	718 Lps @ 141 Pa	1	Roof type fan	✓
	F-R4-4	300 Lps @ 63 Pa	1	Roof type fan	✓
	F-R4-5	101 Lps @ 70 Pa	1	Roof type fan	✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-R4-6	2616 Lps @ 225 Pa	1	Roof type fan	✓
	F-R4-7	860 Lps @ 137 Pa	1	Upblast	✓
	F-R4-8	127 Lps @ 76 Pa	1	Roof type fan	✓
	F-R4-9	114 Lps @ 72 Pa	1	Roof type fan	✓
	F-R4-10	1121 Lps @ 136 Pa	1	Roof type fan	✓
	F-R4-11	63 Lps @ 45 Pa	1	Propeller Fan	✓
	F-R5-33	8360 Lps @ 80 Pa	2	Propeller Fan	✓
	F-R5-34	4165 Lps @ 75 Pa	2	Axial	✓
	Dehumidifier	500 W	1	Woods 2.4 A	✓
Cooling	End Suction Pumps (P-R1-1)	14.18 Lps @ 27 m Head	3	End suction centrifugal secondary chilled water pump	✓
	End Suction Pumps (P-R1-4)	17 Lps @ 26.5 m Head	3	End suction centrifugal secondary chilled water pump	✓
	End Suction Pumps (P-R1-7)	35.6 Lps @ 42.5 m Head	3	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-R1-2)	5.85 Lps @ 17.8 m Head	3	End suction centrifugal secondary hot water pump	✓
	End Suction Pumps (P-R1-5)	7 Lps @ 14.45 m Head	3	End suction centrifugal secondary hot water pump	✓
	End Suction Pumps (P-R1-8)	13 Lps @ 27.6 m Head	3	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-R1-3)	5.16 Lps @ 13.5 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-R1-6)	6.3 Lps @ 12.77 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-R1-9)	11.5 Lps @ 13 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-R1-10)	29.6 Lps @ 21.87 m Head	2	Circulators for Hot water storage tank	✓
	Expansion Tank (EX-R1-1A)	1000 Lps	2	Expansion tank for heating system	✓
	Expansion Tank (EX-R1-1B)	750 Lps	2	Expansion tank for heating system	✓
	Expansion Tank (EX-R1-1C)	1000 Lps	1	Expansion tank for heating system	✓
	Expansion Tank (EX-R1-1D)	1000 Lps	2	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST-R1-1)	4075 Liter	8	Vertical Type Hot Water Storage Tank of 3.68 Lps flow	✓
	Heat Exchanger (HEX-R1-1)	269 Kw	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓

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1.3.2.4 - Work Parcel 1 - List of HVAC Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Heating	Heat Exchanger (HEX-R1-2)	329 Kw	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
	Heat Exchanger (HEX-R1-3)	600 Kw	2	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Galvanized Steel			Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation			15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves			65mm to 250mm	✓
	Balancing Valves			40mm to 80mm	✗
	Globe valves			40mm to 80mm	✗
	Ball Valves			25mm to 50mm	✗

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1.3.2.4 - Work Parcel 1 - List of Plumbing Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Soft Water	Water Softener (WS-R01-1)	1 lps	3	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
Hot Water	Circulator pumps (P-R01-51)	9.97 lps @ 26.26 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Drainage	Submersible Pump (SP-R01-1)	4.3 lps @ 7 m head	2	One acting as standby	✓
	Submersible Pump (SP-R01-2)	1.26 lps @ 7 m head	2	One acting as standby	✓
	Submersible Pump (SP-R01-3)	4.3 lps @ 7 m head	2	One acting as standby	✓
	Submersible Pump (SP-R01-4)	4.3 lps @ 7 m head	2	One acting as standby	✓
	Submersible Pump (SP-R01-5)	4.3 lps @ 7 m head	2	One acting as standby	✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓
Valves	Ball Valves			20mm to 50mm	✓
	Gate Valves			65mm to 75mm	✓
	Globe Valves			15mm to 25mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Hand Dryers				✓

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1.3.2.4 - Work Parcel 1 - List of Plumbing Equipment

Male Dormitories (Bldg R01) - O & M Ref: 1.5.1 - Set 11 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.2.5 - Work Parcel 1 - List of HVAC Equipment

Female Dormitories (Bldg R02) - O & M Ref: 12 - Set 12 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-R2-01)	42 T.R	1	Constant Air Volume AHU with Supply air flow 5695 lps, External Static pressure 310 Pa, with 1 coil	✓
	Air Handling Unit (AHU-R2-02)	76 T.R	1	Constant Air Volume AHU with Supply air flow 10322 lps, External Static pressure 375 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-04)	0.75 T.R	1	Ceiling type FCU, 185 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-06)	1 T.R	308	Ceiling type FCU, 247 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-R-08)	1.5 T.R	24	Ceiling type FCU, 371 lps Supply air flow, External Static pressure 75 Pa, with 1 coil	✓
Ventilation	F-R6-1	1150 Lps @ 107 Pa	1	Inline Centrifugal fan	✓
	F-R6-2	1080 Lps @ 147 Pa	1	Inline Centrifugal fan	✓
	F-R6-3	265 Lps @ 68 Pa	1	Roof extractor type fan	✓
	F-R6-4	124 Lps @ 64 Pa	1	Roof extractor type fan	✓
	F-R6-5	940 Lps @ 154 Pa	2	Upblast centrifugal fan	✓
	F-R6-6	2086 Lps @ 148 Pa	1	Roof extractor type fan	✓
	F-R6-7	1495 Lps @ 149 Pa	1	Roof extractor type fan	✓
	F-R6-8	1495 Lps @ 168 Pa	1	Roof extractor type fan	✓
	F-R6-9	117 Lps @ 70 Pa	1	Roof extractor type fan	✓
	F-R6-10	850 Lps @ 159 Pa	1	Inline Centrifugal fan	✓
	F-R6-11	1500 Lps @ 170 Pa	1	Inline Centrifugal fan	✓
	F-R6-12	374 Lps @ 25 Pa	1	Propeller	✓
	F-R7-1	1370 Lps @ 130 Pa	1	Roof extractor type fan	✓
	F-R7-2	996 Lps @ 117 Pa	1	Roof extractor type fan	✓
	F-R7-3	1121 Lps @ 113 Pa	1	Roof extractor type fan	✓
	F-R7-4	1806 Lps @ 159 Pa	1	Roof extractor type fan	✓

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1.3.2.5 - Work Parcel 1 - List of HVAC Equipment

Female Dormitories (Bldg R02) - O & M Ref: 12 - Set 12 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-R7-5	850 Lps @ 98 Pa	1	Inline Centrifugal fan	✓
	F-R7-6	800 Lps @ 132 Pa	1	Inline Centrifugal fan	✓
	F-R7-7	59 Lps @ 25 Pa	1	Propeller	✓
	F-R7-8	400 Lps @ 82 Pa	1	Roof extractor type fan	✓
	F-R7-9	400 Lps @ 80 Pa	1	Roof extractor type fan	✓
	F-R7-10	1200 Lps @ 152 Pa	1	Upblast centrifugal fan	✓
	Dehumidifier	500 W	1	Woods 2.4 A	✓
Cooling	End Suction Pumps (P-R2-1)	26.6 Lps @ 28 m Head	3	End suction centrifugal secondary chilled water	✓
Heating	End Suction Pumps (P-R2-2)	11.14 Lps @ 18.27 m Head	3	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-R2-3)	18.5 Lps @ 12 m Head	2	Circulators for Hot water storage tank	✓
	Circulator Pumps (P-R2-4)	10 Lps @ 12.68 m Head	2	Circulators for Heat exchanger	✓
	Hot Water Storage Tank (HWST-R2-1)	4075 Liter	5	Vertical Type Hot Water Storage Tank of 3.7 Lps flow	✓
	Heat Exchanger (HEX-R2-1)	517 Kw	2	Heat Exchanger Primary	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Galvanized Steel			Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation			15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓
	Fiber Glass insulation			Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps		With Thermostat	✓
	VAV-5	1045-1320 Lps		With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves		12	50mm to 125mm	✓
	Balancing Valves		54	40mm to 80mm	✓
	Ball Valves		32	25mm to 40mm	✓

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1.3.2.5 - Work Parcel 1 - List of Plumbing Equipment

Female Dormitories (R02) - O & M Ref:1.5.1 - Set 12 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Soft Water	Water Softener (WS-R02-1)	1 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 72 L	✓
Hot Water	Circulator pumps (P-R02-51)	4.42 lps @ 19 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Drainage	Submersible Pump (SP-R02-1)	1.26 lps @ 7 m head	2	One acting as standby	✓
	Submersible Pump (SP-R02-2)	1.26 lps @ 7 m head	2	One acting as standby	✓
	Submersible Pump (SP-R02-3)	0.9 lps @ 5 m head	2	One acting as standby	✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓
Valves	Ball Valves			25mm to 40mm	✓
	Gate Valves			50mm to 150mm	✓
	Globe Valves			15mm	✓

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1.3.2.5 - Work Parcel 1 - List of Plumbing Equipment

Female Dormitories (R02) - O & M Ref:1.5.1 - Set 12 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
Sanitary Fixtures & Accessories	Flush Tanks				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.2.6 - Work Parcel 1 - List of HVAC Equipment

Technical Areas-Bldg(T1,T2&T3)- O & M Ref: 1.5.1 - Set 13 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-T3-1)	14 T.R	1	Variable Air Volume AHU with Supply air flow 2248 lps, External Static pressure 327.4 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-T3-2)	16 T.R	1	Variable Air Volume AHU with Supply air flow 2400 lps, External Static pressure 434 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-T3-3)	22 T.R	1	Variable Air Volume AHU with Supply air flow 3536 lps, External Static pressure 402 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (CRAHU-T3-1)	7 T.R	1	Constant Air Volume AHU with Supply air flow 1800 lps, External Static pressure 125 Pa, with 2 coils (heating / cooling) & electrical reheat of 4 Kw & electrical humidifier of 4 Kg/Hr	✓
	Air Handling Unit (CRAHU-T3-1)	7 T.R	1	Constant Air Volume AHU with Supply air flow 1348 lps, External Static pressure 125 Pa, with 2 coils (heating / cooling) & electrical reheat of 4 Kw & electrical humidifier of 4 Kg/Hr	✓
	Split Unit (CRAC-T3-1)	7.7 T.R	1	DX	✓
	Split Unit (CRAC-T3-2)	5.9 T.R	1	DX	✓
Ventilation	split unit	18000 BTU/hr	1	MDV	✓
	split unit	28000 BTU/hr	1	climasmart	✓
	F-T1-1	15300 Lps @ 260 Pa	1	Centrifugal	✓
	F-T1-2	200 Lps @ 137 Pa	1	Centrifugal	✓
	F-T1-3	400 Lps @ 82 Pa	1	Centrifugal	✓
	F-T1-1	15300 Lps @ 260 Pa	1	Centrifugal fan	✓
	F-T1-2	200 Lps @ 137 Pa	1	Roof Type Fan	✓
	F-T1-3	400 Lps @ 82 Pa	1	Roof Type Fan	✓
	F-T3-1	1690 Lps @ 112 Pa	1	Roof Type Fan	✓
	F-T3-2	270 Lps @ 75 Pa	1	Roof Type Fan	✓
	F-T3-3	509 Lps @ 75 Pa	7	Propeller	✓

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1.3.2.6 - Work Parcel 1 - List of HVAC Equipment

Technical Areas-Bldg(T1,T2&T3)- O & M Ref: 1.5.1 - Set 13 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
	F-T3-5	267 Lps @ 65 Pa	1	Propeller	✓
	F-T3-7	243 Lps @ 70 Pa	1	Propeller	✓

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1.3.2.6 - Work Parcel 1 - List of HVAC Equipment

Technical Areas-Bldg(T1,T2&T3)- O & M Ref: 1.5.1 - Set 13 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-T3-8	584 Lps @ 75 Pa	2	Propeller	✓
	F-T3-9	660 Lps @ 131 Pa	1	Inline Centrifugal	✓
	F-T3-13	1787 Lps @ 75 Pa	1	Propeller	✓
	F-T3-14	2150 Lps @ 220 Pa	1	Centrifugal	✓
	F-T3-15	2350 Lps @ 190 Pa	1	Centrifugal	✓
	F-T3-15A	2350 Lps @ 246 Pa	1	Centrifugal	✓
	F-T3-18	8950 Lps @ 200 Pa	8	Axial	✓
	FAF-T3-01	19750 Lps @ 225 Pa	4	Axial	✓
	F-T3-20	8290 Lps @ 215 Pa	2	Centrifugal	✓
Cooling	End Suction Pumps (P-T3-1)	6 Lps @ 18.5 m Head	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-T3-2)	3 Lps @ 12 m Head	2	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-T3-3)	1.1 Lps @ 6 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-T3-4)	2.6 Lps @ 6 m Head	2	Circulators for Hot water storage tank	✓
	Expansion Tank (EX-T3-1)	300 Lps	1	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST-T3-1)	3000 Liter	1	Vertical Type Hot Water Storage Tank of 2.6 Lps flow	✓
	Heat Exchanger (HEX-T3-1)	115.4 Kw	1	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Piping System & Insulation	Black Steel	–	–	Dia 25mm to Dia 160mm	✓
	Galvanized Steel	–	–	Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation	–	–	15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure	–	–	–	✓
	GSD-Low Pressure	–	–	–	✓
	Fiber Glass insulation	–	–	Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps		With Thermostat	✓
	VAV-2	235-470 Lps		With Thermostat	✓
	VAV-3	475-660 Lps		With Thermostat	✓
	VAV-4	665-1040 Lps	10	With Thermostat	✓
	VAV-5	1045-1320 Lps	1	With Thermostat	✓
	VAV-6	1325-1890 Lps		With Thermostat	✓
Valves	Gate Valves	–	–	20mm to 125mm	✓
	Balancing Valves	–	–	20mm to 50mm	✓

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1.3.2.6 - Work Parcel 1 - List of HVAC Equipment

Technical Areas-Bldg(T1,T2&T3)- O & M Ref: 1.5.1 - Set 13 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Valves	3 Way Valves	–	–	20mm	✓
	Globe Valves	–	–	20mm	✓

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1.3.2.6 - Work Parcel 1 - List of Plumbing Equipment

Technical Areas-Bldg(T1,T2&T3) - O & M Ref: 1.5.1 - Set 13 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Soft Water	Water Softener (WS-T3-1)	0.5 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
Drainage	Submersible Pump (P-T3-52)	3.45 lps @ 9 m head	2	One acting as standby	✓
Drainage	Submersible Pump (P-T3-53)	3.5 lps @ 8 m head	2	One acting as standby	✓
	Submersible Pump SP-T1		2	One acting as standby	✓
Hot Water	Circulator pumps (P-T3-51)	1.61 lps @ 9.06 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
	EWH-T-1	200 Liter	1		✓
	EWH-T1	200 Liters	1		✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓

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1.3.2.6 - Work Parcel 1 - List of Plumbing Equipment

Technical Areas-Bldg(T1,T2&T3) - O & M Ref: 1.5.1 - Set 13 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Valves	Ball Valves			15mm to 40mm	✓
	Globe Valves			15mm to 40mm	✓
	Gate Valves			25mm to 200mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
Sanitary Fixtures & Accessories	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.2.7 - Work Parcel 1 - List of HVAC Equipment

Restaurant & Functional Housing (Bldg U2)- O & M Ref: 1.5.1 - Set 15 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling / Heating	Air Handling Unit (AHU-U2-1)	15.6 T.R	1	Constant Air Volume AHU with Supply air flow 2970 lps, External Static pressure 248 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-U2-2)	54 T.R	1	Constant Air Volume AHU with Supply air flow 6975 lps, External Static pressure 332 Pa, with 2 coils (heating / cooling)	✓
	Air Handling Unit (AHU-U2-3)	112 T.R	1	Constant Air Volume AHU with Supply air flow 14685 lps, External Static pressure 233.4 Pa, with 2 coils (heating / cooling)	✓
	Fan Coil Unit (FCU-U2-1)	3 T.R	8	Horizontal concealed type FCU, 705 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-U2-1A)	1.5 T.R	2	Horizontal concealed type FCU, 355 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-U2-2)	2 T.R	11	Horizontal concealed type FCU, 550 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-U2-3)	1 T.R	21	Horizontal concealed type FCU, 325 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-U2-4)	3 T.R	1	Horizontal concealed type FCU, 780 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
	Fan Coil Unit (FCU-U2-4A)	1.5 T.R	2	Horizontal concealed type FCU, 390 lps Supply air flow, External Static pressure 30 Pa, with 1 coil	✓
Ventilation	(F-U2-1)	100 Lps @ 105 Pa	7	Roof type fan	✓
	(F-U2-2)	208 Lps @ 100 Pa	1	Roof type fan	✓
	(F-U2-3)	120 Lps @ 113 Pa	8	Roof type fan	✓
	(F-U2-4)	480 Lps @ 126 Pa	1	Roof type fan	✓
	(F-U2-5)	97 Lps @ 104 Pa	1	Roof type fan	✓
	(F-U2-6)	2060 Lps @ 159 Pa	1	Roof type fan	✓

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1.3.2.7 - Work Parcel 1 - List of HVAC Equipment

Restaurant & Functional Housing (Bldg U2)- O & M Ref: 1.5.1 - Set 15 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	(F-U2-7)	2020 Lps @ 290 Pa	1	Roof type fan	✓
	(F-U2-8)	3600 Lps @ 191 Pa	1	Fire rated roof type fan	✓
	(F-U2-9)	1050 Lps @ 138 Pa	1	Roof type fan	✓
	(F-U2-10)	183 Lps @ 109 Pa	1	Roof type fan	✓
	(F-U2-11)	150 Lps @ 137 Pa	1	Roof type fan	✓
	(F-U2-12)	71 Lps @ 97 Pa	1	Roof type fan	✓
	(F-U2-13)	167 Lps @ 113 Pa	1	Roof type fan	✓
	(F-U2-14)	243 Lps @ 77 Pa	1	Roof type fan	✓
	(F-U2-15)	71 Lps @ 97 Pa	1	Roof type fan	✓
	(F-U2-16)	167 Lps @ 113 Pa	1	Roof type fan	✓
	(F-U2-17)	66 Lps @ 100 Pa	1	Roof type fan	✓
	(F-U2-18)	689 Lps @ 124 Pa	1	In Line Centrifugal fan	✓
	(F-U2-19)	960 Lps @ 127 Pa	1	In Line Centrifugal fan	✓
	(F-U2-20)	4000 Lps @ 189 Pa	1	In Line Centrifugal fan	✓
	(F-U2-21)	965 Lps @ 105 Pa	1	In Line Centrifugal fan	✓
	(F-U2-22)	355 Lps @ 137 Pa	1	Roof type fan	✓
	(F-U2-23)	2200 Lps @ 128 Pa	1	Propeller type fire rated fan	✓
	(F-U2-24)	10515 Lps @ 167 Pa	1	Centrifugal fan	✓
	(F-U2-25)	220 Lps @ 120 Pa	1	Roof type fan	✓
	(F-U2-26)	244 Lps @ 128 Pa	1	In Line Centrifugal fan	✓
	(F-U2-27)	720 Lps @ 133 Pa	1	In Line Centrifugal fan	✓
	(F-U2-29)	1660 Lps @ 144 Pa	1	In Line Centrifugal fan	✓
	(F-U2-30)	600 Lps @ 118 Pa	1	Roof type fan	✓
	(F-U2-31)	63 Lps @ 45 Pa	1	Propeller type fan	✓
	(F-U2-32)	63 Lps @ 45 Pa	1	Propeller type fan	✓
	(F-U2-33)	70 Lps @ 40 Pa	1	Propeller type fan	✓

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1.3.2.7 - Work Parcel 1 - List of HVAC Equipment

Restaurant & Functional Housing (Bldg U2)- O & M Ref: 1.5.1 - Set 15 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling	End Suction Pumps (P-U2-1)	31.58 Lps @ 26.5 m Head	2	End suction centrifugal secondary chilled water pump	✓
Heating	End Suction Pumps (P-U2-2)	12.52 Lps @ 27.52 m Head	2	End suction centrifugal secondary hot water pump	✓
	Circulator Pumps (P-U2-3)	5.5 Lps @ 13.2 m Head	2	Circulators for Heat exchanger	✓
	Circulator Pumps (P-U2-4)	1.5 Lps @ 13.8 m Head	2	Circulators for Hot water storage tank	✓
	Expansion Tank (EX-U2-1)	500 Lps	1	Expansion tank for heating system	✓
	Hot Water Storage Tank (HWST-U2-1)	1250 Liter	2	Vertical Type Hot Water Storage Tank of 0.75 Lps flow	✓
	Heat Exchanger (HEX-U2-1)	579.2 Kw	1	Heat Exchanger Primary temperature 95 deg C, secondary temperature 60 deg C	✓
Cooling /Heating	split unit	12000 BTU/hr	1	TROPICAL GOLDEN STAR	✓
	split unit	18000 BTU/hr	7	CLIMASMART	✓
	split unit	24000 BTU/hr	2	CLIMASMART	✓
	split unit	30000 BTU/hr	2	CLIMASMART	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Galvanized Steel			Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation			15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure	–	–		✓
	GSD-Low Pressure	–	–		✓
	Fiber Glass insulation	–	–	Blanket type/40 mm thick	✓
	VAV-1	0-230 Lps	–	With Thermostat	✓
	VAV-2	235-470 Lps	–	With Thermostat	✓
	VAV-3	475-660 Lps	–	With Thermostat	✓
	VAV-4	665-1040 Lps	–	With Thermostat	✓
	VAV-5	1045-1320 Lps	–	With Thermostat	✓
	VAV-6	1325-1890 Lps	–	With Thermostat	✓
Valves	Gate Valves	–	–	65mm to 80mm	✓
	Ball Valves	–	–	25mm to 50mm	✓
	Balancing Valves	–	–	80mm	✓
	3 Way Valves	–	–	20mm	✓
	Globe Valves	–	–	20mm	✓

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1.3.2.7-Work Parcel 1- List of Plumbing Equipment

Restaurant & Functional Housing (Bldg U2)- O & M Ref: 1.5.1 - Set 15 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Soft Water	Water Softener (WS-U2-1)	0.5 lps	1	Simplex type WS with Exchange capacity 69225 g/m3, Hardness at inlet 350 ppm, Hardness at outlet 5 ppm, & resin volume 36 L	✓
Drainage	Submersible Pump (P-U2-52)	3.45 lps @ 9 m head	2	One acting as standby	✓
Hot Water	Circulator pumps (P-U2-51)	0.63 lps @ 24 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓
Valves	Ball Valves			15mm to 50mm	✓
	Gate Valves			110mm	✓
	Globe Valves			15mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain				✓
	Lavatory Mixer LAV-1				✓
	Lavatory Tap LAV-2				✓
	Lavatory Mixer LAV-3				✓
	Sink Mixer				✓
	Sink Tap				✓
	Mop Sink Tap				✓
	Shower Mixers				✓
	Bathtub Mixer				✓
	Jaccuzi Mixer				✓
	Bib Cock Perineal Hose				✓
	Angle Valves/Flexibles				✓
	WC Flush Valves				✓
	Urinal Flush Valves				✓
	Flush Tanks				✓
Sanitary Fixtures & Accessories	Hand Dryers				✓
	Liquid Soap Dispensers				✓
	Paper Towel Dispenser				✓

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1.3.2.8 - Work Parcel 1 - List of HVAC Equipment

Central Parking (Bldg U3) - O & M Ref: 1.5.1 - Set 14 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	(F-U3-01A)	7995 Lps @ 192 Pa	1	Centrifugal type exhaust Fan	✓
	(F-U3-01B)	7995 Lps @ 192 Pa	1	Centrifugal type exhaust Fan	✓
	(F-U3-02)	5330 Lps @ 123 Pa	1	Propeller Fan	✓
	(F-U3-03)	4172 Lps @ 120 Pa	1	Propeller Fan	✓
	(F-U3-04)	18760 Lps @ 260 Pa	1	Centrifugal type exhaust Fan	✓
	(F-U3-05)	16800 Lps @ 282 Pa	1	Centrifugal type exhaust Fan	✓
	(F-U3-06)	18760 Lps @ 175 Pa	1	Centrifugal type exhaust Fan	✓
	(F-U3-07)	16800 Lps @ 175 Pa	1	Centrifugal type exhaust Fan	✓
	(EF-U30-1)	30 Lps @ 75 Pa	2	Roof extractor type fan	✓
	(EF-U30-2)	75 Lps @ 75 Pa	1	Roof extractor type fan	✓
	(EF-U30-3)	30 Lps @ 75 Pa	1	Roof extractor type fan	✓
Cooling/ Heating	Split system air conditionner (SSAC-9)	0.75 T.R	1	Heat pump,electric type,wall mounted mini splits	✓
	Split system air conditionner (SSAC-12)	1 T.R	2	Heat pump,electric type,wall mounted mini splits	✓
	Split system air conditionner (SSAC-18)	1.5 T.R	1	Heat pump,electric type,wall mounted mini splits	✓
cooling /heating	split unit	12000 BTU/hr	1	YORK	✓
	split unit	42000 BTU/hr	2	YORK	✓
Piping System & Insulation	Black Steel	–	–	Dia 25mm to Dia 160mm	✓
	Galvanized Steel	–	–	Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation	–	–	15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure	–	–	–	✓
	GSD-Low Pressure	–	–	–	✓
Valves	Gate Valves	–	–	20mm to 125mm	✓
	Balancing Valves	–	–	20mm to 50mm	✓
	3 Way Valves	–	–	20mm	✓
	Globe Valves	–	–	20mm	✓

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1.3.2.8 - Work Parcel 1 - List of Plumbing Equipment

Central Parking (Bldg U3) - O & M Ref:1.5.1 - Set 14 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Drainage	Submersible Pump (P-U3-51)	5 lps @ 7 m head	2	One acting as standby	✓
Piping System & Insulation	PVC			16mm to 50mm DN	✓
	Copper			15mm to 54 mm DN	✓
	Cast Iron			75mm to 110mm DN	✓
	Polypropylene			50mm to 110mm DN	✓
	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
	Fiber Glass Insulation			25mm to 67mm thickness	✓
Valves	Ball Valves			15mm to 50mm	✓
	Gate Valves			65mm to 110mm	✓
	Y-Valves			80mm	✓

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1.3.2.9-Work Parcel 1- List of HVAC Equipment

Eastern Parking (Bldg V1) -O & M Ref: 1.5.1 - Set 14 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-V1-1	5700 Lps @ 100 Pa	2	Propeller Fan	✓
	F-V1-2	6800 Lps @ 100 Pa	2	Propeller Fan	✓
	F-V1-3	11390 Lps @ 200 Pa	2	Fire rated exhaust fan	✓
	F-V1-4	16800 Lps @ 180 Pa	2	Fire rated exhaust fan	✓
	F-V1-8	8880 Lps @ 100 Pa	4	Propeller Fan	✓
	F-V1-EX1	50 Lps @ 110 Pa	1	Centrifugal fan	✓
	F-V1-EX2	3000 Lps @ 150 Pa	2	Centrifugal fan	✓
Cooling /Heating	split unit	9000 BTU/hr	1	YORK	✓
	split unit	12000 BTU/hr	1	YORK	✓
	split unit	18000 BTU/hr	1	MDV	✓
	split unit	19000 BTU/hr	1	YORK	✓
	split unit	24000 BTU/hr	2	YORK	✓
Piping System & Insulation	Black Steel	–	–	Dia 25mm to Dia 160mm	✓
	Galvanized Steel	–	–	Dia 20mm to Dia 50mm	✓
Ducting System & Insulation	GSD- Medium Pressure	–	–	–	✓
	GSD-Low Pressure	–	–	–	✓
Valves	Gate Valves	–	–	20mm to 125mm	✓
	Balancing Valves	–	–	20mm to 50mm	✓
	3 Way Valves	–	–	20mm	✓
	Globe Valves	–	–	20mm	✓

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1.3.2.9-Work Parcel 1- List of Plumbing Equipment

Eastern Parking (Bldg V1)-O & M Ref: 1.5.1 - Set 14 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Drainage	Pump (P-V1-51)	2.6 lps @ 12 m head	2	Submersible	✓
Piping system	Galvanized Steel			20mm to 80mm DN	✓
	HDPE			50mm to 200mm DN	✓
	BSP			15mm to 42mm DN	✓
Valves	Ball Valves			15mm to 40mm	✓
	Gate Valves				✓
	Globe Valves			15mm	✓

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1.3.2.10 - Work Parcel 1 - List of Plumbing Equipment

Water Tower-Bldg(V2)

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Piping	Ductile Iron			80 mm to 350 mm DN	✓
Valves	Ball Valves			80mm to 350 mm DN	✓
	Gate Valves			80mm to 350 mm DN	✓

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1.3.2.11 - Work Parcel 1 - List of HVAC Equipment

Main Pumping Station (Bldg V3)- O & M Ref:1.5.1 - Set 1 / Div 6

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-1	1250 Lps @ 75 Pa	1	Inline Centrifugal type exhaust Fan	✓
	F-2	460 Lps @ 75 Pa	2	Inline Centrifugal type exhaust Fan	✓
	F-3	1220 Lps @ 75 Pa	1	Inline Centrifugal type exhaust Fan	✓
	F-4	1890 Lps @ 75 Pa	1	Inline Centrifugal type exhaust Fan	✓
	F-5	75 CFM @ 60 Pa	1	Inline Centrifugal type exhaust Fan	✓
Cooling /Heating	Split Unit	35000 BTU/hr	2	YORK	✓
	Split Unit	48000 BTU/hr	1	MEDIA	✓
Piping System & Insulation	Black Steel	–	–	Dia 25mm to Dia 160mm	✓
	Galvanized Steel	–	–	Dia 20mm to Dia 50mm	✓
Ducting System & Insulation	GSD- Medium Pressure	–	–	–	✓
	GSD-Low Pressure	–	–	–	✓

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1.3.2.11 - Work Parcel 1 - List of Plumbing Equipment

Main Pumping Station (Bldg V3)- O & M Ref:1.5.1 - Set 1 / Div 6

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Drainage	Submersible Pump	15 lps @ 15 m head	2	One acting as standby	✓
Piping System & Insulation	PVC	–	–	16mm to 50mm DN	✓
	Ductile iron	–	–	80 mm to 350 mm DN	✓
	Cast Iron	–	–	75mm to 110mm DN	✓
	Polypropylene	–	–	50mm to 110mm DN	✓
	Galvanized Steel	–	–	20mm to 80mm DN	✓
	HDPE	–	–	50mm to 200mm DN	✓
	BSP	–	–	15mm to 42mm DN	✓
Valves	Ball Valves	–	–	20mm to 40mm	✓
	Pressure Relief Valves	–	–	50mm	✓
	Gate Valves	–	–	50mm	✓
Sanitary fixtures & accessories	Lavatory Mixer LAV-1	_	_	_	✓
	Emergency shower	_	_	_	✓
	Angle Valves/Flexibles	–	–	–	✓

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1.3.2.12 - Work Parcel 1 - List of HVAC Equipment

Utility Tunnel (Bldg V4)

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	(F-V4-1)	8160 Lps @ 75 Pa	5	Propeller	✓
	(F-V4-2)	8160 Lps @ 75 Pa	5	Propeller	✓
Piping System & Insulation	Black Steel			Dia 25mm to Dia 160mm	✓
	Galvanized Steel			Dia 20mm to Dia 50mm	✓
Ducting System & Insulation	GSD- Medium Pressure				✓
	GSD-Low Pressure				✓

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1.3.2.12 - Work Parcel 1 - List of Plumbing Equipment

Utility Tunnel (Bldg V4)

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Drainage	Submersible Pumps	10 lps @ 10.5 m head	24		✓

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1.3.2.13 - Work Parcel 1 - List of HVAC Equipment

Underground Wester Parking and Central Catering - (Bldg X) - O & M Ref: 1.5.1 - Set 16 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Ventilation	F-X1-01	22660 Lps @ 255 Pa	1	Centrifugal Fan	✓
	F-X1-2	12978 Lps @ 254 Pa	1	Centrifugal Fan	✓
	F-X1-02	12450 Lps @ 230.8 Pa	1	Centrifugal Fan	✓
	F-X1-03	12980 Lps @ 302 Pa	1	Centrifugal Fan	✓
	F-X1-04	8800 Lps @ 255 Pa	1	Centrifugal Fan	✓
	F-X1-05	4330 Lps @ 82 Pa	3	Propeller	✓
	F-X1-06	7480 Lps @ 82 Pa	4	Propeller	✓
	F-X1-07	5280 Lps @ 82 Pa	4	Propeller	✓
	F-X2-01	22660 Lps @ 224.9 Pa	1	Centrifugal Fan	✓
	F-X2-03	12980 Lps @ 272.3 Pa	1	Centrifugal Fan	✓
	F-X2-04A	3365 Lps @ 133 Pa	1	In Line Centrifugal fan	✓
	F-X2-04B	3515 Lps @ 151 Pa	1	In Line Centrifugal fan	✓
	F-X2-05	1582 Lps @ 88 Pa	1	Roof type fan	✓
	F-X2-06A	4065 Lps @ 245.9 Pa	1	Smoke Exhaust Fan	✓
	F-X2-06B	3415 Lps @ 239 Pa	1	Smoke Exhaust Fan	✓
	F-X2-07	5675 Lps @ 191 Pa	1	Roof type fan	✓
	F-X2-10	3415 Lps @ 300 Pa	1	Smoke Exhaust Fan	✓
	F-X2-10A	2870 Lps @ 240 Pa	1	Smoke Exhaust Fan	✓
	F-X2-10B	3415 Lps @ 250 Pa	1	Smoke Exhaust Fan	✓
	F-X2-10D	2500 Lps @ 278 Pa	1	Smoke Exhaust Fan	✓
	F-X2-12A	628 Lps @ 93 Pa	1	Roof type fan	✓
	F-X2-12B	722 Lps @ 115 Pa	1	Roof type fan	✓
	F-X2-13	1587 Lps @ 140 Pa	1	Roof type fan	✓
	F-X2-16	497 Lps @ 40 Pa	1	Propeller Fan	✓

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1.3.2.13 - Work Parcel 1 - List of HVAC Equipment

Underground Wester Parking and Central Catering - (Bldg X) - O & M Ref: 1.5.1 - Set 16 / Div 2

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Cooling/Heating	Split Unit	12000 BTU/hr	1	YORK	✓
	Split Unit	18000 BTU/hr	4	YORK	✓
	Split Unit	18000 BTU/hr	1	CLIMASMART	✓
Heating	Circulator Pumps (P-X2-1)	14.4 Lps @ 19.7 m Head	2	Circulators for Hot water storage tank	✓
	Hot Water Storage Tank (HWST-X2-1)	7830 Liter	3	Horizontal Type Hot Water Storage Tank of 4.78 Lps flow	✓
Piping System & Insulation	Black Steel	–	–	Dia 25mm to Dia 160mm	✓
	Galvanized Steel	–	–	Dia 20mm to Dia 50mm	✓
	Fiber Glass insulation	–	–	15mm to 65 mm thickness	✓
Ducting System & Insulation	GSD- Medium Pressure	–	–	–	✓
	GSD-Low Pressure	–	–	–	✓
	Rock wool insulation	–	–	Blanket type/40 mm thick	✓
Valves	Gate Valves	–	–	110mm	✓
	Balancing Valves	–	–	20mm to 50mm	✓
	3 Way Valves	–	–	20mm	✓
	Globe Valves	–	–	20mm	✓

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1.3.2.13 - Work Parcel 1 - List of Plumbing Equipment

Underground Wester Parking and Central Catering - (Bldg X) - O & M Ref: 1.5.1 - Set 16 / Div 1

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Drainage	Submersible Pump (P-X2-53)	3.66 lps @ 12 m head	2	One acting as standby	✓
	Submersible Pump (P-X2-54)	3.1 lps @ 8 m head	2	One acting as standby	✓
	Submersible Pump (P-X2-55)	1.64 lps @ 7 m head	2	One acting as standby	✓
Hot Water	Circulator pumps (P-X2-52)	0.47 lps @ 12.9 m head	2	Hot Water storage tank circulator pumps one acting as stand by	✓
Piping System & Insulation	PVC	–	–	16mm to 50mm DN	✓
	Copper	–	–	15mm to 54 mm DN	✓
	Cast Iron	–	–	75mm to 110mm DN	✓
	Polypropylene	–	–	50mm to 110mm DN	✓
	Galvanized Steel	–	–	20mm to 80mm DN	✓
	HDPE	–	–	50mm to 200mm DN	✓
	BSP	–	–	15mm to 42mm DN	✓
	Fiber Glass Insulation	–	–	25mm to 67mm thickness	✓
Valves	Ball Valves	–	–	15mm to 50mm	✓
	Gate Valves	–	–	15mm	✓
	Globe Valves	–	–	15mm	✓
Sanitary Fixtures & Accessories	Drinking Fountain	–	–	–	✓
	Lavatory Mixer LAV-1	–	–	–	✓
	Lavatory Tap LAV-2	–	–	–	✓
	Lavatory Mixer LAV-3	–	–	–	✓
	Sink Mixer	–	–	–	✓
	Sink Tap	–	–	–	✓
	Mop Sink Tap	–	–	–	✓
	Shower Mixers	–	–	–	✓
	Bib Cock Perineal Hose	–	–	–	✓
	Angle Valves/Flexibles	–	–	–	✓
	WC Flush Valves	–	–	–	✓
	Urinal Flush Valves	–	–	–	✓
	Flush Tanks	–	–	–	✓
	Hand Dryers	–	–	–	✓
	Liquid Soap Dispensers	–	–	–	✓
	Paper Towel Dispenser	–	–	–	✓

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1.3.2.14- Work Parcel 1 - List of HVAC Equipment

Army and security forces cabinets - (Bldg z)

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
cooling/heating	split unit	12000 BTU/hr	11	Tropical Golden Star	✓
	split unit	18000 BTU/hr	6	Tropical Golden Star	✓
	split unit	18000 BTU/hr	2	YORK	✓
	split unit	24000 BTU/hr	2	Tropical Golden Star	✓
	split unit	24000 BTU/hr	1	YORK	✓
	split unit	24000 BTU/hr	1	PETRA	✓

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in Appendix 1.5.1
Ventilation	ceiling fan	56"	5	multi speed (3) 220V	✓
	exhuast fan	280 m^3/hr	7	MF 150/6 Punto Filo	✓

Lebanese University Campus - Hadath

1.3.2.14 Work Parcel 1 - List of PLUMBING Equipment

Lebanese Army and Interior security forces cabinets - (Bldg z)

System	Equipment	Capacity	Qty	Technical Description	Maintenance instruction provided in O&M Manuals listed in appendix 1.5.1
Domestic water system	Circulating Booster Pump	5 m3/h @ 4 Bar	2	One acting as standby	✘
Water Network	Pressure tank	300 liters	1	2.5->4.5 Bar	✘
	PVC tank	2000 liters	3	–	✘
Toilets	WC		14		✘
	Shower		14		✘
	Lavatory		15		✘

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1.4 - Work Parcel 1-Scope Of Work

1.4.1-Operation And Maintenance tasks

Technical Scope Of Work: Operation

1- Contractor shall comply with the requirements of the Contract documents

2- Contractor shall be responsible for the coordination with the Lebanese University buildings managements in order to operate the systems described in work parcel 1 as per the academic time schedules planned for each buildings.

3- Contractor shall be responsible for keeping systems installed satisfactory to perform their designed functions such as:

a-Perfect attainment of temperatures, air quality and humidity with acceptable noise, vibration levels, consumption of power and water, within manufacturer data sheets.

b-Control of priority contactors in case of emergency to provide maximum services to buildings using the available Power resources (Emergency Generators).

c- Control of potable water quality, in order to fit within the given technical requirements.

d- Control of Mechanical equipment (refer to attached appendix 1.3), via the Building Management System by keeping the key parameters of these equipment effective.

4- Contractor shall be responsible to provide regular report (quarterly) showing the consumption of main consumables (such as chemicals, water, gas etc….) as described in O&M manuals.

5- Contractor shall be responsible to operate the systems taking into account the energy saving measures as for and non-restricted to the following:

a-Planning and updating the schedules for operation of systems according to the results of the reports mentioned in paragraph 3 above.

b- Other energy saving measures as for gas, and water consumptions, should be taken into consideration for efficient operation.

Technical Scope Of Work: Maintenance

1- Contractor is responsible to perform all the preventive (routine) and corrective maintenance (emergency), (as defined in the O&M manuals), cleaning and restoration (painting, welding, minor repairs, corrosion protection) of Mechanical equipment which are defined in the contracts documents.

2- All maintenance works should be performed in accordance with the manufacturer's recommendations and /or as stipulated in the appendices.

3- Reporting:

The contractor shall be responsible to provide regular (quarterly) report showing the maintenance works executed, along with suggestions for future maintenance tasks, status of equipment, frequency & analysis of trouble shootings.

The contractor shall be responsible to provide emergency report for problems that may occur. There report shall contain description of the problem, corrective studies all necessary corrective actions, and budgeting.

4- Refer to the attached document overleaf for specific maintenance aspects within this trade

Lebanese University Campus-Hadath
1.4 – Work Parcel 1 – Maintenance Scope of Work

List of sample tasks scheduling for maintenance

Lebanese University Campus-Hadath
1.4 – Work Parcel 1 – Maintenance Scope of Work

1.4.0.Domestic Cold & Potable Water System- Copper, Galvanized Steel & PVC

Monthly

- Check all exposed pipe work, flanges, connections, etc. for leakage or damage. Report defect and repair as necessary.
- Check alignment of expansion bellows and lugs where applicable. Report any defects. Check guide points for wear and freedom of pipe movement, grease guide rollers if applicable.

Quarterly

- Carry out tasks as detailed for Monthly.
- Check all pipe support brackets for security, and tighten as necessary. Report conditions of supports.
- Check condition of all anti-vibration mounts. Report any defects.
- Check condition of all insulation and covering (if applicable), paying particular attention to the integrity of the vapour seal, report any defects.
- Check operation of valves, stop cocks, drain cocks, etc. Valves should be fully closed then fully opened, (Note the number of turns to fully close, so that valve can be reset to its original position). If operation of valve is stiff, lubricate as necessary, repeat opening and closing until clear, and then return valve to its original position. Report any irregularities.
- Examine all valve gland packing for leakage and adjust or repack as required.

Annually

- Carry out tasks as detailed for Quarterly.
- Check pipe work identification tags remain secure, report any defects.

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1.4 – Work Parcel 1 – Maintenance Scope of Work

- Check for integrity of fire stopping where pipes pass through walls etc. report any defects.

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1.4 – Work Parcel 1 – Maintenance Scope of Work

1.4.1. Domestic Hot Water System - Copper, Galvanized Steel

Monthly

- Check all exposed pipe work, flanges, connections, etc. for leakage or damage. Report defect and repair as necessary.
- Check alignment of expansion bellows and lugs where applicable. Report any defects. Check guide points for wear and freedom of pipe movement, grease guide rollers if applicable.

Quarterly

- Carry out tasks as detailed for Monthly.
- Check all pipe support brackets for security, and tighten as necessary. Report conditions of supports.
- Check condition of all anti-vibration mounts. Report any defects.
- Check condition of all insulation and covering (if applicable), paying particular attention to the integrity of the vapour seal, report any defects.
- Check operation of valves, stop cocks, drain cocks, etc. Valves should be fully closed then fully opened, (Note the number of turns to fully close, so that valve can be reset to its original position). If operation of valve is stiff, lubricate as necessary, repeat opening and closing until clear, and then return valve to its original position. Report any irregularities.
- Examine all valve gland packing for leakage and adjust or repack as required.

Annually

- Carry out tasks as detailed for Quarterly.
- Check pipe work identification tags remain secure, report any defects.

- Check for integrity of fire stopping where pipes pass through walls etc. report any defects.

1.4.2 Storm Water and Soil Networks-(HDPE, Polypropylene, Cast iron)

Bi-annually

Above Ground

- Check security of wall fixings and pipe joints.
- Check connections to roof drains, refix if necessary.
- Check down pipes for cracks or leakage and report all defects.
- Check drain connections and access plates for leaks and report all defects.
- Remove all silt and debris from roof drains and check joints for signs of leakage. Report all defects.
- Report any indication of water drainage to fascias, roofs, walls or structure.
- Flush out installation and inspect for leaking joints.
- Report all items requiring remedial works.

Below Ground

- Check all branches and drain connections.
- Remove grating or access plate where fitted.
- Clean any silt build up from pipe and trap.
- Replace grating or cover, inspect and report on all defects.

Annually

Lebanese University Campus-Hadath
1.4 – Work Parcel 1 – Maintenance Scope of Work

Above Ground

- Carry out tasks as detailed for Bi-annually.

Below Ground

- Carry out tasks as detailed for Bi-annually.
- Remove manholes covers and provide warning signs and barriers to prevent public injury.
- Remove all grease or silt build-up within manhole and flush out.
- Rod through and hose drain runs as required and check flow throughput, advise on condition of installation.
- Examine step irons, where fitted, and report on security and condition.
- Remove rodding eye cover plates to branch drain connections, where fitted. Check for and remove any obstructions. Replace rodding eye cover plates and replace any damaged gaskets.
- Clean covers and frames; clean out lifting keyholes and wire brush to remove rust and scale.
- Regrease manhole cover and frame. Replace or refit gaskets, where fitted, and refit cover. Ensure that all covers have correct sealing.
- Inspect and report all defects.
- Report any evidence of vermin infestation.

Lebanese University Campus-Hadath
1.4 – Work Parcel 1 – Maintenance Scope of Work

1.4.3 Soil and Waste Drainage System (HDPE, Polypropylene,Cast iron)

Bi-annually

Above Ground

- Check security of wall fixings and pipe joints.
- Check connections to outlets for fixings and leakage. Refix if necessary.
- Check exposed pipes for cracks or leaks, and report any defects.
- Remove roof vent cowls where fitted, clean and replace.
- Flush out installation and inspect for leaks. Report any damage to walls and structure.
- Inspect all cleanouts and access covers for leakage around joints. Report on all defects
- Inspect ceiling hangers, if applicable, tighten loose bolts insuring slope. Report condition of hangers.

Below Ground

- Check all branch waste and drain connections for blockage. Repair and report as necessary.
- Remove grating or access plates where fitted.
- Clean any silt build up from pipe and traps.
- Replace grating or cover. Inspect and report on all defects.

Annually

- Carry out tasks as detailed for Bi-annually.

Below Ground

- Inspect manholes and catch pits.
- Remove manhole or catch pit cover and provide warning signs and barriers to prevent public injury.

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1.4 – Work Parcel 1 – Maintenance Scope of Work

- Remove all grease or silt build-up within manhole or catch pit and flush out.
- Rod through and hose drain runs as required and check flow throughput, advise on condition of installation.
- Examine step irons, where fitted, and report on security and condition.
- Remove rodding eye cover plates to branch drain connections, where fitted. Check for and remove any obstructions. Replace rodding eye cover plates and replace any damaged gaskets.
- Clean covers and frames; clean out lifting keyholes and wire brush to remove rust and scale.
- Regrease manhole or catch pit cover and frame. Replace or refit gaskets, where fitted, and refit cover. Ensure that all covers have correct sealing.
- Inspect and report all defects.
- Report any evidence of vermin infestation.

1.4.4. Circulations Submersible Pumps

Monthly

- Examine pump unit and adjacent pipe work, together with associated connection for leaks and corrosion. Report findings.
- Externally clean pumps and motors.

Quarterly

- Carry out tasks as detailed for Monthly.
- Test unit for excessive noise or vibration. Repair as necessary
- Inspect bearings and glands for wear. Lubricate bearings to manufacturer's recommendations. Repack glands as required.
- Examine all pipe work and valves insulation. Repair any damaged section or item.
- Examine and record delivery and suction pressure gauge, together with thermometers. Report any defect.
- Inspect and clean strainers.
- Test all manually operated valves, ensure full and free travel and correct settings. Check for leakage, adjust or replace valve glands as required. Remove all deposits and lubricate valve.
- Examine pump drain points. Ensure they are clean and free from any foreign materials.

Electrical

- Inspect motor electrical terminals. Tighten if required
- Check and record full load running current.
- Examine control switches. Check for proper operation and calibration.

Annually

Lebanese University Campus-Hadath
1.4 – Work Parcel 1 – Maintenance Scope of Work

- Carry out tasks as detailed for Quarterly.
- Examine and ensure motor ventilation airways are clear, remove all dirt and dust by vacuum cleaner.
- Check pump and motor level and alignment. Repair as necessary.
- Check and tighten as required, report on condition of holding down bolts.
- Check and clean anti-vibration mounts. Repair or replace as necessary.

Electrical

- Check motor winding insulation. Report condition.
- Examine and report on condition of all associated wiring facility.

1.4.5. Sanitary Fixtures, Emergency Showers

Weekly

- Visually inspect fixtures for fracture, leakage, or missing elements. Report any defect or leakage.
- Check flexible connections for leakage, close relevant isolating valve, and report for replacement.
- Clean Sanitary fixtures using soap and water. Do not use abrasive or chemical cleaners. Disinfect using special chemicals.
- Clean Faucets and flush valves using soap and water. Wipe dry with clean cloth or towel. Do not use abrasive or chemical cleaners.
- Operate flush valves and check for proper operation. Report any defect.

Monthly

- Carry out tasks as detailed for weekly.

W.C.'s

- Flush all W.C.'s to provide a change of water.
- Check for any defects in flush mechanisms and drainage. Report any defects.
- Examine hose bib gland packings; adjust or repack as required. Check free travel of valve. Lubricate valve stem. Check hose for cracks & leakage. Repair or replace defective items.

Sinks & Wash Basins

- Run hot and cold taps for a minimum of 1 minute to ensure full change of water in supply systems.
- Check for any defects in drainage system. Report any defects.

Urinals

- Flush all urinals.

- Check for any defects in flush mechanisms and drainage system. Report any defects.

Note: All necessary precautions must be taken to ensure non use by the public or premises personnel until the unit(s) are returned to the correct operational setting.

Quarterly

- Carry out tasks as detailed for Monthly.

Showers

- Strip, thoroughly clean and sterilise all shower head(s) and pipe work in a solution of 50 ppm free chlorine, upon re-assembly replace any faulty or damaged parts and ensure correct operation.

- Run each hot shower for 15 minutes to ensure removal of any contamination.

Note: All necessary precautions must be taken to ensure non use by the public or premises personnel until the unit(s) are returned to the correct operational setting.

Bi-annually

- Carry out tasks as detailed for Quarterly.

W.C.'s

- Remove access panel to flush tank (if fitted).

- Check tightness of seat and flap securing bolts for European water closets and adjust as required.

- Flush and check all round bowl rim action, report any defects.

- Check action and ensure correct operation of flush tank.

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- Test and ensure satisfactory operation of tank fill times, correct water level, and correct flush time per unit.
- Check security of all fixings and brackets.
- Examine joint seal between pan and flush pipe and between pan and drain, report on condition.
- Test and report on condition of siphon assembly, advise on the necessity for any remedial works.
- Check floor connection, ensure stability of all fixings, carry out adjustments or repair as necessary.
- Report any damage to sanitary ware and all associated equipment.
- Adjust Flush Valve setting to insure proper flushing where applicable.

Sinks and Wash Basins

- Examine and ensure correct operation of taps, mixer taps assemblies, wastes and overflows.
- Ensure correct operation of tap closure and free spindle movement. Replace any defective tap washers or seals as necessary.
- Replace or take up any valve gland seals as required.
- Examine and check for correct fitting of plug, chain or other outflow control device, adjusting or advise on the necessity to replace any faulty items.
- Check rate of outflow and operation of overflow, if sluggish clean the traps and associated pipe work. Replace by new seals as necessary.
- Examine and ensure security of fixings, carry out adjustments or repairs as necessary.
- Report any damage to sanitary ware and all associated equipment.

Mop Sinks

- Remove trap, clean and replace with new seals as necessary.
- Check plug fit and security of chain.
- Check drain down rate and drain off rate of overflow.
- Operate taps, confirm shut off and freedom of spindle movement. Replace washers or seals as necessary.
- Inspect and report on all defects.

Urinals

- Adjust Flush Valve setting to insure proper flushing where applicable.

Annually

- Carry out tasks as detailed for Bi-annually.

Showers, Emergency Showers

- Examine and ensure integrity of the shower unit fixings, repairing any defects as necessary.
- Examine the valve assembly(s), replacing any defective seals. Testing and ensuring correct operation of mixer if applicable.
- Examine the flexible and associated pipe work, replacing if defective the hose and/or washers.
- Test the rate of drain outflow, if slow strip and clean shower drain trap.
- Inspect and report on all defects.

1.4.6. Electric Water Heaters, Drinking Fountains

Specific Precautions

- For safety, be aware, this water heater is capable of producing hot water at a temperature sufficient enough to cause scalding injury.
- Hydrogen gas can be produced in a hot water system served by this heater that has not been used for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable. To reduce the risk of injury under these conditions, it is recommended that the hot water faucet be opened for several minutes, before using any electrical appliance connected to the hot water system. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. There should be no smoking or open flame near the faucet at the time it is open.

Monthly

- Visually inspect external case and pipe work connections.
- Drain out two gallons of water from the water heater to control the build up of sediment at the base of the storage tank.
- Check pressure relief valve for correct operation. Ensure it is not blocked. Adjust settings. Replace valves suspected to malfunction during operation.
- Check for any internal defects for drinking fountains. Report for any defect.

Electrical

- Check water temperature controls, and compare with thermostat. Adjust thermostat as necessary.
- Check temperature setting of the high temperature cut-out.
- Check electrical connections for drinking water fountains.

Annually

- Carry out tasks as detailed under Monthly.
- Check valves operation. Ensure full and free travel. Lubricate as necessary. Ensure shut off valve to be open during operation.
- Drain the heater until water runs clear to avoid noisy operation and lime and sediment build-up.

Electrical

- Check electrical supply rating to be correct.

1.4.7. Chilled, Heating, Steam, Condensate Systems and Ancillaries

Monthly

- Check all exposed pipe work, joints, connections, etc. for leakage or corrosion. Report defect and repair as necessary.
- Check alignment of expansion bellows and lugs where applicable. Report any defects.
- Check guide points for wear and freedom of pipe movement, grease guide rollers as required.

Quarterly

- Carry out tasks as detailed for Monthly.
- Check all pipe support brackets, hangers, and anchors for security, and tighten as necessary. Report condition.
- Check condition of all insulation and covering, paying particular attention to the integrity of the vapour seal, repair and report any defects.
- Check operation of valves, stop cocks, drain cocks, etc. If operation of valve is stiff, lubricate as necessary, repeat opening and closing until clear, and return valve to its original position.
- Examine all valve gland packing for leakage and adjust or re-pack as required.
- Clean strainer(s).

Annually

- Carry out tasks as detailed for Quarterly.
- Check pipe work identification tags remain secure, report any defects.

- Check for integrity of fire stopping where pipes pass through walls etc. report any defects.
- Re-calibrate pressure and temperature gauges

1.4.8. Chilled and Heating Water Pumps

Monthly

- Examine pump unit and adjacent pipe work together with associated connections for leaks and corrosion, report findings.
- Externally clean pumps and motors.

Quarterly

- Carry out tasks as detailed for Monthly.
- Test unit excessive noise or vibration. Repair as necessary.
- Examine and record delivery and suction gauges together with thermometers. Report any defects.
- Examine all pipe work and delivery and suction. Repair any damaged sections or items.
- Test all manually operated valves, ensure full and free travel and correct setting, check for leakage, adjust or repack valve glands as required, remove all deposits and lubricate valve.
- Ensure security of all brackets, supports and fixings.
- Lubricate pump and motor to manufacturer's recommendations.
- Examine pump drain points; ensure they are clear and free from any foreign matter.

Electrical

- Inspect motor electrical terminals. Tighten if required.
- Check and record full load running current.
- Check and ensure correct operation of controls, controllers and switches.

Annually

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- Carry out tasks as detailed for Quarterly.
- Examine and ensure motor ventilation airways are cleat, remove all dirt and dust by vacuum cleaner.
- Check and tighten as required, report on condition of holding down bolts.
- Check and clean anti-vibration mounts. Repair or replace as necessary:

Electrical

- Check motors winding insulation. Report condition.
- Examine and report on condition of all associated wiring facility and wiring, ensuring security of terminations

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1.4.9. Incinerator
(scope is optional pending fitting out of incinerator)

Monthly & Quarterly

- Readjustment of timer set points.
- Readjustment of photocell and ignition electrodes.
- Verification of burner mouth status.
- Verification and maintenance of ignition transformer.
- Verification of smoke emission and adjustment of primary air damper.
- Checking of feeder cylinder seals.
- Adjustment of limit switches as necessary.
- Repair of cracks in refractory of primary chamber.
- Cleaning of bottom plates.
- Inspection and repair of oxygen probe and draught sensor.
- Verify function of speed control.
- Maintenance of de-ashing tilting cylinder, hinge door.
- Control and change of hydraulic oil.

Quarterly

- Clean up incinerator after shutdown.

1.4.10. Heat Exchangers Hot Water Storage Tanks

Monthly

- Visually inspect heat exchanger, and associated pipe work for leaks and corrosion. Repair leaks and report on condition.
- Inspect cover for damaged edges. Report if any remedial work is necessary.

Quarterly

- Carry out tasks as detailed for Monthly.
- Examine and check pressure gauges, safety valves, pressure regulator, and relief valves for correct operation.
- Check pressure drop across the heat exchanger tube side. Compare with commissioning figures. Report significant increase in pressure drop requiring internal cleaning of tubes.
- Examine all insulation. Report any damage.
- Examine isolation valve gland packing and adjust or repack as required. Check free travel of valve spindle and where applicable ensure hand wheel is secure.

Annually

- Carry out tasks as detailed for Quarterly.
- Test and calibrate pressure gauges.
- Observe interior and exterior conditions of all tubes. Remove scale or sludge with cleaning compounds. Removal of hard scale may be accomplished through mechanical means.
- Inspect tube joints with tube plates for leaks.
- Check for cracks in tubes. Plug-up cracked tubes. Report the number of plugged up tubes. If the number exceeds 5% of the total number of tubes, replace tube bundle.
- Replace all gaskets with a new set.
- Re-fix heads and tighten head bolts by means of torque wrenches. Refer to manufacturers catalogue for exact torque setting.
- After re-assembly, test the unit hydraulically to the pressures shown on the nameplate.

1.4.11. Closed Type Expansion Tanks

Monthly

- Check all valves for full and free travel. Adjust or re-pack valve glands as required. Lubricate valve stems as necessary.

Quarterly

- Carry out tasks as detailed for Monthly.
- Check all associated pipework and connections for leaks. Repair as necessary and report findings.
- Check pressure relief valve for proper operation. Replace if found defective.

Electrical

- Test and ensure all pressure controls and associated components are operating correctly. Advise on necessity to recalibrate or replace any faulty component.

Annually

- Carry out tasks as detailed for Quarterly.
- Test and ensure security of all pipe brackets and supports.
- Check and report on condition of holding down and all retaining bolts. Tighten as required. Replace any defective item.
- Examine and ensure drain pipes and valves are free from obstruction.
- Test and ensure correct operation of gauges. Re-calibrate as necessary.
- Measure tank thickness by ultra-sonic tests.
- Inspect tank for corrosion. Clean tank externally from all spots. Repaint if necessary.

1.4.12. Air Handling and Fan Coil Units

Specific Precautions

- Start motor for short times only if cover is opened, otherwise you risk overloading the motor. For a short start-up with opened revision cover you should stay near the unit.
- When adjusting regulating pulley do not exceed maximum impeller speed and admissible motor current consumption.

Monthly

- Visually examine entire unit, report on condition and carry out remedial works as required.
- Operate and examine for any undue noise, vibration, or rattling. Report and adjust as necessary.
- Check tightness and air leaks between the different sections of the unit. Replace gaskets as necessary.

Heating and Cooling Coils

- Check coils. Ensure no leakage to occur from coils, connections or pipe work. Adjust and report accordingly.
- Vent air from coil. Ensure tightness of vent cock, check for leakage and adjust if necessary.
- Check coil for dirt, corrosion or algae growth and clean with low-pressure water.

Air Filters

- Read differential pressure across filter using the manometer. Alternatively, examine filter medium for dirt and discoloration. Record and report findings. Advise on the need of any remedial work.

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Fan Drive Belts and Pulleys

- Check tension of belt drives and examine for wear and fraying. Renew defective belts.
- Ensure correct tension on belts. Adjust as necessary.
- Check alignment of drive pulleys. Rectify if incorrectly aligned.
- Inspect drive pulleys for security on their respective shafts. Re-secure a loose pulley tightening all security bolts and locks.
- Check security of drive guards. Tighten or refit as necessary. Inspect guards for corrosion and replace an inadequate guard.
- Check volume dampers for corrosion and dirt. Clean as necessary. Ensure clear motion of dampers. Lubricate as necessary, reset to the original position.

Electrical

Fan Motor

- Check voltage and amperage. Record data. Report any significant error.

Quarterly

- Carry out tasks as detailed for Monthly.
- Examine anti-vibration mountings, ensure their security and performance. Report and repair any defects. Replace item if necessary.
- Examine and ensure all brackets, fixings are secure. Check bolts for corrosion. Tighten and replace as necessary. Report on condition of supports.
- Examine and ensure drip trays, drain points, and drain pipework are free from dirt, scale, obstruction, corrosion and algae deposits. Clean as necessary.
- Ensure all space, duct and equipment sensors are functioning correctly. Report and re-set as appropriate. Replace any defective item.

Fan Bearings

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- Examine fan shaft bearings and lubrication system. Check for shaft and bearing overheating, lubricant dilution, or over lubrication. Adjust to ensure suitable lubrication. Lubricate or grease bearings to the manufacturers recommendations.

- Check shaft and bearings for end play. Report on condition. Replace bearings if necessary.

- Examine motor to shaft alignment. Adjust if necessary.

Fan Motor

- Test bearings for wear and shaft endplay. Report findings.

- Check motor RPM. Record data. Compare with commissioning figures. Report significant change.

- Lubricate motor to the manufacturer's recommendations.

- Examine and ensure that motor ventilation airways are clear. Remove all dirt and dust by vacuum cleaning.

- Check motor isolation mounts and fixings. Tighten as necessary.

Fan wheel and Housing

- Remove dirt accumulation from wheel and housing.

- Check wheel, housing, bolts and set screws for tightness.

Air Filters

- Open up and examine filter framework and casing for corrosion. Wire brush and paint with anti-corrosion primer. Report on condition.

- Examine filter element seating for air leakage. Repair and re-join filter element seating as required.

- Check filter element locking devices for security of fastening. Adjust, refit or replace defective fastenings to ensure air tightness.

- Examine and calibrate manometer as necessary.

Mixing Box & Plenum Section

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- Ensure air tightness. Tighten gaskets, bolts, and brackets as necessary. Change defective items.
- Audibly inspect for rattling sounds. Repair as necessary.
- Clean outside and inside as necessary.

Associated Ductwork

- Inspect flexible connections for leaks. Re-tighten brackets or gaskets as necessary. Replace a defective connection.
- Inspect duct insulation paying particular attention to the vapour seal. Repair damaged areas and report on condition.
- Ensure duct hangers rigidity and tightness. Tighten as necessary. Inspect condition of brackets, hangers, and bolts. Report accordingly.

Associated Pipe work

- Check and ensure satisfactory operation of regulating (3way or 2way) valve assembly. If necessary renew as per manufactures recommendations.
- Check for any water leaks. Repair as necessary.
- Examine valves for leakage. Ensure full and free travel. Adjust or re-pack valve glands as required. Lubricate valve stem. Reset valves to their original position.
- Examine strainers for leakage. Clean strainer as necessary.
- Audibly check for cavitation noise in strainer. Repair as required.
- Examine insulation. Repair any defective section.
- Check condensate drain pipe work or hoses for blockage, corrosion, cracks etc.. Repair as appropriate.

Electrical

Electrical Connections

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- Check and ensure correct operation of all switches, controls and controllers.(Smoke detectors, manometers, motorized valves).

- Examine and report on condition of all associated wiring facilities and wiring. Ensure security of termination.

Bi-annually

- Carry out tasks as detailed for Quarterly.

- Clean out external and internal dust and dirt from the unit.

Heating and Cooling Coils

- Comb out fins. Clean deposits on coil with brush where necessary with appropriate sterilising solution such as chlorine.

Fan Shaft.

- Check the bearing locking collar or set screw for tightness.

Annually

- Carry out tasks as detailed for Bi-Annually.

- Check paintwork for corrosion, if present determine and report cause. Clean, wire brush and repaint as necessary.

- Check validity of pressure and temperature readings in gauges. Recalibrate or replace defective gauges.

- Replace air filter if necessary.

- Check CFM and pressure developed by the Air Handling Unit. Compare with previous commissioning results.

Electrical

- Carry out insulation resistance and earth continuity test, report results.

- Check and calibrate all control devices.

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1.4.13. Ductwork, Filters, Insulation And Attenuators

Specific Precautions

- When cleaning or working in ducts it is essential that all sensors or probes be withdrawn from the duct to prevent any damage.
- Care should also be taken to prevent any damage to dampers, linkages and other control devices that may be located in a duct.
- All volume dampers are set up during commissioning and should not normally be subject to further adjustment unless modifications are made to the ductwork distribution system.
- It is essential that all regulated settings of dampers be marked before work is undertaken on the system and noted, so that they can be correctly returned to the position as set when commissioned.
- Check all air filters, attenuators and duct insulation

Quarterly

- Ensure all ductwork supports, brackets and suspension rods are secure. Tighten bolts as necessary. Report any signs of corrosion. Advise on any remedial work.
- Check flexible connections for condition, leaks and secure fittings. Ensure all connections are airtight. Repair or replace as necessary.
- Inspect access doors for any loose panels and ensure door fixings are secure.
- Check door gaskets for damage and air tightness. Repair/Replace as necessary.
- Ensure that all door handles, catches, hinges and locking systems are functioning correctly.
- Check all accessible turning vanes in ductwork are secure and free from debris.

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- Inspect insulation for any damage or deterioration. Report on condition in particular the integrity of the vapour seal and/or loose wire mesh.
- Ensure all ductwork test holes are plugged and airtight.
- Examine grilles, check mountings and clean.
- Check louvers for damage clean & remove any debris.
- Check screens for any damage, clean. Replace if badly blocked.

Volume Dampers

- Check volume dampers for position, ease of movement and security of locking devices. Ensure that damper opens and closes to desired positions.
- Ensure that the damper blades are secure & are correctly aligned and report any that are loose.
- Check for duct leakage through volume damper.
- perate dampers through total range of travel to check for freedom of movement.
- Apply light oil on linkages and pivot pins.
- Check linkages for wear. Report on condition.

Fire Dampers

- Check action and proper operation. Inspect all dampers; apply a few drops of oil to the mechanism.
- Examine dampers for security in the fire barrier and that all fire stopping around the damper is intact repaired. Report any breaks in stopping. Replace damper if necessary.
- Clean out any dirt or debris collected in the blade guide slots.

- Ensure fusible links to be secure and of correct rating. Replace fusible links if damaged or faulty.
- Lubricate axis or guide slots as necessary.
- Gravity shutter fire damper: check free fall of damper to tight shut position.
- Spring shutter fire damper: check the spring for corrosion and elasticity. Replace if required.
- Plate gravity fire damper: check counter weight for tightness if applicable.
- Check for duct leakage.
- Check duct lock for tightness.

Annually

- Carry out tasks as detailed for Quarterly.
- Check internal condition through sampling points where fitted.
- Measure air volumes at each grille and compare with commissioning values. Report any significant alteration in readings.
- Check air volumes on supply diffusers and adjust where required.
- Inspect anti-vibration mounts for permanent set (in springs). Report if renewal is required. If replaced ensure that the correct type is used.
- Check air deflectors for correct position and ensure the absence of rattling sound. Report and repair if required.
- Check all attenuator supports and fixings for security.
- Ensure that all doors, handles, latches, hinges and locking systems are functioning correctly.
- Ensure that seals are intact and efficient. Replace seals if necessary.

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- Ensure that the access doors are not damaged and that they make perfect contact all around with seal.

1.4.14. Grilles, Registers, and Diffusers

Quarterly

- Ensure correct and secure fixing.
- Check for smut around perimeter surface of grilles. Report findings.
- Inspect air leakage around grille neck. Report and repair as appropriate.

Fresh Air Intake Louvers / Grilles

- Check for obstruction debris and blockage. Clean off grille louver and remove obstruction.
- Check for damage and mishap. Repair damage or replace grille / louver if necessary.
- Check for corrosion or rot. A corroded grille / louver is to be wire brushed, dried thoroughly and have one coat of anti-corrosion primer and two coats of paint applied. Renew any grille / louver weakened by corrosion.

Annually

- Carry out tasks as detailed for Quarterly.
- Measure air volumes at each grille and compare with commissioning or design values. Report any significant alterations in readings. Advise on need to re balance system.

1.4.15. Centrifugal In-Line Fans

Weekly

- Visually examine entire unit and ensure correct operation. Check for any undue noise, vibration, or rattling. Report condition and carry out any remedial work as required.
- Examine fan shaft bearings and lubrication system. Check for shaft overheating, lubricant dilution, or over lubrication. Adjust to ensure suitable lubrication according to the manufacturer's recommendations.

Monthly

- Carry out tasks as detailed under Weekly.
- Lubricate or grease fan bearings according to the manufacturer's recommendations.

Quarterly

- Carry out tasks as detailed for Monthly
- Examine anti-vibration mountings; ensure their security and performance. Report and repair any defect. Replace items if necessary.
- Examine and ensure all brackets, fixings, fan enclosure and housing to be secure. Check bolts for corrosion. Tighten and replace as necessary. Report on condition of supports.

Fan Bearings

- Inspect shaft and bearings for wear corrosion and tightness. Repair or replace bearings as necessary.
- Check shaft and bearings for end play. Report on condition. Replace bearings if necessary.
- Check bearing locking collar. retighten and repair as necessary.

Drive Belts and Pulleys

- Check tension of belt drives and examine for wear and fraying. Renew defective belts.
- Ensure correct tension on belts. Adjust as necessary.
- Check alignment of drive pulleys. Rectify if incorrectly aligned.
- Inspect drive pulleys for security on their respective shafts. Re-secure a loose pulley, tightening all security bolts and locks.
- Check security of drive guards. Tighten or refit as necessary. Inspect guards for corrosion and replace an inadequate guard.

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Motor

- Test bearings for wear and shaft endplay. Report findings.
- Check motor RPM. Record data. Compare with commissioning figures. Report significant change.
- Lubricate motor according to the manufacturer's recommendations.
- Examine and ensure that motor ventilation airways are clear. Remove all dirt and dust by vacuum cleaning.
- Check motor isolation mounts and fixings. Tighten as necessary.

Fan Wheel and Housing

- Remove dirt accumulation from wheel and housing.
- Check wheel, housing, bolts and set screws for tightness.

Associated Ductwork

- Inspect flexible connections for leaks. Re-tighten brackets or gaskets as necessary. Replace a defective connection.
- Ensure duct hangers rigidity and tightness. Tighten as necessary. Inspect condition of brackets, hangers, and bolts. Report accordingly.

Electrical Motor

- Check voltage and amperage. Record data. Report any significant error.

Electrical Connections

- Check and ensure correct operation of all switches, controls and controllers.
- Examine and report on condition of all associated wiring facilities and wiring. Ensure security of termination.
- Carry out insulation resistance and earth continuity tests. Reports results.

1.4.16. Centrifugal Fans (Belt Driven)

Weekly

- Visually examine entire unit and ensure correct operation. Report condition and carry out any remedial work as required.
- Examine unit for any undue noise, vibration, or rattling. Report and repair as appropriate.
- Examine fan shaft bearings and lubrication system. Check for shaft overheating, lubricant dilution, or over lubrication. Adjust to ensure suitable lubrication according to the manufacturer's recommendations.

Monthly

- Carry out tasks as detailed under Weekly.

Fan Bearings

- Lubricate or grease bearings according to manufacturer's recommendations.

Quarterly

- Carry out tasks as detailed for Monthly.
- Examine anti-vibration mountings, ensure their security and performance. Report and repair any defect. Replace items if necessary.
- Examine and ensure all brackets, fixings, fan enclosure and housing to be secure. Check bolts for corrosion. Tighten and replace as necessary. Report on condition of supports.

Fan Bearings

- Inspect shaft and bearings for wear corrosion and tightness. Repair or replace bearings as necessary.
- Check shaft and bearings for end play. Report on condition. Replace bearings if necessary.
- Examine motor to shaft alignment. Adjust if necessary.
- Check bearing locking collar, retighten and repair as necessary.

Drive Belts and Pulleys

- Check tension of belt drives and examine for wear and fraying. Renew defective belts.
- Ensure correct tension on belts. Adjust as necessary.
- Check alignment of drive pulleys. Rectify if incorrectly aligned.
- Inspect drive pulleys for security on their respective shafts. Re-secure a loose pulley, tightening all security bolts and locks.

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- Check security of drive guards. Tighten or refit as necessary. Inspect guards for corrosion and replace an inadequate guard.

Motor

- Test bearings for wear and shaft end play. Report findings.
- Check motor RPM. Record data. Compare with commissioning figures. Report significant change.
- Lubricate motor according to the manufacturer's recommendations.
- Examine and ensure that motor ventilation airways are clear. Remove all dirt and dust by vacuum cleaning.
- Check motor isolation mounts and fixings. Tighten as necessary.

Fan Wheel and Housing

- Remove dirt accumulation from wheel and housing.
- Check wheel, housing, bolts and set screws for tightness.

Associated Ductwork

- Inspect flexible connections for leaks. Re-tighten brackets or gaskets as necessary. Replace a defective connection.
- Ensure duct hangers rigidity and tightness. Tighten as necessary. Inspect condition of brackets, hangers, and bolts. Report accordingly.

Electrical

Electrical Connections

- Check and ensure correct operation of all switches, controls and controllers.
- Examine and report on condition of all associated wiring facilities and wiring. Ensure security of termination.
- Carry out insulation resistance and earth continuity tests. Report results.

Motor

- Check voltage and amperage. Record data. Report any significant error.

1.4.17. Minisplits And Wall Type Air Conditioners

Monthly

- Check and clean air filter
- Remove dust from the front panel
- Thermostat Checking
- Freon Level
- Freon temp
- Noise level
- Indoor conditions
- Check power supply Wiring

Quarterly

- Clean and check for obstruction in drain.
- Pan and evacuating piping.
- Contactors and relays.
- Fan voltage and amperage.
- Compressor voltage and amperage.
- Compressor oil level.
- Crankcase heater amperage.
- Pulleys and belts.
- Suction pressure.
- Discharge pressure.
- Coil cleaning and washing.
- Bearings and lubrication.

1.4.18. Axial Fans

Quarterly

- Examine unit for any undue noise, vibration, or rattling. Repair as appropriate.
- Examine anti-vibration mountings; ensure their security and performance. Report and repair any defect. Replace items if necessary.
- Examine and ensure all brackets, fixings, fan enclosure and housing to be secure. Check bolts for corrosion. Tighten and replace as necessary. Report on condition of supports.

Motor

- Test bearings for wear and shaft end play. Report findings.
- Check motor RPM. Record data. Compare with commissioning figures. Report significant change.
- Lubricate motor to the manufacturer's recommendations.
- Examine and ensure that motor ventilation airways are clear. Remove all dirt and dust by vacuum cleaning.
- Check motor isolation mounts and fixings. Tighten as necessary.

Fan Impeller and Housing

- Remove dirt accumulation from impeller and housing.
- Check impeller, housing, bolts and set screws for tightness.
- Ensure tightness of all locking collars, and bolts. Retighten as necessary.

Electrical

Motor

- Check voltage and amperage. Record data. Report any significant changes from rated values.

Electrical Connections

- Check and ensure correct operation of all switches, controls and controllers.
- Examine and report on condition of all associated wiring facilities and wiring. Ensure security of termination.
- Carry out insulation resistance and earth continuity tests. Reports results.

1.4.19. Propeller Fans

Quarterly

- Examine unit for any undue noise, vibration, or rattling. Repair as appropriate.
- Examine anti-vibration mountings; ensure their security and performance. Report and repair any defect. Replace items if necessary.
- Examine and ensure all brackets, fixings, fan enclosure and housing to be secure. Check bolts for corrosion. Tighten and replace as necessary. Report on condition of supports.

Motor

- Test bearings for wear and shaft endplay. Report findings.
- Check motor RPM. Record data. Compare with commissioning figures. Report significant change.
- Lubricate motor to the manufacturer's recommendations.
- Examine and ensure that motor ventilation airways are clear. Remove all dirt and dust by vacuum cleaning.
- Check motor isolation mounts and fixings. Tighten as necessary.

Fan Impeller and Housing

- Remove dirt accumulation from impeller and housing.
- Check impeller, housing, bolts and set screws for tightness.
- Ensure tightness of all locking collars, and bolts. Retighten as necessary.

Dampers

- Check and ensure correct operation of shutter vanes. Adjust as necessary.

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Electrical

Motor

- Check voltage and amperage. Record data. Report any significant changes from rated values.

Electrical Connections

- Check and ensure correct operation of all switches, controls and controllers.
- Examine and report on condition of all associated wiring facilities and wiring. Ensure security of termination.
- Carry out insulation resistance and earth continuity tests. Reports results.

1.4.20.Wall and Roof Extract Fans

Quarterly

- Clean impeller and spinner and ensure no build up of dirt.
- Check fan impeller for cracks, corrosion or other damage. Repair or renew as required.
- Clean exterior surfaces, wheel and housing.
- Remove dust build up on motor housing to ensure proper motor cooling.
- Ensure that all bolts, anti-vibration mountings, locking collars, set screws and fasteners are to be present and secure. Tighten and replace if necessary.
- Check fan casing for corrosion. Repair or renew as necessary.
- Ensure that the fan bearings are in sound condition with adequate lubrication.
- Check belt tension and adjust if necessary.
- Check pulleys for wear and replace both pulleys and belts if wear is evident.
- Ensure motor, drive and pulley are correctly aligned. Replace if aligned condition warrants it.
- Grease motor according to manufacturer's recommendations.
- Grease fan bearings as necessary.

Electrical

- Check operation of switch. Repair or replace as necessary.

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1.5.1- Work Parcel 1- List of Operation And Maintenance Manuals

HVAC System

Faculty	Set Nb.	Division Nb.
Faculty of Fine Arts-Bldg (B)	2	2
Faculty of Law-Bldg (D)	3	2
Faculty of Engineering-Bldg (G)	18	2
Faculty of Pharmacy-Bldg (H)	5	2
Extension of the Faculty of Sciences-Bldg (J)	6	2
Faculty of Medicine-Bldg (M1.1 & M1.2)	8	2
Faculty of Dentistry-Bldg (M1.3 & M1.4)	8	2
Faculty of public Health-Bldg (Q)	10	2

Building	Set Nb.	Division Nb
Conference center-Bldg (F)	4	2
Sport Complex-Bldg (K)	7	2
Library of Medical Sciences-Bldg (M2)	9	2
Male Dormitories-Bldg (R01)	11	2
Female Dormitories-Blgd (R02)	12	2
Technical Area-Bldg (T1,T2&T3)	13	2
Restaurant& Functional Housing-Bldg (U2)	15	2
Central Parking-Bldg (U3)	14	2
Eastern Parking-Bldg (V1)	14	2
Pain Pumping Station-Bldg (V3)	1	6
Utility Tunnel-Bldg (V4)		
Underground Western Parking and Central Catering - Bldg (X)	16	2

Plumbing System

Faculty	Set Nb.	Division Nb.
Faculty of Fine Arts-BLdg (B)	2	1
Faculty of Law-Bldg (D)	3	1
Faculty of Engineering-Bldg (G)	18	1
Faculty of Pharmacy-Blgd (H)	5	1
Extension of the Faculty of Sciences-Bldg (J)	6	1
Faculty of Medicine-Bldg (M1)	8	1
Library of Medical Sciences-Bldg (M2)	9	1
Faculty of public Health-Bldg (Q)	10	1

Building	Set Nb.	Division Nb
Conference Center-Bldg (F)	4	1
Sport Complex-Bldg (K)	7	1
Male Dormitories-Bldg (R01)	11	1
Female Dormitories-Bldg (R02)	12	1
Technical Area-Bldg (T1,T2&T3)	13	1
Restaurant& Functional Housing-Bldg (U2)	14	1
Central Parking-Bldg (U3)	15	1
Eastern Parking-Bldg (V1)	15	1
Pain Pumping Station-Bldg (V3)	1	6
Utility Tunnel-Bldg (V4)		
Underground Western Parking and Central Catering - Bldg (X)	16	1

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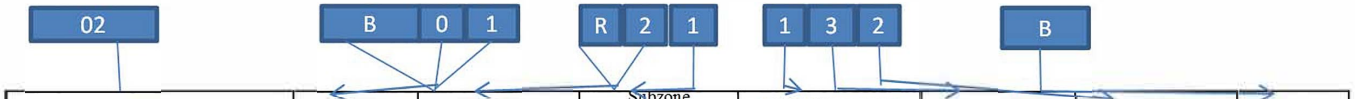
Work Parcel 1: Mechanical Works

1.5.2 List of As Built Drawings in all Trades



IRN	Trades	Block/Zone	Subzone or Scale	Type of Document	Level of Plans	Running Number	Revision
Internal Revision Number		Zone defining the Building Examples: R2: Female Dorm R1: Male Dorm TS: Type Spaces OO: Whole Project	o= (Whole Zone) 1,2,3,4,5,6 (Parts of zone or whole zone) 7= Miscellaneous 8=Typical Spaces	1= Plans 2=Sections 3=Elevations 4=Details on A0 5=General Details on A3 6=Particular Details on A3 7=Schedules 8=Miscellaneous	0=Foundation 1=2nd Basement 3=Ground Floor 4=1st Floor 5=2nd Floor 6=3rd Floor 7=4th Floor 8=5th Floor 9=Roof	To facilitate diff documents of the same type and the same location	A, B, C, D

Trades (As needed for Drawing Numbering)

Trade A		Trade B		Trade C		Trade D		Trade E	
Site Works		Structures & OutBoards		Technical Equipment		Technical Equipment		Finishes	
A05	Main Pumping Station	**B00**	General Structure Drawings	**C00**	General M+E Drawings	**D02**	Swimming Pool Treatment equipment & accessories	**E00**	Architectural Executive Drawings
A06	Water Supply	**B01**	Concrete Works	**C10**	HVAC	**D04**	Decorative Fountains		
A07	Waste Water	**B02**	Frame Works & Canopi es	**C20**	Plumbing	**D08**	Scientific Lab Equipment		
A11	External Signs & Boards	**B03**	Waterproofing & Joints	**C30**	High Voltage Installation General				
A13	Electrical Network	**B05**	External Aluminum & Glazing	**C31**	Transformer Substat				
A14	Low Current (Refer to C04)	**B09**	Reinforcement	**C32**	Static UPS System				
A15	Chilled & Heating Water	**B10**	Precast Elements	**C33**	Lighting layout				
		B11	Concrete Drawings with Reinforcement	**C34**	Miscellaneous				
				C35	Earthing System & Lightning Project				
				C40	Low Current Installation General				
				C41	Telephone Systems				
				C42	Computer Network				
				C43	Sound System				
				C44	Fire Alarm System				
				C45	Clock System				

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1.5.3- Work Parcel 1- List of Equipment Suppliers/Subcontractors

HVAC System

	Equipment	Subcontractor/ Supplier	Contact (TEL.)	Manufacturer	Concenned Bldgs
1	End Suction Pumps	Wilo Salmson SARL	04-772280	Wilo	All except Engineering
		Ghazzawi		Vogel	Faculty of Engineering (G)
2	Air Handling Units (AHU)	ICIE Petra	01-663573	Petra	All except Engineering
		Modern Trading ITL.		Golden star	Faculty of Engineering (G)
3	Fan Coil Units (FCU)	ICIE Petra	01-663573	Petra	All except Engineering
		Modern Trading ITL.		Golden star	Faculty of Engineering (G)
4	Split System Air Conditionner (SSAC)	Al Salem Agencies	01-567115	York	All except Engineering
		Modern Trading ITL.		Golden star	Faculty of Engineering (G)
5	Computer Room Air Conditionner (CRAC)	Al Salem Agencies	01-567115	Denco	All except Engineering
6	Fans	Jacteco Mechanical	01-353223	Greenheck	All Buildings
7	Hot Water Storage Tanks (HWST)	A.Z Tec	01-682407	IMI Rycroft	All Buildings
8	Heat Exchangers (HEX)	A.Z Tec	01-682407	IMI Rycroft	All Buildings
9	Expansion Tanks (EX)	Rimawa	01-204728	Armstrong	All Buildings

Plumbing System

	Equipment	Subcontractor/ Supplier	Contact (TEL.)	Manufacturer	Concenned Bldgs
1	Circulator Pumps for HWST	A.Z Tec	01-682407	Pullen	All except Engineering
		Ghazzawi		Vogel	Faculty of Engineering (G)
2	Distilled Water booster pumps	Arison	01-793900	IDP	All Buildings
3	Submersible Pumps	linaset	01-663316	ABS	All Buildings
4	Water Softener (WS)	Progress Water products	03-324244	Aqua Spring	All Buildings
5	Drinking Fountain	Aqua treat	03-655929	Elkay	All Buildings
6	Electric Water Heater (EWH)	Webco	01-853047	Applimo	All Buildings
7	Lavatory mixers LAV-1	Charles Boustany	01-388412	Presto	All except Engineering
		Domcol	03-437768	Delabie	Faculty of Engineering (G)
8	Lavatory Taps LAV-2	Charles Boustany	01-388412	Presto	All except Engineering
		Domcol	03-437768	Delabie	Faculty of Engineering (G)
9	Lavatory Mixers LAV-3	Charles Boustany	01-388412	Kludi	All Buildings
10	Sink Mixers	Charles Boustany	01-388412	Kludi	All Buildings
11	Sink Taps	Charles Boustany	01-388412	Kludi	All Buildings
12	Mop Sink Taps	Charles Boustany	01-388412	Kludi	All Buildings
13	Shower Mixers	Charles Boustany	01-388412	Presto	All Buildings
14	Bib Cock Perineal Hose	Domcol	03-437768	Delabie	All Buildings
15	Angle Valves/Flexibles	Charles Boustany	01-388412	Kludi	All except Engineering
		Domcol	03-437768	Delabie	Faculty of Engineering (G)
16	WC Flush Valves	Domcol	03-437768	Delabie	All Buildings
17	Flush Tanks	Georges Khoury	01-873872	Duravit	All except Engineering
18	Emergency Showers	Bauhoff	01-312271	potteau	All Buildings
19	Water Hammer Arrestor (WHA)	Domcol	03-437768	Delabie	All except Engineering
		Akiki	01-339322	Zurn	Faculty of Engineering (G)
20	Bathtub Mixer	Charles Boustany	01-388412	Kludi	Bldg U2
21	Jaccuzi Mixer			Grohe	Bldg U2
22	Hand Dryers	Charles Boustany	01-388412	Mediclinics	All Buildings
23	Liquid Soap Dispensers	Charles Boustany	01-388412	Mediclinics	All Buildings
24	Paper towel Dispensers	Charles Boustany	01-388412	Mediclinics	All Buildings
25	Gas Solenoid Valve	Natgas	01-884388	Asco	All Buildings
26	Air Compressor	Philka	03-334335	Ingersoll Rand	All Buildings
27	Vacuum Pumps	Philka	03-334335	Ingersoll Rand	All Buildings
28	Gas Pressure Regulator	Natgas	01-884388	Briffault	All Buildings
29	Emergency Shutt off Valves	Wilo Salmson SARL	04-772280	Crane	All Buildings
30	Gas Leak Detector	Automation&con.	01-487726	Etrans	All Buildings

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1.5.4 - Work Parcel 1- List of Consummables

	Consummable	Systems/Location	Form
1	Refrigerant (R22)	DX air conditionners	Gas
2	Gas	Labs/Workshops	Gas
3	Oxygene	Labs/Workshops	Gas
4	Acetylene	Labs/Workshops	Gas
5	AHU filters	AHUs	Pcs
6	FCU filters	FCUs	Pcs
7	Cartridges for filters	Drinking Fountains	Pcs
8	Lamps for Ultra-violet sterelizers	Drinking Fountains	Pcs
9	Cartridges for air compressors filters	Air compressors	Pcs
10	Anti-Scale Anti-Corrosion	Secondary Heating Loop	Liquid
11	Biocide		Liquid