

ROB PICKETT DESIGN

MECHANICAL SERVICES SPECIFICATION

PROPOSED HUDSON BUILDING

VICTORY LUTHERAN COLLEGE

28 Drage Rd, Wodonga VIC 3690

NOT FOR CONSTRUCTION

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SECTION 1. GENERAL

1.1 SCOPE OF WORK - MECHANICAL SERVICES

This Specification covers the supply, installation, testing, commissioning and maintenance of Mechanical Services for the Proposed Student Services Building for Victory Lutheran College, located at 28 Drage Road, Wodonga VIC 3690.

The scope is comprised of a new building that shall be air conditioned via a combination of split cassette and ducted units. The outside air shall be supplied to the units via concealed ducted fresh air processing units (one unit per floor).

The Ground floor rooms will receive the preconditioned outside air via a slot grille adjacent the ceiling cassette units. The First floor areas with the ceiling shall receive the preconditioned outside air via a ceiling grille; The First floor areas without the ceiling shall receive the preconditioned outside air via a sidewall double deflection type grille at the wall of the room.

The FCU-F.01 & F.09 ducted units shall have an outside air supply without preconditioning, direct from the roof cowl.

The Ground floor preconditioning unit shall be constant 100% outside air supply. The First floor preconditioning unit shall have outside air supply modulated via RA and OA dampers and a CO2 sensor located in the return air path.

The excess air shall be relieved via a relief air roof cowl with, room pressure sensor, motorised relief damper and eggcrate grille located above the Display area. Thus, it shall also assist with relieving stratified hot air from the void area in the summer season.

The Display area shall benefit during heating season from the FCU-F.01 return air grilles located on the Ground floor ceiling. It is also assumed that the Ground floor Display area shall have in-slab heating circuit (by others, out of this scope), which shall assist in managing air stratification in this area.

Several amenity areas in the building shall be ventilated mechanically via wall mounted louvers and inline fans (Cleaner's area is with wall mounted fan due to location).

Lift Supply and install is out of this scope. Mechanical contractor shall include in the scope supply and install of ventilation weather louvre within the lift headroom wall area on the roof. This work shall be liaised with and coordinated with the selected lift manufacturer's requirement.

The outdoor condenser units for splits shall be located on the roof on the roof platform, as shown on drawing, and complete with the AS1657 compliant roof platform, access and walkway (by Builder). Final arrangement TBC and coordinated with roof mounted PV panel's locations (Mechanical contractor shall liaise).

All power for the proposed mechanical services systems shall be supplied via local MSSB Mechanical Services Switch board located on the First Floor. Location to be confirmed prior to construction.

1.1. GENERAL SCOPE OF WORKS – MECHAICAL (*Continued*)

This specification shall be read with the latest issue of architectural and mechanical services design drawings, describing the scope of works. Any discrepancies found by mechanical services contractors between these documents shall be clarified prior to tender stage.

1.2. EXTENT OF WORK - MECHANICAL SERVICES

REQUIREMENT:

The following equipment and ancillary systems shall be provided by the Mechanical Contractor.

The design equipment is provided to assist in pricing and requirement. Alternative equipment make and models may be provided by the Mechanical Contractor only where such alternative equipment is of equal or superior quality and includes all features and functionality of the design equipment specified herein, and when it fits within configuration of the space. **The Mechanical Contractor shall clearly note in the Tender submission that the alternative equipment makes provided within their quotation.** Note, if the alternative make selection of mechanical services equipment entail additional costs for upgrade of electrical equipment (or any other upgrade works), these costs shall be borne by Mechanical Contractor.

The Mechanical Contractor shall ensure that all contract engineering & detail drawings are undertaken and approved prior to the installation of ductwork or ordering of plant & equipment. This shall include adjustment of the foot print and possible ductwork, pipework & air diffusion to suit the desired air and water flows, including changed plant models, all computations such as ductwork resistance calculations, pump head calculations, and shop detail drawings for all plant and associated items, ensuring that the plant fits within the space and all items coordinated between services and builder.

Note: The Mechanical Contractor shall provide technical data equipment schedules for all plant being provided ensuring any alternative plant can be approved in appropriate time not to affect the building programme. Refer to section 1.7.

NEW EQUIPMENT & SYSTEMS

- Supply & installation of 3 (Three) off reverse cycle split systems complete with wall mounted fan coil units “**FCU-G.01 to G.03**” serving **GF Display area** as required; the condenser units “**CU-G.01 to G.03**” shall be located within the roof plant area to be mounted on support stand by Mechanical contractor, complete with controls, antivibration mounts, piping, etc. and drained, as shown on drawings. The condenser and fan coil shall be installed as per the manufacturer’s recommendations.

1.2 EXTENT OF WORKS (Continued)

- Supply & installation of 2 (Two) off reverse cycle split systems complete with 900x900 ceiling cassette fan coil units “**FCU-G.04 & G.16**” serving **GF Coordinator and First Aid areas** as required; the condenser units “**CU-G.04 & G.16**” shall be located within the roof plant area to be mounted on support stand by Mechanical contractor, complete with controls, antivibration mounts, piping, etc. and drained, as shown on drawings. The condenser and fan coil shall be installed as per the manufacturer’s recommendations.
- Supply & installation of 11 (Eleven) off reverse cycle split systems complete with 600x600 ceiling cassette fan coil units “**FCU-G.05 to G.15**” serving **Ground floor rooms** as required; the condenser units “**CU-G.05 to G.15**” shall be located within the roof plant area to be mounted on support stand by Mechanical contractor, complete with controls, antivibration mounts, piping, etc. and drained, as shown on drawings. The condenser and fan coil shall be installed as per the manufacturer’s recommendations.
- Supply & installation of 2 (Two) off reverse cycle split systems complete with ducted type fan coil units “**FCU-F.01 & F.09**” serving **Display area void and Consult area** as required; the condenser units “**CU-F.01 & F.09**” shall be located within the roof plant area to be mounted on support stand by Mechanical contractor, complete with controls, antivibration mounts, piping, etc. and drained, as shown on drawings. The condenser and fan coil shall be installed as per the manufacturer’s recommendations.
- Supply & installation of 7 (Seven) off reverse cycle split systems complete with 600x600 ceiling cassette fan coil units “**FCU-F.02, F.03, F.06 to F.08, F.10, F.11**” serving **First floor rooms** as required; the condenser units “**CU- F.02, F.03, F.06 to F.08, F.10, F.11**” shall be located within the roof plant area to be mounted on support stand by Mechanical contractor, complete with controls, antivibration mounts, piping, etc. and drained, as shown on drawings. The condenser and fan coil shall be installed as per the manufacturer’s recommendations.
- Supply & installation of 4 (Four) off reverse cycle split systems complete with 900x900 ceiling cassette fan coil units “**FCU-F.04, F.05, F.12, F.13**” serving **First Floor Staff and Large Consult areas** as required; the condenser units “**CU- F.04, F.05, F.12, F.13**” shall be located within the roof plant area to be mounted on support stand by Mechanical contractor, complete with controls, antivibration mounts, piping, etc. and drained, as shown on drawings. The condenser and fan coil shall be installed as per the manufacturer’s recommendations.
- Supply & Installation of One (1) off VRV Heat pump system “**CU-OA-01**” serving the outside air requirement to the building. The condenser unit shall be complete with associated controls, antivibration mounts, piping, etc. The unit shall be installed within the roof plant area to be mounted on support stand by Mechanical contractor, as per manufacturer’s recommendations, and drained as required. The Indoor units shall be a fresh air preconditioning ducted fan coil units **FCU-OA-G & FCU-OA-F**, and shall be serving the associated floors as required.

1.2 EXTENT OF WORKS (Continued)

- Supply & Installation of 1 (One) off Outside air fans “**OAF-01**” serving fresh air requirement for the unit FCU-F.01. The fan shall be inline ducted, installed as per manufacturer’s recommendation, complete with flexible connectors, anti-vibration mounts, associated filter boxes, non-return dampers, acoustically lined outside air duct & droppers, roof cowls etc. as required.
- Supply & Installation of 3 (Three) off Exhaust air fans “**EF-01 to 03**” serving exhaust requirement for the amenity areas, as required. The fans shall be inline ducted type, installed as per manufacturer’s recommendation, complete with flexible connectors, anti-vibration mounts, non-return dampers for fans ventilating from air conditioned areas, exhaust duct reticulation, weather louvers, etc as required.
- Supply & Installation of 1 (One) off Exhaust air fans “**EF-04**” serving exhaust requirement for the Clean room area, as required. The fans shall be wall mounted type exhausting via a wall mounted louvre, installed as per manufacturer’s recommendation, complete with non-return shutters, exhaust duct through the wall, weather louvers, etc as required.
- Roof cowls and louvers to be provided as required and shown on drawings. Complete with screens etc. as required. They shall be selected for pressure drop not higher 20 & 30 Pa respectfully and installed as per manufacturer’s recommendations.

EQUIPMENT DUTY SPECIFICATIONS

ITEM	DUTY	ACCESSORIES
FCU-G.01 / CU-G.01 WALL MOUNTED Reverse Cycle split GF Display area	Cooling: 4.5kW GTH 4.5kW GTSH Entering cond.: 22.7 / 16.5C Heating: 3.5kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FTXM60WVMA / RXM60WVMA (or equivalent)		
FCU-G.04 / CU-G.04 CEILING CASSETTE Reverse Cycle split GF Coordinator	Cooling: 2.7kW GTH 2kW GTSH Entering cond.: 22.7 / 17.5C O/A: 80 L/s via PCU Heating: 3.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FCA50CAVMA / RZAV50C1V1 (or equivalent)		
FCU-G.05 / CU-G.05 COMP.CEILING CASS. Reverse Cycle split GF Learn Leaders	Cooling: 3.6kW GTH 3.4kW GTSH Entering cond.: 22.7 / 16.6C O/A: 20 L/s via PCU Heating: 2.4kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		

1.2 EXTENT OF WORKS (Continued)

ITEM	DUTY	ACCESSORIES
FCU-G.06 / CU-G.06 COMP.CEILING CASS. Reverse Cycle split GF Chaplain	Cooling: 3.3kW GTH 3.1kW GTSH Entering cond.: 22.7 / 16.7C O/A: 20 L/s via PCU Heating: 2.1kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		
FCU-G.07 / CU-G.07 COMP.CEILING CASS. Reverse Cycle split GF DOWB-PS	Cooling: 3.3kW GTH 3.1kW GTSH Entering cond.: 22.7 / 16.7C O/A: 20 L/s via PCU Heating: 2.1kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		
FCU-G.08 / CU-G.08 COMP.CEILING CASS. Reverse Cycle split GF DOWB-SS	Cooling: 3.9kW GTH 3.7kW GTSH Entering cond.: 22.7 / 16.6C O/A: 20 L/s via PCU Heating: 2.7kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		
FCU-G.09 / CU-G.09 COMP.CEILING CASS. Reverse Cycle split GF Booking 1	Cooling: 1.6kW GTH 1.4kW GTSH Entering cond.: 22.7 / 17.1C O/A: 30 L/s via PCU Heating: 1.6kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		
FCU-G.10 / CU-G.10 COMP.CEILING CASS. Reverse Cycle split GF Counselling 1	Cooling: 1.2kW GTH 1.1kW GTSH Entering cond.: 22.7 / 17C O/A: 20 L/s via PCU Heating: 1.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		
FCU-G.11 / CU-G.11 COMP.CEILING CASS. Reverse Cycle split GF Speech Psych	Cooling: 1.1kW GTH 0.9kW GTSH Entering cond.: 22.7 / 17.1C O/A: 20 L/s via PCU Heating: 1kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		
FCU-G.12 / CU-G.12 COMP.CEILING CASS. Reverse Cycle split GF Counselling 2	Cooling: 1.2kW GTH 1kW GTSH Entering cond.: 22.7 / 17.1C O/A: 20 L/s via PCU Heating: 1.2kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		

1.2 EXTENT OF WORKS (Continued)

ITEM	DUTY	ACCESSORIES
FCU-G.13 / CU-G.13 COMP.CEILING CASS. Reverse Cycle split GF Sensory	Cooling: 4.6kW GTH 4kW GTSH Entering cond.: 22.7 / 16.9C O/A: 60 L/s via PCU Heating: 3.8kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		
FCU-G.14 / CU-G.14 COMP.CEILING CASS. Reverse Cycle split GF Counselling 4	Cooling: 1.9kW GTH 1.7kW GTSH Entering cond.: 22.7 / 16.9C O/A: 20 L/s via PCU Heating: 1.6kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		
FCU-G.15 / CU-G.15 COMP.CEILING CASS. Reverse Cycle split GF Counselling 3	Cooling: 1.7kW GTH 1.4kW GTSH Entering cond.: 22.7 / 16.9C O/A: 20 L/s via PCU Heating: 1.7kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		
FCU-G.16 / CU-G.16 CEILING CASSETTE Reverse Cycle split GF First Aid	Cooling: 2.9kW GTH 2.4kW GTSH Entering cond.: 22.7 / 17.2C O/A: 60 L/s via PCU Heating: 3.6kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FCA50CAVMA / RZAV50C1V1 (or equivalent)		
FCU-F.01 / CU-F.01 DUCTED Reverse Cycle split FF Display area	Cooling: 23.8kW GTH 22.1kW GTSH Entering cond.: 23.8 / 16.2C S/A: 1500 L/s O/A: 105 L/s via roof cowl Heating: 15.9kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FDYQ250LCV1 / RZYQ10TY1 (or equivalent)		
FCU-F.02 / CU-F.02 COMP.CEILING CASS. Reverse Cycle split FF LE PS Office	Cooling: 3.9kW GTH 3.7kW GTSH Entering cond.: 22.7 / 16.6C O/A: 20 L/s via PCU Heating: 2.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		
FCU-F.03 / CU-F.03 COMP.CEILING CASS. Reverse Cycle split FF Booking 4	Cooling: 1.8kW GTH 1.6kW GTSH Entering cond.: 22.7 / 16.8C O/A: 20 L/s via PCU Heating: 1.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA25BVM / RZAC25E2VM (or equivalent)		

1.2 EXTENT OF WORKS (Continued)

ITEM	DUTY	ACCESSORIES
FCU-F.04 / CU-F.04 CEILING CASSETTE Reverse Cycle split FF PS LE Staff	Cooling: 8.1kW GTH 7.2kW GTSH Entering cond.: 22.7 / 16.8C O/A: 160 L/s via PCU for the whole area Heating: 5.6kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FCA85CAVMA / RZAV85C2V/Y1 (or equivalent)		
FCU-F.05 / CU-F.05 CEILING CASSETTE Reverse Cycle split FF PS LE Staff	Cooling: 8.1kW GTH 7.2kW GTSH Entering cond.: 22.7 / 16.8C Heating: 5.6kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FCA85CAVMA / RZAV85C2V/Y1 (or equivalent)		
FCU-F.06 / CU-F.06 COMP.CEILING CASS. Reverse Cycle split FF Staff Breakout	Cooling: 3.9kW GTH 3.3kW GTSH Entering cond.: 22.7 / 17C O/A: 60 L/s via PCU Heating: 4.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA50BVM / RZAC50E2VM (or equivalent)		
FCU-F.07 / CU-F.07 COMP.CEILING CASS. Reverse Cycle split FF Staff Quiet	Cooling: 3.2kW GTH 2.8kW GTSH Entering cond.: 22.7 / 16.9C O/A: 70 L/s via PCU for the whole area Heating: 2.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA35BVM / RZAC35E2VM (or equivalent)		
FCU-F.08 / CU-F.08 COMP.CEILING CASS. Reverse Cycle split FF Staff Quiet	Cooling: 3.2kW GTH 2.8kW GTSH Entering cond.: 22.7 / 16.9C Heating: 2.3kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA35BVM / RZAC35E2VM (or equivalent)		
FCU-F.09 / CU-F.09 Ducted concealed. Reverse Cycle split FF Consulting	Cooling: 9.2 kW GTH 8.4 kW GTSH Entering cond.: 23.6 / 17.1C O/A: 50 L/s via Roof cowl Heating: 4.7 kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FDYA100AV1 / RZAS100C2V1 (or equivalent)		

1.2 EXTENT OF WORKS (Continued)

ITEM	DUTY	ACCESSORIES
FCU-F.10 / CU-F.10 COMP.CEILING CASS. Reverse Cycle split FF Booking 2	Cooling: 3.1kW GTH 2.9kW GTSH Entering cond.: 22.7 / 16.7C O/A: 20 L/s via PCU Heating: 2kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA35BVM / RZAC35E2VM (or equivalent)		
FCU-F.11 / CU-F.11 COMP.CEILING CASS. Reverse Cycle split FF LE SS Office	Cooling: 2.9kW GTH 2.7kW GTSH Entering cond.: 22.7 / 16.7C O/A: 20 L/s via PCU Heating: 1.8kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FFA35BVM / RZAC35E2VM (or equivalent)		
FCU-F.12 / CU-F.12 CEILING CASSETTE Reverse Cycle split FF SS LE Staff	Cooling: 8.2kW GTH 7.3kW GTSH Entering cond.: 22.7 / 16.8C O/A: 160 L/s via PCU for the whole area Heating: 5.8kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FCA85CAVMA / RZAV85C2V/Y1 (or equivalent)		
FCU-F.13 / CU-F.13 CEILING CASSETTE Reverse Cycle split FF SS LE Staff	Cooling: 8.2kW GTH 7.3kW GTSH Entering cond.: 22.7 / 16.8C Heating: 5.8kW	Wired remote controller Schedule controlled, AH button Connected to central controller Condenser support stand
FCA85CAVMA / RZAV85C2V/Y1 (or equivalent)		

1.2 EXTENT OF WORKS (Continued)

ITEM	DUTY	ACCESSORIES
FCU-OA-G DUCTED FRESH AIR TYPE VRV Heat pump FRESH AIR FOR GF FXMQ200MFV (or equivalent)	Cooling: 7.8kW GTH 7.8kW GTSH Entering cond.: 38.4 / 22.7C S/A: 410 L/s O/A: 410 L/s via roof cowl Heating: 13.1kW	Wired remote controller Schedule controlled, AH button Connected to central controller Motorised damper On/Off
FCU-OA-F DUCTED FRESH AIR TYPE VRV Heat pump FRESH AIR FOR FF FXMQ250MFV (or equivalent)	Cooling: 12kW GTH 12kW GTSH Entering cond.: 38.4 / 22.7C S/A: 530 L/s O/A: 160 - 530 L/s via roof cowl Heating: 15.5kW	Wired remote controller Schedule controlled, AH button Connected to central controller Motorised dampers RA & OA, CO2 sensor in R/A grille
CU-OA-01 Outdoor condenser unit Heat Pump VRV Roof plant area Daikin RXYQ18BYM (or equivalent)	Cooling: GTH: 19.8 kW Ambient cond: 38.4 CDB / 22.7 CWB Heating: 28.6 kW	Connected to Central control. Roof mtd Condenser support stand
OAF-01 Inline ducted Outside Air Fan FCU-F.01 Display area Fantech RIL-150SW(Hi) (or equivalent)	O/A: 105 L/s @ 80 Pa (Est) 240V / 1 phase Noise: SPL max. 48 dB(A) @ 3m	Interlocked with resp. FCUs Non-return damper, Roof cowl
EF-01 Inline ducted Toilet exhaust fan WC + AM+ACC & SHWR Fantech RIL-200SW (Hi speed) (or equivalent)	E/A: 160 L/s @ 90 Pa (Est.) Noise: SPL max. 48 dB(A) @ 3m	Light / Motion sensors c/w 15 min adjustable run-on timer Electr.speed control for comm. NRD, Louver
EF-02 Inline ducted Toilet exhaust fan Student WCs + ACC Fantech APEC031AP10/22 (or equivalent)	E/A: 310 L/s @ 90 Pa (Est.) Noise: SPL max. 48 dB(A) @ 3m	Light / Motion sensors c/w 15 min adjustable run-on timer Electr.speed control for comm. Louver
EF-03 Inline ducted Toilet exhaust fan FIRST AID BATH Fantech RIL-150SW (Hi speed) (or equivalent)	E/A: 60 L/s @ 80 Pa (Est.) Noise: SPL max. 48 dB(A) @ 3m	Light / Motion sensors c/w 15 min adjustable run-on timer Electr.speed control for comm. NRD, Louver
EF-04 Wall mounted Toilet exhaust fan CLEANERS Fantech SILDES300CRZ3C-W (or equivalent)	E/A: 60 L/s @ 30 Pa (Est.) Noise: SPL max. 48 dB(A) @ 3m	Light / Motion sensors c/w 15 min adjustable run-on timer Electr.speed control for comm. Backdraft shutter, Louver

1.2 EXTENT OF WORKS (Continued)

ROOF COWLS – AS REQUIRED

Selected for max. pressure drop 20 Pa generally, unless noted otherwise

IMPORTANT

The Makes & Model numbers have been noted as a guide only. However fine tuning of ductwork, air diffusion & plant foot print shall be dependent on the final Brand & Model selected. It shall be the responsibility of the Mechanical Contractor to ensure that the makes and models selected suit the intent of the design. E.g. ensure that the resistances and air flow etc. are achievable.

All be it marginal with regard to variance, the Mechanical Contractor shall allow to refine the design to suit the actual plant approved, i.e. the contractor shall allow to adjust the foot print and possible ductwork & air diffusion to suit the desired air flows including fan models etc. to suit such changes.

Effective Room Sensible Heat Load & Outside Air Flows are the critical portions of the design alongside of the general intent. The Contractor's Engineering & Shop Detailing personnel shall ensure that the intent is maintained.

GENERAL BUILDING ENVIRONMENT REFRIGERATED SYSTEMS:

Cooling:	Room Temperature	22.5°C DB / 55% RH
	Outside Temperature	38.4° C DB / 22.7° C WB
Heating:	Room Temperature	21°C DB
	Outside Temperature	0.2° C DB / 80% RH

1.2 EXTENT OF WORKS (Continued)

ASSOCIATED MISCELANEOUS ITEMS

- All external finishes shall be as per the architectural requirements for exposed external and internal items e.g. all grilles powder coated, and exposed spiral duct painted. All exposed items shall be checked for finish on architectural details.
- Supply & installation of all necessary equipment mounting items for all outdoor, roof top and indoor plant. This includes but not limited to, plinth stands, Duragal type stands, skids, anti-vibration equipment between all the plant & their support structure (mounting springs, waffle pads, flex connections), and fastening items. The stand shall be selected as per the weight of the associated condensers. AS1657 Plant platform provided by Builder. The plinths shall be 100mm high with a 100x3mm galvanised surround. Concrete infill shall be provided by the **Builder**. All skids shall have waffle pads under and span a minimum of 2 purlins (battens).
- The Contractor shall provide seismic restraints for the installation in accordance with AS1170.4-2007.
Arrange all components, other than service items exempted in AS1170.4, to resist seismic loads determined in conformance with AS1170.4. Securely fix all plant and equipment to the building structure. Use horizontally restrained anti-vibration mounts where required. Do not rely on gravity and/or friction to resist seismic forces. The Contractor shall confirm required force values with the Structural Engineer.
- Supply & Installation of all filters as required (F5 for ducted units and high efficiency filters for cassettes). The successful contractor shall allow for three (3) filter changes, commissioning, 2 sets during defects liability (6 & 12 months).
- Supply & Installation of all air diffusion (grilles, diffusers & registers) as required.
- Door grilles supplied by Mechanical Contractor & installed by **builder**. Mechanical Contractor to liaise.
- Supply of all necessary weatherproof louvers, complete with vermin screens and non-return / shut-off dampers as required. Where there is no shut-off damper and the louver exposed to ambient conditions, the duct coming to the louver shall have fall min. 2% towards the louver to ensure drainage of the duct when it's not operational. Installation of louvres by **builder**. Large weatherproof louvers shall be supplied by **Builder**. Mechanical Contractor to liaise.
- Supply & Installation of roof cowls as shown on the accompanying drawings complete with deck tights, vermin screens and non-return / shut-off dampers as required.

1.2 EXTENT OF WORKS (Continued)

- Provision of all access panel locations (if these vary from the drawings issued). All equipment must be provided with appropriate access for maintenance. If additional access panels are required, it shall be the responsibility of the mechanical contractor to inform the builder within an appropriate time frame prior to tender close allowing this additional cost to be included to builder's works. **Access panels shall not be the subject of variation claims.**
- Supply & installation of all necessary deck tights & over flashings. Penetrations, up stands and under flashings by **builder**. All dimensional data in regard to the mechanical services plant & associated penetrations shall be provided to Builder by the Mechanical Services Contractor.
- **Note**, it is important that the Builder, Truss Manufacturer & Mechanical Contractor liaise prior to commencement of fabrication, ensuring adequate allowance is made for mechanical plant & ductwork reticulation & ceiling cassette set out locations.
- Supply & installation of all support bracing & hangers for ductwork, straddle purlins where applicable.
- Supply & installation of all necessary flexible and rigid supply, exhaust and outside air ductwork, as shown on drawing. Complete with insulation as nominated and as per NCC section J. This includes all cushion heads as required. Flexible ductwork shall be as per NCC and be complete with insulation as required.
- Supply & installation of all necessary balancing, motorised & non-return dampers, as required completing the installation. Relief dampers shall be selected at est. 15 Pa room pressure.
- All service penetrations through fire rated elements will be protected with fire seals (fire dampers) tested to achieve the required FRL in accordance with AS4072.1 and AS1530.4-2015 in accordance with BCA Spec C3.15.
- Supply & installation of all refrigeration pipe work and branch piping kits or joints to drawings and manufacturer's recommendations completing the installation. All piping shall be insulated to the manufacturer's recommendations complete with vapour barrier and where exposed to weather & UV a protective colorbond metal fascia shall cover all components.

1.2 EXTENT OF WORKS (Continued)

- Supply & installation of all associated FCU condensate & condenser drains to tundishes & waste traps provided by **main hydraulics contractor**. The mechanical contractor shall liaise & coordinate final locations on site. All condensate drains from AC units shall be thermally insulated to R1.0 to prevent drips on ceiling tiles and plant room floors, irrespective of whether the pipes are metal or plastic. Mechanical contractor shall supply & install condensate pumps where required to ensure the condensate flow in the correct direction (e.g. First Floor ceiling cassettes).
- Where refrigeration or condensate pipes are exposed to weather & UV, a protective colorbond (colour coordinated with background) metal fascia shall cover all components.
- Supply & installation of drained condensate drip trays to all ducted fan coil units and to all condenser units (if condenser unit trays not supplied by manufacturer). Outside roof mounted plant shall be drained to suitable down pipe via piping the drains to the location by Mechanical contractor. To be confirmed with hydraulic trade..
- Mechanical contractor shall install isolation valves on refrigerant pipework, from branch boxes etc, if they are serving long pipe runs, to allow for conservation of the refrigerant whilst works are done on the units, and allowing refrigerant on extended or unaffected pipe runs not to be discharged.
- Supply & Installation of all **control & power wiring including circuitry** throughout the mechanical services installation complete with all associated field wiring, control panels, thermostats, isolators adjacent plant, etc. as required, to all plant & control points, High & Low Voltage, completing the installation. Note all electrical wiring shall run square & parallel with the building lines and be appropriately supported (AS: 3000).
- Where the mechanical services plant is to be interlocked with lights / motion sensors **the electrical services main contractor** shall provide **2 pole switches / motion sensors** with relay's allowing the mechanical services electrical sub-contractor to activate their associate plant (exhaust fan) which is independently supplied & powered by isolator located adjacent. Note that multiple light switches / sensors may activate the particular plant, therefore multiple 2 pole switches / sensors may be required.
- All fans shall have AOM switch in their respective board.
- Supply, Installation & Connection of central controller (system head end) i-Touch or equivalent. Final control location shall be confirmed with the client prior to installation.
- Supply & Installation of afterhours / occupancy override buttons to all systems located within the area served.

1.2 EXTENT OF WORKS (Continued)

- Supply & Installation of all wall mounted CO₂ sensors providing demand control as required. Toilet PIR sensors' supply & install by the main electrical contractor.
- Supply & Installation of all pressure sensors providing air relief control as required..
- Supply & Installation of Mechanical Services Switch Board(s) to serve new plant. See Mechanical Electrical section for detail.
- Where fire or smoke signal is provided to the electrical board feeding mechanical services plant, the mechanical services plant shall rely on this signal from the Fire Control Panel, ensuring that all NON-essential plant within the mechanical services installation shall be de-activated. Wiring between the fire panel and the switchboards shall be the responsibility of the fire services contractor.
- Provision of 2 hours tuition for client staff addressing the operation and programming of installed systems.
- The mechanical contractor shall ensure all plant is clearly **labelled**. All labelling shall meet the following requirements: All labels shall be permanently fixed, Exterior labels shall be mechanically fixed, Labels shall be engraved laminated plastic with black lettering, Embossed tape or similar is not acceptable, Minimum lettering height 5mm.
- Preparation of shop drawings, as built drawings and maintenance manuals. Refer to Section 1.5 & 1.6 for details.
- Refer to Section 5 for associated Control details.
- Refer to Section 6 for associated Mechanical Electrical details.
- Air balancing and commissioning of plant.
- Mechanical contractor shall liaise with any relevant authorities related to the scope of works and required for completion and compliance of the works.

1.2 EXTENT OF WORKS (Continued)

■ Warranty

Provide a warranty of approved wording for the materials and workmanship.

The installation shall be warranted for a full 12-month Defect Liability Period commencing at practical completion. Any equipment replaced during this Defect Liability Period shall be subject to a further 12 months Defect Liability Period from the time of installation.

The provision of a warranty shall not relieve the Contractor of responsibility to comply with the Contract Documents. The use of a proprietary or an approved system shall not relieve the Contractor of responsibility to provide a warranty. The provision of a warranty shall not relieve the manufacturer or supplier of goods and materials of responsibility for the safety and fitness for purpose of such goods and materials.

The warranty shall include all manufacturers' product warranties. Warranties shall include an undertaking that all work will remain fit for the intended purpose, in good appearance, free of defects and comply with legislative requirements for the warranty period.

- During the Defect Liability Period the contractor shall carry out all mandatory maintenance required & recommended by the Manufactures, Australian Standards & the Building Code of Australia. Details of this **maintenance** shall be performed as per equipment manufacturer's recommendation and recorded in log books, signed off by the Project Manager, and then left with the Project Manager. Contractors shall provide a service schedule detailing all maintenance to be carried out.
- If and where applicable all mechanical services components nominated herein shall be installed in accordance with all relevant Authorities having jurisdiction over the site. The Mechanical Contractor shall comply with the National Construction Code of Australia "**NCC 2022 Volume 1**" e.g. Section J6, Australian Standards / guidelines **AS 1668.2 & 4 - 2012, AS/NZS 1668.1-2015, AS/NZS 5149 parts 1 to 4 - 2016, AS 1170 Part 4-2007** Structural design actions — Earthquake actions in Australia (incorporating amendments 1 and 2), and all other relevant guidelines associated with the works within this contract.
- Note, the design drawings show the intent. It is Mechanical contractor's responsibility to coordinate with other trades and ensure accuracy of each detail of the construction, such as duct reticulation, penetrations, resolution of clashes with other services, etc etc. making installation good. Particularly, coordinate with lighting layout.

1.2 EXTENT OF WORKS (Continued)

DUCTWORK INSULATION

Materials and installation

Aluminium foil laminated type, Mineral Wool & Glasswool

Comply with AS 4254.2-2012 Rigid Ductwork Insulation section and SMACNA Insulation Standards

Performance of Thermal Insulation

Physical Properties to SMACNA Fibrous Glass Duct Construction Standard.

Standard: Comply with AS 4859.1-2002

Ductwork thermal insulation & sealing shall comply with NCC 2019 J5.5 / NCC2022 J6D6 :
R-value shall comply with Table J5.5 / NCC2022 J6D6;

Thermal Insulation R-values for BCA climate zones 1 to 7:

- Within Internal conditioned space, except if it's the only or the last room served by the system: R1.2 (50mm);
- Within Internal unconditioned space: R2 (75mm);
- Exposed to the outside conditions: R3 (100mm).

Generally the following ductwork shall not have thermal insulation, unless specified otherwise: Ventilation only supply air; Relief air; Outside air; Exhaust air, air terminals.

General:

All ductwork for air-conditioning services to be located in ceiling voids or in non-conditioned areas to be fully insulated to ensure that the heat gain to both supply air and return air temperature does not exceed 0.3 °C during peak cooling periods.

Ductwork conveying cold air must be protected by a vapour barrier on the outside of insulation to prevent condensation, sweating and water logging within the insulation.

Insulation Surface outside facings: Aluminium Foil: Reflective foil laminate to AS/NZS 4200.1 with a heavy duty classification, bonded to the base insulation material as part of the manufacturing process.

Insulation Surface Internal facing: Use perforated reflective foil and perforated metal sheet where specified.

External facing as vapour barrier: Use reflective aluminium foil laminate.

1.2 EXTENT OF WORKS (Continued)

Performance of Acoustic Insulation

Insulating materials shall have a minimum average noise reduction co-efficient of 0.70 between 400-2000 Hz and shall be flexible polyester fibre blanket - density 32 kg /m3, with an adhesive fixed vapour barrier of *Sisalation 450* or approved equivalent.

Inside ductwork, the insulation shall have an air side lining of 10% perforated *Sisalation 450* or approved equivalent. The lining shall be applied to the insulating material using a non-flammable adhesive.

Generally acoustic insulation shall be 50mm, if not specified otherwise.

DUCTWORK MATERIAL

SHEET METAL

Standard: Comply with AS 4254.2-2012

Zinc-coated steel, coating class G2/Z275

Fasteners

Rivets: Expanding solid end type, aluminium base alloy, minimum size as follows:

- For sheet metal to sheet metal: 3 mm.
- For sheet metal to supports, brackets and rolled steel angles: 4.8 mm.
- Self tapping screws: bright zinc-plated.
- Self drilling and tapping screws: Bright zinc-plated. Use only if base material into which they screw is thicker than 1.5 mm, and they are likely to be removed or replaced.
- Bolts, nuts, washers and drop rods: Zinc plated steel, service condition number 2.

Kitchen Exhaust Ductwork

Sheet metal: 1.2 mm

Comply with AS1668.1-2015.

Access panels for cleaning as required.

CLEANING

- During installation progressively remove construction debris and foreign material from outside ducts.
- All Hood extraction duct shall have access panels every 3m for cleaning

1.2 EXTENT OF WORKS (Continued)

PIPEWORK INSULATION

Materials and installation

Flexible closed cell type, Fire Retardant rating

Maximum service temperature not less than 105°C (Refrigerant)

Maximum service temperature not less than 90°C (Heating water)

Fire performance

Compliant with the fire-hazard requirements of the Building Code of Australia. Tested according to AS/NZS 1530.3.1999

UV resistance

Facing is required for exposed to outside conditions pipework.

Thermal Performance

Standard:

- All pipework & vessel thermal insulation shall comply with NCC 2019 section J5.8 / NCC2022 J6D9 & AS/ANZ 4859.1
- R-value for piping insulation shall comply with NCC2019 Table. J5.8a / NCC2022 Table J6D9a;

Example of minimum R-values & recommended thickness for the pipework insulation:

<i>Pipe type</i>	<i>R-value</i>	<i>Estimate minimum insulation thickness, mm (range given for information only - confirm with selected supplier)</i>
Low temperature for not more than 2°C for NB 15 to 40mm	1.3	25-38
Low temperature for more than 2°C, not more than 20°C for NB 15 to 40mm	1.0	25
Heated for more than 30°C, not more than 85°C for NB 15 to 40mm	1.7	32-38
High temperature heated for more than 85°C, for NB 15 to 40mm	2.7	44-63

General:

Pipework insulation is necessary to prevent condensation and limit heat gain on air conditioning, refrigerant and chilled water pipe lines. Insulation of piping, vessels, heat exchangers & tanks containing chilled fluid must be protected by a vapour barrier on the outside of the insulation. Refrigerant pipes with pipe work exposed to view shall be protected by metal sheath and finished for painting. Refrigerant pipework below ground shall be wrapped in Denso tape to prevent corrosion.

1.2 EXTENT OF WORKS (Continued)

All valves and fittings shall be similarly insulated.

The insulation including adhesives, vapour barriers, facings and coatings as applicable must comply with Australian standards Test for Early Hazard Properties of Materials & *NCC 2019 Spec C1.10 Clause 7*.

PIPEWORK MATERIAL

Refrigerant pipework:	Copper AS1432 Type B;
Condensate drainage:	UV-resistant where exposed.
Test pressure:	1.5 x working pressure

AIR GRILLES

GENERAL: Manufacture: Provide proprietary grilles. Models shown are of “Holyoake” manufacture. Similar models of other manufacturer can be used if and where required.

Supply Diffusers – Swirl Type Truss / Cushion Head Mounted.

- “Holyoake Radial Induction Swirl, Model CFP” or similar
- Sizes as per the drawings,
- Noise below NC 30..35,
- Max. resistance 25 Pa,
- Painting Powder Coating. (Colour to be advised prior to ordering).

Outside Air Diffuser - Linear Slot Linear Ceiling Mounted

- “Holyoake Linear Slot, Model CSDP” or similar
- Sizes as per the drawings,
- Noise below NC 30..35,
- Max. resistance 25 Pa,
- Painting Powder Coating. (Colour to be advised prior to ordering).

Outside air grilles – Ceiling mounted (small size).

- Eggcrate grilles “Holyoake Model EC-125” or similar
- Complete with OBD behind where balancing required,
- Sizes as per the drawings,
- Noise below NC 30..35,
- Painting Powder Coating, (Colour to be advised prior to ordering).

Supply Grilles – Wall mounted (Air Conditioning).

- Double deflection “Holyoake Model DDL20/OBD” or similar
- Curved frame Double deflection “Holyoake Model TLC-DDL20/OBD” or similar (spiral duct)
- Sizes as per the drawings,
- Noise below NC 30..35,
- Max. resistance 15 Pa,
- Painting Powder Coating. (Colour to be advised prior to ordering).

1.2 EXTENT OF WORKS (Continued)

Return Air Grilles – Ceiling mounted (with the filter).

- Hinged core Eggcrate grilles “Holyoake Model EC-125-FR” or similar
- Sizes as per the drawings,
- Painting Powder Coating, (Colour to be advised prior to ordering).

Exhaust / Make-up Air Grilles – Ceiling mounted.

- Eggcrate grilles “Holyoake Model EC-125” or similar
- Complete with OBD behind where balancing required,
- Sizes as per the drawings,
- Noise below NC 30..35,
- Painting Powder Coating, (Colour to be advised prior to ordering).

Door Grilles

- Door Grille “Holyoake Model DG-52” or similar
- Max. resistance 12 Pa,
- Sizes as per the drawings,
- Painting Powder Coating, (Colour to be advised prior to ordering).

Weatherproof louvers – Wall mounted – Intake or Discharge.

- “Holyoake Model OHL-124” or similar
- “Holyoake Model OHL-45” or similar for louvers below 400 mm height
- Free area approx. 55%, profile selected as per the air flow,
- Max. resistance 20..25 Pa.
- Sizes as per the drawings,
- Painting Powder Coating (Colour to be advised prior to ordering).
- Different models may be used for small sizes as appropriate.

Note: Make & Model Numbers for grilles, diffusers etc. have been nominated for a guide only, the mechanical contractor shall confirm mounting details of all air diffusion equipment prior to final selection & ordering.

1.2 EXTENT OF WORKS (Continued)

FILTERS

GENERAL: Manufacture: Provide proprietary filters.

PLEATED PANEL FILTERS

- Pleated Panel Filter “Camfill Farr” Dual10 or similar.
- F5 Filter Performance Rating.
- Face Velocity not greater than 1.8 m/s
- Resistance <50Pa clean
- Clip in frame.
- Disposable.

FILTER BOXES

- G4 Filter Performance Rating minimum.
- Resistance <40 Pa clean
- Face Velocity not greater than 1.8 m/s
- Clip in frame.
- Disposable.

SEISMIC RESTRAINT

Fixing off all ductwork and equipment shall comply with AS1170.4 Section 8 – Earthquake provisions.

Provide lateral supports to all ductwork greater than 0.3m² in cross sectional area.

Lateral supports shall be equal to vertical (weight) supports spaced at minimum 20% of all vertical supports and as a minimum one per each change of direction.

As part of completing a compliant seismic restraint solution, the contractor shall engage Gripple or suitably qualified seismic restraint consultant to:

- Review documentation
- provide guidance on seismic restraint requirements for services
- inspect and certify the final installation as compliant with AS1170.4 Section 8

1.3. EXTENT OF ASSOCIATED WORK BY OTHER TRADES

REQUIREMENT:

Supply relevant information to allow **Builder** to provide the following works.

- Supply & Installation of all tundishes and suitably nominated drainage points (down pipes / sewer pipes) for all air conditioning plant by **Hydraulics contractor**, coordinated by mechanical contractor.
- Wall, bulkhead & ceiling penetrations throughout by **Builder**, the **Mechanical Services Contractor** shall liaise with **Builder** to ensure that the appropriate details are passed on, allowing such penetrations to be provided accurately.
- All roof penetrations, Up Stands & under flashings shall be provided by **Builder**, the mechanical services contractor shall liaise with Builder to ensure that the appropriate details are passed on, allowing such penetrations to be provided accurately. All structural bracing required due to penetrations as required by Mechanical Contractor to be done by the **Builder**. Over flashings for roof penetrations shall originate from the roof ridge capping.
- Access panels within ceiling for “any” plant access as required to allow servicing of equipment shall be provided by **Builder**. Mechanical contractor shall confirm locations & sizes etc. mechanical contractor to ensure that suitable quantity has been allowed for servicing all new plant. If alternate plant or configuration is offered requiring more access panels these will need to be accounted for during tender period, ***Access panels shall not be the subject of variation claims unless design changes occur.*** After tender is finalised no variation will be accepted from the mechanical contractor to suit alternate plant requirements. After tender is finalised no variation will be accepted from the mechanical contractor to suit alternate plant requirements.
- All structural support provisions (reinforcement if required) for the plant located on the roof and awning by **Builder**, ensuring that required support is provided for plant in these locations as shown on drawings. Builder shall provide AS1657 compliant plant platform. Mechanical contractor shall liaise and confirm the final plant weight and configuration of the support frame with the plant area structure.
- Where required, Plant screen around any exposed mechanical services plant shall be installed **by the Builder**. Mechanical contractor shall liaise and confirm plant locations and height of the equipment. Note, due to plant service access requirement the screen in some locations shall be hinged, ensuring safe access for the maintenance personnel.

1.3. WORKS BY OTHERS (Continued)

- Painting of all exposed ductwork if any shall be by the Builders **main painting sub-contractor** (if required). Colour shall be coordinated with architect.
 - The contractor shall ensure that all ductwork is adequately cleaned via washing down with “sugar soap”;
 - Apply one coat of Galvanised Iron Primer;
 - Two coats of Exterior Acrylic equal to “Dulux Weather Shield or equal” (for exposed ductwork).
- Bulkheads by **Builder** as required. Mechanical contractor shall liaise.
- Door grilles shall be supplied by **Mechanical Contractor** & installed by **Builder**.
- Weatherproof louvers shall be supplied by the **Mechanical contractor** & installed by **Builder**. Large louvres shall be supplied by the Builder.
- Ladder hitching points by the **Builder** where required.
- Supply & Installation of plant access & platform where roof service access required, Lysaught Rooftrack 450 or equivalent to AS1657 by the **Builder**. **Builder** shall ensure that required support and access requirement for the roof mounted outdoor plant are provided for plant in the location as shown on drawings. Mechanical contractor shall liaise and confirm the final plant weight, configuration and access requirement.
- Automatic door closers on all entry doors from outside to indoor conditioned areas above 50 sqm **by Builder**, in compliance with BCA section J3 [2022: J5] Exclusion are doors with reed switches. Coordinate with Mechanical contractor.
- Provide power feed to the new Mechanical Services Switch Board (MSSB) by **Main Electrical Contractor**, as required. Mechanical Contractor to liaise and coordinate. See Section 6 Electrical requirement for detail.

1.3. WORKS BY OTHERS (Continued)

- Where the mechanical services plant is to be interlocked with lights / motion sensors the **Electrical services main contractor** shall provide *2 pole switches / motion sensors with relay's & run on timers* allowing the mechanical services electrical sub-contractor to activate their associated plant (exhaust fan) which is independently supplied & powered by isolator located adjacent (Isolator by Main Electrical Contractor). Note that multiple light switches / sensors may activate the particular plant therefore multiple 2 pole switches may be required. PIR Motion sensors provided to toilets by the **Electrical Contractor**.
- Where there is an FIP board and/or fire / smoke signal provided, the fire signal shall be provided to the electrical board feeding mechanical services plant, The mechanical services plant shall rely on a signal from the Fire Control Panel, ensuring that all NON-essential plant within the mechanical services installation shall be de-activated. Wiring between the fire panel and the mechanical services switchboard (1 off) shall be the responsibility of the **fire services contractor**.
- It shall be the **Builder's** responsibility to ensure coordination between all trades is undertaken. This includes but not limited to submission of mechanical technical data, mechanical shop drawings etc. for approval prior to commencement of works.

1.4. AUTHORITIES APPROVALS - MECHANICAL SERVICES

REQUIREMENT:

The complete installation shall meet with the approval of the Authorities having jurisdiction on all or part of the works.

Minor and Incidental Work: Unless otherwise specified provide all minor and incidental materials and labour including all cutting, boring, flashing and making good necessary to form a complete, safe and reliable installation of the Mechanical Services.

1.5. DRAWING MECHANICAL SERVICES GENERALLY

CONTRACT DRAWINGS:

General: The following drawings form part of this brief and contract. Information contained in either the drawings or the brief but not in the other is considered to be included in both and executed as part of this contract.

DRAWING N°s.	BSG1069-M000 - "T2 Tender Issue" A1 size;
	BSG1069-M100 - "T2 Tender Issue" A1 size;
	BSG1069-M101 - "T2 Tender Issue" A1 size;
	BSG1069-M102 - "T2 Tender Issue" A1 size;
	BSG1069-M300 - "T2 Tender Issue" A1 size;
	BSG1069-M600 - "T2 Tender Issue" A1 size;

Co-Ordination: The drawings are diagrammatic only. Determine exact installation positions, requirements and dimensions from site inspections and site measurements. Co-ordinate the installation with adjacent structure elements and all other services.

SHOP DRAWINGS:

Shop drawings shall be supplied to the Superintendent showing the systems layout and installation details of plant and equipment of the following scales. Obtain "Permission to use" before fabrication or ordering of any equipment. (Number of hard copies - Four (4) off).

- 1:50 - Dimensions of plant layout drawings and ductwork drawings.
- 1:20 - Construction details if required, relating to structural support of equipment etc.
- Block diagram of control circuits and equipment. Electrical Drawings.

The Shop Drawings shall be prepared on CAD (AutoCAD R2000 or higher). Digital copies of the mechanical design shall be provided to the Mechanical Contractor upon request, NOT to be used for construction however can be used to assist in the detailing of the shop drawings. The construction issue of the shop drawings is the sole responsibility of the Mechanical Contractor.

1.5. DRAWING MECHANICAL SERVICES (CONTINUED)

WORK AS EXECUTED DRAWINGS:

Before date of practical completion, submit "Work-as-Executed" drawings to the scales and on the same standard sheets as Contract drawings, showing location of equipment, pipe work, duct work, control panels and the like. Give coordinated dimensions where appropriate. (Number of hard copies - Four (4) off). A CD copy of the drawings shall also be provided by the Mechanical Contractor in DWG format (readable in the AutoCAD 2000 or higher) including PLT files & PDF files of the "Work As Executed" drawings.

VARIATION DRAWINGS:

If it is proposed to change the installation from that shown on the drawings, or if a change is required by a regulatory authority, prepare and submit prior to practical completion marked up drawings showing the proposed change and obtain approval before commencing.

1.6. OPERATING & MAINTENANCE MANUALS

General: Submit operating & maintenance manuals for installations - **3 copies**.

Authors and compilers: Use personnel experienced in the maintenance & operation of equipment and systems installed, and with editorial ability.

Sub-division: Front cover, Emergency information, Index, Section 1.(Scope of work, description of system & operation procedures), Section 2.(manufacturer's contact details & equipment literature), Section 3.(Maintenance Procedures), Section 4.(Commissioning & balancing figures), Section 5.(A3 size As-built drawings including electrical diagrams etc).

Binder: Manuals shall be provided in 4D-ring 25mm binders, ensure that clear plastic cover is inserted at the beginning (front) to protect manual pages.

1.7. INSPECTIONS & MILESTONES MECHANICAL SERVICES

General: A formal procedure of Supply & Installation of all general Mechanical Services including major plant installations etc... & major milestones of the project.

The Mechanical Contractor shall provide the Superintendent with critical dates of Plant Delivery and Installation Milestones, allowing the Principal to inspect and approve. I.e. keeping the Principal aware of core developments & status of the Mechanical Services installation.

SECTION 2.0. TESTING

2.1. TESTING STAGES - MECHANICAL SERVICES

COMMISSIONING DATA:

Measurements carried out on the performance of the completed installation including air balance figures, motor name plate and actual current drain figures, temperature on cooling and heating and other relevant measurements.

2.2. TEST RECORDS - MECHANICAL SERVICES

REQUIREMENT:

For each requirement test, provide a report or certificate in a form suitable for inclusion in the maintenance manuals, signed and dated, legibly typed or printed, recording:

- Type of test
- Apparatus and Instruments Used;
- Date, time and place of the test;
- Ambient and other relevant conditions;
- Test results;
- Where applicable calculations, instrument readings, control settings, name plate readings and the like;
- Variations to the brief if any.

2.3. SYSTEM CAPACITY TESTS - MECHANICAL SERVICES

REQUIREMENT:

Test the capacities and performance of the HVAC systems.

TEMPERATURE MEASUREMENT:

Record dry and wet bulb temperature as follows:-

- In occupied areas: Continuously for 2 separate periods, each of not less than 24 hours;
- In all other conditioned areas: at 9am and 3pm. on two consecutive half-hour intervals.

General:

- Ambient temperatures: dry - and wet bulb;
- Air temperature: Air dry - and wet bulb temperatures;
- Air flow on cooling: total
- Static pressure speed: on high and low speed;
- Fan rotational speed: on high and low speed;
- Fan motor current.

MOTOR DRIVEN APPLIANCES:

Test each appliance for operation to name plate rating. Adjust thermal overloads for actual load during maximum ambient conditions.

2.4. AUTOMATIC CONTROLS TESTING - MECHANICAL SERVICES

REQUIREMENT:

The complete system of controls shall be tested as follows:-

- Test each component for correct function and operation.
- Demonstrate that protective devices perform their safety function by simulating fault conditions, not by electrical short - circuiting or manual tripping;
- Submit the test results to the Superintendent prior to witnessing by the Superintendent.

WITNESSING:

Demonstrate satisfactorily the operation and correct setting of the control systems for all plant prior to Practical Completion.

2.5. NOISE TESTING - MECHANICAL SERVICES

REQUIREMENT:

Where sound power or sound pressure levels are specified for individual plant items of equipment, submit type test data stating the sound levels of the equipment offered and the method of determination used.

SECTION 3.0. ACOUSTIC CONTROL

3.1. NOISE CRITERIA - MECHANICAL SERVICES

INTERNAL:

Continuous noise levels due to mechanical plant shall not exceed the noise ratings tabled below when determined to AS1469-1983 and measured to Clause 5 of AS/NZS 2107-2000

Areas utilising Reverse cycle cooling	Indoor	NR40
Areas utilizing Reverse cycle cooling	Outdoor	NR53

The Mechanical Contractor shall verify that these noise conditions shall be maintained, prior to ordering of any plant and shall also confirm with the supplier that the noise ratings shall not be exceeded. The Mechanical Contractor shall provide noise level advised from the supplier of all plant with particular attention relating to concealed plant.

SECTION 4.0. VIBRATION SUPPRESSION

4.1. GENERAL - MECHANICAL SERVICES

REQUIREMENT:

Keep the transmission of vibration from mechanical services and equipment to a minimum.

4.2. DYNAMIC BALANCING - MECHANICAL SERVICES

Fans and similar equipment, when complete as a full assembly including bearings, (pulley, belts etc. if applicable) shall be statically and dynamically balanced so the “out-of-balance” forces are within acceptable limits.

4.3. EQUIPMENT MOUNTINGS - MECHANICAL SERVICES

GENERAL:

Provide anti-vibration mountings in accordance with the following specifications and schedule. Mountings to be selected and located in accordance with the manufacture’s recommendations to give uniform deflection under the applied load.

DEFINITIONS:

The following definitions shall apply:-

SPRING MOUNTING PADS:

“Spring” type pads shall be free standing and laterally stable with the ratio of spring outside diameter to compressed height exceeding 0.85. At the design load there shall be an additional 50% travel to solid. The isolators shall be complete with neoprene frictional pads between base plate and support; the mounts shall have levelling bolts securely bolted to the base.

NEOPRENE PADS:

“Waffle” type pads with a minimum height of 7 mm each, use a maximum of two layers separated by a shim plate cut to pad size from 1.6 mm galvanised sheet steel. Maximum load 450 kPa.

ISOLATION HANGERS:

Double deflection neoprene similar to “EMELTON” RHD type. Provide not less than four mountings, selected and located to give uniform deflection under the applied load.

4.4. STATIC DEFLECTION LIMITS - MECHANICAL SERVICES

REQUIREMENT:

Set and adjust isolation mounting supports so that they give the required deflections with adequate clearance for free movement.

Uniform static deflections of isolation mounting supports shall be not less than the following:-

ITEM	MOUNTING TYPE	DEFLECTION
Unit mounted on concrete plinth	Double deflection neoprene mounts	10 mm

SECTION 5.0. CONTROLS

5.1. PERFORMANCE - MECHANICAL SERVICES

GENERAL REQUIREMENT:

Provide control systems to control the specified plant, in specified models, to achieve the specified conditions of the control variables. Control systems include sensors, controllers, controller devices, auxiliary control devices and equipment.

CONTROL VARIABLES:

Maintain the specified conditions within the specified tolerances. Supply and commission the control system for safe and stable operation under all practicable conditions of operation, including start up and shut down.

SERVICE INTERRUPTION:

Provide manual restoration to allow restart after power supply interruption.

SAFETY CONTROLS AND INTERLOCKS:

GENERAL REQUIREMENTS:

Provide control devices and mechanisms such that neither personnel nor equipment will be endangered by either normal or abnormal operation of the control system, or as a result of the removal or re-application of power whether expected or unexpected.

RADIO FREQUENCY INTERFERENCE:

Select controls and equipment such that:-

- Interference to radio equipment in the same area does not exceed the limits set out in AS 1044. Provide suppression devices if necessary.
- Operation of system will not be effected by radio frequency interference at the limits set out in AS 1044.

ENVIRONMENT:

Provide system components compatible with the specified environment and with the control system or controlled variable, as appropriate, throughout the specified working stage.

5.2. CONTROL EQUIPMENT MANUFACTURE – MECHANICAL SERVICES

GENERAL REQUIREMENT:

Provide current generation systems of robust, tamper-proof fully compliant controls, from the current range of recognised control manufacturers, for which stocks of replacement parts, spares and service facilities are readily available in Australia.

5.3. INSTALLATION GENERALLY – MECHANICAL SERVICES

GENERAL LOCATIONS:

Select control locations to enable access for calibration and maintenance, and to be representative of the control variable condition and independent of other external conditions.

CORROSION PROTECTION:

Enclose, protect, encapsulate, or locate components of the control system to prevent corrosion.

DUST CONTROL:

Enclose dust-sensitive controls to prevent entry of dust.

5.4. OPERATIONAL REQUIREMENTS OF CONTROLS

EQUIPMENT CONTROL:

The following description shall be read in conjunction with the “Extent of Work” section of this specification.

1. All Refrigerated Reverse cycle plant within the building envelope shall have central **iTouch style controller or similar**. This control shall have:
 - a. Authority over all new reverse cycle mechanical plant;
 - b. Touch screen display;
 - c. 365 day, 24 hour, 7 day a week time clock (adjustable) capabilities for each individual item of plant allowing the following sequences;
 - d. Set points entered to the head end shall be default and the system shall revert to these at every start.
 - e. Full scheduling capabilities, supplied by the manufacturer;
 - f. Capability to lock control panels from the central controller from users altering settings.
 - g. This controller shall be located within the **Coordinator / Reception Area** (to be confirmed by client);
2. Each Fan coil unit shall have proprietary **hard wired control panels**. It shall be mounted within their served rooms, with location excluding areas of direct sun light, free from influence of ambient conditions, and avoiding areas under direct flow of air-conditioned air from diffuser. Location of these panels shall be confirmed prior to construction.
 - a. It shall allow reading of fault codes and setting Temperature set points. Temperature sensor is located within the control panel by default; the panels shall allow a $\pm 2^{\circ}\text{C}$ variation on set point.
 - b. Where control panel is located not in the served area it shall have remote wall mounted temperature sensor; The sensor shall be located within the served room at the 1.5 m height from finished floor level;

5.4 CONTROL REQUIREMENT (*Continued*)

- c. Where the control panel is located within the served area, it shall have a built-in temperature sensor;
 - d. Scheduling capabilities via head end;
 - e. Each wired control panel shall have after hours / override button allowing operation of plant for extended time period (2 hours adjustable) without accessing the time clock programming. Auto Off function. Where the panel is located not within the served area, the area shall receive a separate Afterhours button.
3. All FCU units shall operate on time clock. Exclusions shall be the rooms that are not normally / periodically occupied throughout the operating hours. E.g. Meeting or Staff rooms (TBC) List of these rooms shall be coordinated by the Mechanical Contractor with the client, and these rooms shall be excluded from running on time schedule. They shall operate on occupancy button press, with 2 hours run-on timer (adjustable) as described above.
4. Note, due to building inertia, it takes time for the air conditioning plant to achieve design conditions within the rooms. It is recommended to set the operation schedule to start all relevant plant 1 to 2 hours prior to commencement of occupancy within the building. Ensuring that the system has time to reach the design conditions after the system was off for the night.
5. Fresh Air processing units shall be operating on time schedule, and shall maintain supplied O/A at set point 22°C (adjustable) for when the ambient temperature is above 24°C (adjustable). Below that ambient temperature the air shall be supplied without additional cooling. At ambient temperature below 18°C (adjustable) the unit shall operate in heating mode delivering outside air at temperature set point of 21°C (adjustable).
6. The fresh air processing unit shall have a motorised damper which shall be opened upon the unit's activation, and closed when the unit shuts down, to avoid the ingress of the outdoor air when the rooms are not occupied.
7. Where shown with Return air grilles, Fresh air processing unit (FCUOA-F) shall have R/A (return air) and O/A (outside air) motorised dampers allowing the system to mix recirculated air with outside air between the O/A values as shown in the equipment schedules. The dampers shall be controlled via associated room's CO₂ sensors located as shown on drawing. When the sensors are reading concentration above 800 ppm (hi select if multiple, adjustable), the O/A damper shall modulate towards open position, and R/A shall modulate towards closed position, until the sensor is satisfied. On readings below the lower limit 600 ppm (adjustable) the modulation shall be in opposite direction. The O/A and R/A dampers shall be commissioned for minimum and maximum positions as outlined in the equipment data schedule.

5.4 CONTROL REQUIREMENT (*Continued*)

8. Note, all 240V fans except EC-type shall be supplied with electronic speed controllers (POTS) for the number of speeds required, within ceiling space for commissioning and adjustment purposes. 240V fans above 3A shall have VSD fitted. All 415V fans shall be fitted with VSD. EC-type fans shall have controls suitable for application: Either demand-controlled ventilation based on a sensor's reading, or proper number of steps as per the air flows / speeds required.
9. All fans shall have Auto/Off/Manual switch at the board and On / Fault indicators, allowing the fans control and status indication.
10. Outside air supply fans "**OAF-01**" shall be interlocked with their respective fan coil units.
11. Toilet exhaust fans "**TEF-##**" shall be interlocked with toilets' light switch / motion sensors (whatever is applicable within the electrical design, provided by main electrical contractor), complete with 15-minute run-on timer (adjustable). Note, if there are several rooms served by a fan, all of them shall have to be interlocked. Main electrical contractor shall allow for appropriate number of multi-pole relay switches / sensors.
12. Relief air motorised damper shall be controlled via a pressure sensor, and shall modulate open to achieve maximum set point of 15 Pa within the common area. It shall modulate towards the closed position on lowering pressure, up until 100% closure. The pressure sensor shall be located as shown on drawing.
13. Where fire signal is provided to the electrical board feeding mechanical services plant, all NON-essential plant within the mechanical services installation shall be de-activated (Relevant for the ducted systems serving several areas, as per NCC Section E2 and AS1668.1). Fire signal provision to the board by fire services contractor. Mechanical contractor shall liaise.
14. All control sequences shall be reviewed by the client prior to construction.
15. The contractor shall provide training in the use of this system to those personnel selected by the client. – (see Associated works section)
16. During the 12-month maintenance period, the Mechanical Contractor shall review all settings and repeat fine-tuning to requirements. This shall be carried out at least once for each of the peak summer and winter periods. The complete control sequences & facilities offered shall be provided to the Principal for approval prior to acceptance of the tender.

SECTION 6.0. HVAC ELECTRICAL

SCOPE:

This sub section refers to the electrical works associated with the Mechanical Services only.

STANDARD:

Carry out the electrical installation to AS 3000 and the requirements of local Authorities. The electrical installation shall be performed in accordance with AS 3000 and the requirements of local Authorities.

The Mechanical Contractor shall supply electrical certificate of safety for all works.

POWER SUPPLY:

1. Plant is designed to be operated on 240 volts, 50 Hz single phase And 415Volts 3 phase.
2. All power to mechanical services plant within this contract shall be supplied from new Mechanical Services Switch Board (MSSB-01) by Mechanical Contractor. Power feed to the MSSB is by **Main Electrical Contractor**.
3. Main Electrical Contractor shall allow for reserve, which may be required due to differences between the load requirement for different makes of equipment or in further upgrades.

REQUIREMENT:

- Supply & Installation of Mechanical Services Switch Board(s) MSSB-01 to serve new plant. It shall be located indoor within Reception area-within cupboard with rating not less than IP52 Concept Plus type preferred. Location to be confirmed prior to construction.
- Mechanical Contractor shall allow for reserve (in board space), which may be required for future upgrades.
- The Mechanical Contractor must confirm that all electrical loads incorporated within this installation shall be provided adequately within the supplied power feed. Initially during the design process an estimate of the proposed mechanical services electrical load was provided to the electrical design team.
- Connect power supply & control wiring to all supplied equipment including power supply to any other minor items requiring power including motorised dampers, central controllers etc.

6.0. HVAC ELECTRICAL (*Continued*)

- The power supply to the plant shall be done in the way to prevent shut down of all plant, when one plant is serviced. Connect power supply & control wiring to all supplied equipment including power supply to fan(s), fan coil units, and any other minor items requiring power. Each plant shall receive a separate isolator, making sure that they can be shut off and serviced separately.
- The Mechanical Contractor shall label the switchboard's circuit breakers, isolators, etc. associated with mechanical plant in accordance with AS3000.
- The Mechanical Contractor is responsible for all certification and inspection costs relating to the installed mechanical services equipment, this includes electrical and plumbing certificates.
- The Mechanical Contractor shall provide all equipment necessary for the completion of the electrical works as described herein.

6.1. ESTIMATED ELECTRICAL LOADS FOR NEW PLANT

- As a “**Priority**” the Mechanical Contractor shall provide further details of the Electrical Loads as soon as physically possible to the Projects Main Electrical Contractor via the appropriate channels.
- Note, if Mechanical contractor shall supply alternative makes and / or models of equipment that have increased electrical power requirement, all associated costs for power upgrade due to this change shall be by Mechanical Contractor.

FAN COIL UNITS

MCA: Minimum Circuit Amps; Comp. RLA: Compressor Rated Load Amps;

EQUIP. REF.	SERVING	APPR. MCA	APPR. Comp. RLA (A)	APPR. MFA	APPR. FAN FLA (A)	VOLTAGE (V)	STARTER TYPE
FCU-OA-G	FRESH AIR FOR GF	3.3		15	2.6	230 / 1	DOL
FCU-OA-F	FRESH AIR FOR FF	3.8		15	3	230 / 1	DOL
CU-01		36.7	7.8+11	45	1.3x2	400 / 3	DOL
FCU-G.01/CU-G.01	GF Display area	13.8	5.1	66	1.07+0.49	230 / 1	DOL
FCU-G.02/CU-G.02	GF Display area	13.8	5.1	66	1.07+0.49	230 / 1	DOL
FCU-G.03/CU-G.03	GF Display area	13.8	5.1	66	1.07+0.49	230 / 1	DOL
FCU-G.04/CU-G.04	GF Coordinator	18.1	15.4	20	0.3+0.6	230 / 1	DOL
FCU-G.05/CU-G.05	GF Learn Leaders	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-G.06/CU-G.06	GF Chaplain	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-G.07/CU-G.07	GF DOWB-PS	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-G.08/CU-G.08	GF DOWB-SS	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-G.09/CU-G.09	GF Booking 1	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-G.10/CU-G.10	GF Counselling 1	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-G.11/CU-G.11	GF Speech Psych	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-G.12/CU-G.12	GF Counselling 2	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-G.13/CU-G.13	GF Sensory	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-G.14/CU-G.14	GF Counselling 4	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-G.15/CU-G.15	GF Counselling 3	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-G.16/CU-G.16	GF First Aid	18.1	15.4	20	0.3+0.6	230 / 1	DOL
FCU-F.01	FF Display area	8.8		16	7	230 / 1	DOL
CU-F.01		22	10.4	25	1	400 / 3	DOL
FCU-F.02/CU-F.02	FF LE PS Office	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-F.03/CU-F.03	FF Booking 4	5.4	4.27	10	0.36+0.24	230 / 1	DOL
FCU-F.04/CU-F.04	FF PS LE Staff	17	12.5	20	1.0+1.7	400 / 3	DOL
FCU-F.05/CU-F.05	FF PS LE Staff	17	12.5	20	1.0+1.7	400 / 3	DOL
FCU-F.06/CU-F.06	FF Staff Breakout	10.8	8.7	15	0.8+0.3	230 / 1	DOL
FCU-F.07/CU-F.07	FF Staff Quiet	7.2	5.8	10	0.37+0.27	230 / 1	DOL
FCU-F.08/CU-F.08	FF Staff Quiet	7.2	5.8	10	0.37+0.27	230 / 1	DOL
FCU-F.09	FF Consulting Large	2.8		15	2.3	230 / 1	DOL
CU-F.09		17.9	15.5	20	0.8	230 / 1	DOL
FCU-F.13/CU-F.13	FF Booking 2	7.2	5.8	10	0.37+0.27	230 / 1	DOL
FCU-F.14/CU-F.14	FF LE SS Office	7.2	5.8	10	0.37+0.27	230 / 1	DOL
FCU-F.15/CU-F.15	FF SS LE Staff	17	12.5	20	1.0+1.7	400 / 3	DOL
FCU-F.16/CU-F.16	FF SS LE Staff	17	12.5	20	1.0+1.7	400 / 3	DOL

6.1. ESTIMATED ELECTRICAL LOADS (*Continued*)

FANS

FLA: Full Load Amps;

EQUIP. REF.	SERVING	POWER (Kw)	APPR. FAN FLA (A)	APPR. START AMPS	VOLTAGE (V)	STARTER TYPE
OAF-01	FCU-F.01	0.05 kW	0.22	0.66	240V 1ph 50Hz	DOL
EF-01	GF Toilets	0.12 kW	0.5	1.5	240V 1ph 50Hz	DOL
EF-02	GF Student toilets	0.12 kW	1.1	1.1	240V 1ph 50Hz	DOL
EF-03	GF Bath	0.05 kW	0.22	0.66	240V 1ph 50Hz	DOL
EF-04	GF Clean	0.022 kW	0.09	0	240V 1ph 50Hz	DOL

Over and above these operating loads there are small low voltage controls between switches, indicator lights, thermostats and sensors also motorised dampers.

Note, if Mechanical contractor shall supply alternative makes and / or models of equipment that shall have increased electrical power requirement, all associated costs for power upgrade due to this change shall be by Mechanical Contractor.

SECTION 7.0. STANDARDS

The Contractor shall make sure that the design shall comply with the following standards & codes but not limited to.

7.1. DUCTWORK

Sheet metal ductwork, associated fittings and manually adjustable dampers at duct branch take offs shall comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
Sheet metal ductwork, associated fittings and manually adjustable dampers at duct branch take offs	AS 4254-2012 or SMACNA HVAC Duct Construction Standards, Second Edition 1995 and amendments thereto	
Galvanised sheet metal Material	AS 1397-2011	Grade G2, Coating Class Z275
Base metal thickness	AS/NZS 1365-1996	
Transverse joint reinforcement and intermediate reinforcement	AS 4254.2-2012 or SMACNA HVAC Duct Construction Standards, Second Edition 1995 and amendments thereto	Tables 2.3 (H) and 2.3 (I) Tables of 1-10, 1-11, 1-12 and 1-13
Duct reinforcement	AS 4254.2-2012 or SMACNA HVAC Duct Construction Standards, Second Edition 1995 and amendments thereto	
Duct sealing and sealants	AS 4254.2-2012 or SMACNA HVAC Duct Construction Standards, Second Edition 1995 and amendments thereto	
Duct sealant properties	AS/NZS 1530.3-1999	Spread of Flame Index of zero Smoke Developed Index of not greater than three
Test laboratory	NATA or BRANZ approved	
Duct support Access hatches, access panels, and/or hinged and latched access doors	AS 4254-2012 parts 1 & 2 or SMACNA HVAC Duct Construction Standards, Second Edition 1995 and amendments thereto	
Pitot holes in ductwork	CIBSE Commissioning Code A	

7.1. DUCTWORK (Continued)

Flexible duct Generally	AS/NZS 1668.1-1998 and AS 4254.1-2012	
Air tightness	AS 4254-2012 parts 1 & 2 or SMACNA HVAC Duct Construction Standards, Second Edition 1995 and amendments thereto	
Fire test performance	AS/NZS 1668.1-1998 AS/NZS 1530.3-1999 and AS 4254-2012 parts 1 & 2 UL 181 Burning Test to requirements of, and as qualified by, AS 4254	Spread of Flame Index of zero Smoke Developed Index of zero Clauses 2.82 and 2.83 of AS 4254-2012. Materials shall pass test
Thermal rating	AS 4508-1999	

7.2. DAMPERS

Dampers and components shall comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
Galvanised steel sheet metal	AS 1397-2011	Grade G2, Coating Class Z275.
Stainless steel components	AS 2837-1986	Grade 304.
Aluminium extrusions	6060T5 or 6351T5 alloy	
Sintered bronze	AS/NZS 1567-1997	
Nameplates	AS 60034.1-2009	
Aluminium sheer	AS/NZS 1734 -1997 Grade A-3003-H14	
Damper Testing	AMCA Standard 500 Eurovent 2/2 EN1751	Test Method of Louvres, Dampers and Shutters
Test laboratory	NATA or BRANZ approved	

7.3. AIR FILTERS

Filters and components shall comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
Generally	AS 1324.1-2001	
Marking	AS 1324.1-2001	Clause 5.1 Marking
Performance Tests	AS 1324.2-2003 ASHRAE 52.1	
Test laboratory or organisation	NATA or BRANZ approved	
Filtration efficiency for reduced air quantity	AS 1668.2-2012	
Dry media panel filters	AS 1324.1-2001	Type 1 Class A or B
Combustibility test	AS 1530.1-1994	Non combustible

7.4. FANS

Fans and components shall comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
Dynamically balancing of rotating parts	ISO 1940-1	Quality Grade G6.3
Aerodynamic data fan test methods	ISO 5801 or BS 848-1	-
Electrical components Degree of protection	AS 60529-2004	IP55
Duct connections	AS 4254-2012 parts 1 & 2	-
Bearing life	ISO B10	90 Survival
Drive belt sections	AS 2784-2002	-
Motors cooling methods	AS 1359.106-1996	IC 410 or IC 411

7.5. CONTROL SYSTEMS GENERAL

Comply with the installation requirements of the following referenced Standards and Codes, the requirements of the power supply Authority Service Rules and applicable Regulations and Bylaws of Statutory Authorities, labelling and compliance requirements:

Item	Standard/Code	Specific Requirements
Electrical installations	AS/NZS 3000-2007 AS/NZS 3080-2013	
Open DDC control system	ANSI/ASHRAE Standard 135	
Electrical components degree of protection	AS 60529-2004	IP55

Control Systems Commissioning, Training and Maintenance

Control systems commissioning and components used for commissioning shall comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
Test laboratory or Organisation	NATA or BRANZ approved	

7.6. PREVENTATIVE MAINTENANCE

Comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
air handling units, drains and condensers	AS/NZS 3666-2011 parts 1 to 4, Statutory Authorities Regulations and requirements	Statutory Authorities requirements
Test laboratory	NATA or BRANZ approved	

7.7. INSULATION

Insulation materials, facings, adhesives, mastics, fixings and accessories and all works, work practices and processes shall comply with the following referenced Standards and Codes:

Item	Standard/Code	Specific Requirements
Materials compliance	Building Code of Australia	
Thermal insulation of pipework, ductwork and equipment	AS 4426-1997	
Expanded polystyrene	AS 1366.3-1992	
Sound absorption	AS ISO 354-2006	
Thermal conductivity - sheet insulating materials	ASTM Designation C518	Thermal Conductivity of Materials by Means of the Heat Flow Meter
Thermal resistance of insulation for ductwork	AS 4508-1999	
Ductwork internal insulation	AS 4426-1997	
Chilled water, brine and refrigeration suction pipes		
Work practices and processes	Worksafe Standard National Code of Practice for the Safe Use of Synthetic Mineral Fibres	Statutory Authorities
Flammability test indices	AS/NZS 1530.2-1993	
Fire hazard properties	AS/NZS 1530.3-1999	
Burning test	UL 181 Burning Test to requirements of, and as qualified by, AS/NZS 4245	Clauses 2.7.1(a), 2.7.2 and 2.8.2 Materials shall pass test
Test laboratory or organisation	NATA or BRANZ approved	
Aluminium foil laminate tensile strength	AS/NZS 4200.14-1994 AS 1301.448-2007	
Aluminium foil laminate water vapour permeance	ASTM E96	Procedure B
Aluminium foil laminate breach puncture resistance	TAPPI T830 m	
Facing product marking	AS/NZS 4200.1-1994	Clause 8.2
Sealant properties	AS/NZS 1530.3-1999	Spread of Flame Index of zero. Smoke Developed Index of not greater than three

7.8. REFRIGERATING SYSTEMS

Air conditioning equipment, refrigerant gases, work practices and processes shall comply with the following referenced Standards and Codes:

AS/NZS 5149.1-2016 Refrigerating systems – Definitions, classification and selection criteria

AS/NZS 5149.2-2016 Refrigerating systems – Design, construction, testing, marking and documentation.

AS/NZS 5149.3-2016 Refrigerating systems – Installation site.

AS/NZS 5149.4-2016 Refrigerating systems – Operation, maintenance, repair and recovery.

Item	Standard/Code	Specific Requirements
Refrigerant practical weight limit per room volume	AS/NZS 5149.1-2016	For R134a = 0.25 kg/cub.m. For R410A = 0.44 kg/cub.m. For R32 QLMV= 0.062 kg/cub.m. RCL= 0.061 kg/cub.m. Other limits apply

ATTACHMENT: TENDER SCHEDULES

SCHEDULE OF TENDER COMPONENTS

<u>Work Item</u>	<u>Price</u>
Reverse cycle units	\$
Fans, other than in air handling units	\$
Ductwork including insulation	\$
Grilles, registers and diffusers	\$
Control and Automation system	\$
Electrical work for mechanical services	\$
Workshop and as installed drawings	\$
Operating and Maintenance manuals	\$
Testing, commissioning and evaluation	\$
Project management	\$
Maintenance and Warranty	\$
Construction engineering	\$
Other (list)	\$
Total Tender Sum	\$

Note: 1. The above figures shall exclude GST.
2. The above work items include materials and labour to complete the installation

Signed for the Tenderer by: Date:.....

Name (in block letters):

On behalf of (in block letters):

SCHEDULE OF PROPOSED SUPPLIERS

<u>Package</u>	<u>Proposed Supplier</u>
Reverse cycle units	
Fans	
Grilles	
Filters	
Other	

SCHEDULE OF PROPOSED HOURLY RATES

General Labour

<u>Item</u>	<u>Rate</u>
Project Manager	\$/hr
Engineer	\$/hr
Site Installation	\$/hr
Balancing and Commissioning	\$/hr
Mechanical Electrical	\$/hr

Signed for the Tenderer by: Date:.....

Name (in block letters):

On behalf of (in block letters):