MECHANICAL SPECIFICATION
20 SISLEY STREET, ST LUCIA, QLD 4067

Prepared for:	ANE Properites
Prepared by:	RCA Consulting/SEED Engineers
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Author:	Brendan Boyce
Checked and Approved:	Rob Lord

Amendment Register

The following register each issue of the document and the amendments associated with each issue. Each issue is organised by revision number, page and section number, details of each amendment and the date of issue. All additional changes after construction issue within the document will be marked in ***bold italics***, and all deletions will be crossed out by ~~strikethrough~~.

Amendment Register						
Revision	**Section and Page Number**	**Issue/Amendment**	**Author**	**Project Engineer**	**Checked**	**Date**
A	ALL	FOR REVIEW	BRENDAN BOYCE	BRENDAN BOYCE	ROB LORD	20-NOV-25

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Scope & Extent

The mechanical services for this project include: -

- Heating and cooling to living and bedrooms in apartments
- Exhaust air ventilation to apartment bathrooms
- Make up air ventilation to apartments
- Carpark Ventilation as shown on drawings

Mechanical systems shall be complete with componentry as described below.

- Control systems
- Air Diffusion
- Filtration
- Fire Protection
- Duct and Duct Insulation
- Pipe and Pipe insulation
- Power systems
- Seismic Restraint
- Painting & Labelling

All work and materials not specifically mentioned in this specification but obviously necessary for the proper and complete installation and operation of the services as envisaged shall be deemed to have been included in the scope of work.

Heating and cooling to apartment living and bedrooms

The proposed air conditioning system for the apartments comprises individual VRF heat pump systems. The apartment will have either bulkhead units or mid static pressure units. Each room comes with its own thermostat / controller. All indoor units to come with condensate drain pumps where gravity draining cannot be achieved.

Air conditioning units should use the refrigerant R32 so as to manage charge limits easily. The sizing for the systems is to maintain 24C+1C conditions in air-conditioned spaces in summer.

Insulated refrigeration lines transport thermal energy to and from the indoor unit to the outdoor unit (the condenser). The condensers are arranged so as to be able to fit into the condenser plant provided.

Note that drainage is provided by the hydraulic trade adjacent the condensers.

The route of refrigerant pipes travel through the ceiling space fixed with a D clip hard to the soffit. The detail below is similar but the cover is only required for external routes.

The external refrigerant pipes throughout the project will be covered in colourbond hat section, for aesthetics and insulation protection. This could alternatively be zinc alum product, and painted to an architect- nominated RAL #.

For that reason, we take care to ensure that pipe routes are accessible.

The power for the air conditioning system comes from the apartment DB. A power feed is run by the electrical trade out to the outdoor unit(s) on the roof where it terminates in a weatherproof lockable isolator(s). Final connection from the isolator to the outdoor unit by the mechanical trade. The electrical trade will provide power supply from tenancy DB to each of the FCUs. The mechanical trade to provide signage to each outdoor unit to notify personnel that ancillary equipment is not isolated from the outdoor unit Isolator as per AS3000:2018 Clause 4.19.

The unit manufacturer will provide a simple control system that will allow the user to switch unit(s) in each room on or off, select the zones they wish and even adjust the room temperatures.

The indoor unit will dehumidify the air, creating a need to run an insulated condensate drain to the waterless tundish typically positioned in under the laundry tub or nearest basin location. The access for unit maintenance and drain inspection is through a minimum 450mm sq access panel, always located on the Left Hand Side (LHS) of the unit in the direction of airflow.

The air diffusion type is a flanged linear bar grille, serving as both a supply air grille and a return air grille. The grille neck is min 250mm high subject to the interior design's specification. Thinner grilles should be avoided as they cause noticeable extensions in length.

The Bedroom diffusers are selected at 1.8m/s for noise reasons, and Living rooms are selected at 2.2m/s for throw reasons.

The filtration is held in place at the rear of the unit via a metal frame. This allows side withdrawal of the filters and the positioning of the indoor unit in tight spaces. The frame can be changed during the design to accommodate thicker filters which means that a purchase upgrade option is available for those occupants who desire better air filtration if they are sensitive to pollens or dust.

Ventilation to apartment wet areas and kitchens

The ventilation system for the range hood will comprise the range hood ducting the exhaust to the subhead. We wish to avoid a booster fan as they tend to damage the range hood fan. It is more effective to ensure the kitchen duct run is short and well sized. Flat pack duct is envisaged to maintain high ceilings. The rangehood manufacturer shall demonstrate the system does not require a booster fan as part of their preliminary works.

The ventilation system for the wet areas will comprise a single EC plug fan collecting the exhaust from all wet areas and ducting the exhaust to the subhead. The exhaust duct will have a single non return damper (per NCC2022 J5D6). Flat pack duct will be necessary to maintain high ceilings, but flexible duct will be used where feasible in wet area ceilings. Ducting shall be to open cut to plasterboard in the vertical face of the pelmets.

The wet area fan will be switched whenever a wet area light switch is on or when a laundry dryer current sensor is activated. There is also a supplementary "Fan" switch engraved on the Laundry switch-plate (provided by the electrical trade). This allows the fan to run if the tenant also wants more fresh air into the apartment whilst air conditioning is operable.

They will run-on for 10 minutes (adjustable) after the switch is off. A 4-pin plug (by electrical) is required in the ceiling space directly above the fan access panel. The air will enter each wet area and laundry via 20mm door undercut.

Make up air ventilation to apartments

The ventilation systems will require an adequate source of make-up air so that they operate correctly. The make-up air is to enter the ceiling space via the subhead louver. This is similar to the exhaust detail except there is no duct connection for the trickle ventilation.

The make-up air will have an unimpeded airpath through the return air grilles (within the bulkhead) into the spaces where the exhaust systems extract air.

Ventilation to car park levels

A mechanical ventilation solution has been prepared for the carpark. The design is a performance solution.

Ventilation to refuse store

The ventilation to the refuse store will be via naturally ventilated openings and an odour treatment system.

Ventilation to car park toilet

The ventilation system for carpark wc toilet will comprise a single EC plug fan collecting the exhaust from the wc and ducting the exhaust to an external location. The exhaust duct will have a single non return damper (per NCC2022 J5D6). Metal ductwork will be necessary to maintain high ceilings, but flexible duct will be used where feasible in wet area ceiling.

Compliance Standards

The compliance requirement is as follows:

1. To comply with National Construction Code 2022 (NCC2022 Admt 1).
2. To comply with the Mechanical Ventilation Code AS1668.2-2012 or the Natural Ventilation Code AS1668.4-2012. This is translated into a set of required airflows achieved either through fans or open- able windows.
3. To comply with the BASIX requirements. For this discipline, this is translated as a set of minimum efficiency requirements for fans and air conditioning equipment.
4. To comply with the Acoustic Code AS2107-2016. Acoustic treatment will be provided to any noise source that threatens to breach “Satisfactory” acoustic environments.
5. To comply with AS3666.1 for microbial control design.
6. To comply with NCC 2022 Clause C3D14, E2D2, E2D4, E2D6, E2D7, E2D8, E2D9, E2D10, E2D11, E2D12, E2D13, E2D14, E2D15, E2D16, E2D17, E2D18, E2D19, E2D20, F6D6, F8D4, F8D5, G3D8, J6, & Specification 21.
7. To comply with AS 1668.1 – 2015.

Performance Requirements

Performance requirements of the design

The table below details the minimum performance characteristics of the major mechanical services.

Item #	Design Item	Performance Requirements
1	Ambient Summer Design	33.3^{0}C DB/ 24.1^{0}CWB
2	Ambient Winter Design	7.8^{0}C DB
3	Internal Air Conditions (Residential Air-Conditioned Zones)	24^{0}C + 1 for summer 20^{0}C + 1 for winter No direct RH control provided Calibration limits are not included in these conditions
4	Calibration Limits	+/-1^{0}C maximum temperature +/- 10% RH
5	Skin Velocities	Where no control over direction is provided: - 0.25m/s
6	Noise Control Within the Building	To the "satisfactory" levels nominated in AS2107.
7	Noise Control Outside the Building	Noise Levels at Boundaries will be to within 3dBA of external L_{eq} levels. (Note Nighttime ambient levels are expected to drop to 35dBA).
8	Duct Velocities	<8m/s in risers 5m/s in branch ducts
9	Air Diffuser velocities	To achieve ADPI>0.8 at all times. To simultaneously comply with throw requirements and noise requirements
10	Filtration standards	F5 minimum for critical areas. Manufacturer's standard for bulkhead& non-ducted systems.
11	Cable Sizing	Allow 20% spare to be accessed by simply adjusting or replacing circuit breakers.

Proposed future proofing policies

The significant investment of this development requires a consideration of future-proofing and safety margins.

The following has been adopted for Mechanical Services:-

- Allow 5% safety factor for all ventilation & heat load calculations.
- Allow 10% increase in future electrical loads (equipment and power) when calculating heat loads.
- Allow 2% pipe gain.
- Allow 2% duct gain for non-apartment systems.
- Allow 2% duct leakage for non-apartment systems.
- Allow any roof mounted condensers to face a 3C increase in external ambient temperatures from

direct or reflected solar radiation.

- Allow condensers to accommodate the predicted 1.2C increase in external ambient temperatures for 2050.

Required mechanical contractor behaviour

The following describes the necessary contractor behaviour required to achieve a successful contract:-

DRAFT O&M MANUAL

The successful contractor shall produce a draft version of the O&M manual as a way of submitting the build team details of the equipment. This includes preliminary workshop drawings. Once approved, purchase of items can begin. To meet program, staged submissions are expected.

BUILDING DETAILS

Architectural drawings showing the nature of construction of the building together with reflected ceiling plan layouts are available. Similarly access to site is available for inspection.

The tenderer shall thoroughly inspect the building site & the architectural drawings and make themselves fully conversant with (and allow for in the tender price), all items necessary for the successful completion of the project to the intent of this specification.

COMMUNICATION & COORDINATION

The contractor's representative shall maintain open communications with the design team & the build team. Repeated failure to return calls or respond to items may result in removal of the staff member from the site. Repeated staff issues may see the contract cancelled.

Coordination detail is to be provided in a traceable fashion – emails & drawings. The builder should be able to have at hand any detail that influences another trade other than Mechanical. This would include ceiling spaces below wet areas, plant areas and rooms requiring mechanical ventilation.

STANDARDS

The following codes and standards are applicable in respect of all materials and workmanship associated with this project:-

- Current AIRAH Design guides for all relevant components.
- National Construction Code 2022 and referenced Australian Standards.
- All Australian standards and codes current at the date of tendering. The codes listed below will be audited specifically:-

AS 2107	Ambient Sound Levels for Areas of Occupancy Within Buildings.
AS 3000	Electrical Installations - Buildings, Structures and Premises.
AS 3500	National Plumbing & Drainage Code
AS 3666.1	Control of Microbial Contamination in Air Handling and Water Systems.
AS 4524.1 & 2	Low or Medium Pressure Duct Construction Standard

Where Australian standards and codes do not exist, the appropriate British Standard code shall apply. Include all subsequent amendments to applicable codes as they come into force during the work.

Controls

Apartment Air Conditioning –VRF Systems

Each apartment has a reverse cycle VRF systems, controlled by the manufacturer's own control panels. The indoor unit is capable of temperature control, based on return air temperature.

The indoor unit shall be located close to the space served so that there is minimal duct.

Humidity control is a byproduct of the cooling process and is not actively control monitored. Each air-conditioned room to have its owner thermostat / controller capable of switching on/off all the indoor units in that room with one controller. Seek approval for the location of the unit controller from the Architect.

Each bedroom shall come with its own thermostat / controller. Each living and dinning room shall come with a central controller that is able to control all the units in the living and dinning areas.

Apartment Wet Area Ventilation

Wet Areas are to be served by a single EC plug fan extracting air using a flatpack duct network. Make up air into the wet area is via a 20mm door undercut to each of the bathrooms and 25mm undercut to each of the laundries.

The exhaust ductwork is to comprise flat pack duct and intake & discharge grilles (as sized on the drawings). The make-up air free area shall match the discharge area to comply with code.

The wet area fan will be switched whenever a wet area light switch is on or when a laundry dryer current sensor is activated. There is also a supplementary "Fan" switch engraved on the Laundry switch-plate (by electrical trade). This allows the fan to run if the tenant also wants more fresh air into the apartment whilst air conditioning is operable.

Install run on timer (provided by mechanical, installed by electrical) so fan will keep running for 10min (adjustable) after the lights are switched off. A 4-pin plug (by electrical) is required in the ceiling space directly above the fan access panel. Final connection from the 4-pin plug to the fan by mechanical.

All visible colours of louvres, and grilles are to be matched to the installation location and to be approved by the Architect. All visible service behind the grilles shall be painted to an approved colour.

Car park Wet Area Ventilation

Wet Area are to be served by a single EC plug fan extracting air using a low profile metal ductwork. Make up air into the wet area is via a 20mm door undercut to toilet.

The fan will be switched whenever the light switch is on.

Install run on timer (provided by mechanical, installed by electrical) so fan will keep running for 10min (adjustable) after the lights are switched off. A 4-pin plug (by electrical) is required in the ceiling space directly above the fan access panel. Final connection from the 4-pin plug to the fan by mechanical.

All visible colours of louvres, and grilles are to be matched to the installation location and to be approved by the Architect. All visible service behind the grilles shall be painted to an approved colour.

Apartment Range-hood Ventilation

A new range hood will be supplied and installed by the Builder in the kitchen. The range hood is expected to come with its own fan.

The exhaust ductwork is to comprise flat pack duct and a combined intake-discharge grille (as sized on the drawings).

All visible colours of louvres, and grilles are to be matched to the installation location and to be approved by the Architect. All visible service behind the grilles shall be painted to an approved colour.

Car Park Ventilation

The car park is served by a performance solution for the minimisation of horizontal duct. Hence, there is a combination of supply via openings in walls and via the ramps and exhaust systems (fans) that will create a specific air pattern within the car park. **The air quantities and the locations of intakes and discharges should be in strict adherence to the performance solution.**

The carbon monoxide sensors shall initiate 50% design flow at a CO concentration of 20ppm as a high select signal from the CO sensor network. The variable speed driven fans shall modulate design flow up to 100% design flow by 30ppm. This is arranged so that the experienced CO concentration rate can never average more than 30ppm over an 8-hour period (as per the AS1668.2-2012 standard).

Ideally, the cabling for the carbon monoxide sensors is run horizontally in cast-in rigid PVC conduits and it will be run vertically in exposed rigid square profile conduit to a sensor location that is nominally 1700mm AFFL. This height allows comparison to the CO levels predicted at this height in the CFD model for the performance solution.

This design exceeds AS1668.2-2012 exhaust air quantities and hence the smoke clearance performance of this solution outperforms AS1668.2-2012 deemed-to-satisfy systems.

Time-of-Day Control

- Daytime operation (7am-6pm)– maximum 70% (35Hz), responding to pollutant control strategy below.
- Evening operation (6pm-10pm) operation – 50% (25Hz) responding to pollutant control strategy below.
- Night operation (10pm-7am)– forced to run at 40% (20Hz) flow continuously. This enables compliance with the requirement for a minimum of 1 air change every day.

Pollutant Control

- At the detection of the highest carbon monoxide reading above 20ppm, all fans should start with a common control signal of 20Hz.
- For each 1ppm above 20ppm, the fans should run at 3 Hz above 20Hz.

- Full air flow (as permitted by time-of-day controls) should be achieved before 30ppm at the highest reading of a sensor. This is still 30ppm below the standard's requirement for an average reading of less than 60ppm.

Provide manual on/off/auto control at the FIP to allow emergency services to control the carpark exhaust fan:
In the event that the switch is set to:
'ON' the carpark exhaust fan shall operate at full ventilation rate overriding the CO sensor in the car park.
'OFF' turns the carpark exhaust fan off.
'Auto' sets the carpark exhaust fan to normal operation mode controlled via the CO sensor.

In the event of smoke detector being activated, the following shall occur:
Carpark exhaust fan shall operate at full ventilation rate until the smoke detector is either reset or its is cleared of smoke.

Refuse Store Systems

The refuse store has an odour treatment system that runs constantly. Natural ventilation openings in the walls also provide cross ventilation through the area.

All visible colours of louvres, and grilles are to be matched to the installation location and to be approved by the Architect.

Main Switch Room /Comms Room

The Main Switch Room is naturally ventilated.

Safety in Design

Fall Hazard

There is fall hazard for installation of roof top equipment & mechanical services at high level (e.g. in ceiling space). This may cause injury to mechanical services installers and maintenance / service personnels. The contractor to establish barriers, use harnesses, fall protection and PPE where applicable.

Leak in Refrigerant

Where there is a leak in refrigerant pipework, there is risk of oxygen depletion and health risk to building occupants. To minimise the risk, individual system refrigerant volumes have been designed to be compliant with relevant Australian Standards to maintain individual refrigerant volumes low enough to not be a life safety issues. The contractor to employ licensed trades to work with refrigerant and follow Refrigerant handling Code of Practice.

Risk of Contact with Fan Moving Parts

Works to mechanical systems may require proximity to the fans. This may cause injury to mechanical contractor and other trades. Where fan mechanisms are exposed proper fitting guards are to be provided. Do not work on live equipment and lock out all equipment prior to starting work.

Risk of Electrocution when Performing Live Electrical Work

The contractor to follow manufacturers' recommended service and installation procedures. Ensure lockout of all equipment before starting work, do not work on live equipment, follow lock-out / tag-out procedures and use appropriate PPE.

Hot Works (welding, soldering)

Fire, fumes and smoke accumulation may cause respiratory issues. Hot works in poorly ventilated areas shall be prohibited. Use temporary exhaust fans for better ventilation where required. Use pre-fabricated ductwork where applicable.

Good Planning & Careful Coordination

The mechanical services shall be installed following good planning and careful site coordination. Pay attention to any installation that could cause safety issues including but not limited to the following systems: Basement 1 SF-B2-CF fan system (work in confirmed space), Ground floor plantroom (crowded area, work from height, multiple services coordination etc.) & air conditioning outdoor unit and fan systems on the roof (work from height, services coordination, etc.).

Equipment

All equipment shall be new and suitable for the duty with due allowance being made for dynamic loads, stress concentrations, the operating temperature, pressure range and the environment at site.

Equipment shall be of service-proven design and have spare parts available from stock for parts required for routine servicing and in Australia for all other parts.

Equipment shall be suitable for safe, reliable operation under installed conditions of service and be fitted with approved guards over all safety hazards.

In all cases, equipment shall be protected against operation in conditions which could cause damage to the equipment, danger to personnel, or damage to the building or its contents.

Uniformity of type, life expectancy, protection and finish shall be preserved with practicable limits throughout the installation.

Motors that are powered by Variable Speed Drives

If supplied from variable speed drives, provide motors that comply with the following:

- Standard: To AS 61800.2.
- Select cooling system and internal wiring to maintain the required thermal conditions under all operating situations including running at low speeds corresponding to 10 Hz.
- Select insulation of wiring and components to withstand the pulse voltages generated by the VSD controller, and its associated filter and using a nominal cable length of 30 m, without a reduction in the guaranteed motor service life.
- Comply with acoustic and electrical noise limits under all operating situations.
- Comply with vibration limits under all operating situations.
- Where serving fire ventilation systems, comply with AS1668.1-2015 for both drive and motor.

Toilet Ventilation Systems

Description

- Inline EC plug fan, typically for small ventilation systems, such as toilet ventilation

Key Product Features for this project

- EC speed control

Key Installation Features for this project

- Locate 4 pin plug above fan.
- Locate Access panel under fan

Accessories

- Wrap fan in Rhino Soundlag where motor is 200W or larger.

Basis of Design

The basis of design for this element is AirVent.

Inline Axial Fans

Description

- Inline Axial fans
- Circular casings with spigot or flanges for duct mounting, with construction as follows:
    - Steel: Metallic-coated steel sheet, spot welded. Brush and prime spot welds with zinc-rich organic primer to AS/NZS 3750.9.
- Axial impellers, constructed from metallic-coated steel, extruded aluminium or polypropylene. Balance impellers statically and dynamically.
- Motors: Direct mounted to impellers with minimum Thermal class 155 (F) insulation to IEC 60085.
- Provide sealed for life bearings with a minimum rating fatigue life of 40 000 hours at 40°C ambient.
- Electrical connection: Provide terminal box external to fan casing and wired to fan motor.

Key Product Features for this project

- Provide fans with non-overloading power characteristics.

Key Installation Features for this project

- All fans greater than 500LPS to be wrapped in Rhino Sound Lag
- Ensure access to electrical box and general inspection is provided

Accessories

- Provide aerodynamically shaped cones with finger-guards to inlets of fans where unducted entry.
- Speed control either via VSD, EC motor control or VA pot

Basis of Design

The basis of design for this element is Fantech.

Inline Mixed Flow Fans

Description

- Inline mixed flow fans
- Rectangular or circular casings with spigot or flanges for duct mounting, with construction as follows:
    - Steel: Metallic-coated steel sheet, spot welded. Brush and prime spot welds with zinc-rich organic primer to AS/NZS 3750.9.
    - Glass reinforced plastic (GRP) or plastic: Moulded GRP or impact resistant plastic with integral support foot.
- Mixed flow impellers, constructed from metallic-coated steel, extruded aluminium or polypropylene. Balance impellers statically and dynamically.
- Motors: Direct mounted to impellers with minimum Thermal class 155 (F) insulation to IEC 60085.
- Provide sealed for life bearings with a minimum rating fatigue life of 40 000 hours at 40°C ambient.
- Electrical connection: Provide terminal box external to fan casing and wired to fan motor.

Key Product Features for this project

- Provide fans with non-overloading power characteristics.

Key Installation Features for this project

- All fans greater than 500LPS to be wrapped in Rhino Sound Lag
- Ensure access to electrical box and general inspection is provided

Accessories

- Speed control either via VSD, EC motor control or VA pot

Basis of Design

The basis of design for this element is Fantech.

Split System Air Conditioning

Description

- Non ducted split systems.
- Provide packaged condensing units consisting of refrigerant condensers, compressors and associated piping and electrical connections, mounted within the condenser enclosure.
- Provide indoor units consisting of coils, piping, supply air fan, accessories and electrical connections, mounted within an insulated enclosure.

Key Product Features for this project

- R32 refrigerant

Key Installation Features for this project

- Ensure drainage is provided for condensers and evaporators.

Accessories

- Wired Controller.

Basis of Design

The basis of design for this element can be Daikin Super Multi NX.

VRF Air Conditioning - Air Cooled

Description

- R32 heat pump multi head systems
- Provide packaged condensing units consisting of refrigerant condensers, compressors and Provide indoor units consisting of coils, piping, supply air fan, accessories and electrical connections, mounted within an insulated enclosure.

Key Product Features for this project

- R32 refrigerant

Key Installation Features for this project

- Duct passages have been carefully coordinated and resolved in REVIT. Ensure coordination activities keep trades in their designated spaces.

Basis of Design

The basis of design for this element is Daikin Super Multi NX.

Odour Treatment System

Description

- 24/7 control of odour control system
- The system processes contaminated air to ensure optimum dwell time, without the need for a fan.

Key Product Features for this project

- 24/7 operation
- No refuse exhaust fan required.

Key Installation Features for this project

- Final location to be coordinated with final refuse room equipment layout.
- Single weatherproof GPO located on the ceiling of refuse room.

Basis of Design

The basis of design for this element is Fortressair MT system.

Air Diffusion

Balancing Dampers - Opposed Blade

Description

- Construction: Fabricated from powder-coated galvanized steel or aluminium for durability and corrosion resistance. Refer schedule for Material.
- Blade Design: Utilizes opposed blades for precise airflow control and minimal pressure drop. Refer schedule for Pressure drop at Design Airflow.
- Actuation: Equipped with manual or motorized actuation mechanisms for easy adjustment and precise balancing of airflow. Refer schedule for Actuation.
- Pressure Rating: Designed to withstand system pressures up to the scheduled Pressure Rating to ensure reliable operation under varying conditions.
- Size Range: Available in a range of sizes to accommodate different duct dimensions and airflow requirements.
- Compliance: Complies with relevant industry standards and regulations for airflow performance, fire safety, and duct system balancing.

Key Product Features for this project

- Adjustment: Provide adjustment through the face of the grille or register
- Paint colour to be confirmed by architect.

Key Installation Features for this project

- Installation: Designed for easy integration into ductwork systems, with options for flanged or slip-in connections for seamless installation.

Accessories

- Warranty: Backed by a manufacturer's warranty against defects in materials and workmanship for specified period in Warranty.

Basis of Design

The basis of design for this element is PolyAire Model OBD.

Balancing Dampers – Volume Control Dampers

Description

- Construction: Fabricated from galvanized steel, aluminum, or stainless steel for durability and corrosion resistance. Refer schedule for Material.
- Blade Design: Utilizes opposed blades for precise airflow control and minimal pressure drop. Refer schedule for Pressure drop at Design Airflow.
- Actuation: Equipped with manual or motorized actuation mechanisms for easy adjustment and precise balancing of airflow. Refer schedule for Actuation.
- Pressure Rating: Designed to withstand system pressures up to the scheduled Pressure Rating to ensure reliable operation under varying conditions.
- Size Range: Available in a range of sizes to accommodate different duct dimensions and airflow requirements.

- Compliance: Complies with relevant industry standards and regulations for airflow performance, fire safety, and duct system balancing.

Key Product Features for this project

- Bearings to be suitable for 160^{0}C minimum or 200^{0}C for 2 hours.
- Blade seals are to stainless steel.
- Product submission is show a testing regime that demonstrates low leakage rates are maintained. The performance sought is to match the Basis of Design performance.

Key Installation Features for this project

- Installation: Designed for easy integration into ductwork systems, with options for flanged or slip-in connections for seamless installation.
- Each damper is to be directly supported to structure. It is not to bear weight that may twist it's frame out of square.

Accessories

- Sealing: Features resilient blade seals or gaskets to ensure a tight seal and prevent air leakage when the damper is closed.
- Compatible with accessories such as access doors, locking mechanisms, and insulation liners for enhanced functionality and performance.
- Warranty: Backed by a manufacturer's warranty against defects in materials and workmanship for specified period in Warranty.

Basis of Design

The basis of design for this element is BULLOCKS Model 6700.

Door Grilles

Description

- Material: Constructed from robust materials such as aluminum, stainless steel, or durable plastics (i.e. for aquatic environments) for longevity and resistance to corrosion.
- Design: Features a grille pattern optimized for airflow while providing protection against unauthorized access and intrusion.
- Security Features: Designed with tamper-resistant screws or fasteners to enhance security and prevent unauthorized removal or tampering.
- Finish Options: Available in a variety of finishes including powder-coated, anodized, or painted finishes to match different architectural styles and preferences.
- Mounting Options: Offered with surface mount or flush mount options for easy installation on various door types, including wood, metal, or composite doors.
- Reinforcement: Optionally reinforced around the edges or at stress points to enhance durability and withstand frequent use or impact.

Key Product Features for this project

- Completely Sight-proof
- Sized at 0.8 m/s

Key Installation Features for this project

- Snap fit into door frame.

- Confirm with architect or builder the nominated RAL number before applying final finishes.

Accessories

- Warranty: Backed by a manufacturer's warranty against defects in materials and workmanship for specified period in Warranty.

Basis of Design

The basis of design for this element is Holyoake DG-52.

Linear Bar Grilles

Description

- Material: Constructed from durable materials such as aluminium for longevity and corrosion resistance.
- Design: Features a unique eggcrate pattern design optimized for maximum airflow with minimal pressure drop.
- Finish Options: Available in a variety of finishes including natural aluminum, anodized aluminum, or painted finishes to match different interior aesthetics.
- Mounting Options: Offered with mounting frames for easy installation into standard duct openings, providing a secure fit and professional appearance.

Key Product Features for this project

- Liner Bar Grilles spaced at 12mm nominal spacing.

Key Installation Features for this project

- Mounting Options: Available for duct mounting, sill or wall mounting, with or without flanges.
- Confirm with architect or builder the nominated RAL number before applying final finishes.

Accessories

- Warranty: Backed by a manufacturer's warranty against defects in materials and workmanship for specified period in Warranty.
- Flangeless Options where nominated in the Grille Schedule.

Basis of Design

The basis of design for this element is Holyoake LD1200.

Linear Slot Diffusers

Description

- Material: Constructed from durable materials such as galvanised steel or aluminium for longevity and corrosion resistance.
- Design: Features a unique airflow pattern optimized for maximum airflow with minimal pressure drop.
- Finish Options: Available in a variety of finishes including natural aluminum, anodized aluminum, or painted finishes to match different interior aesthetics.
- Mounting Options: Offered with mounting frames for easy installation into standard duct openings, providing a secure fit and professional appearance.

Key Product Features for this project

- Manual adjustment of throw direction.

Key Installation Features for this project

- Mounting Options: Available for grid ceiling or plasterboard ceiling.
- Confirm with architect or builder the nominated RAL number before applying final finishes.

Accessories

- Warranty: Backed by a manufacturer's warranty against defects in materials and workmanship for specified period in Warranty.
- CSDA Adapters in lieu of cushion heads.

Basis of Design

The basis of design for this element is Holyoake CSD or CSD-P Linear Slot Diffusers complete with CSDA Adapters.

Wire Mesh Grilles

Description

- Light duty type: Fabricate from 1.5 mm thick galvanized steel or bronze wire at 12 mm centres fixed into a folded metallic-coated steel or aluminium frame.
- Heavy duty type: Fabricate from 3 mm thick galvanized steel or bronze wire at 20 mm centres, welded into a 3 mm thick galvanized steel frame.

Key Product Features for this project

- Nil

Key Installation Features for this project

- Nil

Accessories

- Refer schedule as to whether there is a balancing damper behind the grille.

Basis of Design

The basis of design for this element are credentialled metal fabrication workshops.

Weatherproof Louvers

Description

- Extruded aluminium with fixed horizontal blades set into a fixed frame.
- Set blades at nominal 45° angle and incorporating at least one hooked edge to prevent ingress of water under all operating conditions. Brace and stiffen to prevent rattling or movement.
- Flanged or channel frame to suit the installation profile.
- Pressure drop: ≤ 30 Pa at the documented air flow.

Key Product Features for this project

- Provide metallic-coated steel wire or PVC-U mesh screens behind louvres to prevent the entry of vermin, birds, rodents and wind blown extraneous material such as leaves and papers.

Key Installation Features for this project

- Conform RAL number with Architect before ordering.

Accessories

- Refer to schedule for applicable BAL ratings,
- Refer to drawings for nominated accessories such as hinges and door frames.

Basis of Design

The basis of design for this element is the CVS Freeflow Weatherproof louvre range.

Filtration

- Filters are to be from the same manufacturer across the project.
- We have nominated Filtermakers as a basis of design because, in most instances, their offering allows tailoring of the filter size to the fan coil.
- Submissions from CAMFILL would also be considered basis of design with the caveat that their standard filter sizes may need housing adjustments to suit the installation.

Dry media filters - Panel F5

Description

- Disposable media in cardboard frame.
- 100% polyester synthetic media, moisture resistant.
- 45mm width to fit into 50mm slide (typ)

Key Product Features for this project

- Class C, F5 performance as determined by AS1324.1
- Dirty filter to be considered 90Pa
- Support the medium in the mounting frame to provide even air flow.
- Shape pre-formed media to fit the frame.

Key Installation Features for this project

- Permanently and legibly mark, on a suitable section of the filter, the following:
    - Filter type and class.
    - Direction of airflow.
    - Proprietary type, model and serial number.

Accessories

- Hold the medium in place with clips, tabs or similar devices so it does not move in service.

Basis of Design

The basis of design for this element is Filtermakers FMVF (F5)

Dry media filters - Panel G4

Description

- Washable media in V-Form aluminium frame.
- 45mm width to fit into 50mm slide (typ)

Key Product Features for this project

- Class C, G4 performance as determined by AS1324.1
- Dirty filter to be considered 90Pa
- Support the medium on the mounting frame to provide even air flow.
- Shape pre-formed media to fit the frame.

Key Installation Features for this project

- Permanently and legibly mark, on a suitable section of the filter, the following:
    - Filter type and class.
    - Direction of airflow.
    - Proprietary type, model and serial number.

Accessories

- Hold the medium in place with clips, tabs or similar devices so it does not move in service.

Basis of Design

The basis of design for this element is Filtermakers FMVF (G4).

Fire Protection Measures

References to AS1530.4 relate to the latest version of this standard (i.e. 2014). Submitted test certificates shall be conducted to this standard as there are significant changes, particularly to how dampers are tested.

Curtain Fire Dampers

Description

- Provide free cross section area at least 85% of the face area. Provide oversize damper and enlarge duct both sides of damper if necessary to achieve this.
- Provide frangible bulb or fusible links.
- Smoke dampers: Provide fusible links activated by either local heat or a low power external electrical impulse.

Key Product Features for this project

- Refer to the equipment schedule for duct or grille connections either side of the damper.

Key Installation Features for this project

- Dampers shall be installed in strict accordance with the manufacturer's installation instructions, to comply with the certificates of test furnished by the manufacturer.
- Provide for maintenance of dampers and replacement of links.

Accessories

- Metal spacers allow the damper to be installed insitu with a 10mm controlled expansion gap (AS1682.2-2015).

Basis of Design

The basis of design for this element is Bullocks Manufacturing Model 4900 Curtain Type

Fire Mastic

Description

- Intumescent fire-rated mastic
- Water-based, low VOC

Key Product Features for this project

- Non toxic

Key Installation Features for this project

- Test certificates to approximately match the context on site.

Accessories

- Nil

Basis of Design

The basis of design for this element is Trafalgar FyreFlex or FyrePEX HP Mastic depends on application.

Fire Rated Door Grilles

Description

- AS1530.4-certfied intumescent fire dampers suitable for door mounting.

- Rigid galvanised steel framework that supports a series of evenly spaced reinforced parallel

slats that contain an intumescent material.

Key Product Features for this project

- Rating -/120/- in the construction portrayed on drawings

Key Installation Features for this project

- No more than 3 grilles per door leaf.

Accessories

- Supply test certificates to incorporate in Builder's Passive Fire Protection Matrix.

Basis of Design

The basis of design for this element is Kilargo or Lorient.

Fyre-Wrap FRL

Description

- Wraps or modular duct systems to achieve the required FRL when tested to AS1530.4.
- Tested and approved in accordance with AS 1530.4-2005 and AS/NZS 1530.4-2014
-

Key Product Features for this project

- Seismic and vibration tolerant
- Flexible material for easy installation
- Compliant to AS2419 for steel pipe hanger and support protection
- Compliant to AS2419 for copper hydrant protection

Key Installation Features for this project

- Secured simply with steel cable ties.
- Repairs can be patched by sisalation tape without fear of losing rating.

Accessories

- Nil

Basis of Design

The basis of design for this element is Trafalgar Fyre Wrap.

Intumescent Dampers

Description

- AS1530.4-certfied intumescent fire dampers
- Rigid galvanised steel framework that supports a series of evenly spaced reinforced parallel slats that contain an intumescent material.

Key Product Features for this project

- Rating -/120/- in the construction portrayed on drawings

Key Installation Features for this project

- Visual inspection access panel required in ceiling and duct where necessary.

Accessories

- Supply test certificates to incorporate in Builder's Passive Fire Protection Matrix.

Basis of Design

The basis of design for this element is Kilargo or Lorient.

Intumescent Pipe Collars

Description

- AS1530.4-certfied intumescent fire collars
- Rigid galvanised steel housing that contains evenly spaced intumescent material, sufficient to crush pipe and form a rated seal.

Key Product Features for this project

- Rating -/120/- in the construction portrayed on drawings

Key Installation Features for this project

- Visual inspection access panel required in ceiling and duct where necessary.

Accessories

- Supply test certificates to incorporate in Builder's Passive Fire Protection Matrix.

Basis of Design

The basis of design for this element is Kilargo or Lorient.

Intumescent Services Passages (Fire-box)

Description

- AS1530.4-certfied intumescent fire protection system for multi-disciplinary penetrations
- Rigid galvanised steel framework that houses intumescent material, sufficient to form a rated seal when set off.

Key Product Features for this project

- Rating -/120/- in the construction portrayed on drawings
- Space-saving, eliminates the need for 200mm separation between adjacent services

Key Installation Features for this project

- Visual inspection access panel required in ceiling where necessary.

Accessories

- Supply test certificates to incorporate in Builder's Passive Fire Protection Matrix.

Basis of Design

The basis of design for this element is Trafalgar or Promat.

Fire protection of ductwork

Description

- Fire resistant sprayed coating to achieve the required FRL when tested to AS 1530.4. Provide additional cement hard set finishing coat in locations requiring protection against damage or water.
- Alternative - Wraps or modular duct systems to achieve the required FRL when tested to AS1530.4.

Accessories

- Fire damper access: Where access is required to the duct interior such as at fire damper

access panels, damper quadrants etc, provide easily removable panels of FRL equivalent to the required FRL of the duct.

- Exhaust fan access: For items such as smoke exhaust and kitchen exhaust fans that are too large or heavy to remove through access panels provide a fire rated enclosure around the item with fire rated doors or removable fire rated panels large enough to permit removal of the item.

Certification

- Before the date for practical completion submit certification that the installed ductwork fire protection meets the required FRL when tested to AS1530.4.

Basis of Design

The basis of design can be vermiculite sprays or Fyrewrap.

Duct & Duct Insulation

All duct & duct insulation

- Conform to NCC2022 Section J6

Proprietary and non-standard systems

- Conform to functional criteria in AS 4254.

Sheetmetal systems

- Conform to AS4254

Microbial control

- Conform to AS/NZS 3666.1 and the recommendations of SAA/SNZ HB 32.

Installation of glass wool and rock wool insulation

- Comply with the ICANZ Industry Code of Practice for the Safe Use of Glass Wool and Rock Wool Insulation.

Thermal insulation performance

- Submit evidence of conformance to AS/NZS 4859.1.

Access Panels

Description

- Minimum clear opening - Personnel access: 450 x 450 mm for fan 600 x 600 for air conditioning unit & Hand access: 200 x 300 mm.
- Duct size is to be at least 50mm larger than panel to allow frame installation.
- Manufactured to match duct material (i.e. stainless steel or galvanised iron, or heater-bank)
- Double panel, deep formed, steel construction, insulated to match the duct, or filled with at least 25 mm glass wool or rock wool insulation.

Key Product Features for this project

- Arrange to prevent condensation on cold surfaces.
- Provide rigid matching galvanized steel frames securely attached to the duct.
- Do not protrude any part of the panel or frame into the airstream.

Key Installation Features for this project

- For fire dampers, the size and location of the panel in small ducts must be such that the damper can be released and reset with one hand and out of sight.
- Contractor may be asked to demonstrate that this is possible with the fire damper and access panel combination offered.

Accessories

- Wedge type sash latches, minimum 2 for hand access, and minimum 4 for personnel access.
- Handles: Provide a ‘D’ handle on access panels for personnel access.
- Seals: Silicone rubber or soft neoprene gaskets mechanically fixed to either the panel or the frame to ensure an airtight seal against the operating pressure when latched in the closed position. For fire rated seals, provide woven ceramic fibre material.

Basis of Design

The basis of design for this element is Bullock Manufacturing.

Flexible Duct

Description

- Uninsulated flexible duct: Aluminised fabric clamped on a formed metal helix. Do not use adhesives. If a metal helix is provided, it must not be in contact with the air stream.
- Insulated flexible duct: As for uninsulated flexible duct with flexible blanket insulation wrapped around duct and covered with an outer vapour barrier.
- Material R-value: To BCA Spec J6.2.

Key Product Features for this project

- Minimum R Value for air conditioned duct streams R1.0
- Polyester or glasswool insulation where insulated.
- 4-Zero Fire rating

Key Installation Features for this project

- Keep duct taut and bends to a minimum.
- Installation to comply with AS4254.1-2021

Accessories

- Support with a load support strap with a minimum width of 75mm.

Basis of Design

The basis of design for this element is either Bradflo or PolyAire.

Attenuators

Description

- Rectangular or circular, with or without internal pod.
- Metallic-coated sheet steel casing stiffened to meet the functional criteria of AS 4254 Section 4.
- Splitters fabricated with high density acoustic infill with factory applied tissue facing.
- Sheathing: Provide perforated metallic-coated sheet steel sheathing over the fill, 0.6 mm thick on the sides and 1.0 mm thick at bull-nose ends.
- Finish: Clean weld areas and touch up with a zinc rich primer, wire brush generally and prime.

Key Product Features for this project

- Submit type test data from a Registered testing authority with broad-band sound insertion loss and re-generated noise level to AS 1277, BS EN ISO 7235. Include air flow resistance.

Key Installation Features for this project

- Provide welded end flanges conforming to Ductwork or proprietary riveted flanges as appropriate to the size of the silencer.

Accessories

- For health facilities and near cooling towers, the sound absorbent material needs to be wrapped to be prevent microbial growth.
- Wrap insulation with polyester film.
- Seal edges with aluminium foil laminate tape.

Basis of Design

The basis of design for this element is Fantech.

Elastomeric Foam

Description

- Chemically blown closed cell nitrile rubber in sheets or rolls.
- Provide with a smooth natural finish and vapour barrier properties.
- Conform to ASTM C534.
- Thermal performance to comply to Section J6.
- Non-hygroscopic.
- Water vapour permeability: ≤ 0.065 ng/Pa.m.s.

Key Product Features for this project

- Anti-Microbial product protection preferred in high risk mould contexts
- Can be used as an internal liner or external wrap.

Key Installation Features for this project

- Metal sheath insulation where exposed to sunlight or subject to mechanical damage.

Accessories

- Adhesives: Adhesive fix and seal exterior joints. Provide only solvent-based adhesive supplied by insulation manufacturer and designed specifically for the material being used.

Basis of Design

The basis of design for this element is Armaflex AP an AP FS roll.

Filter Boxes

Description

- Prefabricated filter boxes especially suited to return air duct systems

Key Product Features for this project

- Fabricate to accommodate foot traffic where foreseeable.
- Maintain entire coverage of insulation for air conditioned pathways.
- Incorporate Filter slides or deep bed filter housings

Key Installation Features for this project

- Fabricate solid floors and frames to accommodate foot traffic where foreseeable.
- Protect from plinth under with Embelton red neoprene 1 layer.

Accessories

- Lifting hooks are necessary for weights over 100kg to avoid twisted frames.

Filter Slides

Description

- Prefabricated filter slide assemblies especially suited to return air plenums.

Key Product Features for this project

- Fabricate to accommodate side or rear withdrawal as required.
- Incorporate 2mm tolerance for filter slide

Key Installation Features for this project

- Use “D” latches to secure filter seal.
- Locate to be accessible from access panel.

Accessories

- Nil

Basis of Design

The basis of design for this element are credentialled metal fabrication shops.

Flexible Connections

Description

- Heavy duty, waterproof materials such as neoprene.
- UL-listed or NFPA compliant materials.
- Fix to attachments with metallic-coated steel strip. Seal joints.
- Do not paint flexible material.
- Arrange to permit easy removal and replacement without disturbing ductwork or plant.

Key Product Features for this project

- Fire protection: To achieve the FRL of the attached duct when tested to AS 1530.4.
- To be capable of fitting TDF/TDC flanges.
- Suitable for pressures up to 3000Pa.

Key Installation Features for this project

- Isolate fans and conditioner casings from ductwork, by means of airtight flexible connections.
- Provide sufficient slack to ensure free movement and vibration isolation under operating and static conditions.
- Align openings of connected equipment. Do not protrude connections or frames into the airstream where this would be detrimental to the air flow.
- Insulate (external wrapping) where condensation is predictable.

Accessories

- Provide metal over-flashing in weather.

Basis of Design

The basis of design for this element is DuroDyne Flexible Duct Connector – Metal Fab for standard systems, and Super Metal Fab for systems where corrosion is a consideration (pool halls, seasides etc)

Sheetmetal Duct

Description

- Acceptable materials include galvanized steel duct and mild steel components up to 3 mm thick, stainless Steel (304) duct, Zinc Alum duct (where priming is difficult) or Aluminium duct (where cleaning agents may damage other duct surfaces).
- Prime quality lockforming galvanized steel, to AS 1397 Grade G2 or G3 with Z275 coating.
- Duct wall thickness to comply with AS 2338.
- Components for stainless steel and aluminium ductwork shall use materials with a similar or higher corrosion resistance than that of the duct wall material.
- Seal all openings in the surface, joints and seams of ducts in accordance with AS 4254 clause 2.2.1 and not lower than Class C to AS 4254 Table 2.2.1 regardless of duct pressure or location.
- Use only sealants that do not foster microbial growth.
- Ensure sealants have a smoke developed index ≤ 3 and a spread of flame index ≤ 0 when tested to AS/NZS 1530.3.
- Sealants are to maintain their sealing performance for the life of the duct system and bond to the surface of application without primers.
- Sealants are resistant to oils, refrigerants and water after curing, and remain non-toxic.
- Sealants are suitable for application by gun or hand tools.
- Do not use duct tape as the primary duct sealing agent. Use only as a secondary sealant on joints sealed by other means such as mastic, liquids or gaskets. Do not use duct tapes for non-sealant purposes.
- Use mastic at corners of flanges

Key Product Features for this project

- Join with TDF or TDC flanges for all duct sizes greater than 550mm.
- Drive-slide is an option for duct widths less than 550mm. Note that duct leakage shall be increased for duct systems with drive slides.

Key Installation Features for this project

- Provide minimum clear spacing, additional to duct insulation, as follows:
    - 25 mm between adjacent ducts.
    - 25 mm between duct flanges or upper surfaces of ducts and undersides of beams and slabs.
    - 50 mm between ducts and electric cables.
    - 150 mm between ducts and ground, below suspended floors.

Accessories

- Rivets: Expanding solid end type, aluminium base alloy for galvanized duct, stainless steel for stainless steel duct, 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: Zinc-plated for galvanized duct, stainless steel for stainless steel duct.

- Self drilling and tapping screws: Zinc-plated for galvanized duct, stainless steel for stainless steel duct. Provide only if base material into which they screw is thicker than 1.5 mm and they are unlikely to be removed or replaced.
- Bolts, nuts, washers and drop rods: Zinc-plated steel, service condition number 2 for galvanized duct, stainless steel for stainless steel duct. Parts on stainless steel duct not in contact with air stream or corrosive conditions may be zinc-plated as for galvanized duct. Provide washers under nuts and bolt heads.
- At completion of fabrication, seal duct internal with blue cellophane to protect duct from dust entry.

Basis of Design

The basis of design for this element are credentialled metal fabrication shops.

P3 Duct

Description

- P3 Ducting is duct fabricated from preinsulated aluminium panel with 20mm or 25mm thick phenolic insulation in both black and silver aluminium facings.
- Used for flexible duct extensions, vee-boxes or cushion heads.

Key Product Features for this project

- Anti-microbial coating on duct surface.
- Duct fabricated in accordance with Italian engineering manual : *P3_manuale_costruzione_condotte_eng*.

Key Installation Features for this project

- Seismic restraints are not required for P3 duct.

Accessories

- Waterproofing “gum” for external applications shall be provided where necessary.
- Reinforcement rods within the duct shall be provided where necessary.

Basis of Design

The basis of design for this element are credentialled P3 duct fabrication shops.

Perforated Faced Glasswool - Metal Angles

Description

- Electro-pin insulation to cleaned duct surfaces.
- Insulation to be equal to Bradford Supertel 32kg/m2.
- Provide internal insulation with the following absorption performance.

Minimum absorption coefficients table

Insulation	**Absorption coefficients (nominal) to AS ISO 354 at**					
	125 Hz	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**
Perforated foil faced: R 0.9 to AS 4508	0.12	0.48	0.84	0.96	0.97	0.94

Insulation	Absorption coefficients (nominal) to AS ISO 354 at					
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
R 1.5 to AS 4508	0.23	0.62	1.00	1.07	1.12	0.78

- Perforated aluminium foil laminate sheet to comply to AS/NZS 4200.1 as follows:
  - Internal insulation: Heavy duty prior to perforation.
  - External insulation: Heavy duty unperforated.
- Test criteria: To UL 181 with performance to AS 4254 Table 2.8.2.

Key Product Features for this project

- R1.5 performance at 50mm thickness
- For kitchen exhaust systems, use “raw” glasswool, line with mylar, then face with perforated sisalation.

Key Installation Features for this project

- Fix glasswool into place with 40mm metal angles.
- Provide an overlap of at least 300 mm where insulation changes from the inside of the duct to the outside.
- Provide metal lining when within 700mm of humidifier spears.

Accessories

- Laminate tape (for sealing loose edges) adhesive: Nontoxic, high tack, synthetic pressure-sensitive type.
- Tape liner: Silicone coated paper.
- Tape backing: Aluminium foil laminate.

Basis of Design

The basis of design for this element are credentialled metal fabrication shops.

FlatPack Duct

Description

- FlatPack duct is a low profile alternative to round PVC pipe commonly used in ventilation systems. It has a compact design that makes it ideal for applications where space is limited and features a smooth inner surface which minimises pressure loss and therefore improves air flow. The modular, slide-together design of the system makes it simple to install into most applications.

Key Product Features for this project

- Smooth inner surface which minimises pressure loss and therefore improves air flow.
- Low profile.

Key Installation Features for this project

- Seismic restraints are not required for FlatPack duct.

Basis of Design

The basis of design for this element is Fantech ‘FlatPack’ duct.

Balancing Dampers – Spigots or Motorised Spigots

Description

- Spun metal or pressed metal spigots complete with blade.

Key Product Features for this project

- Motorised spigots to come with proprietary actuator bracket

Key Installation Features for this project

- Options for ovalized spigots where ceiling demands it

Accessories

- Metal and nylon duct banding, screws and housings, banding tools and duct tapes to seal flexible duct to spigot.

Basis of Design

The basis of design for this element are Bullocks Manufacturing Galvanised Duct Spigots. Samples can be submitted from a credentialled metal fabrication workshop for review as an accepted alternative.

Non Return Dampers

Description

- Aluminium non return damper, capable of 16 m/s without blade flutter
- Galvanized steel or stainless steel where matching duct material is same.

Key Product Features for this project

- Blades ganged outside the airstream
- Capability for damper to be fitted with barometric conversion kit for easy weight adjustment
- Blades to pivot on 12mm shafts with stainless bushes

Key Installation Features for this project

- Damper to be capable of mating with TDF TDC flange systems

Accessories

- Where nominated by Performance Requirements, there is to be high temperature - no nylon - format

Basis of Design

The basis of design for this element is Bullocks Manufacturing Model 3100.

Pipe & Pipe insulation

Provide piping systems complete with all necessary piping, valves, supports, guides, drains, vents, expansion compensation and all fittings necessary for their safe and efficient operation.

Follow the line of walls, ceilings, etc., and include all necessary offsets and arrange to avoid interference with the building or other services regardless of whether or not these aspects are shown on the drawings.

Make provision for plant isolation and maintenance. Locate valves and other components in ceilings where they are easily accessible and where access or leaks will not cause inconvenience or risks to occupants, or damage to water sensitive equipment.

Arrange connections to plant to permit dismantling of the plant without disturbing other pipes and to permit removal of the plant without removal of the piping.

Provide a union on at least one side of each screwed valve and screwed pipeline component requiring removal for inspection or maintenance.

Provide insulation to hot and cold piping, flues, exhaust pipes, tanks vessels and plant.

Key quality characteristics must be adhered to, in terms of the following:

- R-Value.
- Durability during and after installation.
- Corrosion resistance.
- Cold bridging.

Copper Pipe & Fittings

Description

- Hard drawn Type B.

Key Product Features for this project

- Silver brazed capillary joints for refrigeration or water piping.
- Brass flanges with brass nuts and bolts for water piping only.
- Upon consultant approval, proprietary grooved joints or flare compression joints can be provided.

Key Installation Features for this project

- Provide sleeves that permit normal pipe movement through all walls, floor slabs, and building elements.

Elastomeric Foam Pipe Insulation

Description

- Chemically blown closed cell nitrile rubber in tubular sections for pipe insulation, in sheets for insulating pipe fittings, and in sheets or rolls for large pipes, tanks, vessels and heat exchangers. Provide with smooth natural finish and vapour barrier properties.
- To ASTM C534.
- Non-hygroscopic.
- Water vapour permeability: ≤ 0.065 ng/Pa.m.s.

Key Product Features for this project

- Thermal conductivity <0.06 W/K

Key Installation Features for this project

- Adhesive fix all joints. Use only solvent-based adhesive supplied by insulation manufacturer and designed specifically for the material being used.
- Protection: Metal sheath insulation where:
  - Exposed to sunlight.
  - Subject to mechanical damage.

Accessories

- Wood spacers or Armaflex spacers shall be used for pipe supports to avoid cold bridging.
- Armaflex 520 shall be used for adhesive.

Basis of Design

The basis of design for this element is Fire-rated Armaflex FRV.

Flexible Connections & Expansion Joints

Description

- Seismic Expansion Joints
- Rubber Bellows
- Provide flexible Connections between all rotating or vibrating plant and pipework.

Key Product Features for this project

- Reinforced rubber type, spherical shape with flanged ends.
- Subject to consultant approval for DN15: Flexible reinforced nylon hose

Key Installation Features for this project

- Keep flexible connections taut.
- Painted, Zinc, Galvanised or Stainless Backing Rings
- Threaded, or Flanged - Table D, E, ANSI.

Basis of Design

The basis of design for this element is Promax.

Insulated Pair Coil

Description

- PairCoil use with domestic split system air conditioners.
- Manufactured to AS/NZS1571 and is suitable for use with high pressure refrigerants R410A (refer to air conditioning schedule).

Key Product Features for this project

- Highly flexible 13mm and 19mm paired tubular closed cell (as nominated on drawings) elastomeric nitrile rubber foam
- Safe Working pressures at 65C to be greater than 4100 kPa.

Key Installation Features for this project

- 20 metre lengths of pre-insulated copper tube intended to be installed without the use of glue or tape.

Accessories

- Provide AS1530 certification

Basis of Design

The basis of design for this element is Kemba Paircoil Max.

Pipe Solar Covers

Description

- Folded colourbond steel covers, to reflect solar radiation from insulated pipes

Key Product Features for this project

- 0.55mm thick minimum.

Key Installation Features for this project

- Ensure complete coverage.

PVC Condensate Drainage

Description

- Unplasticised pipes and fittings (PVC-U): To AS/NZS 1477.
- Oriented PVC (PVC-O) pipes: To AS/NZS 4441.
- Solvent cement: To AS/NZS 3879.
- Insulate drain with 9mm wall for 9m distance or to suit condensation predictions.

Key Product Features for this project

- All PVC pipe shall be manufactured and installed following PIPA POP Guidelines, aa found on Technical Guidelines - Plastics Industry Pipe Association of Australia (pipa.com.au)

Basis of Design

The basis of design for this element is Vinidex.

Roof Penetrations

Description

- Dektite flashings shall be used for pipe penetrations through roofing.

Key Product Features for this project

- Liaise with Dektite to ensure the correct base is used to match the roofing.

Key Installation Features for this project

- Test flashing with hosed water after installation is completed.

Basis of Design

The basis of design for this element is Dek Industries.

Steel Pipe & Fittings

Description

- Where water in the system does not come into contact with the atmosphere, provide pipe to the following:
  - AS 1074.

- BS EN 10216-1.
- BS EN 10217-1.
- API Spec 5L.
- ASTM A53/A53M.

Key Product Features for this project

- For welded pipe: use butt weld fittings (e.g. bends and tees). Provide sweep tees and long radius type bends.
- Steel for fabricated pipe fittings shall use the same grade and wall thickness as the pipe.
- Fittings for non-vertical lines shall use eccentric reducing fittings installed to avoid gas binding, liquid retention or both.

Key Installation Features for this project

- Pipe Supports are as per AS 4041 Table 3.28.2.

Seismic & Wind Forces Restraint

- All seismic calculations shall be submitted in accordance in AS1170.4 2007 - Section 8 – Advanced methodology.
- All Seismic calculations shall have the assumptions for spectral shape, importance factor, soil classification, & earthquake design category verified by the structural engineer.
- All building and infrastructure elements subject to wind load must comply with CiDD Alert 'Wind Effects on Building and Infrastructure Elements' - March 2017
- Seismic performance shall be C2 as the minimum standard.
- Chemical anchors shall not be used without prior approval.
- Reference to the ASHRAE Seismic Restraint Manual – Guidelines for Mechanical Systems is expected when submitting seismic calculations. This also verifies that the designer has reviewed this manual in assigning seismic restraints to the HVAC components.

Duct restraint.

Description

- All threaded rods shall be M10 or larger.
- Every 9m, a rigid lateral restraint shall be provided in the form of a Unistrut frame or transverse wire restraints.

Key Product Features for this project

- Seismic fixings shall be used.

Key Installation Features for this project

- 100mm clearance between pipe and surrounding services shall be maintained.

Accessories

- Seismic fixings shall be used.

Basis of Design

The basis of design for this element is Unistrut (rigid), or Eurofast or Gripple (cabled systems).

Electrical Panel Restraint

Description

- Three fixing points shall be used as a minimum.

Accessories

- Seismic fixings shall be used.

Basis of Design

The basis of design for this element is Unistrut (rigid), or Eurofast or Gripple (cabled systems).

Floor Standing Equipment

Description

- Four fixing points shall be used as a minimum.

Key Product Features for this project

- Equipment loads greater than 100kg shall be fitted with Snubbers.

Key Installation Features for this project

- Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double-acting and located as close to the vibration isolators as possible.

Accessories

- Seismic fixings shall be used.

Basis of Design

The basis of design for this element are Mason Snubbers Z1011.

Pipe restraint

Description

- All threaded rods shall be M10 or larger.
- Every 9m, a rigid lateral restraint shall be provided in the form of a Unistrut frame or transverse wire restraints.

Key Installation Features for this project

- 50mm clearance between pipe and surrounding services shall be maintained.

Accessories

- Seismic fixings shall be used.

Basis of Design

The basis of design for this element is Unistrut (rigid), or Eurofast or Gripple (cabled systems).

Seismic fixings

Description

- Seismic design and assessment of post-installed fasteners is to be assessed per Australian Standard AS 5216:2021 (Design of post-installed and cast-in fastenings in concrete).
- Seismic performance shall be C2 as the minimum standard.
- Chemical anchor shall not be used without prior approval.

Key Product Features for this project

- M10 is a minimum diameter.

Key Installation Features for this project

- 2mm diameter clearance is required for all fixings. (That is, a M10 fixing is through a M12 hole).
- 65mm embedment for concrete fixing is a minimum.

Accessories

- Seismic approval certificates shall be submitted for review prior to construction.

Basis of Design

The basis of design for concrete fixing is the Hilti HST3 (-R) expansion anchor.
The basis of design for steel fixing is the Hilti HST3 (-R) expansion anchor.

Soffit Mounted Equipment

Description

- Four fixings minimum.

Key Product Features for this project

- Where feasible, limit the threaded rod length to 300mm from soffit.

Key Installation Features for this project

- Minimum M10 fixings

Accessories

- Seismic fixings shall be used.

Basis of Design

The basis of design for this element is the Hilti range of seismic-certified expansion anchors.

Wall Mounted Equipment

Description

- Three fixings minimum for seismic loads >0.1g

Key Product Features for this project

- All directional restraint is required.

Key Installation Features for this project

- Minimum M10 fixings

Accessories

- Seismic fixings shall be used.

Basis of Design

The basis of design for this element is the Hilti range of seismic-certified expansion anchors.

Electrical

General: To AS/NZS 3000 Section 2 unless otherwise documented.

Electrical systems: To AS/NZS 3008.1.1 and SAA HB 301.

Degrees of protection (IP code): To AS 60529.

EMC: To AS/NZS 61000.

Cable Tray

Description

- Provide a complete cable support system consisting of trays or ladders and including brackets, fixings.
- Run cables < 13 mm diameter on cable trays or in ducts.-
- Standard & Type tests to NEMA VE-1
- Provide proprietary trays, ladders, fittings and accessories from a single manufacturer for the same support system.
- Select cable tray/ladder in conjunction with support system installation to achieve the documented loading and deflection requirements.

Key Product Features for this project

- Spare capacity: ≥ 50%.

Key Installation Features for this project

- Submit shop drawings showing the following:
  - Cable tray and trunking routes.
  - Layout of cable supports and enclosures on the current architectural background coordinated with the structure and other services.
  - Technical data for ducted wiring enclosure systems.
  - Cable support systems.

Accessories

- Provide Covers where water or moisture risk is present (near air conditioning or drainage systems)

Basis of Design

The basis of design for this element is EzyStrut.

Cabling

Description

- Polymeric cables: To AS/NZS 5000.1.
- Use multi-stranded copper cable generally.
- Default insulation: V.75.
- Default sheathing: 4V.75.

Key Product Features for this project

- Allow to size cables from boards to end devices at 2.5% VD.
- Minimum size:
  - Power sub-circuits: 2.5 mm2.
  - Sub-mains: 6 mm2.
  - Control systems in spoke configuration 1.5mm2
  - Control systems in daisy chain configuration 2.5mm2

Key Installation Features for this project

- If exposed to view, install conduits in parallel runs with right angle changes of direction.
- 'Exposed to view' includes plantrooms and excludes false ceiling spaces.
- Conduits in roof spaces: Locate below roof insulation and sarking.
- In accessible roof spaces, provide mechanical protection for light-duty conduits.
- Inspection fittings: Locate in accessible positions.
- Draw cords: Provide 5 mm2 polypropylene draw cords in conduits not in use.
- Do not run in concrete toppings. Do not run within pretensioning cable zones.
- Cross pretensioning cable zones at right angles.
- Route to avoid crossovers and minimise the number of conduits in any location.
- Space parallel conduits ≥ 50 mm apart.
- Minimum cover: The greater of the conduit diameter and 20 mm.
- The conduit cover can be related to the achievement of a required fire rating.
- If conduits > 25mm are required they should be coordinated with the structural design.
- Fixing: Fix directly to top of the bottom layer of reinforcing.

Accessories

- Provide draw wires to pull in conductor groups from outlet to outlet, or provide ducts with removable covers.

Basis of Design

The basis of design for this element is APEC Cables.

Switchboard Components

Description

- Rated duty: Uninterrupted in non-ventilated enclosure.
- Rated making capacity (peak): ≥ 2.1 x fault level (RMS) at assembly incoming terminals.
- Utilisation category: To AS 60947.1clause 4.4.
- Circuits consisting of motors or other highly inductive loads: At least AC-23.
- Other circuits: At least AC-22.
- Coordination: Select and adjust protective devices to discriminate under over-current and earth faults.
- Enclosure: IP65 minimum.
- Switch-isolator
  - Standard: To AS 60947.1 and AS/NZS 3947.3.
  - Poles: 3.

  - Operation: Independent manual operation including positive ON/OFF indicator.
  - Shrouding: Effective over range of switch positions.
  - Rated breaking capacity: ≥ rated full load current.
- Moulded case and miniature circuit breakers
  - Moulded case breakers: To AS 60947.1 and AS 60947.2.
  - Miniature circuit breakers: To AS/NZS 60898.1 or AS/NZS 3111.
  - Operation: Independent manual operation including positive ON/OFF indicator.
  - Miniature circuit breakers: Fixed thermal, fixed magnetic trip.
  - Isolation facility: Required.
  - Moulded case breakers require current limiting.
  - Mount circuit breakers so that the ON/OFF and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.
- CB Trip settings: Set as documented, seal, and label.
- Contactors: Enclosed, block type, air break, electro-magnetic .
  - Poles: 3.
  - 4 pole units are available for specific uses, e.g. generator changeover circuits etc.
  - Rated operational current: The greater of:
  - Full load current of the load controlled.
  - ≥ 16 A.
  - Mechanical durability: 10 million cycles to AS 60947.4.1.
  - Refer to AS 60947.4.1 clause 8.2.4.3 for guidance on alternatives. Consider d.c. switching and coil voltage.
  - Electric durability: ≥ 1 million operations at AC-22 to AS 60947.4.1.
  - Mounting: Mount with sufficient clearance to allow full access for maintenance, removal and replacement of coils and contacts, without the need to disconnect wiring or remove other equipment.
  - Auxiliary contacts: Provide auxiliary contacts with at least one normally-open and one normally-closed separate contacts with rating of 6 A at 230 V a.c., utilisation category: AC-1.
  - Slave relay: If the number of auxiliary contacts exceeds the number which can be accommodated, provide separate slave relays.
- Incandescent indicators:
  - Incandescent oil tight type minimum 22 mm diameter or 22 x 22 mm.
  - Lamps: Changeable from front of panel without removing the holder.
  - Lamp rating: 1.2 – 5 W.
  - Neon indicators: 240 V, 12 mm diameter with in-built resistor.
  - LED indicators: 12 or 24 V as necessary, in corrosion-resistant bezel, nominal 5 mm diameter.
  - Press-to-test:
  - Compartments/subsections with < 5 indicating lights: Provide each indicating light with a fitted integral press-to-test lamp actuator.

- Compartments/subsections with ≥ 5 indicating lights: Provide a common press-to-test lamp push-button.

Key Product Features for this project

- Nil

Key Installation Features for this project

- Conduct earth fault resistance tests on site once board is positioned

Accessories

- Nil

Basis of Design

The basis of design for this element is NHP.

Switchboards

Description

- Provide custom-built switchboards as follows and as documented.
- Standard: To AS/NZS 3439.1. IP rating:
- General: IP 42.
- Weatherproof: IP 56 minimum.
- Separation: Form 1 for non essential; Form 4 for essential services
- Spare pole capacity: ≥ 20%.
- Position equipment to provide safe and easy access for operation and maintenance. Group devices according to function.
- Separate shipping sections, subsections, cable and busbar zones, functional unit modules and low voltage equipment compartments by means of vertical and horizontal steel partitions which suit the layout and form of separation.
- Segregate BCA emergency equipment from non-emergency equipment by means of metal partitions designed to prevent the spread of a fault from non-emergency equipment to emergency equipment.
- Fabricate from sheet metal of rigid folded and welded construction.
- Use extruded aluminium sections for supporting and mounting structures; non-insulating type for mounting panels; 1.6 mm sheet steel.
- Coating class: Indoor assemblies: Z200 & Outdoor assemblies: Z450.
- Provide ventilation to maintain design operating temperatures at full load.
- Cover ventilation openings with non-combustible and corrosion resistant 1 mm mesh.
- Equipment mounting panels: To support the weight of mounted equipment.
- For assemblies with shipping dimensions exceeding 1800 mm high x 600 mm wide, provide fixings in the supporting structure and removable attachments for lifting.
- Wall mounted assemblies to be limited to ≤ 2 m2.
- Floor-mounting: Provide mild steel channel plinth, galvanized to class Z600, with toe-out profile, nominal 75 mm high x 40 mm wide x 6 mm thick, for mounting complete

assemblies on site. Drill M12 clearance holes in assembly and channel and bolt assemblies to channel. Prime drilled holes with zinc rich organic primer to AS/NZS 3750.9.

- Cable entries: Provide cable entry facilities within assembly cable zones for incoming and outgoing power and control cabling. Provide sufficient clear space within each enclosure next to cable entries to allow incoming and outgoing cables and wiring to be neatly run and terminated, without undue bunching and sharp bends.
- Cover plates: Provide 150 mm maximum width cover plates butted together and covering the continuous cable entry slot.
- Gland plates: Provide removable gland plates fitted with gaskets to maintain the degree of protection.
- Gland plate materials: 1.5 mm thick steel, 5 mm thick composite material or laminated phenolic.
- Covers maximum dimensions: 900 mm wide and 1.2 m2 surface area.
- Covers fixing: Fix to frames with at least 4 fixings. Provide corrosion-resistant acorn nuts if the cover exceeds 600 mm in width. Rest cover edges on the cubicle body or on mullions. Do not provide interlocked covers.
- Provide corrosion resistant D type handles.
- Escutcheons: For doors enclosing circuit breakers, provide escutcheon plates as barriers between operating mechanisms and live parts.
- Escutcheon plates: Provide plates or removable covers with neat circuit breaker toggle cut-outs allowing interchangeability of 1, 2 and 3 pole circuit breakers. Provide corrosion-resistant lifting handles or knobs. Provide unused circuit breaker toggle cut-outs with blanking in-fill pole covers.

Key Product Features for this project

- Standard for finishes: To AS 2700.
- Apply protective coatings to internal and external metal surfaces of assembly cabinets including covers, except to stainless steel, galvanized, electroplated, or anodised surfaces and to ventilation mesh covers.
- Thermoset powder coating to AS 4506 or two-pack liquid coating of AS/NZS 3750.13 primer and proprietary or epoxy acrylic full gloss spray finish

Key Installation Features for this project

- Before making inter-panel connections, fix assemblies and metering equipment enclosures into position, level and plumb.
- Neatly adapt one or more cable entry plates, if fitted, to accept incoming cable enclosure.
- Provide the minimum number of entry plates to leave spare capacity for future cable entries.
- Do not run cables into the top of weatherproof assemblies.
- Single core cables rated > 300 A: Pass separately through non-ferrous gland plates. Do not use metal saddles.
- Continue cable enclosures to or into assemblies and fit cable entry plates so that the IP rating of the assembly and the fire rating of the cable are maintained.
- Support or tie cables within 200 mm of terminations. Provide cable supports suitable for stresses resulting from short circuit conditions.

- Submit the following:
  - Makes, types and model numbers of items of equipment.
  - Type test certificates for components, functional units and assemblies including internal arcing-fault tests and factory test data.
  - Design calculations of non-type tested and non- proprietary busbar assemblies.
  - Overall dimensions.
  - Fault level.
  - IP rating.
  - Rated current of components.
  - Number of poles and spare capacity.
  - Mounting details.
  - Door swings.
  - Paint colours and finishes.
  - Access details.
  - Schedule of labels.

Accessories

- Where indication lamps are nominated in the schedule, include lamp test indication light

Basis of Design

The basis of design for this element are credentialled electrical fabrication workshops.

Variable Speed Drives

Description

- Microprocessor controlled, solid-state electronic type, providing motor speed control of 3 phase squirrel cage induction motors by means of stepless variable frequency, variable voltage pulse width modulated (PWM) output.
- Application: Suitable for the documented applications.
- Selection
- Provide variable speed motor drive controllers selected for the following:
  - Rating: Continuously rated to suit the full load current stated on the motor nameplate and the length and type of cable feeding the motor.
  - Service conditions: To AS 61800.2 Section 4.
  - Speed ranges: Suitable for the load duties.
  - Control deviation band: To suit the controls functional specification.
- Provide the following:
  - Soft start (initially start motors on low speed).
  - Adjustable maximum current limit.
  - Automatic reset/restart of system after removal of fault or power failure condition. If the number of reset/restart attempts is limited for safety and equipment protection, provide for safe shut down and manual restart in the event of an unsuccessful attempt at the reset/restart sequence.

  - Ability to immediately restart a motor following momentary interruption of supply, even if the motor is rotating, or rotating in the reverse direction.
  - Protection: Provide protection against:
  - Instantaneous power failure.
  - Instantaneous over current.
  - Internal and external overload.
  - Under and over voltage.
  - Over temperature of the controller.
- Protect from contact with live parts without the removal of fixed covers or panels.
- Provide automatic, electronic motor thermal overload protection facility wherein the tripping time is based on the motor's running frequency, actual motor current, operating time, and the rated current.
- Motors ≥ 22Kw: Provide PTC thermistor input to initiate motor shutdown under fault conditions.

Key Product Features for this project

- Provide integrated harmonic suppression filters to limit the harmonics to within the value prescribed by the electricity distributor for the motor load and environment.
- Provide Native BacNET connectivity & HLI.

Key Installation Features for this project

- Screened cable standard: To AS/NZS 61000 and AS 61800.3 Category C1 for the actual length and type of cable feeding the motor.
- Comply with the requirements of the Australian Communications Authority.
- Switchboard mounting: Install each controller, together with associated equipment, in separate ventilated subsections of AS 60034.7.
- Wall mounting: Install in an IP54 rated enclosure.
- Routine tests: Standard separate device and power drive system tests to AS 61800.2 and AS 61800.3.
- Site tests: Test input power factor and harmonic content on completed installation.

Accessories

- Where located within 1km of the coast, coat internal surfaces with proprietary corrosion resistant treatment.
- Ensure the capability to add a control card.

Basis of Design

The basis of design for this element is ABB ACH series.

Commissioning

Commissioning is to be performed in accordance to the relevant CIBSE commissioning codes. The codes provide a management framework that can be integrated with other building systems. This set of codes outlines what is being measured and why.

This is not to be confused with NEBB Commissioning Procedural Standards. This set of procedures outlines how the measurements are being taken reliably and reported. Queries regarding the format of commissioning reports are directed to the relevant NEBB Procedural Standards.

The contractor is to engage an independent, NEBB-qualified firm for all commissioning activities, including planning. NEBB Qualified personnel are required to ensure the credentials of the commissioning team.

The Mechanical Trade shall make good or pay all costs in respect of patching, filling, painting, etc. of holes and chases or damage caused by them or their Trade Contractors in the execution of the Works. Such making good shall be of a standard to restore the surface to its original condition.

CIBSE Commissioning Code A (Air Systems)

Description

- All final air quantities are to be within the tolerances in **Air quantity tolerance table**.
- Each air quantity measured deviates by less than the instrument accuracy from the previous reading on the same component with the same instrument.

Key Product Features for this project

- Commission the air systems such that air quantities are within the Air Quality Tolerance table below:

System type	Terminal air quantity tolerance	Branch air quantity tolerance	Total air quantity tolerance
Low velocity supply, return or exhaust system where all terminals on any one sub-branch serve the same space	+20% -0%	+10% -0%	+10% -0%
Low velocity supply, return or exhaust system where the terminals on any one sub-branch serve more than one space	+15% -0%	+10% -0%	+10% -0%
Supply systems for any induction units	+5% -0%	+5% -0%	+10% -0%

Key Installation Features for this project

- Resistance across the cooling coil bank (if present) is equal to the wetted coil resistance.
- Resistance of the filter bank (if present) is equal to that of the filter fully loaded with dirt.
- For fans with variable speed drives, the frequency to the motor is ≤ 50 Hz.
- At least one outlet on each branch has its damper at the minimum pressure drop position.
- At least one sub-branch damper is at the minimum pressure drop position.
- At least one branch damper is at the minimum pressure drop position.
- The fan speed or pitch angle is at the lowest value consistent with the above.

Accessories

- The CIBSE Commissioning Code A includes tasks for designers & for installers. Presume the Designers tasks are completed. Complete the tasks for pre-commissioning, commissioning and post-commissioning.
- Contact the SEED Representative if the tenderer has any queries or concerns stemming from the CIBSE CCA.

CIBSE Commissioning Code C (Control Systems)

Description

- Test all controls hardware and software for correct operation in accordance with the Functional Controls Description.
- Sensor calibration – Calibrate all sensors to within the documented accuracy of the sensor.

Key Product Features for this project

- Test all field wiring from terminals to field interface terminal strips and attend the testing of all equipment that interfaces to the controllers to confirm the operation of such equipment from the controller interface terminals.
- Test each component for correct function and operation. Check the operation of controlled devices to ensure that they operate in the required direction and through the correct range of physical movement relative to the applied control signal.
- Test and verify calibration of all controller inputs and outputs, actuators and sensors for proper response by actual operation of the devices.
- Test and commission all control panels separately before connecting to the network.
- Test the host computer installation, including power supplies and batteries. Verify local area network communications to remote systems and controlled devices. Test the required operation of each control point from the operator's workstation and verify the status of all points and alarm functions on the computer database and graphic displays.
- Verify and demonstrate dynamic point information, alarm detection and action, time functions, control strategies including, but not limited to, energy management and fire mode, database functions and trending functions.
- Test the operation of the plant and control systems in the documented modes to ensure that the documented plant operation and controlled variable conditions are consistently achieved and in a stable manner.
- Record all commissioning tasks and results on either neatly hand written or typed standard test forms. Include the records in the Operation and Maintenance Manual.

Key Installation Features for this project

- Confirm all safety trips and alarms are functional. Test each safety control and facility by simulating the unsafe condition that the control is intended to protect against.
- Ensure that monitoring and safety measures are in place for the test to protect personnel from injury and the building and equipment from damage.
- Operate the mechanical systems continuously during the 7-day plant verification period.

- Provide one or more experienced operators either in constant attendance in working hours or on call to monitor the plant operation and make necessary adjustments to keep it operating properly.
- Verification is to confirm the automatic controls are commissioned to operate without regular attendance.

Accessories

- The CIBSE Commissioning Code C includes tasks for designers & for installers. Presume the Designers tasks are completed. Complete the tasks for pre-commissioning, commissioning and post-commissioning.
- Contact the SEED Representative if the tenderer has any queries or concerns stemming from the CIBSE CCC.

CIBSE Commissioning Code M (Management)

Description

- Provide a program consistent with, and forming part of, the construction program. Set out the proposed program for completion, commissioning, testing and instruction.
- Identify related works and timing of the works pre-requisite to successful and timely completion of the works.
- Revise the program as the project proceeds.

Key Product Features for this project

- Fire safety: Complete testing and certification of all fire safety measures before occupation of the building.
- Complete a Commissioning Risk Assessment – outlining what could threaten the success of commissioning activities. This is to be shared with the builder to enable risk mitigation.

Key Installation Features for this project

- The commissioning program should ensure that adequate time is allowed in the overall building program for commissioning and that the requirements for commissioning are complete before commissioning is commenced.
- Common problem areas include incomplete building works such as missing ceiling tiles, doors not hung and the building not being airtight. The results of not properly programming commissioning are that either it is done in too little time or it is done after the building has been handed over when it often leads to complaints. In both situations the result is normally a poorly commissioning.
- Running in period: Include time in the program for the running period prior to the date for practical completion.

Accessories

- If the subcontractor would like a typical Commissioning Plan template, please liaise with the SEED HVAC engineer for the project who should be able to furnish a template.

CIBSE Commissioning Code R (Refrigeration)

Description

- Test completed sections of piping system progressively.
- Dehydrating and refrigerant charging are covered under the **Charging** subclause.
- Pressure/leak tests conducted in accordance with AS/NZS 1677.2 Section 5 and SAA HB 40.1 clauses 6.2 and 8.1.7.
- Test medium: Dry nitrogen.

Key Product Features for this project

- Dehydrate the refrigeration gas system before charging with refrigerant gas.
- Use a high-vacuum pump, connected to both high- and low-pressure sides of the system with valves open and controls connected. Measure the pressure with calibrated electronic or similar gauges. Do not use wet-bulb determination.
- Pressure to be achieved:
    - For systems with a suction temperature < 0°C: 27 Pa.
    - For systems with a suction temperature > 0°C: 53 Pa.
- Vacuum test: Maintain vacuum for at least 24 hours, after taking account of changes in ambient temperature.
- Note ambient temperature at commencement and end of the 24 hour period, and allow for any temperature change having an effect on the vacuum reading, when evaluating any possible rise over this period. If any doubt exists, use the dry nitrogen double evacuation method and check again after 24 hours.
- Systems with a suction line > DN 50: After dehydration, charge the system with dry nitrogen to the system test pressures, then dehydrate again using the above method.
- On completion of dehydration, charge the system with refrigerant and oil and test for leaks using an electronic gas detector.
- State if refrigerant may be added and if leak test gas is to be recovered - both recommended in SAA HB 40.1 clause 6.2.
- Test criteria: No loss of pressure over a 24-hour test period after taking account of changes in ambient temperature.

Key Installation Features for this project

- Isolate items of equipment not designed to withstand the test pressure and secure pipes and fittings in position to prevent movement during the tests.

Accessories

- The CIBSE Commissioning Code R includes tasks for designers & for installers. Presume the Designers tasks are completed. Complete the tasks for pre-commissioning, commissioning and post-commissioning.
- Contact the SEED Representative if the tenderer has any queries or concerns stemming from the CIBSE CCR.

CIBSE Commissioning Code W (Water)

Description

- All water quantities are within documented tolerances.

- Water quantities measured deviate by less than the instrument accuracy from the previous readings on the same component with the same instrument.
- When water balancing is complete:
    - Lock final balancing position of calibrated balancing valves.
    - Mark balanced position of lever on lever operated valves.
    - Record turns open for screw operated valves.
    - Remove any temporary provisions.
    - Set system into normal operation.
    - Submit water balance reports.

Key Product Features for this project

- Balance water systems to the designated water quantities within the following tolerances:
    - Chillers, cooling towers, heat exchangers and boilers: ± 5% designated flow rate.
    - Coils and terminals: ± 10% designated flow rate.
    - Bypass on coils with three way valves: ± 10 designated flow rate.
- Total system flow: ± 5% designated flow rate.
- Cooling Tower Water consumption (where applicable) : Adjust supply and bleed rates to give the lowest practicable water consumption.

Key Installation Features for this project

- At least one balancing valve on each branch is fully open.
- At least one branch balancing valve is fully open.
- For pumps with variable speed drives, the frequency to the motor is ≤ 50 Hz.
- The pump balancing valves (if fitted) are fully open.
- The pump impeller diameter is not more than 5% greater than that to achieve the above.
- Any other steps required to achieve lowest practicable pump power consumption have been taken.

Accessories

- The CIBSE Commissioning Code W includes tasks for designers & for installers. Presume the Designers tasks are completed. Complete the tasks for pre-commissioning, commissioning and post-commissioning.
- Contact the SEED Representative if the tenderer has any queries or concerns stemming from the CIBSE CCW.

NEBB Commissioning

Description

- Engage an independent, NEBB-qualified firm for commissioning activities.
- Conduct heating and air-conditioning performance tests. This shall be provided in non-apartment, air conditioned spaces only.
- It is important that, as part of commissioning, the overall performance of the system is checked by measuring the room conditions achieved.
- In most comfort airconditioning situations, only temperature is controlled but humidity should also be logged to ensure that some control or other defect is not causing excessive humidity levels.

Key Product Features for this project

- Performance Tests: Record dry-bulb and relative humidity at each location continuously for 2 separate periods of at least 24 hours.

Key Installation Features for this project

- Automatic control system: If the automatic control system has been documented to have facilities for logging sensed values, provide trend logs of sensor values over the same periods.
- Reports: Provide graphical printout of values recorded by instrument together with control system log graphs where this facility is provided.
- Electric duct heaters: Conduct Performance tests: Test operation step by step, measuring operating current and checking operation of controls.
- Motor-driven equipment performance tests: Conduct Performance tests. Adjust thermal overloads for actual current and record measured current and overload settings.
- It is also important that logging uses independent instruments and does not rely on the automatic control system sensors. If logging uses the control system sensors defects in sensor calibration, response time, control logic and the like may be hidden. Control system trend logs should also be obtained for comparison with the recordings from the independent instruments. Any discrepancy between the two that exceeds the documented tolerances may be treated as a defect in the control and/or mechanical system.

Accessories

- Instrumentation: Electronic data logger with temperature and humidity sensors or thermo-hydrograph.

Fire Mode Operation

Description

- Test all systems required to operate in fire mode.
- Conform to AS/NZS 1668.1.
- Complete testing before practical completion.
- Test related air handling systems for correct operation in conjunction with fire protection and other related systems. (i.e. confirm the Fire Matrix behaviour is achieved reliably)
- Verify that all systems return to normal operating mode after fire mode operation.

Key Product Features for this project

- Once the contractor has demonstrated the systems work correctly, organise a witnessing event with the Builder and potentially the Fire Authority prior to Practical Completion.
- Allow a period for adjustments before Practical Completion.

Key Installation Features for this project

- Fire and smoke dampers: Commission to AS 1682.2. Test that fire and/or smoke dampers close fully with fans operating.

Sound Measurements

Description

- Provide sound pressure measurements as follows:

  - Internal: To AS/NZS 2107.
  - External: To AS 1055.1.
- Measure the A-weighted sound pressure levels and the A-weighted background sound pressure levels at the designated positions.
- Measure the sound pressure level and the background sound pressure level over the full range of octave band centre frequencies from 31.5 Hz to 8 kHz at the designated positions.
- Make corrections for background noise to AS/NZS 2107 Table B1.
- Complete testing 1 week before practical completion to allow consultant review.

Key Product Features for this project

- Provide for a test for all fans >500LPS airflow and all fan coils >800LPS airflow.
- Allow for a further 10 tests in locations directed by the consultant. If this is undertaken in a well-planned manner, the consultant can attend during commissioning to minimise time delay.

Key Installation Features for this project

- Test all systems required to operate in fire mode.
- Test all locations (stair lobbies etc) required to be satisfied in fire mode.
- If a test position is designated only by reference to a room or space, do not take measurements less than 1 m from the floor, ground or walls.

Hydrostatic Testing

- Preparation for testing: Isolate items of equipment not designed to withstand test pressures. Leave pipe joints exposed to enable observation during tests. Secure pipes and fittings in position to prevent movement during tests. Restrain expansion bellows.
- Water pretreatment: Conform to Water treatment. For steel piping, introduce corrosion inhibiting chemicals. Use chemicals from a water treatment specialist in accordance with the specialist's instructions and under the specialist's supervision. Leave pre-treated water in the system until the system is ready for chemical cleaning and flushing.
- Procedure: Test completed piping systems including equipment designed to withstand test pressures. Isolate equipment not designed to withstand the test pressure.
- Test criteria: No loss of pressure over the test period after taking account of changes in ambient temperature.
- Pressure piping test pressures: To AS 4041.
- Other piping: Test systems at 1.5 times the working pressure or 1 MPa, whichever is the greater, for at least 24 hours.

Painting & Labelling

Architectural Painting

Description

- All services exposed to public view (i.e. without any screening) shall be painted to a RAL colour number nominated by the architect.
- Where an air diffuser can otherwise permit a view of a shiny surface behind, it shall be treated with a matt black treatment.
- Paint shall be Dulux, Wattyl or other approved manufacture.

Key Product Features for this project

- In terms of surface treatment and number of coats, the painting specification shall match the paint specification on surrounding surfaces.
- For internal spaces, VOC levels must be in accordance with The Australian Environmental Labelling Association, Inc. Standard No: AELA 23-2005 'Australian Voluntary Environmental Labelling Standard Architectural and Protective Coatings'.
- Conformance with the Standard (refer to table below) must be demonstrated by test reports from laboratories accredited to carry out the relevant tests and/or calculations and appropriate documentation of production methods and quality controls.

Product Type	***Maximum TVOC Limit (g/litre)***
Interior gloss	75
Interior semi gloss, satin	16

- For solvent-based coatings the paint shall not contain VOC's in excess of 200g/litre. For recycled paints the VOC level averaged across batches of paint must no exceed 100g/litre.
- The paint's VOC content must either be calculated from the VOC data for each of the raw materials or experimentally by ASTM D3960, as qualified by the AELA 23-2005.
- Where the raw material is a mixture of compounds, some of which contain VOC's the VOC content of the mixture may in turn be calculated from the VOC content of the individual components. Where this is not known, it must be determined by the methodology detailed in AELA 23-2005.

Key Installation Features for this project

- The treatment shall have a lifetime of 10 years as a minimum.
- All paint shall be delivered to the site in the manufacturer's branded and sealed tins. Prepare and apply all materials in strict accordance with the manufacturer's recommendations. Additions to or adulteration of the materials, except where specifically recommended by the manufacturer, constitutes sufficient grounds for rejection of the batch.
- Select sealers, priming coats, undercoats and finishing coats suitable for the particular surface and capable of withstanding the surface temperatures without deterioration.

Labelling

Description

- All services outside of apartments shall be labelled with the plant identification on these drawings.
- All power supplies and isolators for non-apartment services shall be labelled as to what plant they serve.

Key Product Features for this project

- The label shall be a decal applied to the duct/isolator/plant. The lettering height shall be range from 10mm for electrical isolator identification, 35mm for duct and pipe identification, to 50mm for plant identification generally.

Key Installation Features for this project

- Labelling shall be applied every 5m in a location that is relevant and in public view.

Procurement Labelling

Description

- The plant identifier is to be used on the serial plates installed by the manufacturer.

Key Product Features for this project

- The plant identification used in equipment submissions shall be found on the manufacturers' serial plate. This enables maintenance staff to track equipment from the Operations Manual to the plant on site.

Key Installation Features for this project

- Locate Serial plates in a location that is visible from access panels etc.

Maintenance & Handover

Building Tuning

Description

- Building Tuning involves the quarterly adjustment of services to ensure the system is operating in a manner that is best for project.
- The duration of this period is to match the defects liability period.
- This may include adjustment of time schedules or setpoints beyond what was considered appropriate at Practical Completion.

Key Product Features for this project

- This only applies to Common Areas systems such as carpark, plantroom and fire ventilation systems. It also applies to the DHW heating system.
- This does not apply to systems that are under the direct control of tenants or occupants.

Key Installation Features for this project

- The work will be directed by the Facility Manager (details tbc) who will identify that an issue is found. The subcontractor shall research the issue, outline the proposed adjustments and confirm they have been executed.

Accessories

- Adjustments shall be recorded in the O&M Manuals for the sake of future issues.

Basis of Design

The basis of design for this element is to allow a PC sum representing 24 hours per quarter.

Defects & Liability Period

Description

- Defects & Liability Period is a 12 month period following Practical Completion.
- During this period, consumables are funded by the tenant or Owner but all other expenses are provided for by the tenderer.

Key Product Features for this project

- Defects & Liability Period may uncover workmanship defects that need to rectified by the tenderer at no cost to the Owner.

Key Installation Features for this project

- Where consistent failure is found around a circumstance, the successful tenderer may be required to replace all circumstances whether failure has occurred or not.

Documented Handover

Description

- Handover shall include 8 hours instruction for the Owner on how the specific systems are to be maintained.
- This instruction may need to recorded via video for the sake of creating a record.

Key Product Features for this project

- Two weeks prior to handover, all documentation for handover shall be provided to the Owner to allow perusal and questions.

Key Installation Features for this project

- All material shall be electronic and hard copy.
- Baseline data shall be provided in a format that is suitable to stored within the Fire Control Room.

Accessories

- A Handover agenda shall be provided, coordinated with other trades for completeness.
- All material shall be reviewed for completeness prior to acceptance.

Basis of Design

The basis of design for this element is that the successful tenderer provides staff for an 8 hour period (including specialist contractors) to answer reasonable questions from the Owner. This may include demonstration of specific maintenance activities.

Operations Manual

Description

- An Operations Manual shall be provided in electronic and hard copy format prior to Practical Completion.

Key Product Features for this project

- It shall comprise product detail for each product
- It shall include contacts details for the suppliers of each product
- It shall comprise warranty information for each product
- It shall comprise this specification and tender drawings

Key Installation Features for this project

- It shall comprise As Built drawings, which must also include make and model identification.
- It shall include equipment submissions.
- It shall comprise maintenance procedures for all equipment.
- Fire safety provisions (including test certificates) shall be separable to store in the Fire Control Room to allow Easy retrieval for the Owner's Facility Management Team.

Accessories

- Equipment that is provided for apartments shall be a separable document suitable for providing apartment owners so that they can manage their own maintenance activities and their own warranty provisions.

Recommissioning

Description

- Recommissioning is an activity where the commissioning activities are repeated in the last month prior to Defects & Liability Period conclusion.

Key Product Features for this project

- This is applicable to the DHW system and the Car Park Ventilation system only.

Key Installation Features for this project

- The recommissioning test results shall be added to the Operations Manual.

Warranty

Warranty Provision

Description

- Manufacturers' Warranty shall be 5 years parts and labour for air conditioning systems.
- Manufacturers' Warranty shall be 1 year parts and labour for ventilation systems.
- Sub Contractor's Warranty shall be 5 years parts and labour for ducting, piping and cabling systems. By extension, this includes the fixings and support systems.

Key Product Features for this project

- Confirmation of warranties is to form part of the tenderer's technical and commercial offers.
- It is suggested to the tenderer that they include carefully the reasonable requirements of other trades to preserve warranty (e.g. voltage variations, lead lag factors etc)
- Warranties shall form part of the handover documentation.

Warranty Defence

Description

- The contractor's design team shall be informed as to what could potentially minimise warranty.
- The submitted drawings shall demonstrate that the warranties provided by manufacturer's are defended.

Key Product Features for this project

- The Consultant will independently contact the Manufacturers during design and construction to verify that warranty is not threatened.

Key Installation Features for this project

- Air Conditioning Manufacturers are to provide a site inspection near Practical Completion and identify any instances where warranty may be threatened.
- Warranty defence includes the works of nominating on drawings the access requirements for plant maintenance and eventual plant removal.
- It is required that where warranty is threatened, the subcontractor shall repair or rectify the installation to ensure warranty is maintained.

Tender Return

Tender Offer

Description

- Tenders shall have separated components – a technical offer and a commercial offer.

Key Product Features

- The Technical offer shall describe departures from basis of design.

Accessories

- Allow to discuss the technical offer with the client's representative. This may be necessary to seek clarity.
- A significant extent of legal conflict can be traced back to miscommunication at this stage, and it is imperative that the tenderer is prepared to outline or justify alterations contained within the technical offer.

Tender Details

Description

- The tenderer shall nominate the legal entity with whom a contract is being formed. Further particulars to be included are insurance provisions, resource capability (i.e. the level of experience of proposed staff), past references and the intended resources for this project. (We acknowledge resources may be modified during the project).
- The tenderer shall also furnish a considered program for design submissions, any offsite testing and identification of long lead items. This allows design reviewers to appreciate particular review constraints.

Key Product Features for this project

- Design Program
- Nomination of any deviations from basis of design selections.

Hourly Rates & Margins

Description

- The tenderer is to provide a set of hourly rates and procurement margins. This is solely for the assessment of variations.

Key Product Features for this project

- Outline rates for multiple levels of resource considered for this project, including engineering, drafting, installation labour, commissioning & project management.