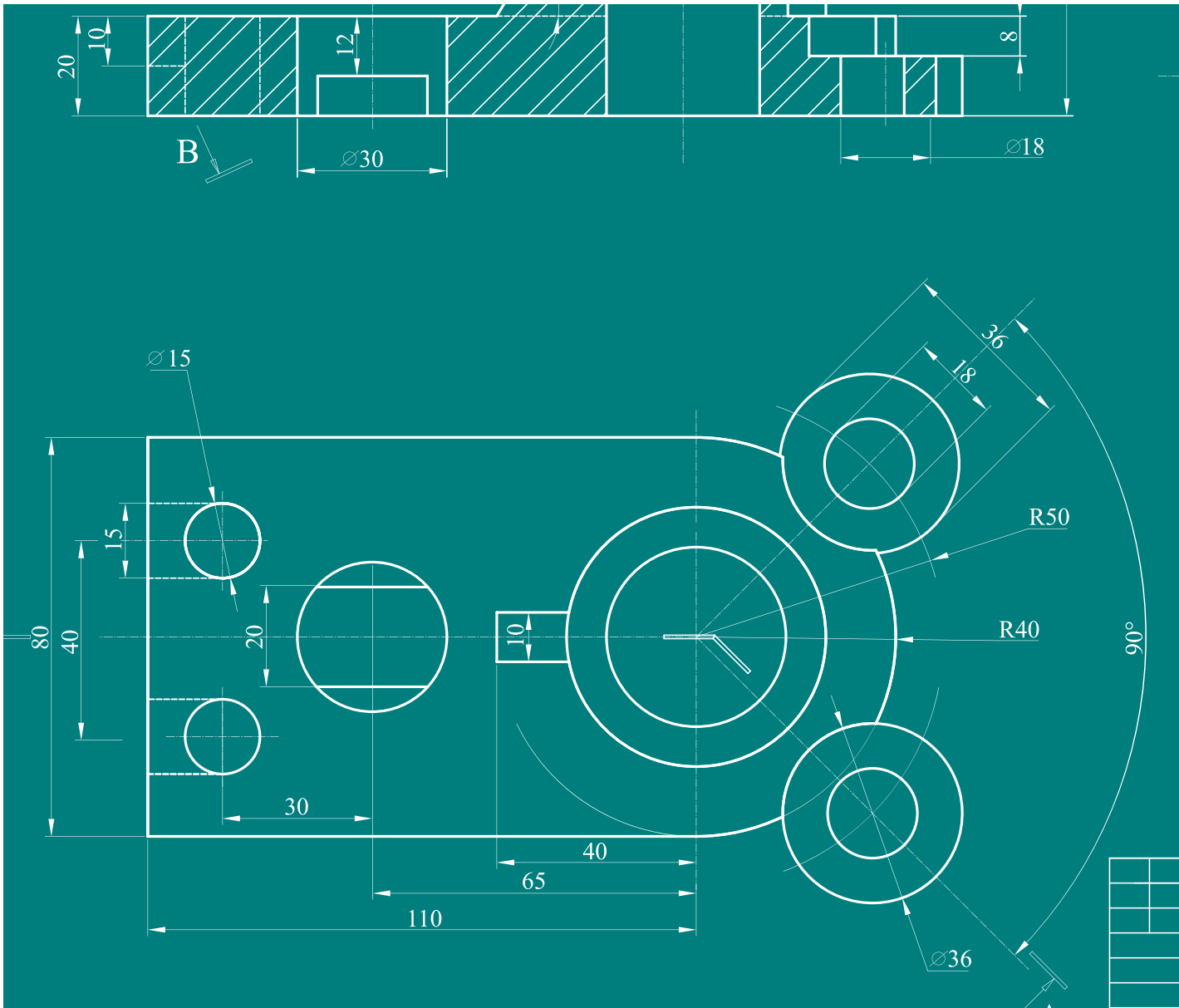
5.0 Mechanical



Mechanical Design Guidelines

The design guidelines have been developed to provide a greater level of certainty for all stakeholders when CIAL embark on developing a new commercial asset – the focus is to deliver on the three core pillars of our mission: enhancing people's lives, fuelling economic prosperity and being great Kaitiaki of our planet.

This document outlines CIAL's Mechanical design requirements for commercial projects with the aim of providing safe, compliant, sustainable, simple and cost effective outcomes for the mechanical elements of a building asset.

PURPOSE

CHAMPIONING TE WAIPOUNAMU THE SOUTH ISLAND AND AOTEAROA NEW ZEALAND FOR TODAY AND TOMORROW

MISSION

CHRISTCHURCH AIRPORT IS RECOGNISED FOR

ENHANCING PEOPLE'S LIVES
Our team, customers, partners, communities

+

FUELLING ECONOMIC PROSPERITY
of the South Island and New Zealand

+

GREAT KAITIAKI OF OUR PLANET
Safety, security and sustainability

CHRISTCHURCH AIRPORT

CONTENTS

5.1 INTRODUCTION

Mechanical services to be provided to CIAL developments shall be designed and installed to balance energy efficiency with capital and operating costs. All mechanical systems shall be specifically designed and installed to spaces requiring mechanical treatment for ventilation, heating and cooling services.

The guidelines are intended to ensure that the mechanical services reticulation, equipment and installation are consistently maintained at a high standard, with a constant level of quality and service throughout the lifetime of each development.

Selected mechanical systems must be rationalised against the alternative options described in these guidelines to ensure that all options have been considered and the final solution is the most fit for purpose. All projects are to complete the attached compliance checklist for each major design phase.

The guidelines are not intended to restrict designers from making recommendations in the interest of the project but rather to encourage the incorporation of features and systems that will provide flexibility for change of use, new technologies or expansion in the future.

5.2 ENVIRONMENTALLY SUSTAINABLE DESIGN PRACTICES

Environmentally sustainable design (ESD) practices and features should be considered for the mechanical systems installed in CIAL developments in accordance with the section 1.1.7 of the General Design Guidelines.

Some specific ESD practices to be considered for mechanical systems are listed below:

- Ventilation heat recovery.
- EC fan motors.
- Demand controlled ventilation (CO_2 control).
- Efficient heating and cooling equipment.
- Variable-flow pumps.
- Where possible, consider sustainable and lower environmental impact materials (i.e. reduce PVC).

5.3 CODES AND STANDARDS

Below are the key codes and standards governing the design, specification and installation of mechanical services systems.

Note that, while the design will generally comply with the codes and standards below, some aspects of these codes and standards are not applicable to New Zealand. There are also variations between some of the codes where they overlap. The design and installation shall comply in all respects with the latest/currently ratified versions of the following:

- Building Act
- Christchurch District Plan
- Civil Aviation Authority regulations and advisories
- Health and Safety at Work (Hazardous Substances) Regulations
- The NZBC including section H.1.3.6 relating to energy efficiency of systems
- NZS 4303*Ventilation for acceptable indoor quality*
- AS 1668.2 *The use of ventilation and airconditioning in buildings – Mechanical ventilation in buildings*
- Duct Code (SMACNA, [YEAR], 5th edition)
- AS 1851 *Routine service of fire protection systems and equipment*
- CIBSE Commissioning Codes
- AS/NZS 3000 *Electrical installations – Known as the Australian/New Zealand wiring rules*
- NZS 4302 *Code of practice for the control of hygiene in air and water systems in buildings*
- NZS 4219 *Seismic performance of engineering systems in buildings*
- Electrical (Safety) Regulations
- Relevant New Zealand standard specifications and codes of practice whether specifically mentioned herein or not
- All other standards and documents produced by each and any authority having jurisdiction over the works

5.4 HEALTH AND SAFETY BY DESIGN

Health and safety by design shall be considered as part of the mechanical design. Refer to the Health and Safety Design Guidelines for specific details with regard to expected documentation and templates.

All items of installed plant shall be designed to ensure safe and easy access for installation and future maintenance and replacement. Consideration shall be given to the size, weight and type of the plant and any ancillary equipment required for installation and maintenance.

Maintenance access shall form a part of the health and safety by design review for the development, and **mitigation measures shall be put in place to minimise the risks as a result of that review.**

Designers shall avoid locating plant and services in inaccessible or difficult to access locations. Specifically, the below must be considered:

- Large outdoor plant shall be located on the ground but away from shopfront/public view where possible.
- Where outdoor plant is roof mounted, the design team shall coordinate safe access for regular maintenance, to be detailed by the architect.
- Where plant is on the roof this shall be treated as a 'non-conforming' design solution.
- In-ceiling services to be ideally accessed in the ceiling space above using plant deck or walkway. Access to the ceiling space should be via a large access panel/ladder located in the service space.
- Where ceiling space access is not practical, provide in-ceiling access panels for equipment requiring regular maintenance (filters etc.)

5.5 EARTHQUAKE PROTECTION AND SEISMIC RESTRAINT

Consultation is required with CIAL and the tenant to determine the importance level of the new building, and suitable seismic restraint shall be allowed for in full compliance with all applicable standards.

The mechanical contractor shall subcontract a chartered professional structural engineer or specialist seismic restraint supplier to design the services supports, flexible connections at seismic joints and any other measures required for the entire mechanical system (including all subtrade works to mechanical).

The design must be compliant with NZS 4219, include specific design of aspects that are not covered by standard NZS 4219 solutions and incorporate the requirements of any other standards applicable to the support of the mechanical services systems such as AS/NZS 1170.2 for wind loading for exterior mounted plant.

The seismic designer shall provide design and as-built drawings along with a PS1 and PS4.

5.6 APPROVED CONTRACTORS

Consider and discuss with CIAL prior to tendering of mechanical works in CIAL developments whether there is a preference for any nominated contractors or subcontractors.

5.7 DESIGN CONDITIONS AND REQUIREMENTS

5.7.1 DOCUMENTATION LEVEL

The level of detailing (LOD) appropriate for the mechanical services shall be considered and discussed with CIAL. However, the minimum level of detailing expected for mechanical is LOD 300.

5.7.2 COORDINATION WITH DESIGN TEAM

The mechanical design and associated drawings/model shall be coordinated with the architectural and other design consultants including but not limited to the following:

- Civil
- Hydraulic
- Structural
- Electrical
- Fire (including fire protection services).

5.7.3 FUTURE FLEXIBILITY

Consideration shall be given by the designer to future flexibility of the installation to allow for potential expansion or integration of new technology and appropriate allowances made. In particular, consideration shall be given to the spatial requirements and services connections (ducts, pipes, cabling etc.) required to allow for potential future expansion or alterations.

Additional consultation with the tenant shall be carried out and allowances made for any specific requirements.

5.7.4 OUTDOOR DESIGN CONDITIONS

Systems shall be sized for the 2.5% NIWA Christchurch Aero design conditions (latest). These are conditions that will not be exceeded more than 2.5% of the time during 0800–1800 hours local time. Design temperatures are specified as follows,

- Summer outdoor temperatures – 26.9°C DB 18.6°C WB
- Winter outdoor temperatures – -1.9°C

When outdoor temperatures are outside the above range, the HVAC systems will not necessarily be able to maintain the indoor conditions specified below.

5.7.5 INDOOR DESIGN CONDITIONS

The mechanical systems shall be designed to maintain the following temperatures at the outdoor design conditions specified above:

- Open offices, meeting rooms and staff areas – 22 $\pm$2°C DB
- Comms rooms – 24 $\pm$2°C DB (cooling only)

5.7.6 DESIGN CRITERIA

Ventilation rates shall be at least to minimum NZBC requirements for fresh air and extract systems. These are listed below. Mechanical ventilation shall be provided to all office areas and toilets.

- Fresh air supply – 10L/s/person
- Toilet extract – 10L/s/m^2

The following internal loads shall be allowed for in the design of the mechanical systems:

- Occupancy (office) – 12m^2/person (where actual expected occupancies are not known)
- Occupancy (meeting rooms) – 2m^2/person (where actual expected occupancies are not known)
- Office equipment – 15W/m^2
- Lighting – proposed installed load from electrical engineer
- Building leakage – 0.25ACH (this assumes a well-constructed and sealed building)

5.7.7
Thermal comfort

Predicted mean vote (PMV) is an index that predicts the mean value of the votes of a large group of persons occupying a space and relates to a predicted percentage of occupants dissatisfied (PPD).

The mechanical services to be installed within CIAL developments shall be capable of controlling the internal conditions of the spaces within a tolerance of $\pm$1.0 on the PMV scale, which relates to no more than 25% PPD, while $\pm$0.5 is no more than 10% PPD and $\pm$0.25 is no more than 5% PPD.

Thermal comfort modelling may be requested by CIAL in order to prove the anticipated PMV of the proposed building and system. This shall be assessed on a case-by-case basis.

5.7.8
ZONING

Areas with different load characteristics (e.g. glazed façade areas, meeting rooms, office space and internal zones without glazing) shall be served by different systems to enable winter perimeter heating and simultaneous internal cooling.

5.7.9
PROTECTION OF SERVICES

Reticulation consideration in terms of the installed asset must be considered where services are:

- exposed to the environment – appropriate products or protection must be provided
- exposed to public/traffic – where this is unavoidable, appropriate security or protection shall be provided (e.g. barrier, enclosure)
- reticulated through seismic gaps – where this is unavoidable, specific design to be provided (e.g. flexible braided hose for pipework).

5.8
SYSTEMS AND COMPONENTS

The design of the mechanical services systems shall adhere to the below performance criteria for the specific system selected. Only equipment listed in the approved equipment and materials lists (see section 5.14) shall be specified installed, unless explicitly discussed and agreed with CIAL during the design phase.

Mechanical heating and cooling options are listed in the following table with the associated building quality level.

The building quality level shall be confirmed by CIAL before design commences.

Table 5.1: Heating and cooling options

Building quality level	System type
Stanard	Single split heat pumps and/or radiant heaters
Medium	VRF heat pumps and/or packaged AC units
High	Heating and chilled water

5.8.1
RADIANT HEATERS

Electric or gas radiant heaters to be specified for warehouse/factory heating only.

5.8.2
SPLIT-TYPE AC UNITS

5.8.2.1
Single split heat pumps

- Must be the latest systems to ensure manufacturer support for the entire life cycle of the asset.
- Manufacturer's maximum pipe lengths between components shall be adhered to. This includes:
  - total length from outdoor unit to indoor unit
  - maximum height difference between outdoor unit and indoor unit.

5.8.2.2
Variable refrigerant flow (VRF) heat pumps

- Must be the latest systems to ensure manufacturer support for the entire life cycle of the asset.
- Manufacturer's maximum pipe lengths between components shall be adhered to. This includes:
  - outdoor unit to branch control (BC) box
  - BC box to furthest indoor unit
  - outdoor unit to furthest indoor unit
  - maximum height difference between outdoor unit and BC box/indoor unit.
- The equipment supplier shall review the plant and piping layout to ensure the layout meets the specific requirements of their system including distances from indoor to BC boxes and outdoor units
- Hard-drawn copper pipe shall be used between outdoor unit and BC box.
- Pair coil refrigerant pipe shall only be permitted to run from BC box to indoor units.
- Pipework running external to the building shall be run in a cable tray with coloured steel capping. Where pipework crosses trafficable routes, provide a hot-dip galvanised checker plate cover.
- Confirm the potential refrigerant concentrations in case of leakage are compliant with the latest version of AS/NZS ISO 817 *Refrigerants – Design and safety classification* and any applicable JRA-GL standards.
- Systems must provide simultaneous heating while in defrost mode.

5.8.2.3
Indoor AC units

The indoor units for VRF and single split heat pump systems shall conform to the following:

- Concealed ducted units shall be used in reception, meeting rooms and general office spaces where ceiling space is adequate.
- Ceiling cassette units shall be used in office areas where concealed ducted type units cannot be made to fit in the ceiling cavity.
- High-wall units shall only be used in back-of-house areas and comms rooms, except where agreed with CIAL. High-wall units shall be located at heights where filters can be easily accessed without requirement of a ladder.
- Comms/computer rooms are to have full duty standby single split AC units installed. These units shall be standalone from any other systems installed.
- Flexible connections shall be used between ducted AC units and adjacent ducts to reduce vibration.

5.8.2.4
Outdoor AC units

Outdoor AC units for single split and VRF heat pump systems shall conform to the following:

- Outdoor units typically to be mounted on the ground or on support frames along walls where possible.
- All ground-mounted plant to be protected from public or motor vehicles.

5.8.3
PACKAGED AC UNITS

- Packaged AC units shall be roof mounted but located away from shopfront/public view where possible.
- Architect shall detail safe access for regular maintenance.
- Packaged AC units shall be designed to incorporate full economiser mode to reduce conditioning energy.

5.8.4
HEATING AND CHILLED WATER

5.8.4.1
Hydronic chillers and heat pumps

Hydronic chillers and heat pumps shall be specified where a high-quality HVAC system is selected to provide heating and chilled water to distributed conditioning units. The chillers and heat pumps shall comply with the following requirements:

- Multi-stage to allow for part-load operation.
- Units to be mounted on the ground where possible.
- Chiller and heat pump mounts are to be specifically designed by structural engineer.
- All chiller and heat pump controllers are to be located in MCC boards (where available) or in distribution boards.

5.8.4.2
Pumps and auxiliary items

The following requirements shall be complied with for all pumps and auxiliary items for the high-quality heating and chilled water HVAC system:

- All mechanical pumps are to be specified with an integral variable speed drive (VSD).
- All pump controllers are to be located in MCC boards (where available) or in distribution boards.

5.8.4.3
Fan coil units (FCUs)

- In-ceiling FCUs shall be specified where a high-quality HVAC system is selected and individual room control is required.
- Flexible connections shall be used between fans and adjacent ducts.

5.8.4.4
Air-handling units (AHUs)

AHUs shall be specified where a high-quality HVAC system is selected for either fresh air supply or where specialist space conditioning (e.g. humidity control or large space volumes) is required. AHUs shall comply with the following:

- Typical AHU configuration shall be as follows: fresh air inlet/return air inlet plenum, pre-filter, cooling coil, gap for access to cooling and heating coil, heating coil, humidifier section, drip eliminator (if required for humidifier), final filter, fan section.
- AHU panels to be polyurethane clad in metal. Cladding shall be either coloured steel or marine grade aluminium.
- Where the AHU is installed outside, provide an additional sloping coloured steel roof, TWS type or equivalent weather louvres with insect mesh and ensure all penetrations and gauges are fully grommeted (including UV resistance).
- Flexible connections shall be used between fans and adjacent ducts.

5.8.5 VENTILATION

5.8.5.1
Fresh air inlets and exhaust outlets

All fresh air inlets and ideally exhaust points are to be located away from social/BBQ/smoking areas.

5.8.5.2
Transfer air

Transfer/make-up air is to be provided to areas where air is extracted via 10mm door undercuts or ducted ceiling transfer systems.

5.8.5.3
Fans and cowls

- Fan control to be 0–10V or variable amplitude (VA).
- All fan controllers are to be located in MCC boards (where available) or in distribution boards.
- Roof cowls and louvres are to be painted to a colour as specified by the architect.
- Roof cowls are to be located set back from the shopfront as far as practicable.
- Where possible, inline fans located in the ceiling shall be selected over cowl fans to reduce requirement for roof access.
- Flexible connections shall be used between fans and adjacent ducts.

5.8.5.4
Filters

- Filters shall be sized to achieve a maximum of 1.5m/s face velocity.
- Filters shall be accessed by hinged panels and shall be easily removable for cleaning/replacing.

5.8.5.5
Duct heaters

Duct heaters shall be interlocked with the respective fan and shall not run if the fan is off.

5.8.5.6
Attenuators

Attenuators shall be included where necessary to meet acoustic requirements.

5.8.5.7
Commercial kitchen hoods

Commercial kitchen hood designs should consider UV treatment of discharge to reduce haze production in the discharges, given the airport environment.

5.8.6
IN-CEILING SERVICES

5.8.6.1
Grilles, diffusers and louvres

- Grilles shall be of the style listed in the following table for corresponding spaces. All grilles to be powder-coated metal apart from where noted for toilet extract only.

Table 5.2: Diffuser options

Space type	Grille/diffuser style
Office	Supply or fresh air – swirl, multi-pattern or sidewall Return, extract or transfer – perforated, egg crate or sidewall
Meeting/board rooms and reception areas	Supply or fresh air – slot, swirl, multi-pattern or sidewall Return, extract or transfer – perforated, egg crate or sidewall
Toilets	Extract – perforated, egg crate or ceiling round (plastic)
Warehouse	Supply or fresh air – high-flow swirl or double-deflection Return, extract or transfer – perforated or egg crate

- Grilles shall be sized to the following criteria:
  - Maximum NC – 20
  - ADPI – 90%
- External weather louvres shall be sized at a maximum velocity of 2.5m/s (exhaust) and 2.0m/s (intake).

5.8.6.2
Ductwork

- All ductwork shall be constructed in accordance with HVAC Duct Construction Standards: Metal and Flexible (SMACNA, latest edition).
- All rigid ductwork shall be constructed of galvanised metal or PIR sandwich panel.
- External ductwork joints shall be flanged construction sealed against moisture and capped.
- Ductwork construction and dimensions shall be based on site measurement and shop drawings.
- Rigid rectangular ductwork serving supply, return or fresh air systems shall be either externally or insulated with 25–50mm insulation.
- Where exhaust duct runs externally to the thermal envelope, this shall be externally lined to the same extent as the other system described above.
- All flexible ductwork within the thermal envelope shall be insulated to a minimum R0.6m^{2}W/K.
- All flexible ductwork running outside the thermal envelope shall be insulated to a minimum R1.0m^{2}W/K.
- The maximum allowable length of flexible duct is 3m. Flexible duct shall be installed with no deformation.
- Balancing dampers in the form of opposable blade dampers (OBD, rectangular) or butterfly dampers (BD, circular) shall be installed to final grille take-offs on all systems, excluding transfer systems. OBDs integrated into the back of grilles are not acceptable.
- Ducts shall be sized based on the below design requirements:
  - Rigid main duct – max. 5m/s
  - Rigid branches – max. 4m/s
  - Flexible – max. 3m/s
  - Commercial kitchen extract – min. 5m/s, max. 8m/s
- Fabric duct shall only be acceptable in the warehouse/factory spaces. Fabric duct to be installed using manufacturer's dual track support system.

5.8.6.3 Pipework

Pipework shall be supported as per the following table.

Table 5.3: Pipework supports

PIPE TYPE (NUMBER OF PARALLEL PIPES)	SUPPORT SYSTEM
Chilled/heating water (all)	Threaded rod, Unistrut (or equivalent) hanger and pipe clamps
Hard-drawn copper (all)	Threaded rod, Unistrut (or equivalent) hanger and pipe clamps
Pair coil (1–2, including final run-outs)	Threaded rod with BBJ pipe clips (or equivalent) or simple fix is acceptable where mounted directly to building structure
Pair coil (3+)	Cable tray or cable basket
Plastic condensate pipework	Threaded rod with BBJ pipe clips (or equivalent)

Pipework shall be sized with a maximum pressure drop of 280Pa/m. Pipework insulation shall be as per the following table.

Table 5.4: Pipework insulation

Pipe type (system)	Insulation type (thickness)
PPR (chilled and heating water)	25mm closed cell
Mild steel (chilled and heating water)	25mm closed cell
Hard-drawn copper (VRF)	25mm closed cell
Pair coil	Insulated unit
External pipework	25mm closed cell
Plant rooms below 2m AFFL	Aluminium clad, 25mm closed cell

- For all PPR pipework, the pipe supplier shall undertake an inspection of the installation.
- Air cocks shall be installed at high points in water pipework to remove air locks. Automatic air vents (AAVs) shall be used where practical, and discharge from AAVs shall be piped to local tundish.

5.8.6.4 Fire treatment

- Mechanical fire dampers shall be installed where possible, and intumescent fire grilles should only be considered where access cannot be achieved for the mechanical style damper.
- Ensure fire dampers are installed with breakaway joints as per manufacturer's details.
- Fire collars shall be installed around all PPR pipework penetrating fire walls.
- Where mild steel pipes penetrate fire walls, penetration to be filled with fire mastic.

5.9 NOISE AND VIBRATION

5.9.1 AIRBORNE NOISE

Noise levels due to plant supplied shall not exceed the following when measured anywhere in the space at 2m above floor level:

- Occupied areas – NC40
- Office areas – NC35
- Plant areas – NC50
- Outdoor areas – ambient levels required by the Christchurch District Plan.

5.9.2 VIBRATION ISOLATION

Mechanical plant and equipment shall be vibration isolated from the building structure to prevent structure-borne noise.

5.10 ELECTRICAL FOR MECHANICAL

- All MCC items on exterior of board shall be labelled using engraved Traffolyte labels.
- Main plant to have auto/off/manual switches and run/fault lights located on the MCC.
- All main cable runs shall be run on a cable tray. For smaller cable runs or final run-outs, it is acceptable to use catenary.
- The overall power factor for the mechanical services supply shall be between 0.95 and 1.0.
- Power factor correction is required for all motors 4kW and larger.

5.11 CONTROLS

Mechanical services controls systems are to be developed on a case-by-case basis for specific project requirements. Controls strategy for each project to be reviewed by CIAL.

Building controls system shall contain the following as a minimum:

- Central controller (VRF) or building management system (BMS).
- Time schedules.
- User interface, including building graphics and all mechanical plant/equipment.
- BACnet capable.
- Energy monitoring and reporting.

5.12 COMMISSIONING AND TUNING

- Mechanical systems shall be commissioned by an independent third-party commissioning company to ensure compliance with design/code requirements.
- Mechanical systems shall be commissioned in accordance with CIBSE Commissioning Code A.
- Commissioning results must be within 5% of design parameters to be acceptable.
- Mechanical contractor to provide 12-month guarantee and maintenance period from date of practical completion.

5.13 DOCUMENTATION (CLOSE-OUT INFORMATION)

- As-built drawings of mechanical services in .dwg and .pdf format.
- As-built drawings of mechanical services seismic restraint.
- Mechanical contractor's PS3.
- Seismic restraint designer's PS1 and PS4.
- Electrical for mechanical certificate of compliance.
- Full air, refrigerant (if applicable) and water (if applicable) commissioning report/results.
- Mechanical consultant's PS1 and PS4.
- Operation and maintenance manual (hard cover, A4 ringbound, typed and sectionalised, plus pdf) containing as a minimum:
  - contents page
  - introduction, including a list of contact details of consultants and contractors used (with identification of the applicable responsibility areas) and a description of the building and its use
  - detailed description of installed systems and controls and the operation of the systems
  - schedules of all plant and equipment installed
  - manufacturers' data for all plant and equipment installed
  - maintenance requirements and schedules for all plant and equipment in accordance with AS/NZS 3666.2 *Air-handling and water systems of buildings – Microbial control - Part 2: Operation and maintenance*
  - commissioning data for all plant and equipment.
- CIAL asset register to be updated.
- CIAL maintenance register to be updated.

5.14
APPROVED EQUIPMENT AND MATERIALS LIST

Refer below sections for approved equipment under specific consultant headings. Where a particular equipment type is not listed, please consult CIAL for approval.

Table 5.6: Approved equipment and materials list

EQUIPMENT	MANUFACTURER/ SUPPLIER	MODEL	COMMENTS
Radiant heater – electric	Devi EEP		
Radiant heater – gas	Schwank		
Single split heat pump	Daikin Mitsubishi Electric	Sky Air Mr Slim	Commercial range to be used for better longevity Refrigerant gas shall be industry best practice and the lowest global warming/ozone depletion potential possible
VRV/VRF heat pump	Daikin Mitsubishi Electric	VRV IV Heat Recovery City Multi Heat Recovery	Heat recovery versions only Refrigerant gas shall be industry best practice and the lowest global warming/ozone depletion potential possible Supply and return plenums of ducted AC units internally lined with 50mm Novahush Panel Absorber or Autex QuietStuf Rigid Duct Liner
Packaged AC unit	Temperzone	OPA	Inverter compressors EC fan motors
Air-handling unit	Temperzone Cookes	Clever Airpak	EC fan motors Refer filters for grade and style
Fan coil unit	Temperzone	IMDL-Y, IMD-Y, IXDL-Y, SP	EC fan motors Refer filters for grade and style Supply and return plenums internally lined with 50mm Novahush Panel Absorber or Autex QuietStuf Rigid Duct Liner
Chiller/hot water heat pump	Carrier York Trane		Refrigerant gas shall be industry best practice and the lowest global warming/ozone depletion potential possible Integral power factor correction (where available) EC fans (where available)

EQUIPMENT	MANUFACTURER/ SUPPLIER	MODEL	COMMENTS
Unit mounting	Monkeytoe		Mounting design by Monkeytoe
Buffer vessel	Temperzone Cookes		
Expansion vessel	Temperzone (Pneumatex) Cookes	Statico	Bladder type expansion tank only
Pump	Grundfos Wilo		Integral VSDs where possible
Fan	Fantech Pacific HVAC		EC fan motors Insect mesh installed to roof cowl fans Wrap fans with Soundlag 4512 (8kg/m^2 barrier and minimum 12mm absorber backing) or equivalent
Roof cowl	Fantech		Insect mesh installed
Heat recovery	Simx – Venco Airchange	VHR	To contain the following options: EC fan motors, G4 filters, summer bypass option, CO2 control, economiser
Filter	Camfil Farr Ipsco		AHU pre-filter – EU4 grade, pleated panel AHU final filter – F7 grade, bag or cassette FCU filter – EU3 grade, roll media with plastic frame
Duct heater	Avon Electric Smooth-air	Modulating solid state relay	Comply with AS 1668.1 *The use of ventilation and airconditioning in buildings – Fire and smoke control in buildings* and AS 3102 (R2016) *Electric duct heaters* Contain manual reset over temperature thermostat, sail switch to isolate elements when low airflow, fusible links on each element and fan run-on
Variable-speed drive	Danfoss Schneider Electric	FC-102 Altivar 212	Drives located within MCC boards Drives to be HVAC specific type
Fire damper – mechanical	Halton Holyoake	FDR (rectangular), BSD (round) IBD-B (rectangular)	
Fire damper – intumescent	Firepro	FG40	

EQUIPMENT	MANUFACTURER/ SUPPLIER	MODEL	COMMENTS
Grille/diffuser	Holyoake (or Temperzone)	Swirl: CFP Multi pattern: CMP Slot: CSD Sidewall: LD, DDL, SDL Warehouse supply: DDL Return/transfer: EC-125, RLP, RLL Extract: EC-125, RLP or ECO Weather louvre: OHL-FD	Where swirl diffusers are used, use supplier's proprietary grille boot Temperzone equivalent is acceptable ECO plastic grilles are suitable for toilet extract applications only Insect mesh installed behind louvres
	Smartair	Swirl: Harmony SD or HSC-FD Slot: LMC-AD Sidewall: PMW-AD Warehouse supply: HSC-AD (thermal actuated)	Where swirl diffusers are used, use supplier's proprietary grille boot.
	Colt	Weather Louvre: 2UL	Insect mesh installed behind louvres
Attenuator	Fantech Cooke Industries NCS		To suit acoustic engineers requirements
Lightweight ductwork	Kingspan Smooth-Air	KoolDuct TD-PIR	
Duct insulation – external wrap	Forman Autex	Ductwrap GreenStuf ADW Duct Wrap	
Duct insulation – internal lining	Novahush Autex	Panel Absorber QuietStuf Rigid Duct Liner	
PPR pipework	Aquatherm	Heating/chilled: Blue SDR Non-potable: Lilac	
Pipework insulation	Armaflex	FR	
VRF central controller	Daikin Mitsubishi Electric	Intelligent Touch Manager AE200	
Single split/VRF wall controller	Daikin Mitsubishi Electric		
Automatic air vent	SpiroTech	SpiroTop	

5.15 MECHANICAL SERVICES COMPLIANCE CHECKLIST

PROJECT NAME: **DATE:**

SUBMITTED BY: **STAGE:**

SECTION 05. MECHANICAL SERVICES

1.0	GENERAL DESIGN GUIDELINE	Compliant	Non-Compliant	Not Applicable	Comments
	All Clauses	☐	☐	☐	
5.0	**MECHANICAL SERVICES GUIDELINES**				
5.1	Introduction	☐	☐	☐	
5.2	Environmentally sustainable design practices	☐	☐	☐	
5.3	Codes and standards	☐	☐	☐	
5.4	Health and safety by design	☐	☐	☐	
5.5	Earthquake protection and seismic restraint	☐	☐	☐	
5.6	Approved contractors	☐	☐	☐	
5.7	Design conditions and requirements	☐	☐	☐	
5.7.1	Documentation level	☐	☐	☐	
5.7.2	Coordination with design team	☐	☐	☐	
5.7.3	Future flexibility	☐	☐	☐	
5.7.4	Outdoor design conditions	☐	☐	☐	
5.7.5	Indoor design conditions	☐	☐	☐	
5.7.6	Design criteria	☐	☐	☐	
5.7.7	Thermal comfort	☐	☐	☐	
5.7.8	Zoning	☐	☐	☐	
5.7.9	Protection of services	☐	☐	☐	
5.8	Systems and components	☐	☐	☐	
5.8.1	Radiant heaters	☐	☐	☐	
5.8.2	Split-type AC units	☐	☐	☐	
5.8.2.1	Single split heat pumps	☐	☐	☐	

		Compliant	Non-Compliant	Not Applicable	Comments
5.8.2.2	Variable refrigerant flow (VRF) heat pumps	☐	☐	☐	
5.8.2.3	Indoor AC units	☐	☐	☐	
5.8.2.4	Outdoor AC units	☐	☐	☐	
5.8.3	Packaged AC units	☐	☐	☐	
5.8.4	Heating and chilled water	☐	☐	☐	
5.8.4.1	Hydronic chillers and heat pumps	☐	☐	☐	
5.8.4.2	Pumps and auxiliary items	☐	☐	☐	
5.8.4.3	Fan coil units (FCUs)	☐	☐	☐	
5.8.4.4	Air-handling units (AHUs)	☐	☐	☐	
5.8.5	Ventilation	☐	☐	☐	
5.8.5.1	Fresh air inlets and exhaust outlets	☐	☐	☐	
5.8.5.2	Transfer Air	☐	☐	☐	
5.8.5.3	Fans and cowls	☐	☐	☐	
5.8.5.4	Filters	☐	☐	☐	
5.8.5.5	Duct heaters	☐	☐	☐	
5.8.5.6	Attenuators	☐	☐	☐	
5.8.5.7	Commercial kitchen hoods	☐	☐	☐	
5.8.6	In-ceiling services	☐	☐	☐	
5.8.6.1	Grilles, diffusers and louvres	☐	☐	☐	
5.8.6.2	Ductwork	☐	☐	☐	
5.8.6.3	Pipework	☐	☐	☐	
5.8.6.4	Fire treatment	☐	☐	☐	
5.9	Noise and vibration	☐	☐	☐	
5.9.1	Airborne noise	☐	☐	☐	
5.9.2	Vibration isolation	☐	☐	☐	
5.10	Electrical for mechanical	☐	☐	☐	
5.11	Controls	☐	☐	☐	
5.12	Commissioning and tuning	☐	☐	☐	
5.13	Documentation (close-out information)	☐	☐	☐	
5.14	Approved equipment and materials list	☐	☐	☐	