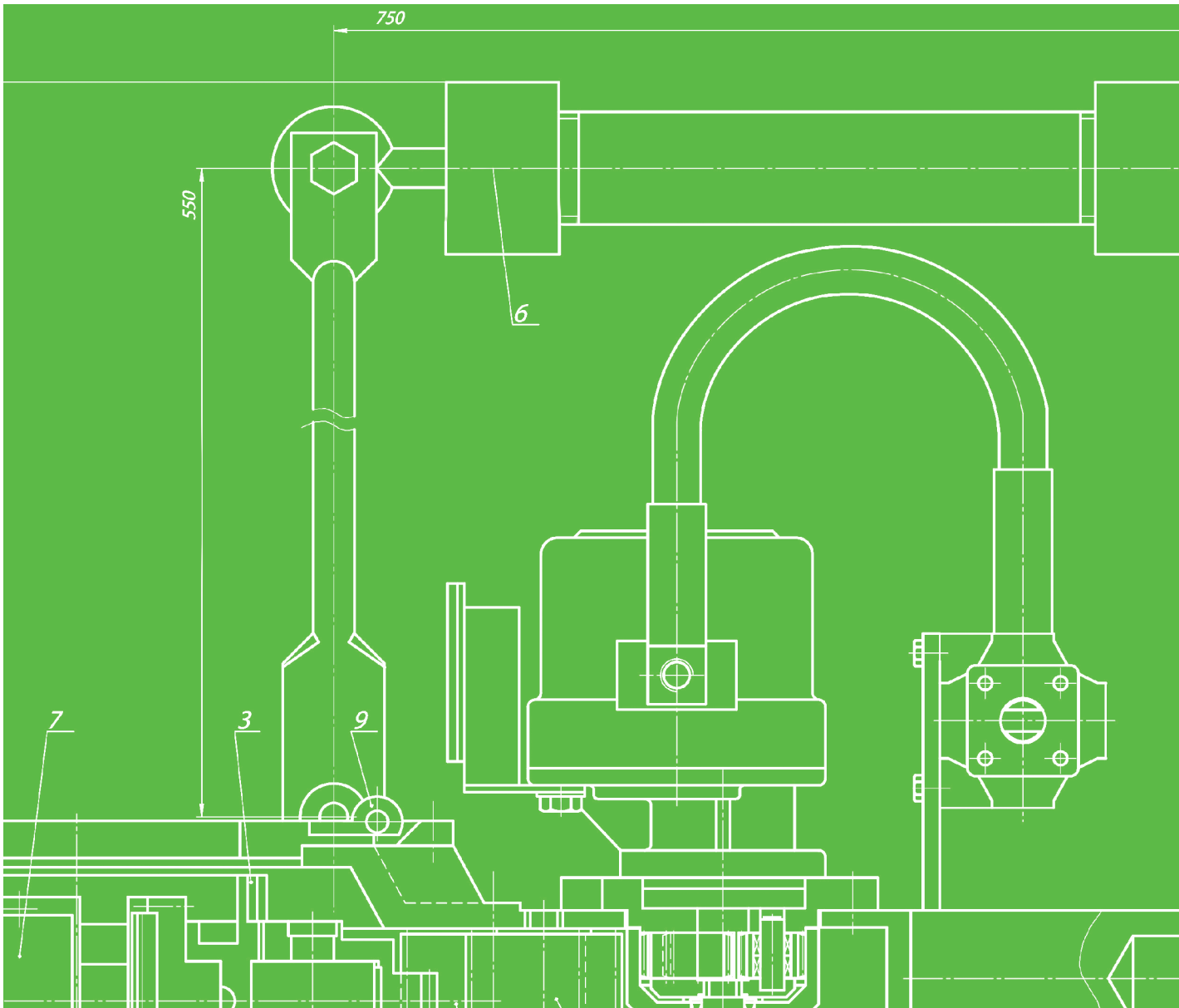
7.0 Hydraulics



Hydraulics 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 our three core business pillars of Stronger Business, Kaitiaki and Enhancing Customer Journeys.

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

Championing the South Island

OUR MISSION

To be a champion airport, acknowledged at home and abroad as the engine room of the South Island's social and economic prosperity

Being a Champion Airport is built on three pillars:

BUILDING A STRONGER BUSINESS

Together we work to make this organisation even more successful and enduring, with strong commercial returns. We do it because that benefits everyone in our place—especially the people and businesses that call it home.

ENHANCING CUSTOMER JOURNEYS

Customers are at the centre of everything we do, so we do everything we can to make their experience all it can be. We challenge ourselves to think about all that's possible, embracing innovative thinking and wise investment. We keep our airport terminal and wider campus one that welcomes, inspires and engages.

BEING GREAT KAITIAKI

We've been given a special responsibility for our place in the world, and we take that seriously. We embrace the Māori concept of Kaitiakitanga (responsibility, care and guardianship). We are especially focused on safety, security and the sustainable use of our natural resources.

CHRISTCHURCH AIRPORT

CONTENTS

7.1 INTRODUCTION

Hydraulic services to be provided to CIAL developments shall be designed and installed to balance energy efficiency with capital and operating costs. All hydraulic systems shall be specifically designed and installed to spaces requiring water supply and drainage.

The guidelines are intended to ensure that hydraulic 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 systems must be rationalised against the alternative options described in these guideline 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.

7.2 ENVIRONMENTALLY SUSTAINABLE DESIGN PRACTICES

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

Some ESD practices to be considered for hydraulic services systems are listed below:

- Higher WELS rated tapware and sanitary fittings.
- Pre-heated hot water generation (e.g. pre-heat from mechanical services systems).
- Efficient hot water heating (e.g. hot water heat pumps).
- Variable-flow pumps.
- Solar hot water heating.
- Rainwater harvesting.
- Where possible, consider sustainable and lower environmental impact materials (i.e. reduce PVC).

7.3 CODES AND STANDARDS

Below are the key codes and standards governing the design, specification and installation of hydraulic 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 and standards where they overlap.

Where inconsistencies exist or alternative solutions are considered, approval from CIAL shall be required.

- Health and Safety at Work Act
- Health and Safety at Work (Hazardous Substances) Regulations
- The NZBC including section H1.3.6 relating to energy efficiency of systems
- AS/NZS 3500.1 *Plumbing and drainage – Part 1: Water services*
- AS/NZS 3500.2 *Plumbing and drainage – Part 2: Sanitary plumbing and drainage*
- AS/NZS 3500.4 *Plumbing and drainage – Part 4: Heated water services*
- CIBSE Commissioning Code W
- NZS 4219 *Seismic performance of engineering systems in buildings*
- AS/NZS 5601.1 *Gas installations – Part 1: General installations*
- CIAL Potable Water Connection and Back Flow Prevention Standard
- 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

7.4 HEALTH AND SAFETY BY DESIGN

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

It is critical that safe and easy access for regular maintenance is considered when laying out plant and equipment. Maintenance access shall form a part of the health and safety by design review for the development and **mitigation measures 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:

- All plant shall ideally be located on the ground but away from shopfront/public view where possible. Discuss with CIAL where this is not practical/possible.
- Where outdoor plant is roof mounted, the design team shall coordinate safe access for regular maintenance, to be detailed by the architect. Roof plant must be approved by CIAL.
- In-ceiling services to be ideally accessed in the ceiling space above using plant deck or walkway. Access to 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 (tempering valves etc.). Services valves should not be located in critical work/clean/process areas. Discuss with CIAL where this is not practical/possible.

7.5 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 hydraulic 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 hydraulic system (including all subtrade works to hydraulic).

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 hydraulic services systems.

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

7.6 APPROVED CONTRACTORS

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

7.7 DESIGN CONDITIONS AND REQUIREMENTS

7.7.1 DOCUMENTATION LEVEL

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

7.7.2 COORDINATION WITH DESIGN TEAM

The hydraulic services include the internal building domestic hot and cold water reticulation and the internal building sanitary plumbing and drainage. Interfaces between the other disciplines are outlined below:

- Civil services to provide water supplies and convey stormwater and foul sewer from building line. Hydraulic engineer and civil engineer must agree on drainage design code used (i.e. NZBC acceptable solution G13/AS2 or AS/NZS 3500.2).
- Hydraulic engineer and civil engineer to review demarcation of fire sprinkler services requirements.
- Mechanical and/or electrical services to provide electrical wiring, BMS/controls/automation.
- Architect to design rainwater and downpipe to building line for civil services to pick up. Hydraulic engineer to assist architect with documenting internal downpipes to the building perimeter.
- Structural design to allow for coordinated penetrations.

Where these consultants are not engaged on a project, the hydraulic consultant shall identify any areas of concern or issues with compliance in these areas to the CIAL project manager for discussion.

7.7.3 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.

7.7.4 PROTECTION OF SERVICES

Reticulation consideration in terms of the installed asset must be considered in the following situations:

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

7.7.5 WATER RETICULATION

7.7.5.1 Critical parameters

- Maximum water flow velocity – 1m/s.
- Maximum hot water temperature for plastic pipework – 65°C.
- Maximum building water pressure – 500kPa.
- Peak building water pressure (fire event) – 700kPa.
- Jointing in concealed locations should be avoided (i.e. a single length of pipework should be used instead of two short pipes). Welded, sliding sleeve and crimped joints are acceptable. Jointing methods such as screw threads and push fit should be avoided completely.

7.7.5.2
Domestic hot water systems

The typical domestic hot water plant options are:

- direct electric
- electric hot water cylinders
- air-source heat pumps
- solar hot water.

It is possible that combinations of above are used.

Redundancy of plant to be considered where a centralised system is used.

Selection of systems shall be based on site usage requirements with a cost/benefit balance.

Gas hot water systems (continuous or hot water boiler) shall only be considered in special instances and confirmed with CIAL at concept design stage.

7.7.5.3
Backflow protection

In addition to the boundary backflow preventer (refer Civil Design Guidelines 8.0), additional backflows within the building may be required as follows:

- Zonal protection as required (e.g. mechanical services water supplies, fire hydrant pressure sustaining supply, industrial equipment water supplies etc.).
- Testable valve locations (see also section 8.7.14) to be clear on as-built layouts.
- An allowance for water main metering must be discussed with CIAL with all alterations & new connections.

7.7.5.4
Isolation valves

Isolation valves to be provided at a minimum to groups of hygiene fixtures (e.g. toilet block).

Isolation valves should be provided to each appliance/ equipment (e.g. dishwasher, ice machine, process machinery).

7.7.5.5
Internal metering

Metering is required when there are multiple tenancies within the building and when the building has trade waste.

7.7.6
SANITARY PLUMBING AND DRAINAGE

7.7.6.1
Drainage venting

The design code (e.g. AS/NZS 3500.2) that will be implemented shall be confirmed with the civil engineer.

Ensure coordination with the civil engineer to ensure sufficient venting has been provided for the drainage system.

Atmospheric venting shall be used. Where this is not possible, air admittance valves shall be used. Where pressure attenuators are used for the drainage system, the design shall be submitted to CIAL for approval.

Aesthetics must be considered for location of sewer vents through the roof.

7.7.6.2
FLOOD PROTECTION

Floor wastes should be considered in areas with a flood risk. Overflows within the building shall not discharge to the stormwater system.

Plumbing fixtures proposals shall be reviewed to ensure overflows are incorporated (e.g. overflow slots in basins and sinks).

7.7.7
LPG SERVICES

CIAL preference is to have site gas supply via Rockgas street reticulation.

Seismic valves must be installed on the building supply where gas is reticulated from the street or is from a compound of more than 100kg.

Where the above applies, the building gas supply shall be interlocked to shut off to the fire alarm panel.

Buried pipework shall be installed with a tracer wire and tape identifier.

7.7.8
SERVICES IDENTIFICATION

Pipelines shall be identified by colour banding in accordance with NZS 5807 *Code of practice for industrial identification by colour, wording or other coding*.

Identification bands should be located at no greater than 4.5m centres and provide arrows to indicate direction of flow.

Large labels that can be read at floor level are to be used.

Where identification labels on piping, control valves etc. are provided for the benefit of users, the labels shall spell out the full name of the service.

Labels on piping shall be of the plastic adhesive type (Deneefe style stickers or similar).

Larger plant items (e.g. HWCs, pumps, tanks) shall be identified with engraved white/black/white Traffolyte fastened with a minimum of two metal thread screws or steel link etc. as practical.

7.7.9
NOISE CONSIDERATIONS

Acoustic treatment (e.g. lagging, acoustic pipe) should be considered for noise-sensitive areas.

Design documents to be provided to the acoustic engineer in the project for specific commentary.

7.7.10
ELECTRICAL/CONTROLS FOR HYDRAULIC SERVICES

Requirements shall be confirmed with electrical and/or mechanical services.

7.8
COMMISSIONING AND TUNING

Hydraulic services systems shall perform as per design (PS1) and signed off by the installer (PS3) and engineer (PS4) confirming as such.

Hydraulic services systems shall be commissioned by an independent third-party commissioning company when applicable.

Hydraulic systems shall be commissioned in accordance with CIBSE Commissioning Code W or equivalent.

Commissioning results – where a system is tested in parts, dated QA sheets shall be recorded for each test.

Hydraulic contractor to provide a 12-month guarantee and maintenance period from date of practical completion.

All new Hydraulic installations must have provision for a ‘pulse water meter’ to be installed that is specified in the CIAL backflow standard’ refer 8.0 Civil Design Guidelines.

This will be connected to a telemetry device that will be supplied and installed by a nominated CIAL supplier.

7.9 DOCUMENTATION

- As-built drawings of hydraulic services in .dwg and .pdf format.
- As-built drawings of hydraulic services seismic restraint.
- Pipe pressure test certificates.
- Hydraulic services contractor's PS3.
- Gas certificate of compliance.
- Seismic restraint designer's PS1 and PS4.
- Electrical for hydraulic certificate of compliance.
- Commissioning report/results.
- Hydraulic services 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 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
- commissioning data for all plant and equipment.
- CIAL asset register to be updated.
- CIAL maintenance register to be updated.

7.10
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 7.8: Approved equipment and materials list

EQUIPMENT	MANUFACTURER	MODEL	COMMENTS
Backflow preventers	Emerson ValvCheQ	RP03 DC03	High hazard to be used at boundary
Floor wastes	Allproof		
Heat tracing	Raychem		If heat trace used on buried pipework, appropriate insulation to be used for application (e.g. insulation is not compromised due to compression)
Hot water cylinders	Peter Cocks Rheem Superheat Sigma Sheetmetal		Larger custom cylinders/calorifiers shall be submitted to CIAL for review/approval
Pumps	Grundfos Wilo		High-level control to be considered where a building BMS is used
Pipework (buried) – potable water	Refer to comments		This shall match external reticulation from civil services
Pipework – potable water	Aquatherm Green PPR Rehau Rautitan PEX-a	SDR 7.4, SDR 9 PP-RP Platinum, Red	
Pipework – non-potable water	Aquatherm Lilac PP-R Rehau Rautitan PEX-a	Lilac SDR11 Lilac, Green	
Pipework – gas			Buried gas pipework to be installed with tracer wire and identification tape
Pipework – sanitary drainage	Marley iPlex Rehau Gerberit	uPVC, dBlue, HDPE uPVC Raupiano HDPE	Acoustic products to be approved by acoustic engineer
Pipework (specialist) – sanitary drainage	ACO/Blucher	Stainless Steel	Appropriate non-chloride insulation to be used on stainless steel where applicable
Pipework – cladding			
Pipework acoustic lagging	Acoustop Pyrotek	AFL 4-12 Soundlagg 4512	Acoustic products be approved by acoustic engineer

EQUIPMENT	MANUFACTURER	MODEL	COMMENTS
Pipework thermal insulation	Armaflex	FRV	
Tanks – potable water store	RX Plastics Bailey		Standard plastic tanks up to 30,000 litres
Valves – flow regulating	IMI Hydronic	TA-Therm	
Valves – pressure control	Apex Caleffi RMC Bermad		
Valves – tempering	Apex Caleffi RMC		
Valves – isolation	Supplied by MRC Global	Stainless steel ball valve type	
Water meters	ABB Elster Zenner		Boundary water meters are under the scope of civil services
Backflow Preventers	Tyco	RPZ	

7.11
HYDRAULIC SERVICES COMPLIANCE CHECKLIST

PROJECT NAME: **DATE:**

SUBMITTED BY: **STAGE:**

SECTION 7.0 HYDRAULIC SERVICES DESIGN GUIDELINES

		Compliant	Non-Compliant	Not Applicable	Comments
1.0	**GENERAL DESIGN GUIDELINE**				
	All Clauses	☐	☐	☐	
7.0	**HYDRAULIC SERVICES DESIGN GUIDELINES**				
7.1	Introduction	☐	☐	☐	
7.2	Environmentally sustainable design practices	☐	☐	☐	
7.3	Codes and standards	☐	☐	☐	
7.4	Health and safety by design	☐	☐	☐	
7.5	Earthquake protection and seismic restraint	☐	☐	☐	
7.6	Approved contractors	☐	☐	☐	
7.7	Design conditions and requirements	☐	☐	☐	
7.7.1	Documentation level	☐	☐	☐	
7.7.2	Coordination with design team	☐	☐	☐	
7.7.3	Future flexibility	☐	☐	☐	
7.7.4	Protection of services	☐	☐	☐	
7.7.5	Water reticulation	☐	☐	☐	
7.7.5.1	Critical parameters	☐	☐	☐	
7.7.5.2	Domestic hot water systems	☐	☐	☐	
7.7.5.3	Backflow protection	☐	☐	☐	
7.7.5.4	Isolation valves	☐	☐	☐	
7.7.5.5	Metering	☐	☐	☐	

		Compliant	Non-Compliant	Not Applicable	Comments
7.7.6	Sanitary plumbing and drainage	☐	☐	☐	
7.7.6.1	Drainage venting	☐	☐	☐	
7.7.6.2	Flood protection	☐	☐	☐	
7.7.7	LPG services	☐	☐	☐	
7.7.8	Services identification	☐	☐	☐	
7.7.9	Noise considerations	☐	☐	☐	
7.7.10	Electrical/controls for hydraulic services	☐	☐	☐	
7.8	Commissioning and tuning	☐	☐	☐	
7.9	Documentation	☐	☐	☐	
7.10	Approved equipment and materials list	☐	☐	☐	