



University of Otago

Building Technologies – Standards Suite

CHAPTER 1: INTRODUCTION TO BUILDING TECHNOLOGY STANDARDS

# DOCUMENT CONTROL

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# BUILDING TECHNOLOGIES STANDARDS SUITE INDEX

This document is only one chapter of the University of Otago Building Technologies Standards Suite.

The Building Technologies Standards Suite consists of the following chapters (chapter highlighted refers this document):

Chapter 1	Introduction
Chapter 2	Cabling Infrastructure Pathways Standard
Chapter 3	IT Infrastructure – Generic Cabling Systems Standard
Chapter 4	IT Infrastructure – Passive Optical LAN Cabling Standard
Chapter 5	Electronic Safety and Security (ESS) Systems Standard
Chapter 6	Closed Circuit Television (CCTV) System Standard
Chapter 7	Audio Visual (AV) Cabling Standard
Chapter 8	Labelling Standard

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## FOREWORD

The tertiary education environment is one of the most challenging for the operation of Information and Communication Technology (ICT) infrastructure solutions. It has exceptionally high requirements for reliability, fault-tolerance and service availability that exceed many other similarly sized operating environments.

Tertiary education providers are frequently at the leading edge of the technology lifecycle with both research and lecture systems often involving new and innovative applications, extensive use of graphical content, monitoring, and reviewing functions. Compared with their commercial or government counterparts, teaching is more likely to involve the use of complementary technologies such as wireless and cabled monitoring systems, audio-visual applications, presentation applications, multi-media content, metering and control requirements and collaborative developments.

The University's cabling infrastructure therefore needs to support not only the standard applications of telephony and data connectivity, but also the unique requirements of heavy burst-oriented network traffic over relatively shorter periods associated with educational systems, extensive use of multi-media technologies, both wired and wireless networking, along with other related systems e.g., Security, Audio Visual, Building Management Systems and Passive Optical Local Area Networks.

The goal of this document, **CHAPTER 1: INTRODUCTION TO BUILDING TECHNOLOGY STANDARDS** is to provide a reference document for design and construction of cabling infrastructure for all University of Otago facilities in New Zealand. It outlines the minimum standards required to ensure consistency and compatibility of all new and existing cabling systems and network infrastructure systems in facilities owned by the University of Otago.

Prior to using this document, the user shall confirm that they have the latest version which may be obtained by emailing [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz).

## 1. DOCUMENT PURPOSE

The Building Technologies Standards Suite outlines the University of Otago's expectations covering the design, installation methodology and component specifications to be used for the construction of Information and Communication Systems [commonly referred to as Extra Low Voltage (ELV) systems] within new University facilities.

This suite of documents will also be used as the baseline for any gap analysis on existing installations if and/or when Information and Communication Systems are scheduled for Moves, Adds or Changes or nominated for replacement or remediation works.

The Building Technologies Standards Suite has been provided to ensure consistency of Information and Communication Systems across all the University's facilities. The suite provides the minimum standards and requirements for the design, installation and support of Information and Communication Systems in all the University's facilities.

The Standards Suite covers several topics as referenced in the Building Technologies Standards Suite Index. The directory shall be reviewed by design consultants and installation contractors to ensure they obtain appropriate guidance that is aligned with the scope of the project they are undertaking.

This document will be updated periodically, with copies and details of changes being issued to the holders of the document as listed in the document control register.

This document suite provides guidance on required standards in the following areas:

- i. Technical requirements for cabling systems
- ii. Product selection
- iii. Design, installation and testing
- iv. Labelling, administration and documentation.
- v. Pathways

### 1.1. Assumptions

It is assumed that the reader of these documents has a reasonable understanding of Information and Communication Systems [commonly referred to as Extra Low Voltage (ELV) systems] suitable to understanding terminology, other documents referenced and the associated issues typically encountered during design management and installation.

## 1.2. Design consultant and contractor responsibility

The use of The Building Technologies Standards Suite does not replace current relevant legislation, industry standards or manufacturer guidelines nor does it reduce the responsibility of the design consultant or installation contractor to apply regulatory standards to their work in line with best practice and legal requirements.

The design consultant and contractor shall refer to other sources such as relevant legislation, New Zealand standards and manufacturer installation guidelines for detailed design and installation guidance.

## 1.3. Chapters and format

The Building Technologies Standards Suite covers the following Information and Communication Systems. Each system is presented as a separate chapter:

- Chapter 1 – Introduction to Building Technologies Standards Suite
- Chapter 2 - Cabling Infrastructure Pathways Standard
- Chapter 3 - IT Infrastructure – Generic Cabling Systems Standard
- Chapter 4 - IT Infrastructure – Passive Optical LAN Cabling Standard
- Chapter 5 - Electronic Safety and Security (ESS) Systems Standard
- Chapter 6 - Closed Circuit Television (CCTV) System Standard
- Chapter 7 - Audio Visual (AV) Cabling Standard
- Chapter 8 – Labelling Standard

The format of each chapter follows a consistent layout for ease of use and reference as follows:

- Building Technologies Standards Suite Index
- Document Contents
- Appendices / Figures / Tables (if applicable)
  - 1) Document Purpose
  - 2) Using this document
  - 3) Referenced Documents
  - 4) Definitions and abbreviations
  - 5) System overview
  - 6) General Conditions
  - 7) Design Criteria
  - 8) Additional Sections as required
  - 9) Appendices

## 2. PRINCIPLES

### 2.1. Performance specifications

The design consultant is commissioned and paid to create and document specific design solutions relevant to the project. The level of design development and documentation shall be as per the design consultant's contractual agreements and the project brief, and in all cases shall supply sufficient information to provide the level of understanding necessary to facilitate the early evaluation of the design solutions.

Performance specifications defer responsibility for design decisions into the procurement and construction phases of the project. As such, performance specifications shall not be applied without pre-approval from the University.

### 2.2. Design stages

All new projects shall follow design and delivery stages in line with the New Zealand Construction Industry Council (NZCIC) guidelines which are as follows:

- 1) Concept design
- 2) Preliminary design
- 3) Developed design
- 4) Detailed design
- 5) Tender/Consent issue
- 6) Construction

The design process shall involve close collaboration with University stakeholders and project managers to ensure that the requirements of the Building Technologies Standards Suite are properly interpreted and included into the emerging design.

The University expects full coordination between all consultants and contractors contributing to the design development. This forms part of the Quality Assurance process and shall be confirmed by each consultant at each formal document release.

### 2.3. Risk management

Mitigating and managing risk must be a proactive and ongoing process throughout the life of the project. Risk management processes must be established and undertaken to meet this commitment.

### 2.4. Value management

Value management workshops are expected to be carried out up to and including Developed Design stage to test expenditure sensibility within defined project budgets.

## 2.5. Safety in Design

A Safety in Design plan must be submitted for the project, clearly identifying mitigation actions taken to prevent injury or death through design principles. This plan will be regularly reviewed and updated throughout the design process.

The plan shall include all the following lifecycle requirements – Demolition, Construction, Commissioning/Testing, Operation and Maintenance.

## 2.6. Confidentiality

All items such as documentation, drawings, information and samples supplied by the University shall be treated as confidential. The design consultant or contractor shall not share this information with any third party unless the University has given written consent to do so.

All submissions, specifications, drawings, schematics, etc. related to the University's facilities, shall be the property of the University of Otago.

## 2.7. Quality

All materials must be new, fit for purpose, and ensure sustainable operation for the duration of the contract under the environmental conditions onsite. Materials must be delivered to the site in the original packaging unless pre-installation or configuration has been undertaken. All minor and incidental items necessary for the proper functioning of the entire system, even if not specifically detailed or mentioned, must be suitable for use with the manufacturer's products and supplied even though these items may not be specifically detailed in the specification or drawing layouts.

The project may include services that will be exposed at high level, visible to the occupants and therefore requiring particular attention to aesthetics. Accordingly, a high standard of coordination and attention to detail shall be applied that results in an installation of professional appearance. The client may require the replacement of work undertaken that is considered to be of a poor standard or appearance at no additional cost.

## 2.8. Change approval process

Any change to the Building Technologies Standards Suite shall be done through a Change Approval Process. This process shall be as follows:

- The design consultant or contractor shall detail the change request, with an explanation and clarification as to why the change is requested, the impact of the change and how it will improve the system functionality as per the specific standards requirements.
- The design consultant or contractor shall submit the change request form to the relevant University's appointed Project Manager.

- The Project Manager shall discuss the request with the University's Head of IT Infrastructure.
- The University shall determine whether the change is project specific or to be a permanent change to the Standards Suite.
  - Should it be decided that the change is project specific, the Project Manager shall issue an instruction to the design consultant or contractor, giving approval for the change, but that this deviation from the standards shall only apply to the relevant project.
  - If the University determines that the change shall be a permanent change to the Building Technology Standards Suite, the Head of IT Infrastructure shall further review the change request with key stakeholders (Operations/Property teams) to determine the final requirements.
- Once final approval has been given by all key stakeholders, the change shall be incorporated into a new version of the Standards Suite.

## 2.9. Document sponsor

This document has been developed and is controlled by the University of Otago.

The contractor or designer shall adhere to the latest published edition of all standards and technical documents for all responses and construction work. Should a conflict exist between the standards or any scope of work, the contractor shall notify the consultant or University of Otago Head of IT Infrastructure of any conflict and seek clarification prior to continuation.

All queries, errors, omissions or suggestions related to this document are to be directed to:

The Head of IT Infrastructure

University of Otago

PO Box 56

Dunedin 9054

New Zealand

Email: [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz).

### 2.9.1. Outcome statement

By using this document suite and relative standards, designers and contractors will meet the University of Otago's minimum standards for the safety, design, installation and support of generic and structured cabling systems and information and communications technology environments that the University manages and operates.

## 3. USING THIS DOCUMENT

### 3.1. Interpretation of this document

#### 3.1.1. Interpretation

This document uses key words "must", "must not", "required", "shall", "shall not", "should", "should not", "recommended", "not recommended", "may", and "optional". These are to be interpreted as described in RFC2119.

##### 3.1.1.1. RFC 2119 gives the following definitions:

1. **must** This word, or the terms "**required**" or "**shall**", mean that the definition is an absolute requirement of the specification and mandatory.
2. **must not** This phrase, or the phrase "**shall not**", mean that the definition is an absolute prohibition of the specification.
3. **should** This word, or the adjective "**recommended**", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
4. **should not** This phrase, or the phrase "**not recommended**" mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood, and the case carefully weighed before implementing any behaviour described with this label.
5. **may** This word, or the adjective "**optional**", means that an item is truly optional. One vendor/ supplier may choose to include the item because a particular marketplace requires it or because the vendor/ supplier feels that it enhances the product while another vendor/ supplier may omit the same item. An implementation which does not include a particular option **must** be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. An implementation which does include a particular option **must** be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.)

## **3.2. Application of this document**

### **3.2.1. Regulations, codes, and Standards**

All cabling system works shall be carried out in accordance with the regulations, codes, and Standards listed at the beginning of this document.

Where New Zealand and international Standards are referenced in this document the application of the Standard shall be, unless specifically stated elsewhere to the contrary, to the latest edition and amendments available on the date 30 calendar days prior to the issue of any request, quote, tender or proposal.

Where design and construction of a new build spans multiple stages, each new stage shall comply with the requirements of this clause.

Where the design and tender is completed as a single stage, but construction spans multiple stages, the standard to which the first stage was initially designed shall remain the same throughout the rest of the build programme, unless a variation and instruction is issued to change by the University of Otago or the relevant Project Manager.

Where specifications or Standards, or any other references in this document refer in turn to other specifications, Standards or documents whether whole or in part, the strictest of those consequential references shall apply to this specification as if they were completely contained in the original reference.

### **3.2.2. Regulatory requirements and Codes of Practice – cabling**

Other than for compliance with the Electrical Regulations and relevant New Zealand Codes of Practice, there are no regulatory requirements for telecommunications cabling components, design practices, or installation practices in New Zealand.

The Telecommunications Act 2001 gives any Network Operator the right to refuse connection or to disconnect unsatisfactory cabling and components from their network under section 108 subsection (2) if they do not meet published standards as per section 108 subsection (1) and 109 Regulations.

For cabling connected to the national telecommunication network, compliance with Spark PTC specifications is a contractual requirement.



### 3.2.3. Acceptance of these standards

The contents of this document shall be accepted by any designer or installation contractor that provides data cabling services to the University of Otago. This includes construction companies and their subcontractors. All companies that are engaged on University of Otago work are responsible for conveying these standards to installers engaged in data cabling works.

#### *Designer and Contractor note: Topology*

Copper cabling in buildings that has a designed cabling system shall follow the original cabling topology. Where a floor distributor is provided per floor all outlets on the floor shall terminate in the cabinet servicing that floor. In the event of a cabinet being full options for expanding the cabinet shall be considered. The University's IT Infrastructure Team shall be consulted prior to any decision being made to cable outside of a cabling zone.

### 3.2.4. Variation from this document

Compliance to the requirements of this document may, under some circumstances, not be practical, or cost effective, or an alternative solution may exist that better suits the conditions on site.

The designer and contractor are advised that, if compliance to this document cannot be met, before undertaking the non-compliant works the designer or contractor shall obtain written approval for a variation from:

The Head of IT Infrastructure

University of Otago

PO Box 56

Dunedin 9054

New Zealand

Email: [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz).

### 3.2.5. Conflicts

If a conflict exists between the Standards and with the Scope of Works, then the contractor shall notify the University of Otago's Project Manager or their representative of any conflicts and seek clarification prior to continuation.

The general order of precedence shall be:

- a) Statutory Codes and Regulations
- b) The University of Otago publication relevant chapter of the Building Technology Standards Suite (this document and other associated chapters)
- c) Standards and specifications within the tender or contract
- d) Referenced New Zealand and International Standards



In situations where tender specific standards, specifications, or both, exceed the University's requirements, these shall take precedence.

Where reference is made to a specification, the latest release available on the date 30 calendar days prior to the issue of any request, quote, tender or proposal shall apply.

Conflicts in requirements or requests for variation from published documents that are identified by staff, consultants, designers, tenderers, or contractors shall be notified in writing to:

The Head of IT Infrastructure

University of Otago

PO Box 56

Dunedin 9054

New Zealand

Email: [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz).

**NB.** Written confirmation from the University is to be received before resolution.

### **3.2.6. Service Reach**

New IT infrastructure cabling in all University of Otago sites, leased or owned. Any generic cabling systems or structured cabling that will be connected to the University of Otago network directly or indirectly via intermediary active equipment shall comply with this document.

### **3.2.7. Exclusions**

- a) Sites co-owned by University of Otago. Cabling standards on these sites are to be negotiated on a per site basis.
- b) Sites with existing structured cabling systems purchased by the University may not comply with these standards. In such cases, a migration to these standards may need to be staged.
- c) Temporary installations such as conference cabling or cabling to portable buildings. A temporary installation is defined as having a lifespan of 5 years or less.
- d) Sites where the University has network equipment as a third-party provider, e.g., sites within District Health Board buildings.
- e) IT Infrastructure cabling installed for non-University network provision has some exemptions. This is detailed in a separate section: Third Party Network Provision.
- f) Data Centre cabling is outside the scope of this standard.
- g) Legacy analogue telephone cabling.

## 4. REFERENCED DOCUMENTS

Reference is made in this document to the following:

### 4.1. New Zealand Standards

NZS 4219	Seismic performance of engineering systems
NZS 6801	Acoustics - Measurement of environmental sound
NZS 6802	Acoustics - Environmental noise

### 4.2. Joint Australian/New Zealand Standards

AS/NZS 1680	Interior and workplace lighting
AS/NZS 2107	Acoustics – Recommended design sound levels and reverberation times for building interiors
AS/NZS 2967	Optical fibre communication cabling systems safety
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules). The cited version of AS/NZS 3000 as per the Electrical (Safety) Regulations 2010.
AS/NZS 3084	Telecommunications installations – Telecommunications pathways and spaces for commercial buildings
AS/NZS 3085.1	Telecommunications installations – Basic requirements
AS/NZS 14763.2	Telecommunications installations – Implementation and operation of customer premises cabling - Part 2: Planning & Installation
AS/NZS 60079.10.1	Explosive atmospheres – Classification of areas – Explosive gas atmospheres
AS/NZS 61000.6.3	Electromagnetic compatibility (EMC) - Part 6.3: Generic standards - Emission standard for residential, commercial and light-industrial environments
AS/NZS CISPR 22	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
AS/NZS ISO 717.1	Acoustics – Rating of sound insulation in buildings and of building elements-airborne sound insulation

### 4.3. Australian Standards

AS 11801.1	Information technology — Generic cabling for customer premises — Part 1: General requirements
AS 11801.2	Information technology — Generic cabling for customer premises — Part 2: Office premises
AS 11801.3	Information technology — Generic cabling for customer premises — Part 3: Industrial premises
AS 11801.4	Information technology — Generic cabling for customer premises — Part 4: Single Tenant Homes
AS 11801.5	Information technology — Generic cabling for customer premises — Part 5: Data Centres
AS 11801.6	Information technology — Generic cabling for customer premises — Part 6: Distributed building services
AS/CA S009	Installation requirements for customer cabling (Wiring Rules)
AS ISO 140.4	Acoustics – Measurement of sound insulation in buildings and of building elements - Field measurements of airborne sound insulation between rooms

### 4.4. Other Publications

New Zealand Building Code	<p>Compliance document for New Zealand Building Code – Clause C Protection from Fire (including amendments 2 and 3)</p> <p>Compliance document for New Zealand Building Code – Clause E2 External Moisture (including all amendments)</p> <p>Compliance document for New Zealand Building Code – Clause G9 Electricity (including amendment 6)</p>
Association of Building Compliance	Code of Practice for Electro Mechanical Controlled Locking Devices on Egress Doors

Building Industry Consulting Service International, Inc (BICSI) - TDMM	Telecommunications Distribution Methods Manual (TDMM), 14th Edition
Building Industry Consulting Service International, Inc (BICSI) - OSP	Outside Plant Design Reference Manual (OSPDRM), 6th Edition
Otago University Campus Passive Fire Guide	Volume 1 – General Volume 2 – Product Selection Volume 3 – Basic Solutions

#### 4.5. Websites

<http://www.legislation.govt.nz/>

<http://www.otago.ac.nz>

<http://www.telepermit.co.nz/PtcSpecs.html>

#### 4.6. Latest Revisions

The users of this document shall ensure that their copies of the above Standards, Codes and Publications are the latest revisions.

Amendments to referenced New Zealand and Joint Australian/New Zealand Standards can be found on <http://www.standards.co.nz>.

## 5. DEFINITIONS AND ABBREVIATIONS

For the purposes of this document the following definitions and abbreviations shall apply.

### 5.1.1. Definitions

Term	Definition
As-built	Final set of drawings produced at the completion of a construction project, including all changes made to the original construction drawings
Building backbone cabling	Cable that connects the building distributor to a floor distributor
Campus	An area or site which contains several University buildings, and includes the grounds in which a cabling system is installed
Campus backbone cabling	Cable that connects the campus distributor to the building distributor(s)
Campus distributor	Distributor from which the campus backbone cabling starts
Category 6 <sub>A</sub> (Cat 6 <sub>A</sub> )	A definition of cabling components which provide a permanent link that, when tested, meet AS 11801.1 Class E <sub>A</sub> performance
Catenary wire	A wire supported at two points kept under mechanical tension to provide a support to which cabling may be fastened.
Clear working spaces	A ventilated working space allowing quick unrestricted egress or escape in the event of emergency
Contractor	Where the term “Contractor” is used within this document it shall be interpreted as the “Communications Contractor”.
Designer	A person who plans the look, or workings, or both, of something prior to it being made, by preparing drawings or plans
Distributor	The term used for a collection of components (such as patch panels, patch cords) used to connect cables
Enclosure	A housing for accommodation of equipment and cabling that includes mounting rails and protective panels

Term	Definition
Equipment footprints	The vertical and horizontal planes occupied by a piece of equipment in normal operation
Generic cabling system	Structured telecommunications cabling system, capable of supporting a wide range of standardised applications. Standards based design
Horizontal cabling	Cable connecting the floor distributor to the terminal equipment outlets
Installer	A person that places or fixes equipment or machinery in position ready for use. The party(s) responsible for the supply, installation, testing and warranty of cabling systems
Integrator	A person that places or fixes active IT equipment e.g. Network switching, Wireless Access Points, Servers, Desktop Computers etc. in position and configures, programs them ready for use. The party(s) responsible for the supply, installation, testing and warranty of active equipment systems
Manufacturer	A person or company that makes cabling goods for sale
Power over Ethernet	Power over Ethernet (PoE) is a technology for wired Ethernet local area networks (LANs) that allows the electrical current necessary for the operation of each device to be carried by the generic cabling system rather than by power cords. Typical uses include VoIP phones, WAPs, IP CCTV cameras, or lighting.
Power Over SCS or GCS cabling	Power over structured telecommunications cabling (application specific cabling) or power over generic cabling (non-application specific cabling),
Permanent link	Transmission path between the telecommunications outlet and the floor distributor
Service Distributor (SD)	Equivalent to distributor 1 in AS 11801.1
Service Outlet (SO)	Equivalent to a TE Outlet in AS 11801.1
Single vendor system	A system provided by a single vendor to help reduce operational, configuration, and management complexity
Site	See <b>Campus</b>

Term	Definition
<b>Structured Cabling System</b>	Specific cabling solution designed with a set of cabling and connectivity products that are constructed (engineered) according to standardised rules to facilitate specific connectivity requirements e.g. Nurse Call (Staff Assist). Legacy design.
<b>Suitably qualified person</b>	A person with the professional qualifications and experience in the industry to undertake the design and supervision of the works
<b>Terminal Equipment Outlet (TEO)</b>	Fixed connecting device which provides and interface to the terminal equipment. N.B. The term telecommunications outlet is used in some other parts of the AS 11801 series, while the term terminal equipment outlet is used within AS 11801.1 and this document.
<b>Velcro™</b>	A proprietary form of Hook & Loop fastener/cable tie



## 1.2.1 Abbreviations

AFFL	Above Finished Floor Level
BD	Building Distributor
BTSS	Building Technology Standards Suite
CAD	Computer Aided Design
CD	Campus Distributor
CES	Communications Earth System
CoC	Certificate of Compliance
CP	Consolidation Point
DB	Electrical Distribution Board
EMC	Electromagnetic Compatibility
ES1	Energy Source Class I
ES2	Energy Source Class II
ES3	Energy Source Class III
ESC	Electrical Safety Certificate
FD	Floor Distributor
FOBOT	Fibre Optic Break Out Termination
F/UTP	Overall screened cable with unscreened twisted pairs (often referred to as FTP)
GbE	Gigabit (per second) Ethernet
GPO	General Purpose Electrical Outlet
GCS	Generic Cabling System
IT	Information and Communications Technology
IDC	Insulation Displacement Connection

IP	Internet Protocol
LAN	Local Area Network
LC	A small form factor optical fibre connector type
MAC	Moves Adds Changes
MATV	Master Antenna television
MCB	Miniature Circuit Breaker
MMOF	Multimode Optical Fibre
MCB	Miniature Circuit Breaker
MPTL	Modular Plug Termination Link
MUTO	Multi User Telecommunications Outlet
ODF	Optical Distribution Frame
OFCS	Optical Fibre Communication Systems
PE	Polyethylene
PL	Permanent Link
PoE	Power over Ethernet
POL	Passive Optical LAN
RCBO	Residual Current Breaker (with overcurrent protection)
RCD	Residual Current Device (No overcurrent protection)
RJ45	Registered Jack Number 45
RU	Rack Unit
SCS	Structured Cabling System
SCP	Service Concentration Point
SD	Services Distributor
S/FTP	Overall braid screened cable with foil screened twisted pairs (often referred to as STP or PIMF)

SFF	Small Form Factor
SMOF	Single Mode Optical Fibre
SO	Service Outlet
SPD	Surge Protection Device
TEO	Terminal Equipment Outlet
TO	Telecommunications Outlet
TR	Telecommunications Room
TRC	Telecommunications Reference Conductor
UoO	University of Otago
UPS	Uninterruptible Power Supply
uPVC	Unplasticised polyvinyl chloride
UTP	Unshielded Twisted Pair
UV	Ultraviolet
WA	Work Area
WAP	Wireless Access Point
WLAN	Wireless Local Area Network

## 6. GENERAL CONDITIONS

### 6.1. Cabling system works

The scope of work for the provision of any infrastructure cabling system typically includes supply, installation, testing, commissioning, labelling and documentation.

Installations shall only be carried out by a UoO approved contractor who hold current accreditation from the manufacturer of the cabling system and connecting hardware as qualified to perform the cabling work relevant to the performance standard of the cabling system.

They shall also hold a current GCS Manufacturer Approved Contractor certification for all GCS installation work.

Any contractor responding to a Request for Proposal (Price) (RFP) or requested to provide a quotation, shall provide evidence that they hold a current manufacturer certification within their response.

### 6.2. Standards and references

All works shall be carried out in accordance with the regulations, codes, and standards referred to in the appropriate section of this document and the associated Scope of Works. In addition, all works involving product and equipment shall be carried out in accordance with the manufacturer's product guidelines, instruction sheets and specifications. See "Referenced Documents" sections above for more information.

It is the contractor's responsibility to obtain the latest editions of and familiarise themselves with these documents and publications.

### 6.3. Occupational Health and Safety (OSH)

The contractor shall comply with all Acts and Regulations, approved Codes of Practice, all relevant standards, WorkSafe New Zealand guidelines, Occupational Health and Safety requirements, manufacturer's instructions and any temporary rules and restrictions that may be in force at the time.

The contractor shall comply with UoO Health and Safety policy, guidelines and rules when engaged in work UoO sites and equipment and shall conform to all site-specific requirements including safety requirements.

Reference shall be made to the **IT Infrastructure Site Access Guideline** document that will issued at contractor inductions.

Prior to the commencement of any design or construction work on UoO property involving access to grounds or buildings the contractor shall ensure they have received:

- a) A copy of the UoO safety plan, including the location of UoO safety and first-aid equipment e.g., chemical showers, AEDs etc.
- b) A vehicle access plan including safe access and parking for contractor and delivery vehicles.
- c) Safety induction on site
- d) A copy of the UoO Hazard Register
- e) Any specific site requirements

The contractor shall ensure that all its personnel have undertaken appropriate training and have a recognised site safety accreditation for both the site and work to be undertaken. They shall supply and wear appropriate personal protective equipment (PPE) to carry out the work and contractor identification shall always be worn while onsite.

### **6.3.1. Important notes about Health and Safety regarding an incident register**

All contractors shall ensure incidents, accidents, injuries and near misses are recorded and reported to the UoO and all incidents involving injuries investigated as per the reporting process in the IT Infrastructure Site Access Guideline document.

Notifiable events shall be notified to WorkSafe NZ.

For more information:

- <https://www.otago.ac.nz/health-safety/index.html>
- <https://www.otago.ac.nz/health-safety/otago643467.pdf>

- a) No open pits, holes, trenches, or access areas, shall be left unattended at any time. All are to be clearly marked and secured in accordance with OSH regulations and all ground or structural disturbances are to be secured and/or removed at the end of each day's work in accordance with OSH regulations. The contractor shall be familiar with the safety in design register applicable to the work being undertaken.
- b) The IT designer shall create a safety in design register for any new design and shall include an overarching document that covers all 5 stages of Safety in Design (SiDs).
- c) The designer shall refer to AS/CA S009 for additional safety requirements and include these within the SiDs register.

### 6.3.2. Safety

PoE switching shall not exceed the designed remote powering capability of the cabling system. If new PoE switches are installed in a cabinet for remote powering purposes and no remote powering label exists on the cabinet, then the contractor shall install a warning label on the front, back and sides of the cabinet detailing the maximum permitted remote powering as per the cabling manufacturer's warranty and recommendation.

All communications contractors, IT staff and Integrators installing PoE switching, or patching fibre optic cabling shall have completed the manufacturer's approved contractor course to demonstrate competency in understanding the safety requirements for working with fibre optic cabling, remote powered systems and any network providing connectivity to safety devices e.g., lockdown, CCTV, Panic Alarms (Security Intrusion Detection Systems) etc.

The contractor's manufacturer's certificate shall be provided to the University for their records if they are on the approved list and update these when they expire.

The University will check its database of approved contractors and any quotations or pricing submitted by a contractor with expired certificates shall not be considered.

All contractors, IT staff and integrators shall ensure all fibre cabling and network interfaces have compliant labelling installed.

All IP CCTV camera cabling shall be undertaken by the GCS Manufacturer qualified contractor on any of the University sites or facilities.

### 6.3.3. Asbestos

Asbestos is managed by Property Services under the Asbestos Management Team and a register is held documenting the areas of concern.

Staff can review the Property Services asbestos hazard information using your University account:

<https://jira.otago.ac.nz/confluence/display/OST/Property+Services+Asbestos+Hazard+Information>

Refer to the Policy, Asbestos Management:

<https://www.otago.ac.nz/administration/policies/otago629859.html>

Asbestos Health and Safety at Work Regulations 2016:

<https://www.legislation.govt.nz/regulation/public/2016/0015/latest/DLM6729706.html>

All buildings with Asbestos should be labelled as 'No Entry' and any work should be halted, and advice sought from your immediate manager and DHSO.

Network and Operations staff should attend the Asbestos Awareness course held by Health and Safety <https://corpapp.otago.ac.nz/training/hs/course/4713/search/0/>.

## 6.4. Advice

The contractor shall advise the UoO and gain approval before undertaking any work that may or will result in voice, data, security or other IT network service disruption or network downtime to existing network infrastructure.

Any work that may result in network down time will require scheduling with UoO representatives and shall be notified via the ITS Request for Change (RFC) process.

## 6.5. Third Party Network Provision

From time to time, non-University IT cabling infrastructure installation work may be required to be carried out on campus. To protect the integrity of the University's buildings and to minimise the impact of third-party installations on the University's own network the following requirements shall be met:

- a) All sections of this standards document shall be complied with.
- b) Any third-party cabling infrastructure shall be carried out with the prior approval of the Property Services Facilities Manager and the ITS Network Services Manager or their representatives.
- c) All networking equipment shall be installed in existing comms spaces within a building. Installation of network elements within spaces not already used for communications equipment shall be done with the prior approval of the Property Services Facilities Manager and the ITS Network Services Manager or their representatives.
- d) All penetrations of fire structures (i.e. walls, slabs, etc) used by third party cabling and network equipment shall be sealed as per the requirements in the UoO Campus Passive Fire Guide.
- e) Third party cabling shall be labelled with the name of the owner.
- f) Any third-party cabling works that carry the risk of a service outage to the University network shall be notified via the ITS Request for Change (RFC) process.
- g) Contractors shall be UoO approved personnel from approved companies.
- h) Heritage features and aesthetic factors shall be considered in any installation. The Property Services Facilities Managers are to be consulted on these matters in the first instance.
- i) Care shall be taken to identify and avoid any asbestos disturbance with all build works. Installation staff shall consult asbestos surveys and/or registers before undertaking any work.
- j) The university reserves the right to request the immediate removal of any third-party networking equipment or cabling.

- k) Third parties can apply to the Network Services Manager to run services over UoO's IT network.

## **6.6. Site conditions**

The contractor shall familiarise themselves with the site conditions prior to undertaking or providing quote or estimate prices for any work. Specific conditions to be observed include site access and entry requirements, OSH requirements, qualification and identification of personnel and onsite legacy equipment and configurations.

Contractors shall fully inform themselves of the site conditions and other factors that could affect the cost and execution of works outlined in the design and scope of works.

This includes (but is not restricted to):

- a) Hazards that may be present e.g., asbestos, heritage registration of buildings.
- b) Environmental conditions including special precautions for the protection of flora and fauna.
- c) Local site conditions including weather hazards and cultural significance.
- d) Easements
- e) Safety of UoO students and staff with respect to pit covers and location.
- f) Existing and projected underground services,

## **6.7. Contractual obligations**

The contractor shall complete all works in a manner consistent with the UoO objectives and requirements, and consistent with the detail contained in this standard and the associated Scope of Works for any work to be undertaken. The contractor shall also conform to all regulatory requirements applicable to the work being undertaken.

## **6.8. Contractor qualification**

### **6.8.1. GCS qualifications**

For GCS installations, the contractor's lead installer, site manager or site supervisor shall have attended and passed the Manufacturer's training course. Fifty percent (50%) of all other staff working onsite shall all hold a valid certification from this course. All works must have oversight by a senior person holding this certification. The size of the installation will determine the necessary time that this person shall be onsite during GCS construction and certification.



The contractor's personnel undertaking any installation or remedial work on a UoO site or facilities IT system are required to be trained by the Manufacturer or its representatives on the product, system and components being installed. All workmanship shall be compliant with regulatory requirements and with the Manufacturer's warranty requirements.

The contractor shall ensure that all its personnel undertaking any work are fully trained and accredited for the work being undertaken.

### **6.8.2. Security qualifications**

The contractor undertaking the design, installation, testing and commissioning of any electronic security and/or staff assist call system shall:

- a) Be experienced and skilled in the design, installation and commissioning of intruder detection alarm, automated access control, and staff assist call systems. Verification of proven experience shall be provided if requested.
- b) Be a current channel partner or certified agent and installer of the proposed systems offered.
- c) Be Police vetted when working at childcare facilities, proof of vetting shall be provided
- d) Hold a current Company Licence under the Private Security Personnel and Private investigators Act.
- e) Only use staff members that hold current 'Certificates of Approval' under the Private Security Personnel and Private investigators Act.
- f) Use a technician with a minimum qualification of NZQA Level 3 – Electronic Security. The Security Technician (ST) certification shall be included on the technician's Certificate of Approval (COA) held by the Private Security Personnel Licensing Authority (PSPLA). There shall not be more than a ratio of one trainee per qualified technician.
- g) The contractor shall have a local office and be able to provide onsite support and technical assistance within two hours of notification of a system fault.
- h) The University reserves the right to conduct any enquiries it deems necessary with any supplier, manufacturer, or training provider to verify the validity of the status of any qualification, certification and authorisation claimed by the contractor and or employees of the company. Any person, including subcontractors or a contractor engaged by the company is deemed to be an employee of the company.

The accredited contractor shall provide photocopies or softcopies of the above items to the Project Manager as part of any tender response and all technicians shall display their COA on their hi-vis vest while working onsite.

## 6.9. Existing sites floor plans

For existing buildings, floor plans shall be provided by the UoO or its representative for mark up by the contractor. The contractor shall mark up the drawings to reflect locations, numbering, and so on, and return them to the UoO or its representative. Any identified additions or deletions to the plans will be required to be supplied to scale.

Existing plan requests can be emailed to: [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz).

## 6.10. Design by the Contractor

When the contractor is required by a Scope of Works to develop the design shown on the contract drawings into a fully detailed final design (e.g., Design Build Contract), the contractor shall coordinate with the UoO or its representatives, and with other contractors to prepare design documents for construction purposes.

The contractor shall submit the design and documents to the UoO or nominated representatives for review and approval before work is undertaken.

## 6.11. Electrical installation works

The installation of all electrical products and equipment shall be installed in accordance with electrical engineer's design, manufacturer's instructions, electricity safety regulations and applicable standards by a registered electrician. See the electrical section of this document for more information.

## 6.12. Equipment locations

Equipment and cable pathways shall be installed in accordance with approved drawings and plans.

When deciding on a suitable location for equipment all factors in equipment spaces shall be considered.

The following factors, and not limited to, shall be considered when designing equipment spaces:

- a) Door width and height
- b) Door opening side
- c) Equipment walls
- d) Floor loadings
- e) Cable tray/basket entry and exit
- f) Floor penetration locations
- g) HVAC load and locations

- h) Lighting levels and placement as per AS/NZS 1680
- i) Electrical distribution boards and distribution inside the telecommunications space
- j) Security
- k) Location in relation to EMI and RFI sources (e.g. lift motors and shafts, copier rooms)
- l) Location in relation to wet areas (e.g. toilets and kitchens).
- m) Fire stopping materials
- n) Equipment room space acoustic treatment as per referenced standards.
- o) Space and clearance requirements as per relevant standards

Additions or modifications to installed plant shall not be made without the written approval of the University. Such additions or modifications shall be detailed on drawings and plans.

### **6.13. Fit for purpose**

The contractor shall provide all equipment that is required for a complete and working installation to attain the specified performance.

All cable and equipment shall be new and selected to ensure satisfactory operation at the site.

Cables and equipment shall be delivered in the original packaging except where pre-installation commissioning, run-up and configuration may require equipment to be worked on off-site.

All minor materials and fittings or any work which is necessary for the satisfactory installation and operation and efficient functioning of the installation, (or which is generally provided in accordance with accepted trade practices) shall be provided or carried out as part of the works even though such material or work may not be explicitly mentioned in this document, the installation specification, or shown on construction drawings.

### **6.14. Coordination with other services**

The designer and/or the contractor shall be responsible for coordination with UoO personnel and representatives and with other works and trades including communications, civil, building, electrical, mechanical, fire and security where cabling work is dependent upon or carried out in conjunction with these works.

For the contractor this shall include (but is not restricted to):

- a) Health and Safety compliance
- b) Use of site and access facilities

- c) Closure or restriction of access to site and facilities
- d) Scheduling of works, site construction resources and utilities
- e) Maintaining mandatory segregation of services
- f) Site reinstatement
- g) Seismic design and installation as per NZS 4219.

For system designers this shall include (but is not restricted to):

- h) Architectural services
- i) Electrical services
- j) Communications services
- k) Civil services
- l) Mechanical services
- m) Security services
- n) Fire services

The civil contractor and civil designer shall include electrical, fire and communications cabling ducts and detail these on the civil design, and price to install under the civil contract. The civil designer shall coordinate with specialist IT, electrical and fire designers for duct and pit sizing and location. Ducting shall share common trenches where possible. Segregation of services coordination shall be made with the Local Fibre Company (LFC) for any new or relocated ultrafast fibre (UFB) connections and ducts. All UFB underground ducts and cable pits shall be of a LFC approved type.

Fire services shall not share communications ducts or pits.

The electrical contractor and electrical designer shall include cable tray for communications cabling and detail these on the design, and price to install under the electrical contract. The electrical designer shall coordinate with specialist IT designer for cable tray routes and sizing.

In summary:

The civil contractor shall install all ducts and pits external to the building envelope.

Where more than 12 cables share a common route, the electrical contractor shall provide containment for electrical, communications and fire services within the building envelope.

## 6.15. Out of hours work

Periodically, contractors may need to work at UoO facilities out of normal hours. If required by the University, the contractor shall arrange for a UoO representative to be present while contractors undertake such work.

## 6.16. Testing

Refer to the specific standards chapter for the testing requirements.

## 6.17. Site reinstatement

All works undertaken as a refit or extension to existing installations, shall be reinstated to their original condition to the satisfaction of the UoO staff or their representatives. This shall be carried out as soon as practicable after works have been completed.

Site reinstatement shall be considered part of the installation and shall include the removal of all packaging materials and waste, the painting and plastering of wall surfaces damaged during installation, and the reinstatement to original condition of any ground surfaces damaged during earth works (OSP – Outside Plant works).

## 6.18. Cleaning

The contractor shall maintain a clean working environment minimising disruption to UoO staff and students. All packaging materials, off-cuts and materials left over from the installation of its product are to be removed and the area left clean on completion of all works.

The contractor shall keep underground ducts and cable pits free of building debris material and rainwater by sealing the ends of the ducts.

## 6.19. Removal of redundant materials

When any cabling work is complete, the contractor responsible for the new installation work shall identify and remove any redundant cabling and cabling materials.

Unused cabling may be left in place if it may be used at a later stage, or if removal of the cable may damage other services, or where removal is prohibitive. Written approval from the UoO or its representatives shall be obtained prior to deciding to keep any cabling.

Cabling left in place shall be tagged and labelled for future use and as-built documentation updated to show retained cabling and associated pathways.

## 6.20. Practical completion

The stage in the execution of the works under the contract where the Contract Works are complete.

The following procedures shall be undertaken to consider the installation work is completed:

- a) All preliminary testing, pre-commissioning and commissioning of the installation shall be completed and accepted.
- b) Draft O&M manuals incorporating completed commissioning results together with DRAFT updated as-built drawings shall be provided and approved.
- c) Certificates of compliance are provided.
- d) Producer Statements PS3 construction provided (if applicable).
- e) Equipment warranties shall be handed over to the University.
- f) Provide the Design Engineer with written notification that the installation has reached Practical Completion.

## **6.21. Audits and inspections**

Site audits may be initiated during construction, commissioning and operational phases by the UoO or its representatives to confirm compliance with UoO standards, the specifications, and construction drawings.

The manufacturer of the cabling system (or its authorised agent) shall inspect the site to confirm compliance with this specification and their warranty requirements and provide sign-off. For large installations multiple visits by manufacturer shall be undertaken.

These audits and inspections will include, but not be limited to, written reviews of:

- a) Compliance with the UoO Standards publications
- b) Installation practices to current regulatory requirements
- c) Installation techniques and OSH guidelines, for the safety of site users and installation staff
- d) Test results
- e) Site reinstatement
- f) All work completed is to the former condition and the University representative's satisfaction.
- g) All work completed as soon as practicable after the works are complete.
- h) Required project documentation and warranties.

## **6.22. Warranties**

Warranties, Certificate of Compliance, Defect Periods and guarantees shall be required as part of the Scope of Works for installation, maintenance, and refit of facilities.

Warranty periods shall commence at practical completion or, if not concurrent with practical completion, at acceptance of installation.

The project shall not be considered completed until all warranty documentation has been received by the University or its representative.

Two types of warranties apply to system installations:

- a) Installation Warranty (Defect Liability Period)
- b) Manufacturer's Warranty.

### **6.22.1. Installation Warranty**

The cabling system contractor shall provide a Defect Liability Period warranty on its own work and workmanship for a minimum period of 12 months or greater period as stipulated in the overall build contract or scope of works. This includes any remedial work done to bring existing cabling up to the required standard.

### **6.22.2. Manufacturer's Warranty**

A manufacturer's system performance warranty with a minimum of a twenty-five (25) year validity period is a mandatory requirement for GCS and Blown Fibre Solutions.

If the manufacturer's requirements contradict those within this document, the contractor shall bring those contradictions to the attention of the University or its representative immediately.

Any additional cabling at the warranted premises shall not compromise the existing warranty. All modifications and additions to already warranted cabling systems shall be tested by a manufacturer approved contractor and warranted by the University approved manufacturer. An updated warranty and system certification shall be provided at the completion of any additions.

### **6.22.3. Records and retention**

All records, warranties, test results in RAW format, guarantees and drawings relating to installation and maintenance work undertaken by the contractor shall be maintained by the contractor for a minimum period of one year after the end of the warranty or guarantee period.

Copies of all warranties, test results in RAW format, guarantees and other records relating to installation or maintenance and upgrade work are to be provided to the University or its representative within two weeks of practical completion.



### **6.23. Intellectual property**

All submissions, drawings, schematics, policies, and procedures related to the University network and its facilities are the property of the UoO.

### **6.24. Confidentiality**

All drawings, specifications and other information, samples, models, patterns, and the like supplied by either the University, or by the designer or contractor are regarded as confidential.

The designer or contractor shall not disclose any such information to a third party without the written consent of the University.

### **6.25. Training**

The contractor shall provide operator training and operational manuals as required for University's personnel. Training shall be carried out not later than one week after and not earlier than 4 hours before practical completion.



## 7. DESIGN CRITERIA

### 7.1. Criteria for use

The designer and contractor shall refer to sources and publications outlined at the beginning of this document for general design guidance.

### 7.2. Coordination with other design disciplines

#### 7.2.1. Electrical Engineer

Electrical requirements for the specific building technology service shall be provided to the electrical engineer. Service coordination shall be undertaken to ensure separation requirements are followed. Earthing and bonding of cable containment systems and data cabinets is to be specified by the electrical engineer.

Networking and IT cabling requirements for electrical systems shall be obtained from the electrical engineer. These include lighting control systems and metering devices.

##### 7.2.1.1. Electrical Design

#### Building and electrical earths - design

The following shall be considered by the IT designer (or contractor for design and build) in co-ordination with the electrical engineer during the design process:

- a) Bonding to the electrical power system
- b) Primary protector
- c) Bonding conductors
- d) Busbar connections
- e) Bonding connections
- f) TMGB (Telecommunications Main Grounding Bus Bar) and TGB (Telecommunications Bus Bar)
- g) Bonding equipment, racks and cabinets

#### Building and electrical earths – installation

Building earth systems and electrical earth systems shall be provided as part of the building works (main contractor works – electrical works). Testing and commissioning shall be completed by the electrical contractor.

- a) Earthing and related works by the contractor shall be limited to the following (in coordination with the electrical contractor and in compliance with AS/NZS 3000):



- i. Provision of communications earth system (CES) where specified as part of the works.

### **7.2.2. Mechanical Engineer**

Mechanical requirements for the specific building technology service shall be provided to the mechanical engineer. Cooling requirements shall be calculated from room loadings.

Networking and IT cabling requirements for mechanical control systems shall be obtained from the mechanical engineer. These include actuators, fan control units and monitoring equipment.

### **7.2.3. Architect**

Spatial requirements are to be coordinated with the architect. Outlets for ceiling mounted services shall be coordinated with the architect and included on the BIM model and/or reflected ceiling grid plans.

Acoustic requirements shall be coordinated with the architect, or an acoustic engineer if the project has one. Outlet placement shall follow the architectural furniture and equipment plan and room data sheets.

### **7.2.4. Structural Engineer**

Structural requirements of cable pathway penetrations, equipment room floor loadings, and cable containment devices shall be coordinated with the structural engineer. Seismic bracing of cabinets, cable containment systems, suspended or wall hung AV equipment and ceiling mounted IT equipment, shall be defined by the structural engineer.

### **7.2.5. External Network Designer**

Should an external network designer be responsible for the network design of a particular project, the following information shall be provided to the **ITS Infrastructure team** for approval:

- a) The active network architecture to permit the cabling topology and sizing to be defined.
- b) The active equipment specifications for all equipment being installed
  - a. This shall also be provided to the cabling infrastructure designer to determine rack layouts, room power requirements and room thermal loadings.
- c) The cabling infrastructure designer shall provide outlet count and any PoE loadings, to inform the network designer's specification.
- d) The network designer shall utilise a wireless planning tool to confirm wireless performance post installation and provide guidance on system tuning.



### **7.2.6. Security designer**

Cabling, rack space and controller mounting requirements shall be obtained from the security designer. Outlets for security cameras shall be coordinated with the security designer. TR and ER security requirements shall be provided to the security designer.

### **7.2.7. Fire Engineer**

Fire requirements for the specific building technology service shall be provided to the Fire engineer.

Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices

### **7.2.8. UoO Information Technology Services**

Storage and compute hosting requirements are to be obtained from the UoO Information Technology Services department. Networking functional requirements are to be obtained from the UoO ITS department.

All IT plans shall be approved and signed off by the UoO Information Technology Services department.

### **7.2.9. UoO Information Technology Support Services**

AV networking requirements shall be obtained from the **IT Infrastructure Team** and services shall be coordinated with the team.

*For AV requirements, refer to Chapter 7: Audio Visual (AV) cabling Standard of the Building Technologies Standards Suite.*

## **7.3. Exclusions - cabling or system**

Related cabling or systems that are outside the scope of these standards include:

- a) Network equipment, such as servers and switches that are connected to the GCS
- b) Master Antenna Television (MATV) cabling and equipment
- c) Wireless LAN equipment
- d) Radio based carrier interface
- e) Patch by exception balance cable termination systems
- f) Audio visual equipment



#### **7.4. Aesthetic design**

In all cases the cabling installation shall be designed and installed in a manner that is suitable for the building and not in conflict with the environment.

#### **7.5. Heritage buildings**

There are several buildings on the University's campus that have significant historical or cultural significance. Modification or work within these buildings may be difficult and the amount and nature of any refurbishment is subject to specific controls and restrictions. Designers and installers are required to ensure that in the proposed construction activities do not compromise the restrictions imposed in these buildings.

See Appendix A for additional information.

#### **7.6. Exposed cabling**

The designer is expected to minimise the use of exposed conduit and capping and overhead connections. Where possible all cabling and cable pathways, including pits and external conduits, shall be hidden from view and not attract attention. It is expected that where service pathways are provided, they are utilised e.g., walkway cavities shall be used to distribute IT cabling Infrastructure around the campus. If for any reason this may not be practicable, then written agreement from the University's authorised representative shall be obtained.

When it is not possible to completely hide the cable pathways, contractors shall use materials and products that are the least obtrusive to view.

#### **7.7. Moves, adds and changes**

When moves, adds, and changes (MACs) are being undertaken on existing installations, and where a warranty is already in place for the existing installed system, MACs shall be consistent with the installed product and shall not, where possible, void an existing warranty. Where applicable the warranty for the existing system shall be extended to include the new works.

#### **7.8. Dimensioning**

The network requirements and configuration in any given area shall be determined and confirmed by the University. Sufficient outlets and accompanying GPOs shall be installed in all areas to meet the Building Technologies Standards Suite and as per the specific scope documents and tender documents.

## **7.9. Environmental Considerations**

### **7.9.1. Salt spray and corrosive environments**

Care shall be taken for installations in coastal regions to minimise the exposure of equipment to salt. Equipment enclosures and distributors shall not be installed in open areas. Equipment room vents shall be fitted with filters to minimise salt spray ingress. See ASNZS ISO IEC 14763.2 for additional information.

### **7.9.2. Chemical corrosion**

#### **7.9.2.1. Equipment rooms**

Equipment rooms and distributors shall not be located near to corrosive conditions.

Equipment and plant located in geothermal environments such as Rotorua or near corrosive industrial environments, shall have appropriate corrosion protective treatments as follows:

#### **Protection of electrical equipment**

- a) Main distribution boards, control panels, server racks for the BMS and IT, etc. shall be co-located in an environmentally controlled room.
- b) All electrical, telecommunications, IT and AV equipment rooms shall be pressurised with at least 2 air changes per hour positive pressure by a mechanical supply system with “CamPure 8” molecular filters. A controlled spill air path shall be provided. The IT designer shall coordinate with the mechanical engineer for the implementation of this requirement.
- c) All equipment shall be protected against the effects of H<sub>2</sub>S (Hydrogen Sulphide). This includes all bare copper, steel etc including electronics such as protection devices/cards or similar.
- d) All electronics shall be H<sub>2</sub>S resistant and shall be coated with an H<sub>2</sub>S resistant epoxy coating. All electronic circuit boards, including PLC modules and PT modules, shall have conformal coating in compliance with IEC 60721-3-3. Conformal coating shall be to Class 3C2 as a minimum.
- e) Electrical distribution boards feeding general power circuits throughout the building shall not be installed in a MER or TR as per AS/NZS 3084 Clause 6.3.

#### **Support steelwork**

- f) The use of electroplated or galvanized components in a geothermal environment is not recommended, as zinc will undergo accelerated corrosion resulting in its early breakdown.

- g) Any zinc-based coating shall be coated with a suitable industrial paint system ending with an epoxy barrier coat. Where exposed to sunlight, a polyurethane topcoat to provide UV protection should also be applied.
- h) Alternatively, a sealed thermal aluminium metal spray may provide the optimum protection in this environment.
- i) Storage areas
- j) Storage areas for cleaning solvents and other chemical products shall not be used to house cabling equipment and shall not be adjacent to equipment rooms or equipment room vents.

### Wet areas

- k) Computer and networking equipment should not be installed in wet areas or rooms containing hot water cylinders, cleaner's equipment, sinks or basins.
- l) If installation in a wet area is unavoidable, then approval shall be received in writing from the University prior to commencement of installation.

### 7.9.3. Noise

Equipment enclosure locations shall be selected such that noise levels in work areas arising from the enclosed equipment, when combined with other sources of work area noise, shall be maintained within the limits specified by AS/NZS 2107 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

Recommended design sound levels for different areas of occupancy in buildings are given in Table 1 of AS/NZS 2107, from which the following design details are extracted and may also be reproduced with permission granted by Standards New Zealand under licence 001075.

Type of Occupancy / Activity	Design sound Level (LAEQ DBA)		Reverberation Time (s)
	Satisfactory	Maximum	
Computer Room – Teaching	40	45	0.4-0.6
Duplicating Rooms / Stores	45	50	0.6-0.8
Library General Area	40	50	0.4-0.6
Library Reading Area	40	45	0.4-0.6
Student Accommodation Room	30	35	0.4-0.6



### **Table 1: Acoustic Noise Levels**

A noise level calculation should be obtained from all parties installing active equipment in a comms room. This may necessitate architectural or acoustic engineering solutions to be specified.

Further information on acoustics can be found in NZS 6801, NZS 6802, AS ISO 140.4, and AS/NZS ISO 717.1.

Fire Stopping requirements shall take precedence of acoustic treatments.

## **7.10. Legacy systems**

The cabling system design shall consider the interface requirements of legacy equipment in existing installations. If any discrepancies are noted they shall be highlighted in writing to the University or its representative. Specific legacy cabling and equipment requirements are detailed in the chapter pertaining to this work. General requirements are detailed below.

### **7.10.1. Cable removal**

Where practical, all cabling that does not meet the required standard shall be removed from site prior to any new installation.

Consideration shall be given to ensuring a minimal service disruption period during installation. This includes associated pathways and the repair of any building structures because of the removal.

### **7.10.2. Cable management systems**

Existing cable management in an enclosure can be retained and used for new cabling in conjunction with new installations providing this does not compromise the manufacturer's warranty.

## **7.11. Fire rating**

All penetrations made by the contractor through fire rated walls shall maintain fire ratings where wiring goes through fire rated elements.

- a) Fire rated elements and structural members shall not be penetrated without approval from the Property Services or the University's Building Compliance Manager.
- b) All penetrations, vertical and horizontal shall be sealed utilising a system or product, or both, that adheres to all requirements of the relevant specific building design, Standard, University, Local Authority, and New Zealand Building Code regulations
- c) All materials utilised for the sealing of the necessary fire rated risers and walls shall be suitable for the purpose and comply with any Fire Safety Feature Reports that are issued and with all local authority regulations

- d) Where fire rated walls are penetrated a tested and approved fire rated stopping solution shall be utilised that provides for services to be added or subtracted without the destruction of the system such as a Hilti Speed Sleeve.
- e) Vertical risers and penetrations shall be sealed horizontally and utilise an easily removable solution that allows for future expansion and meets with necessary regulations.
- f) Where ladders or trays pass through ceilings, walls and floors provide neat, close fitting apertures. At openings through fire rated elements, terminate the ladders or trays both sides of the opening and provide holes for the cables only. All firewall penetrations shall be fire-stopped with a proprietary product that exceeds the fire resistance of the materials being filled and shall be installed to the manufacturer's specifications. Fire separation products shall be selected, installed and documented as per the University's Campus Passive Fire Guide.
- g) Due to the frequent re-entry requirement of cable path penetrations, selection of passive fire separation products shall prioritise ease of re-entry. Products that require destructive re-entry work and the use of sharp tools around existing cabling to facilitate penetration reuse shall be avoided.
- h) Fire separation penetration systems shall be installed by appropriately qualified personnel who are trained in the installation of the specific product being installed.
- i) Fire safety for buildings must be adhered to under <http://www.legislation.govt.nz/regulation/public/2006/0123/latest/DLM382048.html>
- j) The University will free issue equipment for the correct recording of Passive Fire Separation information which must be returned upon completion of the record taking. Training in the use of this system is available at no cost.
- k) Any penetrations uncovered by the contractor in existing firewalls that are not related to the work being carried out, that are non-compliant shall be notified in writing to the project manager and the University via email to [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz).
- l) Repair work shall be outside the scope of the works being undertaken and shall be the responsibility of the project manager or University to request a variation quotation or organise and pay for the repair outside of the contract.



## 8. ELECTRICAL

The contractor shall refer to the relative chapter of the standards suite for all Electrical requirements and general conditions required by the University when installing any cabling under this suite of standards.

### 8.1. Electrical installation works

Security, Audio Visual, IT and networking installations may require electrical work to be carried out to complete the installation or programme of works. When electrical installation work is required as part of a network system upgrade the following shall apply:

- a) All electrical work shall be carried out by a registered electrician in accordance with the Electricity Safety Regulations, applicable standards and the compliance document for New Zealand Building Code – Clause G8 Artificial light (for equipment rooms and floor distribution locations) and Clause G9 Electricity
- b) A special note should be taken of requirements for the installation of residual current devices (RCD) in New Zealand educational facilities, specifically the requirements laid out in AS/NZS 3000.
- c) Electrical certification documents consisting of Certificates of Compliance (CoC) and/or Electrical Safety Certificates (ESC) and/or Records of Inspection (RoI) shall be issued for all relevant electrical work undertaken.
- d) Electrical test results shall be recorded on CoCs or provided as supporting documents.
- e) Photographic evidence shall be collected for each completed, E2 penetration, cabinet fixing, main pathways and pit/duct installation. This shall include a time and date stamp, and form part of the completed handover documentation supplied to the University or its representative.
- f) Should the contractor identify non-compliant electrical installations, they shall notify the University or its representatives of the non-compliance immediately in writing.

### 8.2. Electromagnetic compatibility

Within New Zealand, there are presently no EMC regulations covering cabling installations and systems. In the absence of regulations, the following cabling installation practices are recommended to limit the risk of interference to other services and the risk of interference from unwanted external emissions.



For unscreened cabling, the EMC performance of the installed cabling is controlled by its 'balance'. Balance is a measure of the control exercised over the physical relationship of individual conductors inside the cable or connecting hardware and is, therefore, a critical parameter during the manufacture of the high-performance cables and connecting hardware used in IT infrastructure - generic cabling.

It is necessary to utilise installation methods that maintain the original balance of the cabling components:

- a) Transmission equipment shall meet the requirements of AS/NZS CISPR 22
- b) Complete systems shall meet the requirements of AS/NZS 61000.6.3.

To facilitate satisfactory EMC performance of the overall GCS the design of cable routes and pathways shall take consideration of requirements detailed in AS 11801.1 and AS/NZS 3084.

In general, it is required that manufacturers of transmission equipment take full account of the contribution of the cabling to the overall EMC of the transmission system. In this case it is necessary to ensure that the performance of the installed cabling channel is within the limits specified by the transmission equipment.

These same separation and compliance rules shall be applied to any Audio Visual or BMS cabling.

## 9. DOCUMENTATION

### 9.1. Design documents and process overview

For cabling solutions designed and installed at UoO sites and facilities, items that shall be in scope include the following:

- a) A formal scope of works document detailing all components, actions, responsibilities, accountabilities, and co-ordination applicable to the cabling deployment for respective projects and in compliance with this standards suite of documents.
- b) Undertake a design process in accordance with New Zealand Construction Industry Council (NZCIC) Guidelines.
- c) Prepare layout drawings and plans detailing the construction of the solution encompassing:
  - i. cabling schematics
  - ii. outlet positioning
  - iii. Equipment space requirements
  - iv. Racks/frames/cabinets/enclosures
  - v. Environmental
  - vi. Security
  - vii. Room or mounting construction
  - viii. Applicable civil services
  - ix. and cable pathways etc.

Subject to specific project-based scope documents, further items that may be encompassed include the following:

- a) Perimeter trunking, floor boxes, cable basket, horizontal cable tray, vertical riser cable tray and umbilical cable managers from ceiling to workstations.
- b) Penetrations through the floor and structural beams.
- c) Fire alarm cabling or systems.
- d) Electrical or automation services.
- e) Telephone system.
- f) Servers, backup systems and uninterruptible power supplies (UPS).
- g) Network switching and other active equipment.
- h) Server room air conditioning.
- i) Wireless equipment, including access points, controllers, RFID tagging etc.
- j) Access control cabling & equipment.
- k) Building Management System (BMS) cabling & equipment.
- l) MATV cabling infrastructure and hardware.
- m) AV active equipment, switchers, converters, projectors, monitors etc.
- n) Telco services up to the point of interface with UoO.
- o) Passive Fire system selection



## 9.2. Final design approval

The design and proposals for all work shall be reviewed and approved by a person with a recognised industry certification with a minimum of 3-years relevant design experience prior to final signoff by the UoO or its representatives.

## 9.3. Contract drawings

When contract drawings are diagrammatic or indicative only, they are not intended for construction purposes. In conjunction with the design requirements described in this specification, the contract drawings are used to show the general layout of the system and to describe the performance requirements.

The quantity and specification of the equipment shown in diagrammatic contract drawings and the associated schedules are typically the minimum requirements only.

## 9.4. Computer Aided Design (CAD) drawings

All drawings shall comply with the requirements using recognised symbols and graphics as identified in AS/NZS 3085.1 and be in Revit (2021 or R21 or later), AutoCAD RL2004 (or later version) .dwg with attribute blocks.

Drawings shall be issued as compressed and secured, if not distributed via the Main contractor portal i.e. Aconex, Procore, iTWOcx etc. (dependant on main contractor's contract management use).

## 9.5. Shop drawings

Shop drawings shall be provided to the UoO or its representative for written approval prior to commencement of site works. At a minimum, the shop drawings shall provide the following:

- a) System type, manufacturer and warranty details
- b) Proposed site, building and floor location of all distributors, controllers, enclosures and cabinets
- c) Proposed cabinet, rack or frame layouts showing dimensioned location of all new and existing cabling
- d) Proposed site pathway plan showing locations for all pit, pipe, cable tray and significant (more than 12 cables) catenary systems.
- e) Floor plans showing proposed location and numbering of all equipment rooms, pathways and outlets
- f) Any proposed changes to the electrical systems and switchboards.

- g) The shop drawings shall take account of site dimensions, actual dimensions and access issues for the installation, builder's works penetrations and servicing of any equipment supplied. The drawings shall also correspond and detail coordination with the building structure, finishes and other services as set out in the design details. Drawings shall be compliant with any requirements from statutory authorities and network companies.
- h) Pit Manufacturer and data sheets shall be submitted along with shop drawings.
- i) A copy of manufacturer accreditation or certification for all contractors that will be working on the respective site.
- j) A copy of current and valid UoO induction for all contractors that will be working on the respective site.

All shop drawings shall be provided and scaled, by the contractor, to present the information within the drawing in a clear and easily viewable layout in .pdf, and either Revit, or AutoCAD format.

That is, a drawing with a high density of devices, endpoints or outlets shall be presented in a scale that allows for all information on each to be read easily without the need to zoom in on the electronic version of the drawing.

All drawings shall be to a scale that will be legible and easy to follow when reproduced on A3 paper e.g., a drawing scaled to an A1 or A2 drawing will be divided into 4 separate drawings.

Equipment room spaces and high-density areas e.g., AV spaces and AV walls. These shall have call outs added to separate drawings e.g., the equipment rooms shall be a call out and added to a separate equipment room space layout drawing.

Shop drawings are **not** to be a direct copy of the design output, they shall be on the contractor's own title blocks with all the above information detailed for review.

Shop drawings shall be utilised by the contractor to ensure all cable runs are within maximum distance for the systems operation and to obtain a warranty. It shall be the responsibility of the contractor to draw to the designer's attention any over length cable runs.

Shop drawings shall be provided with all zoning, outlets, devices, and endpoints labelled. The shop drawings shall be adjusted to match the final build.

## **9.6. Time elapsed**

Due to the time elapsing between the release of new build tender specifications and the installation and construction works for a specific cabling system, it is anticipated that some of the equipment proposed will be superseded by later models by construction time.



The contractor shall review products and confirm the models of all equipment and products proposed with the design engineer one month prior to the procurement and installation of the equipment including but not restricted to all cabling system components and associated ancillary products.

## 9.7. Construction documentation

Installation shall be in accordance with approved construction drawings that shall be produced in accordance with UoO Building Technology Standards Suite.

Construction documentation shall be provided by the Cabling Systems Designer and include the following:

- a) Scaled site and building/floor location plans showing the location and size of pathways and the cables to be installed therein, cable routes, pit locations and enclosure/distributor locations. Drawings will be to a reasonable accuracy, see Figure C1 of AS/NZS 3085.1
- b) Schematic diagrams detailing the quantity and types of cables linking distributors (Backbones), see Figure C2 of AS/NZS 3085.1
- c) Equipment room layouts
- d) Physical enclosure layouts, see Figure C3 and C4 of AS/NZS 3085.1
- e) Sample schematic diagram detailing patch panel layout and port numbering
- f) Physical layout drawings of communications and power outlet positions
- g) Typical pit installation layout
- h) E2 Penetration installation examples
- i) Security components and zones.
- j) AV outlets and associated hardware (if applicable)

For all new works, the designer shall provide designs to the UoO and its representatives and agents in .pdf, and either Revit, or AutoCAD format.

## 9.8. Planning & Design Documentation

IT Build plans shall be provided under the following circumstances:

- a) Addition of >12 TO's.
- b) Addition of any fibre backbone cables.
- c) Addition/Alteration of any TR or ER.
- d) Addition/Alteration of any data cabinet or rack.
- e) Construction of any new building.
- f) Alteration to any existing building that impacts on ICT cable pathways or spaces.



## 9.9. CAD/BIM Elements

Where a project utilises a BIM model, elements that are to be attached to the building, they shall be included in the model. These elements include:

- a) Communications Cabinets
- b) Cable Trays/Basket/Ladder/Containment systems
- c) Penetrations of walls, floors and structural elements
- d) Perimeter Trunking
- e) Telecommunications Outlets
- f) Wireless Access Points
- g) Security components e.g. sensors, sirens, controllers, access control, CCTV cameras etc.
- h) AV components
- i) BMS components
- j) Mechanical components associated with these standards

The specifications detailed in the project's BIM execution plan shall be followed.

## 9.10. Schematics

The following schematics shall be produced:

- a) Backbone cabling schematic
- b) Rack layout diagrams

## 9.11. Specifications

A detailed specification shall be prepared to accompany plans and schematics. The specification shall reference this document and any other relevant standards to be followed.

## 9.12. As Built Documentation

The specific cabling discipline contractor shall provide comprehensive documentation to University of Otago within 20 working days of practical completion. This documentation includes:

- a) Electronic copies of all test results for all installations
- b) Electronic floor plans showing outlet, device and endpoint locations, and their designations
- c) Warranty and certification information where applicable



- d) Rack layout diagrams
- e) Patching schedules

The contractor shall provide a system and application warranty covering the installed cabling system against defects in workmanship, components, and performance, and follow-up support after project completion.

The relevant site, building, floor and any detail plans or diagrams shall be provided in an acceptable format and shall contain all information required for the specific project scope. This information shall be compiled and supplied to the UoO project manager (or nominee) within two weeks of the practical completion of the works.

### **9.12.1. Content**

The documentation shall include the following information:

- a) Declaration of Conformity to the applicable standard.
- b) Site and building or floor location plans showing the location and size of pathways and the cables installed, cable routes, pit locations and enclosure and distributor locations
- c) Schematic diagrams detailing the quantity and types of cables linking distributors
- d) Physical enclosure layouts
- e) Schematics of patch panel layout and port numbering.
- f) Physical layout drawings for GCS detailing outlet positions (TOs, TEOs, SOs and GPOs) and identification numbers
- g) Physical layout drawings for security detailing zones, sensors, sirens, access control components, CCTV and their identification numbers.
- h) Description of the patching system and the labelling system used
- i) Equipment lists detailing the installed equipment (type/make/model) including racks, enclosures, patch panels, and outlets
- j) Test reports detailing procedures, equipment configuration, and test results (in the test equipment native format) for both balanced copper and optical fibre cable.
- k) Manufacturer 25-year warranty certificate for GCS and ABF solutions.
- l) Manufacturer warranty letter detailing what is covered by the warranty
- m) Photographic evidence shall be collected for each completed firewall penetration, E2 penetration, cabinet fixing, main pathways and pit/duct installation. This shall include a time and date stamp, and form part of the completed handover documentation supplied to the University or its representative.
- n) As-built drawings detailing final outlet layouts i.e. encompassing any mid project moves, additions and changes.





- o) GCS as-built drawings detailing cabinet, frame, and rack layouts.
- p) GCS as-built drawings detailing the configuration and labelling of voice patch frames.
- q) GCS as-built drawings detailing the final termination of all backbone cabling.
- r) CCTV Camera field of view shall be provided on as-built.

### 9.12.2. Submission of as-built documentation

As-built documentation shall be provided to the:

- a) UoO IT Department via email to [its.infrastructure.networking@otago.ac.nz](mailto:its.infrastructure.networking@otago.ac.nz) Should files exceed 10Mb, then a link to OneDrive or other secure link shall be provided for a minimum of 30 days to permit the University to download the files for storage.
- b) UoO Approved Cabling Manufacturer for warranty application purposes.
- c) Primary Contractor for inclusion into the O & M Manual

And shall also be provided to the following:

- a) A copy to the design consultant for review and sign-off

The Contractor shall refer to the Documentation section of this document for additional requirements.

For all new works, floor plans showing outlet, device or endpoint locations and numbering, these shall be able to be read in AutoCAD 2012 and PDF format, or as otherwise agreed with the UoO project manager.

### 9.13. Maintenance of As Built Documentation

When any cabling alterations are made to a site, the Project Manager shall submit the As Built Documentation within 5 working days:

Document	Details	Format
Civil Drawing Update	To be updated if any external ducting is added or amended.	DWG format
WAP Plans	To be updated if any wireless access points are moved, removed or added.	PDF format*
Communications Outlet plans	To be updated if any data outlets are moved, removed or added.	PDF format*

Document	Details	Format
Rack Layout	To be updated if cabinet layouts have changed i.e. added patch panel	PDF format
Cabinet Record	To be updated if cabinet has been added	XLSX format
Patching Schedule	To be updated after every mac/patch change or addition.	XLSX format
Fibre Test Results	New fibre test results added to register.	PDF format
Copper Test Results	New outlet cabling test results added to register.	PDF format



## **A APPENDIX A: HERITAGE SITES**

(Informative)

### **A.1 General**

The University has objects such as buildings or trees that may have a heritage status or be deemed as protected by a local or regional council.

Information is often not easy to find and can be in various places depending on the local or regional council. In addition to the heritage status and council designation the site may also be recognised as an archaeological site or one of significant Māori heritage.

If a building is suspected of heritage status the following information can be used to determine the relevant details. Contact the Head of IT Infrastructure to request any heritage building information.

### **A.2 Historical Sites**

Historic sites are registered in the New Zealand Historic Places Trust (NZHPT). The NZHPT has a regulatory role regarding protected historic places, archaeological sites and sites of importance to Māori and can bring prosecutions under the Historic Places Act 1993

There is likely to be historic significance if the building was built pre-1930s.

The designer will need to search the Historic Trust's register located at <http://www.historic.org.nz/theregister>.

It is useful to search the suburb or town to ensure that all historic places in the area are captured. Care needs to be taken when dealing with suspected historic places.

Confirmation from the University is not sufficient and if heritage significance is suspected, confirmation in writing from the NZHPT shall be received.

### **A.3 Archaeological Sites**

An archaeological site is defined in the Historic Places Act 1993 as any place associated with pre-1900 human activity. Any works that may affect an archaeological site shall have written authority from the NZHPT before work begins.

Archaeological sites may be listed in the NZHPT register or, in a council district plan, or council database. If in doubt, contact the NZHPT at [archaeologist@historic.org.nz](mailto:archaeologist@historic.org.nz) AND the relevant council.

### **A.4 Māori Heritage**

Māori heritage can be divided into the physical/tangible, natural and intangible. The NZHPT employs specialist Pouārahi (Māori Heritage Advisors) and other staff based in its offices in Kerikeri, Auckland, Tauranga, Christchurch, and Wellington.



If the site (or locations within the site) is suspected as of Māori Heritage then contact the NZHPT for advice on proceeding further. This may be necessary around a marae (particularly if it is an old site), or if old carvings are present (for example).

## **A.5 Council Designation**

The NZHPT does not manage all historic places and many of them are managed by the local or regional council.

Councils have responsibilities under various pieces of legislation for heritage management and protection, notably the Resource Management Act, Historic Places Act, Building Act and Local Government Act.

Sites may be protected under a council designation and each council and region has a difference database and method of accessing that database. Some councils only have these listed in their district plan and other councils may not have digital records or a searchable database.