Information and Communications Technology Cabling Standard

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Information and Communications Technology cabling standard

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For more information contact:
Digital Architecture, Strategy Architecture and Information Services Branch, eHealth Queensland, Department of Health, GPO Box 48, Brisbane QLD 4001, email: ehealtharchitecture@health.qld.gov.au , phone (07) 3170 4946.

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The Queensland Health ICT cabling standard has been approved by Architecture and Standards Committee at the 10 May 2023 meeting.

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Advisory

The Information and Communications Technology Cabling Standard (ICTCS) includes mandatory requirements imposed under legislation intended to ensure the safety of Queensland Health personnel and its clients, cabling providers, carrier staff and the general public.

Therefore, eHealth Queensland operational staff and cabling providers are reminded that metallic telecommunication conductors, earth connections, metallic parts etc. may at any given time, be at a voltage that exceeds the telecommunication network voltage (TNV) rating of AS/NZS 60950.1.

Examples of an overvoltage condition may include:

a) Contact with alternating current (AC) mains power through equipment failure or cabling faults

b) Power feeding

c) Surge currents and induced voltages through power system faults or lightning.

Accordingly, eHealth Queensland operational staff and cabling providers working on, or with, Queensland Health cabling are advised to treat the metallic parts of a telecommunication installation as potentially harmful.

Preface

About the standard

The goal of the Queensland Health Information and Communications Technology Cabling Standard (ICTCS) is the cost effective design and construction of communication distribution infrastructure, built on low voltage cabling systems, at Queensland Health owned and leased facilities that:

i. complies with Commonwealth and state law
ii. complies with relevant Australian and International Standards
iii. complies with QGEA ICT Cabling Infrastructure Policy and Technical Standard
iv. complies with Queensland Health ICT Cabling Protocol and with the ICTCS (this document)
v. best accommodates implementation of current and future agency communication needs with the least amount of change and disruption to operations
vi. uses best practice
vii. is designed and constructed to obtain value for money.

The ICTCS provides the requirements for:

i. Architects, engineers and designers required to produce the necessary designs for installation, testing and commissioning of telecommunication distribution systems at both Queensland Health owned and leased facilities. These designs blueprint new, remodelled or refurbished Queensland Health facilities where telecommunication infrastructure currently exists or will be installed. The sections of this standard relating to design are typically policy, introduction and design and performance.
ii. Designers required to develop cabling designs. Contractors and installers responsible for the appropriate construction and installation of telecommunication distribution systems and materials specified for Queensland Health owned and leased facilities. The section of this standard relating to construction is typically Installation.

It is the responsibility of the project manager to coordinate with the other built environment disciplines (architectural, electrical, mechanical HVAC etc.) to determine that these others systems are compatible with, and complementary to, the ICT cabling system and the workings of ICTCS. It is also the responsibility of other built environment disciplines (architectural, electrical, mechanical HVAC and so on) to reciprocate.

If a conflict cannot be resolved, a decision may be made not to connect the site to the Queensland Health ICT network.

This standard includes mandatory requirements which are identified by the words “shall” or “shall not”. All other references are recommendations only.

Intent of the Standard

Standardising cabling design and construction is necessary to ensure the safe operation and successful performance of the complex systems intrinsic to large health care organisations such as Queensland Health. These systems are highly dependent on low voltage cabling for their reliable and sustained operation.

This standard detail the minimum requirements for a Queensland Health facility so that other enterprise system designs can be made based on these minimum outcomes. Failure to meet these minimum requirements may have detrimental consequences for other enterprise systems.

The intent of ICTCS is to:

i. promote system design and construction consistency
ii. advance conformance to the physical connectivity requirements of systems
iii. provide structured communication facilities that enable efficient system expansion
iv. provide uniformly documented systems
v. ensure the safety of system operators.

ICTCS is an agency standard based on compliance with QGEA ICT Cabling Infrastructure Policy and Technical Standard:

i. Queensland Health is obligated through legislation to comply with QGEA ICT Cabling Infrastructure Policy and Technical Standard
ii. AS/ACIF technical standards address safety requirements and product suitability, AS/NZS standards are intended to ensure system performance by providing installation requirements and guidelines. The need to comply with these standards is embodied in QGEA ICT Cabling Infrastructure Policy and Technical Standard.

Adjunct to the Australian standards, Queensland Health regards the material contained in the latest revision of the following publications from Building Industry Consulting Services International (BICSI):

i. BICSI Telecommunications Distribution Methods Manual (TDMM)
ii. BICSI Outside Plant Design Reference Manual (OSPDSM)
iii. BICSI Information Technology Systems Installation Methods Manual (ITSIMM)
iv. BICSI Data Centre Design and Implementation (ANSI/BICSI 002-2014)
v. BICSI Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities (ANSI/BICSI 004-2012)

as a valued source of practical information and the basis for establishing sound telecommunications distribution design and construction materials, methods and practice.

Unless otherwise stated, the requirements defined in the Queensland Health ICTCS apply to new construction, refurbishment, remodelling and relocation projects for

Queensland Health owned and leased facilities, and for ICT cabling moves, adds and changes.

The ICTCS uses many terms and abbreviations that are common in the ICT cabling industry. While a glossary is included in this standard, please refer also to the glossary of the BICSI manuals for further, more detailed information.

The requirements contained in the ICTCS are considered to be in addition to any of those listed in legislation and standards. Where conflicting requirements are encountered, the order of precedence of documents contained in section 1.11 *Precedence of documents* shall apply.

ICT cabling built environment

The scope of the Queensland Health built environment for ICT cabling is based on ratified standards and covers telecommunications distribution systems using a physical hierarchal star network topology for transporting communications signals.

The environment covers telecommunication distribution systems supporting medical[1] grade networks, carrying voice, data, video, audio, security, imaging, medical telemetry and environmental control for transporting information between and throughout Queensland Health owned and leased buildings, on the customer's side of the network boundary.

The agency's telecommunications distribution systems include:

Table 1 Typical Queensland Health ICT cabling systems and applications

- copper and optical fibre horizontal, building and campus backbone systems and their pathways
- spaces and raceways and cable media
- patch panels/cords
- connecting blocks
- fire-stopping
- grounding and bonding
- electrical transient suppression
- cable support
- telecommunications outlets
- adaptors (i.e. baluns)
- connectors, and associated hardware
- modular furniture soft wiring

1 Medical grade networks are designed and engineered to deliver a high level of security, availability and productivity and to ensure interoperability across each functional area of healthcare, demanding compatibility between telecommunication systems planned for, or designed and constructed to utilise, different cabling technology, providing varying degrees of signalling performance. Medical grade networks are critical not only to patient care, but also for regulatory compliance mandated for healthcare. As Queensland Health deploys new systems and capabilities, additional capacity planning shall be undertaken. The department's adoption of Quality of Service technologies has partly addressed the capacity issue, providing greater bandwidth utilisation on high traffic links. It is expected that with greater efficiencies and availability increased bandwidth demands will become more and more a reality. The design and construction of the cabling solutions to support medical grade networks shall provide the performance capability to meet the expected continued growth in demand for increased signalling speeds, within the solution life cycle.

- work areas
- distribution frames and cabinets.

Also in scope is the outside cabling plant owned and/or installed by, or on behalf of, Queensland Health beyond its designated property boundaries, including dark optical fibre.

ICT cabling systems and applications

Queensland Health currently supports a number of applications that rely on different ICT cabling systems for transportation. Table 1 *Typical Queensland Health ICT cabling systems and applications* lists typical Queensland Health applications dependent on a wired infrastructure, to varying degrees, for signalling:

- Voice
- Data
- Nurse call
- Duress alarm
- Patient monitoring
- Pathology imaging
- Diagnostic health
- Video conference
- Closed circuit television (CCTV)
- Security
- Building management
- Access control
- Wireless access
- Paging
- Community antenna television (CATV)
- Master antenna television (MATV)
- Fire*

Today, it is possible to provide a common cabling distribution system to reduce construction (CAPEX) and operational expenditure (OPEX) costs and to create a facility that can provide substantial health care benefits throughout its economic life. Where practical, consideration should be given to providing the capability for the integration of discrete low voltage systems, their points of integration and their common types of terminations.

***Note: Fire systems are an exception and shall remain as separate and distinct systems due to code requirements.**

Compliance – Laws, standards and policies

This standard, Information and Communications Technology Cabling Standard (ICTCS), applies to all parties completing work for a Queensland Health site.

eHealth Queensland shall be responsible for developing and promulgating appropriate standards on behalf of Queensland Health for the provision of communications cabling plant which is used to support all Information and Communication Technology (ICT) services in sites occupied Queensland Health.

Implementation

Queensland Health shall be responsible to ensure the accuracy and currency of the ICT cabling standard, and:

- shall implement and maintain current 'as installed' documentation for all sites where ICT cabling has been installed. All cabling works shall be audited and documented in accordance with the QGEA ICT Cabling Infrastructure Policy and Technical Standard and the ICTCS.
- shall ensure the involvement of eHealth Queensland nominated regional personnel in the Working Party for campus or building development, refurbishment projects and to inspect and report on ICT cabling as required.
- shall be responsible for the engagement and management of all cabling contractors employed for installing, repairing or removing ICT cabling plant within Queensland Health sites (with the exception of Capital Infrastructure Delivery Unit (CIDU) projects).
- shall maintain within eHealth Queensland, an appropriate level of certified cabling design capability to administer Queensland Health's ICT cabling requirements and obligations, for ICT cabling requests, design, installation and audits as specified within this standard.

Consultants and designers, either internal or external of Queensland Health, shall adhere to all the requirements of the ICTCS.

ICT cabling compliance

All communication distribution infrastructures shall comply with all relevant documentation. Conflicting information shall be governed by reference to the latest editions / drafts / replacements of the following documents in descending rank order:

- relevant Australian government legislation and regulation (e.g. *Telecommunications Act* 1997 (the Act), AS/ACIF S008:2010 and AS/ACIF S009:2013) etc.
- relevant Queensland government legislation and regulation (e.g. Queensland Workplace Health and Safety regulations) etc.
- QGEA ICT Cabling Infrastructure Policy and Technical Standard
- Queensland Health ICT cabling protocol and the Queensland Health ICT cabling standard

- site specific design specifications
- relevant Australian standards
- relevant International standards

Roles and responsibilities

The ICT cabling protocol and this associated standard shall be used by:

- Architects, engineers and designers to produce the necessary designs for installation, testing and commissioning of telecommunication distribution systems at both Queensland Health owned and leased facilities. These designs blueprint new, remodelled or refurbished Queensland Health facilities where telecommunication infrastructure currently exists or will be installed.
- Designers to develop cabling designs. Contractors and installers are responsible for the appropriate construction and installation of telecommunication distribution systems and materials specified for Queensland Health owned and leased facilities. The section of this standard relating to construction is typically Installation.

All cabling works shall be audited and documented in accordance with the QGEA ICT Cabling Infrastructure Policy and Technical Standard and the Queensland Health ICTCS.

eHealth Queensland shall be responsible to facilitate and/or insure the protocol and standards are provided to all tendering contractors for inclusion in the contractor's tender proposals or quotations.

Consultants and designers, either internal or external of the department, shall adhere to all the requirements of the protocol and standard.

The project manager and designer shall coordinate with the other built environment disciplines (architectural, electrical, mechanical HVAC etc.) to determine that these others systems are compatible with, and complementary to, the ICT cabling system and the workings of ICTCS. It is also the responsibility of other built environment disciplines (architectural, electrical, mechanical HVAC and so on) to reciprocate. If a conflict cannot be resolved, a decision may be made not to connect the site to the Queensland Health ICT network.

Working party

The working party for all Queensland Health ICT cabling work shall be formed, at the commencement of the work, and coordinated by the Queensland Health / eHealth Queensland project manager assigned to the project. This working party should include personnel comprising, as a minimum, a suitably qualified and experienced representative from eHealth Queensland, with the project manager providing first level consultancy. The project manager shall subsequently coordinate the involvement of other eHealth Subject Matter Experts (SMEs) if required. Where more specific technical advice and guidance is required, the architects and engineering firm shall

engage the services of the designer and a nominated representative of eHealth Queensland or a design reviewer to ensure compliance to the protocol and standards.

Notwithstanding the creation of the working party as stipulated above, the change to the network infrastructure shall occur through the formal change process under the control of the nominated request for change (RFC) manager and the assigned project manager.

The project manager shall ensure the working party that the project:

- adheres to departmental and Queensland Government cabling standards.
- defines all ICT cabling requirements, numbers and locations.
- communicates the departmental policy, standards, and operational procedures to all members of the working parties and subsequent contractors.
- is responsible for the quality of initial plan.
- satisfies client requirements.
- ensures that variations to the approved design are subject to agreed configuration management and change control procedures.
- ensures any ICT exemption requests are dealt with speedily and efficiently.

Duty of care for design and construction

There is a due care and skill requirement in the design and construction of ICT cabling systems, which includes, but is not limited to:

- ensuring that the design focusses on the future operability of the site such that future moves, adds and changes are not compromised by building design.
- ensuring adequate protection is provided to the cabling infrastructure where it is reasonable to expect that any part or all of it might be damaged, caused to malfunction, be tampered or interfered with, resulting from: misadventure, vandalism, system failure, exposure to the weather (including direct sunlight), water, excessive dampness, corrosive fumes, an accumulation of dust, steam, oil, high temperature, or any other adverse conditions and/or contaminates which may be reasonably encountered during their use.
- familiarisation with the site environment and the impact this may have on the effective and efficient operation, maintenance and support of the ICT cable system. This is critical where the contractor has discretion in the location and placement of ICT cabling.
- obtaining all approvals from third parties (such as the building owner, local authority etc.) and keeping the project manager informed in writing of the progress of the applications by providing the project manager with written copies of the approvals once they are granted.
- accountability exists under the QGEA ICT Cabling Infrastructure Policy and Technical Standard to administer and maintain the agency's records and documentation for Customer Premises Cabling (CPC) installations, pursuant to the Financial Accountability Act 2009.

- ensuring items and materials used in the construction of ICT cabling systems are fit for their purpose, subject to the following limitations:
    - Queensland Health has specified or effectively specified the item or material to be used by nominating a supplier.
    - To the extent that the relevant details of Queensland Health's requirements have been made known to the contractor.

Upgrading ICT cabling infrastructure to support new technology

Queensland Health may install new technology at a facility where the existing ICT cabling infrastructure is inadequate for a new application. It is the responsibility of the sponsor, or business unit, undertaking the installation of the new technology to ensure that the existing ICT cabling infrastructure is capable of supporting the new technology, or that it be upgraded to support the new technology. Any upgrades shall meet the requirements of the ICTCS.

Upgrading ICT cabling infrastructure to meet new standards

Unless an upgrade is required to correct a statutory standard or code violation, address a vendor warranty issue, deal with a security concern or to correct an operational problem, there is no requirement to upgrade existing ICT cabling infrastructure at any Queensland Health facility simply to meet enhanced industry standards or requirements of the standards. However, an upgrade may be required where the minimum requirements of QGEA ICT Cabling Infrastructure Policy and Technical Standard cannot be met.

Nevertheless, upgrades to existing buildings or entire campuses may be required to correct deficiencies in the ICT cabling infrastructure that was improperly designed and/or installed prior to development and enforcement of the Queensland Health ICTCS.

An upgrade may also provide an additional advantage over an existing infrastructure (i.e. shielded systems for PoE+ applications to reduce heat generation and potential accelerated degradation of an existing cable plant).

Additional problems can occur within telecommunication systems when subsequent installations of electrical cable and/or equipment fail to follow statutory clearances for EMI reduction in accordance with AS/ACIF S009. In these situations, it may be necessary to change/rearrange the electrical cable/equipment or ICT cabling infrastructure to alleviate the problems.

Individual components may be upgraded and/or replaced, and while the whole facility is not required to be upgraded to meet this standard, an ICT exemption shall be required to identify which components are not up to standard.

Design and construction work using Queensland Health personnel

An engineered telecommunication design shall be required for all new construction, major renovation, remodelling or relocations, including telecommunication services specifications and drawings to be used as the basis for the design and construction. An engineered telecommunications distribution design shall also be developed for projects where Queensland Health personnel will be used for design and construction.

Queensland Health shall require the use of a designer to design the telecommunications distribution infrastructure for all new construction, major renovation or remodelling, major telecommunications upgrades, and all telecommunications distribution infrastructure work performed by Queensland Health personnel. Designers are typically employed by architectural and engineering firms and Queensland Health.

Telecommunications distribution infrastructure shall be designed and installed in accordance with relevant Australian standards, industry best practice and codes. Due to the special-use characteristics and security requirements of many Queensland Health facilities, some technical design solutions are better suited than others. This standard identifies which design solutions are appropriate for and approved for common types of buildings and areas at Queensland Health facilities.

Telecommunications distribution infrastructure design shall be incorporated during the preliminary design phase of each project. This will provide Queensland Health the opportunity to influence the design from the start to address telecommunications requirements at appropriate points in the design process.

The architect and engineering firms shall work closely with the designated project designer and the Queensland Health project manager from the start of each project through completion. The architect and engineers shall include both the designer and the Queensland Health project manager in all design and construction meetings.

Telecommunications distribution infrastructure installation projects may be large Queensland Health projects to establish or replace outmoded or failing infrastructure or in preparation for the installation of new technology, or a separate project concurrent with a locally managed project.

For projects or installation of additional cabling, a contractor may be engaged for the installation. The contractor shall be on the approved list maintained by eHealth Queensland, and shall be currently listed as a prime-contractor on the Queensland Health SOA for ICT Cabling Products and Services panel.

An alternative, on small projects (containing less than twenty-four (24) TO’s considered to be service or moves, adds and changes (MAC) works, using a SOA prime-contractor (for copper cabling installation only) or local Queensland Health personnel (cablers) who shall:

- hold an ACMA open cabler registration with the relevant speciality competencies, i.e. structured cabling or optical fibre.
- be a current, verified certified installer for the particular structured cabling system.
- perform field testing to the testing requirements of this standard.
- comply with all requirements of this standard

A specialised designer is not required where:

1. The structure of the building does not require modification
2. Floors or firewalls do not require penetrations
3. Quantity of cables does not exceed the growth capacity of the cable support structure present
4. Only catenary from the primary cable support to the outlets is being installed (cable basket or tray is not required)
5. Cables are being installed into existing ICT racks.

Exceeding any of the five limits above are catalysts for requiring the services of a RPE and or RCDD (discipline dependent) to ensure that the proposed design meets all engineering requirements in line with standards, codes and regulations. RCDD's and RPEs shall advise if the services of other specialists, RPEs or RCDDs are required. The site BEMS department and local eHealth Queensland Digital Partnership Team are to be contacted by the installers for details and approvals in regards to any building alteration works and capacity issues prior to works commencing.

There shall be no exceptions to these requirements in this situation.

If Queensland Health staff are undertaking the installation, the line manager of the installation staff shall comply with the ACMA Industry Code - cabling requirements for business in relation to the ICT cabling installation staff they have under their control, the cabling work they perform and the cable records management. (Refer to cable records management). Queensland Health staff shall not install unterminated fibre and shall not install fibre outside a telecommunications room. This allows for suitably qualified, accredited Queensland Health personnel with the appropriate ACMA endorsements to install 'plug and play' optical fibre cabling within an equipment room in accordance with the requirements of this standard. For cabling works directly engaged by Queensland Health, installation contractors not listed on the Queensland Health SOA for ICT Cabling Products and Services panel as a prime-contractor shall not be used without first obtaining written approval from the eHealth Queensland Contracts and Procurement Manager.

Cable records management

It is imperative that business units are fully cognisant of the issues and the ramifications for the organisation in its quest for best practice in the management of its cabling records. To adequately meet the records management requirements business units shall have sufficient capacity and the capabilities to effectively enable:

a) Compliance management

ICT cabling also known as Customer Premises Cabling (CPC) is one of the most regulated sectors of the telecommunications industry. Regulation means organisations, including public corporations like Queensland Health, who are subject to a range of accountability and management measures designed to provide more commercial focus, greater operational freedom, management independence and accountability. Regulatory regimes operate in both state and federal jurisdictions enacted by laws that mandate compliance across the full gambit of CPC activities.

The on-going management of Queensland Health CPC requires programs that enable compliance with its legal obligations, as well as any other relevant obligations such as industry and organisational standards, principles of good governance and accepted community and ethical norms. Also, the underlining management principles cover commitment to achieving compliance, implementation of compliance programs, monitoring and measuring of compliance, as well as continuous improvement.

Effective compliance outcomes rely on Queensland Health continually meeting its legal obligations and responsibilities through the adequate recording and documentation of cable information via:

i. Accountability exists under the QGEA ICT Cabling Infrastructure Policy and Technical Standard to administer and maintain the agency's records and documentation for CPC installations, pursuant to the *Financial Accountability Act.*

   With regard to the maintenance of records, QGEA ICT Cabling Infrastructure Policy and Technical Standard states "*Records should be kept in a manner which permits them to rapidly satisfy queries on any aspect of the installation which they cover. Although paper-based records have been used previously, Campus ICT centres are to implement computer-based records, with graphics and CAD representation, as a high priority strategic investment*".

ii. Accountability exists under the technical standard *AS/ACIF S009:2013, "Installation requirements for customer cabling (Wiring Rules)*" to protect the integrity of, and provide safety for persons working on or operating, telecommunication networks or facilities, subordinate to the *Telecommunications Act 1997 Part 21 s376* (Cth)(the Act). In complying with this statutory requirement, the identification, recording and retrieval of cabling data is crucial in supporting the proper and safe end-to-end functioning of Queensland Health connected telecommunication networks or facilities. Part 21 s446 and s447 of the Act have provision for the disconnection of telecommunication services, if, the manager of the network or facility has an honest belief that the cabling is, or is likely to be, a threat to the health or safety of persons, the ready identification of installed cabling is essential.

iii. Accountability exist under the AMCA Industry Code "*Cabling Requirements for Business"* (the Code), pursuant to the Telecommunication Act 1997 Part 6 s121 and s122 (Cth). The code of practice places obligations on entities (known as Cabling Service Operators, which includes Queensland Health line managers) that contract or are otherwise engaged in cabling activities, but are not covered by the cabling provider rules (CPRs). These obligations augment the responsibilities placed on individual registered cablers by the CPRs. In complying with the code rules line managers shall record specific information pertaining to the registered cablers under their control and the cabling work they perform. There is also a responsibility to record information regarding the work performed by unregistered cablers under the direct supervision of a registered cabler. This information is subject to regular audit by the ACMA.

Request for an ICT exemption

The standard identifies specific design solutions intended to meet the technical requirements of Queensland Health. Designs not consistent with the requirements in this standard shall require prior approval through the exemption request (ER) process. Requests to deviate from specified standards will be considered on a case-by-case basis. Any request to deviate from statutory standards shall not be accepted.

Requests for exemptions shall be submitted in writing using the *ICT Policy Dispensation Process* for consideration. The requestor shall forward a duly signed copy of the request, if accepted by the business, to eHealthArchitecture@health.qld.gov.au for consideration along with any supporting documentation such as drawings and costs/benefits analysis. Upon consideration, eHealth Queensland will return to the requestor a written record of the decision, approving the exemption or otherwise. The exemption process should be initiated and managed by the project manager. Where an exemption is provided resulting in a different cabling requirement, all providers will have the option to provide either the original solution or the new solution allowed under the exemption.

The project manager (or designer) shall provide evidence in writing demonstrating how the proposed alternative design, resulting from the exemption, meets the applicable performance requirements, and identifying any performance limitations, disadvantages and benefits from using the alternative design. Any risks and proposed mitigations should be recorded in the appendix of the exemption request.

The project manager shall be responsible for properly conducting the ER process. For projects where the project manager is not the accountable person, the accountable person shall be responsible for properly conducting the ER process, and shall participate in the process (review, acknowledge and address issues) to determine that Queensland Health business requirements are met.

Registered to practice

Where legislation requires board registration of an individual to practice in a profession, work of the profession shall not, under any circumstances, be performed by others providing design and construction services to Queensland Health.

The relevant legislation includes:

- Architects Act 2002 s10 (Qld)
- Professional Engineers Act 2002 s10 (Qld).

Licensed to work

Where legislation requires work to be performed by a licensed person, the work shall not, under any circumstances, be performed by others providing design and construction services to Queensland Health.

The relevant legislation includes:

- Telecommunications Act 1997 (Cth) s420 (Cth)
- Electrical Safety Act 2002 s20 (Qld).

1. Introduction

a) This standard and its attachments describe the minimum requirements for the:

   i. responsibilities
   ii. design
   iii. performance
   iv. installation
   v. testing
   vi. audits
   vii. documentation

   of all campus, backbone and horizontal ICT cabling and associated hardware used throughout Queensland Health.

b) Specification documentation including plans, cabinet layouts etc., for cabling works performed in Queensland Health sites shall be submitted to the eHealth Queensland Infrastructure Management Assurance. eHealth Queensland will respond with recommendations. This process will continue until the design is endorsed. ICT cabling works shall not commence on any site without the endorsement of eHealth Queensland. This technical document is to be read in conjunction with the documents listed in section 1.11 *Precedence of documents*. All employees, manufacturers, accredited installers, contractors and consultants involved in Queensland Health ICT cabling projects shall:

   i. comply with this standard.
   ii. have a copy of this standard with them while on site or access to an electronic copy on site.
   iii. contact eHealth Queensland:
      - if they identify any errors, omissions or multiple meanings / interpretations
      - to clarify/confirm site specific information (contained in site information database)
      - to confirm that they are working to the latest version of this standard before proceeding.

1.1 Precedence of documents

a) All parties shall ensure that all work performed at Queensland Health sites comply with all relevant documentation, some examples of which are listed below. Conflicting information shall be governed by reference to the latest editions / drafts / replacements of the following documents in descending rank order:

   i. Relevant Australian government legislation and regulation (e.g. Telecommunications Act 1997 (the Act), AS/ACIF S008:2010 and AS/ACIF S009:2013) etc.

ii. Relevant Queensland government legislation and regulation (e.g. Queensland Workplace Health and Safety regulations) etc.

iii. QGEA ICT Cabling Infrastructure Policy and Standard

iv. Site specific design specifications

v. The Queensland Health ICT cabling protocol and the Queensland Health ICT cabling standard

vi. Relevant Australian standards to be found in the CCM Package-2007: Communications Cabling Manual (Volumes 1 and 2)

vii. Relevant International standards.

1.2 Site information database

a) The site information database is managed by eHealth Queensland and stores the following details about a site:

i. Name of the site (e.g. Royal Brisbane and Women's Hospital)

ii. Short site name (e.g. RBWHS)

iii. Classification of site (e.g. tertiary, secondary or primary health care facility)

iv. Name of the building or buildings and labelling identifier

v. Street address

vi. Site contact (name and telephone number)

vii. eHealth Queensland contact (name and telephone number)

viii. Workplace Health and Safety contact (name and telephone number)

ix. Manufacturers' products installed

x. Telecommunications outlet labelling information

xi. As-built documentation, test results, Visio floor plans, TCA1 forms, acceptance tests.

b) The accredited installer shall contact the project manager for up-to-date details about any site prior to starting work. If the accredited installer finds any details incorrect the project manager shall be informed in writing so that the database can be updated.

c) Queensland Health does not warrant the timeliness or accuracy of, or accept liability for, the site data provided to a third party either directly or indirectly.

d) At practical completion an approved ICT cabling auditor will inspect the works, provide acceptance or list defects for rectification. If any defects are found, once rectified, reinspection will occur and acceptance of works from the project manager will be provided, prior to addition to the site information database. Refer to section 10.4 *Progress audit*.

1.3 ICTCS stakeholders

1.3.1 Contractors

a) For the purpose of the ICTCS, the organisation or individual that contracts with Queensland Health for the design and /or construction of ICT cabling and / or supporting infrastructure for Queensland Health building, campus or other facilities.

1.3.2 Architects and engineers

a) For the purpose of the ICTCS, the company, organisation or firm including their employees principally contracted for providing architectural and engineering services for a project and typically assigned responsibility for the design of the telecommunications distribution system, including consultation and design/construction drawings and specifications.

1.3.3 Project director

a) For the purpose of the ICTCS, the person assigned by Queensland Health to supervise and coordinate both those projects and project managers under their control.

1.3.4 Project manager

a) For the purpose of the ICTCS, the person assigned by Queensland Health with the objective to ensure the project design of the telecommunications distribution systems and ICT cabling for Queensland Health facilities meet the requirements of both the ICTCS and the functional requirements of each individual Queensland Health business unit.

1.3.5 Recognised designer of telecommunication distribution systems

For the purposes of this standard, the recognised designer of telecommunication distribution systems or the designer shall:

a) be a registered communications distribution designer (RCDD) or be a registered professional (RPE) with at least two (2) current cabling vendor design certifications. Cabling design certifications should include design, a certified copy of the certification curriculum, and shall be provided for verification. A verifiable certificate from each manufacturer clearly stating the designer's name and date of certification as well as continuing education requirement satisfaction shall also be required to maintain their registration for the duration of any Queensland Health ICT cabling project they are working on.

b) be responsible to apply the guidelines, instructions, and requirements in this document in the course of designing a fully compliant telecommunications distribution infrastructure at Queensland Health facilities.

c) be in good standing and maintain their registration for the duration of any Queensland health ICT cabling project they are working on.

1.3.6 Design reviewer

a) The design reviewer will be responsible to review the overall design, paying particular attention to areas of the design that are related to the current or future operation and maintenance of the telecommunications distribution system including low voltage systems other than voice and data.

b) The design reviewer shall meet the requirements of section 1.3.5 a) *Recognised designers of telecommunications distribution systems.*

c) The design reviewer will identify issues that do not appear to be compliant with the requirements in the ICTCS.

d) The design reviewer shall not perform any design services.

e) Other services (upon specific Queensland Health request):

   i. On some projects, Queensland Health may also use a design reviewer to provide services during the construction phase. These services may include tender review and construction observation services. In these situations however, the designer always remains responsible for tender review, construction observation, and other standard services.

   ii. In these situations, the design reviewer shall provide written comments to Queensland Health and to the designer.

   iii. In turn, Queensland Health will decide how to act on the written comments, and then direct the architects and engineers, the designer or the accredited installation company and their installers accordingly.

   iv. The design reviewer shall not, under any circumstances, give direction to the architects and engineers, the designer or accredited installation company and their installers.

1.3.7 Accredited installation companies

a) Only cabling companies who have the following may install cabling work for Queensland Health:

   i. Current Government Information Technology Conditions (GITC) accreditation, and

   ii. Current verifiable accreditation with the manufacturer of cabling products provided including continuing education requirements. It shall be the installer's responsibility to ensure that the persons that attended the training are currently employed on a full time basis and will participate in the installation. All the staff working on ICT cabling on a site shall be accredited from the cabling manufacture.

1.3.8 Accredited installers

a) Accredited installers are individuals employed on a Queensland Health site who have:

i. attended and passed certification / re-certification from the manufacturer (who is offering the warranty for the site) within the last two (2) years, and have satisfied all continuing education requirements from the manufacturer.

ii. an Australian Communications and Media Authority (ACMA) or accredited industry registrar cabling license with the relevant speciality competencies for the work being performed or an open registration, and directly involved in the testing of ICT cabling and shall be the holder of a certified test technician's accreditation from the test equipment manufacturer.

iii. Only accredited installers shall perform cabling installation on Queensland Health facilities. Direct supervision of non-"accredited installers" shall not be allowed.

iv. ACMA and registrar licence details can be verified at:

http://www.acma.gov.au/.

b) The accredited installer shall provide certified photocopies or softcopies of both items to the project manager or nominated representative. No individual is to start work on any site until the accredited installer receives confirmation from the project manager that they have received the copy and everything is in order.

c) For all work involving the installation or relocation of more than twenty-four outlets (e.g. more than twelve dual outlets), the accredited installer shall inform the manufacturer involved with the project in writing. The accredited installer shall provide a schedule to enable the manufacturer the option to visit the site during the installation to check that the installation meets the requirements for warranty. The manufacturer's visit should happen at 33%, 66% and 99% of the installation completion to ensure that all remediation required occurs during the installation period.

1.3.9 Accredited auditors

a) Accredited auditors are individuals employed on a Queensland Health site that meet all of the following requirements:

i. Meet the requirements of section 1.3.5 *Recognised designers of telecommunications distribution systems*

ii. Meet the requirements of section 9.2 *ICT cabling installation testing technician*.

2. Design and Performance

2.1 Design plan and criteria

2.1.1 Plan

a) All new buildings or floors scheduled for occupation by Queensland Health shall have a fundamental ICT design plan developed (regardless of whether a service is requested) as detailed in QGEA ICT Cabling Infrastructure Policy and Technical Standard and endorsed by the eHealth Queensland prior to installation. This plan shall detail the design for all areas located on the campus, with particular emphasis on all areas located within the building, including all floors and the locations of Telecommunication Outlets on the outside walls of the building.

b) Queensland Health sites and tenancies can be broadly placed into three (3) health care facility categories:

   i. Tertiary health care facility sites include large hospitals such as but not limited to the Royal Brisbane and Women's Hospital and Townsville Base Hospital.

   ii. Secondary health care facility sites include district hospitals such as but not limited Roma Base Hospital and Toowoomba Base Hospital.

   iii. Primary health care facility sites include rural and remote regional hospitals such as but not limited to Charleville Base Hospital and Bamaga Base Hospital.

   A. Administrative only sites will be classified into one of the categories above depending on the size and/or significance e.g. a corporate facility consisting of more than 1000 (one thousand) staff is classified as a secondary size facility.

2.1.2 Criteria

a) The ICTCS is not intended to be a comprehensive design guide resource for telecommunications distribution design at Queensland Health facilities. The designer shall look to the other sources such as relevant legislation, the BICSI TDMM (Telecommunication Distribution Methods Manual) and other BICSI Standards and Manuals for general design guidance. The resulting construction documents shall also be consistent with the installation practices described in the BICSI Information Technology Systems Installation Methods Manual (ITSIMM).

b) Where Australian standards or BICSI manuals offer multiple choices with a preferred method identified, and where the eHealth Queensland ICTCS does not select one method over another or define specific requirements precluding use of the preferred method, the Australian standards or BICSI-preferred method should be selected. The exception shall be where legislation mandates a specific method or practice.

c) Where Australian standards or BICSI manuals identify warnings regarding potential adverse effects from certain design or installation methods, the

design or installation method used should typically be the method with the least potential for adverse effects. For example, the overvoltage conditions warning carried in AS/ACIF S009 and reproduced at the front of this standard.

d) Telecommunications distribution systems shall be designed for construction using materials sourced from the current ICT cabling products and services standing offer arrangement (SOA) where cabling installation works are procured via the SOA. The design documents shall require that the workmanship fully comply with the selected cabling vendor's design and Installation guidelines and performance specifications.

e) Telecommunications distribution pathways shall be designed and installed to be fully compliant for with the cabling vendor's certified installation requirements for that particular media. Any fill ratio in excess of this requirement shall be noted in any response and shall be approved by eHealth Queensland.

f) Any request to deviate from the requirements of the standards or alternative designs that would adversely affect the cabling vendor's warranty shall not be accepted. Requests to deviate from industry standards, the manufacturer's requirements or the eHealth Queensland ICTCS design solutions will be considered on a case-by-case basis by the project manager. Designers are encouraged to contact the project manager to discuss proposed alternatives before spending any significant time on an alternative.

g) Architects, engineers, and designers shall ensure that all telecommunications distribution infrastructure for Queensland Health ICT projects fully comply with the current eHealth Queensland ICTCS.

2.1.3 The project manager shall review and facilitate the approvals of all the telecommunications distribution infrastructure designs and construction methods related to facility security. Future growth

a) Queensland Health's facilities continually require expansion of both clinical and administration buildings to meet increasing health care demands. The architects, engineers, and designer shall consider the future growth requirements for the facility when telecommunications distribution infrastructure is designed for a project. Within the Queensland Health campus areas affected by the current project(s), the main backbone telecommunications distribution infrastructure shall be designed and sized to readily accommodate the identifiable future growth.

   i. Following are areas where this design criterion is most significant:

      - horizontal distribution systems
      - backbone distribution systems
      - equipment rooms
      - Telecommunications entrance facilities.

   ii. To determine the size and design of telecommunications distribution infrastructure to support the future growth, the

designer shall gather and review planning information about the facility from:

- architects
- local BEMS
- QH Digital Partner Teams (local and regional)
- HHS information technology services (ITS)
- eHealth Queensland Infrastructure Management Assurance
- consultant engineers
- eHealth Queensland
- QH strategic plans.

iii. The designer shall provide a telecommunications distribution infrastructure pathway design sized to support the project(s) with the capacity to economically support future buildings identified from the sources listed above that would obviously utilise the same pathway or portions thereof. The designer shall review this information with all of the parties identified above and a joint decision by the project manager shall be made for the design and size criteria for the telecommunications distribution infrastructure on the project(s) in areas such as:

- Quantity of conduits in Outside Plant (OSP) ductbanks, including entrance facilities, and the size of maintenance holes to provide pathways for future buildings:
  a. The maximum number of conduits required to support the identifiable future growth should be included in the project where funding is sufficient. If less than the maximum conduits are installed, the ductbank shall be constructed to allow the maximum number of conduits to be added at a later date with minimal impact, cost, and disruption to the facility.
  b. Maintenance holes (MH) shall be sized and located to accommodate the current and future conduit requirements up to the last MH needed for the project(s).
- Placement of ductbank pathways that avoid foundation footprints of future buildings.
- Locations for MH, not just to provide a installation pulling point for the current project, but also located to provide a suitable entrance pathway for future buildings.
- Size and layout of equipment rooms (ER) to accommodate all of the future growth identified above.
- Design and construction methods used for the ER in the current project that allows future expansion with the least amount of expense and disruption to the facility operations.

iv. Designs shall take into consideration the usable floor space when sizing pathways, rooms and spaces not just the immediate installation requirements at the time of the design. Refer to Appendix 8 – *Typical TR / ER layout diagrams*.

2.2 Single cabling solution per site

d) Single site solutions shall be applied to the whole campus of all owned or leased buildings by Queensland Health. To ensure there is a well-defined custodianship of warranty related issues for both copper and optical fibre based cabling systems, a single system which is certified by the manufacture of the infrastructure connecting hardware, unless deemed as unsuitable, shall be used (with the exception of voice backbone cabling, if manufacture approved). Mixing products under various brand names from a single manufacturer is prohibited and shall not be allowed. Product for new installations shall be determined by compliance to the standards for both cabling (copper and fibre) and connectivity. All products shall conform to the standard specified.

   Note: If there is a requirement for a specialist optical fibre solution, then a different manufacture for the entire campus may be explored for the optical fibre only. This option shall be decided on a case by case basis through the design endorsement process. The intent of this note is not to allow different copper and optical fibre manufacturers on the same campus, but to allow a specialist fibre manufacturer to be installed where there are specific business requirements for that specialist solution.

e) Product for the extension of existing cabled sites shall be based upon business requirements, risk and value for money of the full period of occupancy as well as the mandatory compliance with the QGEA ICT Cabling Infrastructure Policy and Technical Standard requirements. When considering a change of cabling product brand within the current manufacturer's warranty period where the current manufacturer does not have products conforming to this standard the current manufacturer should be given the opportunity to address this issue in a timely manner (this timeframe should be a few weeks not months).

f) Any deviations, exceptions or other conditions from a manufacturer that would void the warranty for the cabling system during the warranty period shall be identified during the bid process. Queensland Health reserves the right to disqualify any vendor whose warranty is deemed counter-productive to ongoing operations.

2.3 Project design requirements

a) Where a project involves horizontal cable reticulation for greater than twenty four (24) outlets or any backbone cable reticulation (copper or fibre) the requirements of this section shall apply.

b) This section contains requirements for architects, engineers and telecommunications distribution designers regarding Queensland Health procedures for ICT cabling projects that include telecommunications distribution systems. This applies both to projects that entail primarily telecommunications distribution work (such as telecommunications distribution infrastructure replacement projects) as well as to architectural projects and other work (such as a new building or campus) that involve telecommunications distribution design.

c) This section is not intended to supersede the requirements in the Architects Act 2002 and Professional Engineers Act 2002, but rather to complement them, providing additional requirements that apply

specifically to telecommunications distribution design projects at Queensland Health facilities.

d) It is intended that the requirements in this section be considered contractually binding for professional firms providing telecommunications distribution design services.

e) All ICT cabling tender and construction documentation including specifications and drawings shall be endorsed by eHealth Queensland or nominated representative prior to being issued. eHealth Queensland or the nominated representative shall respond in writing within agreed service level agreement either endorsing the documentation or advising of the changes required.

f) In order to achieve successfully designed, constructed and provisioned telecommunication facilities, it is imperative that the telecommunications distribution design be incorporated during the preliminary architectural design phase.

g) In addition to eHealth Queensland or the nominated representative, the architects and engineers for the project shall consider the designer, design reviewer (when used) and project manager as part of the working party and work closely with them from the beginning of the project, starting with the schematic design phase, through to the final project closeout.

h) The architects and engineers shall notify the working party members of all scheduled design and construction meetings, with agendas attached, and forward copies of all meeting notes.

2.3.1 Cross discipline coordination

a) The success of the project requires design coordination between the disciplines involved in the project. The designer shall coordinate the telecommunications requirements and design features with the designs produced by the other designers on the project.

b) At a minimum, the following aspects of the design shall be coordinated:

i. Outside plant telecommunications distribution infrastructure:

- Ductbank routing around obstacles (trees, tunnels, buildings, existing ductbanks etc.)
- Coordinate the locations of maintenance holes and pits to assure they are not located in areas of water concentration. Site requirements, drainage, traffic, joint usage, utility requirements etc.
- Coordinate the elevations of pits and ductbanks in relation to finished floor elevations of TR's and ER's to assure no ingress of water into buildings
- Proximity of ductbanks to sources of EMI
- Proximity of ductbanks to other services
- Routing of entrance conduits through buildings
- Backbone cabling requirements of other disciplines (fire alarm, HVAC, security, CATV etc.)

- Specifying the appropriate number of conduits between pits for main backbone distribution pathways and proper depths.

ii. Horizontal and Intra-building backbone cabling infrastructure:

- Location and size of ERs and TR's
- HVAC cooling and humidity requirements for ERs and TRs
- HVAC ductwork routing (avoiding ER and TR ceiling spaces)
- Plumbing routing avoiding ER and TR spaces
- Lighting requirements for ERs and TRs
- Power requirements for ERs and TR
- Power requirements for work areas (receptacle locations near telecommunications outlet locations)
- Proximity of cabling to sources of EMI
- Routing of telecommunications conduits through and location of telecommunications pull boxes in congested areas (HVAC ductwork, plumbing, electrical etc.)
- Floor treatments in ERs and TRs.

2.3.2 Utilisation of designers

a) All Queensland Health ICT cabling designs shall be prepared by the designers meeting requirements of section 1.3.5 *Recognised designers of telecommunications distribution systems*.

b) Correspondence regarding ICT cabling design and telecommunications distribution systems between the project manager, architects and engineers shall be mainly through the designer.

c) On projects where the designer is not the prime consultant, the designer shall keep the architects and engineers informed of all direct communications with Queensland Health.

d) The designer with the RCDD qualification, shall affix their RCDD logo stamp (showing the registration number and expiration date) and signature to the final construction documents (drawings and specifications) pertaining to the telecommunications distribution design to acknowledge compliance of the design to the ICTCS (this document).

e) The designer with the RPE qualification shall affix their registration details and signature to the final construction documents (drawings and specifications) pertaining to the telecommunications distribution design to acknowledge compliance of the design to the ICTCS (this document).

2.3.3 Design review requirements

a) In accordance with section 2.3 a) *Project design requirements*, Queensland Health may engage a designer (other than the designer currently engaged on the project) to act in the capacity of design reviewer to Queensland Health. Refer to section 1.3.6 *Design reviewer* for role requirements.

b) Typical scope of the design review shall include but not be limited to:

i. Review telecommunications distribution system design:

- for compliance with Queensland Health and Industry standards
- to identify apparent conflicts (routing, electromagnetic interference etc.) with other discipline's designs
- for apparent coordination with telephone service providers or other utilities
- for general document clarity
- for approval from the manufacturer holding the warranty

ii. Review the completed requirements analysis report.

c) Review the cutover plans.

d) The design reviewer shall review the documents according to Queensland Health's scope of work and then produce a report consistent with Appendix 7 *Design review report format*.

e) The architects and engineers working on Queensland Health projects shall first provide a copy of their requested scope of work to the project manager for review and comment.

f) The project manager shall review the request to ensure all relevant aspects of the telecommunications distribution infrastructure design and construction within the scope of the project are adequately detailed by the architects and engineers based on the requirements of the Queensland Health ICTCS.

g) If required, due to non-compliance with the ICTCS, the architects and engineers shall modify their scope of work based on the comments provided by the project manager.

h) The project manager may require additional meeting/s with the architects and engineers to further refine the scope of work.

2.3.3.1 Review process

a) The project documents shall pass through a design review process at the end of each design phase plus follow-up reviews when necessary.

b) Stage 1 of the telecommunications distribution design review process with a design reviewer shall consist of:

i. Each time a review is required, the architects and engineers shall provide two (2) copies of the complete project documents set (drawings and specifications for all disciplines involved in the project) to the project manager and the design reviewer, defined in section 1.3.6 *Design reviewer*.

ii. The design reviewer shall review the design documents and provide a written review report to the project manager using Appendix 7 *Design review report format*, as a report guideline.

iii. The project manager shall review the design documents and the design reviewer's comments.

iv. The project manager will update the review report, if required, with any additional comments.

v. Following their review and update of the design review report, the project manager will distribute the updated report to the design reviewer and hold brief discussions about its contents.

c) Stage 1 of the telecommunications distribution design review process, without a design reviewer shall consist of:
    i. The architects, engineers and designer shall meet with the project manager to initiate the review process.
    ii. Each time a review is required, the architects and engineers shall provide two (2) copies of the complete project documents set (drawings and specifications for all disciplines involved in the project) to the project manager.
    iii. The project manager shall review the design documents and create the design review report using Appendix 7 *Design review report format*, as a report guideline.

d) Stage 2 of the telecommunications distribution design review process which shall consist of:
    i. The project manager shall send the design review report to eHealth Queensland for review and comment.
    ii. eHealth Queensland shall review the design review report and provide written comments if required.
    iii. The design review report shall then be sent to the designer.
    iv. The designer shall then review the comments and respond to them in writing. Negative responses to any comment shall include a discussion of the reasons for non-compliance.
    v. Finally, a meeting or tele/videoconference shall be held with eHealth Queensland, the project manager, the design reviewer (if applicable) and the designer to discuss the design review report and the designer's responses.
    vi. Following the meeting, the designer shall revise the design in accordance with Queensland Health's resolution for each comment.

2.3.3.2 Quality check

a) The designer shall also be responsible for performing a quality check on the telecommunications distribution design prior to releasing documents for each phase of the review.

b) The quality check shall include in its scope, but not be limited to, the components detailed in the second table of Appendix 7 *Design review report format* and comments following the format of the first table.

c) The architects, engineers and designer shall require eHealth Queensland to review the documents and respond with written review comments, if required, to the designer at each phase of the design.

d) The architects, engineers and designer shall not proceed with the next phase of telecommunications distribution design without receipt of written comments, if required, from the project manager and approval to proceed from the project director.

e) The project director shall not authorise a project to proceed until the ICT issues are appropriately addressed in the construction documents by the designer.

f) The architects and engineers shall be responsible for ensuring the review process is conducted in accordance with the requirements of Queensland Health including the project manager, and shall participate in the review

process to ensure the review comments are satisfactorily addressed prior to issuing of the documents for tender.

2.4 ICT exemption

a) Requests to deviate from industry standards (not mandatory) or the ICTCS design and construction requirements shall be considered on a case-by-case basis and be completed through the ICT exemption process.

b) Upon receipt of complete information, a decision on the ICT exemption will be made.

c) Requests to deviate from the requirements of regulatory standards and codes shall not be accepted.

d) Requests to deviate from Queensland Government Enterprise Architecture (QGEA) standards shall be submitted to the QGCIO for consideration, by the business unit wishing to deviate. It is recommended the request be submitted in the form of a “Brief Note for Approval” through the appropriate channels.

e) Verification and certifications from manufacturers that warranties will not be impacted.

2.5 Certification of building work

a) Where building work is undertaken to provide ICT cabling infrastructure, the work shall be certified under section 30 of the *Building Act 1975* and the *Queensland Development Code*. The work shall be assessed by a licensed building certifier. Work undertaken for the crown is defined as “self-assessable” under the *Sustainable Planning Act 2009* and does not require development approval.

b) The assessment shall be made prior to commencement of the work, and records of the process shall be lodged with the project manager.

c) An assessment is specifically required where:

   i. fire rated structures are to be penetrated

   ii. a change of use will occur in a building space. For example, converting office accommodation to telecommunication rooms, closets and a like. Particularly where the conversion may change the distance of travel to an exit, coverage of fire reels or hydrants and possible assess for persons with disabilities.

d) A licensed building certifier may be engaged as:

   i. a suitably qualified employee of the department.

   ii. an external certifier, however, it shall be made clear that the certifier is conducting a crown self-assessment and not a development approval.

   iii. the chief building surveyor, Department of Housing and Public Works.

e) On Capital Infrastructure Delivery Unit. (CIDU) projects, the project manager shall seek written confirmation from the CIDU project manager that the certification process was undertaken as part of the building design and construction.

f) Detailed requirements for building work certification can be obtained from the office of the chief building surveyor, Department of Housing and Public Works.

2.6 Shop drawings

a) Shop drawings shall be provided to the project manager for written approval prior to commencement of site works.

b) As a minimum, the shop drawings shall provide all of the following:

   i. system type, manufacturer and warranty details

   ii. proposed site, building and floor location of all distributors and ICT cabinets

   iii. proposed IDC frame and ICT cabinet layouts showing location of all new and existing cabling and ICT equipment (routers, switches patch panels etc.)

   iv. proposed site pathway plan showing location for all pit, pipe, cable tray and catenary systems

   v. floor plans showing proposed location and numbering of all telecommunications outlets

   vi. any proposed changes to the electrical systems and switchboards.

c) All shop drawings shall be provided in native and Adobe Portable Document Format (PDF) electronic format.

d) All shop drawings shall be provided and scaled to present the information within the drawing in a clear and easily viewable layout i.e. a drawing with a high density of TO's shall be presented in a scale that allows for all information on each TO to be read easily without the need to zoom in on the electronic version of the drawing.

2.7 ICT equipment and cabling plant rooms

a) It is well recognised that adoption of ICT in healthcare is now crucial in the delivery of healthcare services. Queensland Health is seeking to establish state based e-health development and implementation. To collect, store and process individual health information in electronic systems, healthcare providers need to comply with legislation that deals with the privacy and interception of transmitted information. While deploying ICT systems in healthcare operations can provide advantages in healthcare delivery, the risks in e-health systems shall be addressed. Adopting standards-based, built environments for telecommunication infrastructure plant can simplify some of the complexity associated with information security concerns

b) .Dedicated rooms that house ICT equipment, and terminate and route cables are an important component in the effort to provide secure telecommunications, at a physical level.

2.7.1 Types of plant rooms

a) There are five dedicated room spaces that may be found at Queensland Health sites as designated in sub-sections below.

2.7.1.1 Equipment rooms

a) The equipment rooms (ER) shall be dedicated to telecommunications functions. However, where there are no dedicated data centre facilities at Queensland Health site, the ER may be the central location on a campus where the major core telecommunications equipment is located and where the main campus backbone cables terminate. The ER typically contains the telephone switching system (PBX), the enterprise file servers and server farms, the core local area network (LAN) switch, and wide area network (WAN) communications equipment. Where these core facilities are provided in the ER, the ER shall be designated as the main equipment room (M-ER) and shall be the central hub of a hierarchical star topology for an Ethernet LAN design. The hierarchical star topology is also the recommended topology for structured cabling backbone systems in buildings and in campus environments.

b) There may also be secondary equipment rooms (S-ER) acting as consolidation or concentration points for routing telecommunications backbone cables to various buildings in a selected geographical area of a campus, in lieu of homerun routing the cables from the M-ER. LAN distribution switches or fibre concentrator LAN switch are typically located in an S-ER and up-linked to the core LAN switches in the M-ER with a high speed fibre optic cable. There may be multiple S-ER at a large Queensland Health site, such as Townsville Hospital.

2.7.1.2 Telecommunications Rooms

a) The telecommunications room (TR) shall be dedicated to telecommunications functions and is the location(s) in a building where the telecommunications cabling is terminated. In Queensland Health facilities, the TR(s) in a building should be dedicated to voice and data systems equipment with inter-connected pathways for cabling to other system equipment rooms, such as building automation systems and low voltage equipment (BAS/LVE), typically containing electronic equipment intended to serve the building or a portion of the building, and other electronic services such security. The BAS/LVE room (if separate) should be located directly adjacent to the TR to take advantage of minimising the backbone cable lengths inside the building if they require direct termination in the BAS/LVE.

b) If any equipment contained within the TR supports more than just the floor that TR supports, then that room shall be deemed an equipment room and all elements for an equipment room shall be required.

2.7.1.3 Entrance facilities

a) Entrance facilities (EF) are used solely to change from outdoor cable types to indoor and as such, sufficient wall spaces must be allowed for multiple transition enclosures/frames to meet the future needs of the campus, including carrier requirements

2.7.1.4 Combined rooms

a) Combined rooms (CR) may perform some or all the functions of the above mentioned rooms within a single space, particularly at smaller sites.

2.7.1.5 Data centres

a) The data centres (DC) support all Queensland Health facilities across the state and are usually located either off-site from a Queensland Health facility or at a Tertiary Hospital (Category 1).

b) Data centres are a specialised equipment room that must be engineered by a specialist designer to ensure the data centre is fit for purpose and as such their specific design elements are excluded from this document.

2.7.2 Plant room design

a) The designer shall:

i. Be responsible to determine that the architectural, environmental, mechanical, and electrical power requirements for the room space is met as specified in this standard. For projects where an architect is involved, the designer shall coordinate directly with the architect, mechanical engineer, and electrical engineer to verify that their design documentation meets the Queensland Health requirements and is fully conveyed in the construction documents (CD), specifications and drawings, including CD sections outside of the telecommunication distribution design sections. For projects without the involvement of an architect and mechanical or electrical engineer, the designer shall alert Queensland Health where additional architectural, environmental, mechanical, and electrical elements are needed to meet Queensland Health's requirements and is fully conveyed in the CD, specifications and drawings, including CD sections outside of the communication distribution design sections.

2.7.3 Common design requirements for ER and TR plant rooms

a) The designer shall:

i. obtain detailed information from the architects, engineers, project manager, and other Queensland Health sources as necessary regarding the equipment that will be located in the room to perform room/cabinet design and to ensure HVAC and electrical requirements are met. This information shall include specific types of cabinets, size (RU's if cabinet mounted), weight, lighting, placement location requirements, voltage and ampere requirements including specific electrical receptacles to match equipment plugs, single or dual power supplies, heat generated-kW's, UPS requirements etc.

2.7.3.1 Location

a) The designer shall:

i. be responsible to inform the architect of these requirements and to do this early in the schematic design phase of the project.

ii. where these design requirements cannot be met, the designer and the project manager shall prepare an ICT exemption, refer to section 2.4 *ICT exemption*).

b) The ER and TR shall contain the floor distributors (cabinets). The purpose of this is to reduce points of cable administration and potential failure, and to save floor space. At least one floor distributor shall be provided for every one thousand (1000) square metres of useable floor space or part thereof plus an additional one floor distributor per room.

c) The ER and TR shall not be used for any other purpose other than telecommunication functions and/or house ICT equipment. In particular it shall not be designed to facilitate the ease of storage of goods and materials, nor shall any electrical, plumbing, mechanical or other service (not specifically required for the ICT equipment or cabling), enter into or pass through these rooms.

d) The ER and TR shall not be located adjacent to wash rooms, toilets or kitchens where the room and its equipment could be damaged due to raising damp, seepage or a flooding event. Refer also to AS/ACIF S009 for requirements where the room contains a distributor that terminates a carrier's lead-in cabling. If an ER or a TR is located adjacent, then suitable protection shall be provided to prevent any moisture ingress to the ER or TR in the event of a spillage.

e) The ER and TR shall be located away from electrical switchboard rooms, mechanical plant rooms, medical imaging rooms, lift motor rooms and transformers and any other sources of excessive electromagnetic interference (EMI). Typically, cabling should have at least one (1) metre separation from sources of electromagnetic fields:

f) The designer shall refer to AS 2834, AS/NZS 3084 and AS/ACIF S009 to ensure clearance requirements are maintained. Telecommunication equipment has critical setback clearance distance requirements from all electrical sources for EMI reduction.

g) The ER and TR shall not be located within an earth potential rise (EPR) hazard zone particularly where the building is supplied by HV power or the property is surrounded by HV power sources like HV transmission towers and transformers. Refer also to AS/ACIF S009 for typical EPR hazard zones:

   i. The designer and the project manager shall, where these design requirements cannot be met, prepare an ICT exemption, refer to section 2.4 *ICT exemption*, with the engineered design as per AS/ACIF S009 6.1.3.

h) The ER and TR shall house cabinets for the sole use of the agency ICT managed infrastructure and shall not to be shared with other agencies / tenants without the prior written permission of eHealth Queensland.

i) The ER and TR shall have room entry/ access points maintained free from obstructions. Where the room opens to trafficable areas such as, car parks, a “clear working space” shall be provided at the entrance, demarcated with removable bollards which can be locked in place. The type, number and spacing of the bollards shall be by design.

j) The ER and TR shall be located above the Q100 flood level.

k) The ER and TR may be situated in multiple floor or building locations: their interconnecting pathways and spaces shall be capable of accommodating growth in cable density as determined in section 2.1.3 *Future growth*.

2.7.3.2 Sizing

a) The designer shall:

   i. be responsible to inform the architect of these requirements and to do this prior to the schematic design phase of the project.

   ii. in a functionally efficient arrangement, lay out the equipment for the TR and ER with clear working spaces as identified in following sections. Some equipment, such as WAN equipment, LAN servers, tape backup equipment, switches, and patch panels will require regular access, and shall be located where they are easily accessible.

   iii. determine the final TR and ER size, after developing the design layout, based on the useable office floor space incorporating all of the defined equipment footprints and clear working spaces.

   iv. size the TR and ER in compliance with this standard and “AS/NZS 3084 plus a minimum of 30% additional”. For preferred floor plan layouts refer to Appendix 8 *Typical TR / ER layout diagrams*.

2.7.3.3 Architectural provisioning

a) The designer shall:

   i. be responsible to inform the architect of these requirements and to do this early in the schematic design phase of the project

ii. where these design requirements cannot be met, the designer and the project manager shall prepare an ICT exemption, refer to section 2.4 *ICT exemption*.

b) The ER and TR shall comply with the following height requirements:

i. A minimum height clearance of 2.4 metres to any overhead fixtures (i.e. cable tray /cage, light fittings etc.) from the finished floor level.

a. A minimum clear accessible space of one hundred and fifty (150) millimetres, preferably three hundred (300) millimetres above cable raceways. Encroachment of the150mm minimum clearance shall be allowed, only where the following condition is met:

- At least 80% of the cable raceways are not encroached.

b. No more than 300mm of the cable raceway is encroached at a time.

c. Normal practices for MAC's can be performed without impediment.

ii. If the ER or TR requires a raised access computer floor, the raised floor shall have a minimum of three hundred (300) millimetres clearance to the base floor and shall have a ramp entry with a 1:14 gradient.

iii. The designer shall request determination of when a raised floor is required from the project manager at the start of design.

c) For raised floors, all floor-standing equipment and equipment cabinets should be securely anchored to the sub floor. For concrete subfloors, concrete floor anchors shall be used.

d) The ER and TR flooring shall be slip resistant and have anti-static properties. Carpet is not acceptable in telecommunication spaces.

e) The ER and TR walls, floors and ceilings shall be sealed to reduce dust and finished in a light colour to enhance lighting. Fire retardant finishes shall be finished at the direction of fire certifier. False ceilings are not preferred in telecommunication spaces.

f) The ER and TR shall provide unhindered access to equipment by maintaining a "clear working space" of for maintenance access and installation of equipment in addition to the following:

i. At least nine hundred (900) millimetres deep behind the cabinet.

ii. At least 900mm or the depth of the cabinet (whichever is the greater) at the front of the cabinet.

iii. At least 900mm out from walls at one end of every cabinet row.

iv. At least 300mm, preferably 600mm, shall be allowed for wall mounted equipment on at least 25% of the overall length of the ER and TR. For example, if the room has a total wall length of 12m (a 3m x 3m room) then 3m shall be allowed.

v. For wall-mounted cabinets and frames the “clear working space” shall comply with AS/ACIF S009 and HB 29 in addition to any space required by this standard, to allow for door/gate swing:

a. The designer shall ensure the clearances for “equipment footprints” and “clear working space” requirements are incorporated as specified in this standard.

b. The designer shall not eliminate or reduce the defined “clear working space” requirements. Room layouts with inadequate “clear working space” for equipment are not acceptable. Certain “clear working spaces” are a regulatory requirement under AS/ACIF S009.

(Refer to Appendix 8 – *Typical TR/ER layout diagrams*)

g) The ER and TR doors shall:

- use swipe card access
- preferably open outwards
- be located in hallways or other common areas and in no case shall the door be located in another buildings occupants’ space
- have venting depending on the air handling design
- be minimum solid core and meet all requirements specified by the fire certifier. Glazing is not acceptable.
- one (1) door shall be at least nine hundred (900) millimetres wide and two thousand two hundred (2200) millimetres high (to allow for the entry and removal of the cabinets); if door height at the front is smaller than 850 mm x 2200 mm, rear clearance for the racks is to be the depth of the cabinet plus 100 mm.
- Signage shall be attached to the inside of the door stating: ‘Caution the door opens outwards into a walkway’.
- The designer shall coordinate room lock/key requirements with the project manager.

h) The ER and TR shall have a minimum of nineteen (19) millimetre AC grade plywood backboard fitted to the wall (where the wall-mounted equipment is to be mounted). Refer to section 7.6.5 *Plywood backboards*. Reasons are:

i. To allow for dust free mounting of equipment

ii. To maintain the fire rating of the wall when fixing to the wall (hence 19 mm ply).

i) The ER and TR shall be capable of housing various types of wall mounted equipment (i.e. PBX, Nurse Call, Paging, DECT etc.) and the plywood shall extend from the floor to a height of 2.4 metres above finished floor level (AFFL). In rooms where the power conduits are retrofitted in a surface mounted fashion, it might be convenient to mount the plywood at a height of one hundred and fifty (150) millimetres AFFL, extending to 2.6 metres AFFL. The one hundred and fifty (150) millimetre space below the backboard can then be used to route the power conduits to the outlets without obstructing plywood backboard space.

j) In new ER and TR constructions, the mounting of plywood backboard shall not interfere with power and telecommunications outlets, light switches, and all electrical and mechanical control devices in the room.

Where equipment backboards are applied to existing walls with existing power outlets and light switches, cut-outs in the backboards shall be provided for access to the existing electrical devices with extended mounting blocks installed as appropriate.

k) The ER and TR shall have a document holder on the wall into which landscape A3 [two hundred and ninety-seven (297) millimetres high by four hundred and twenty (420) millimetres wide] 'as installed' site plans (showing outlet numbers, locations and cable pathways) can be easily inserted and removed. The top of the document holder shall be mounted at one thousand four hundred and fifty (1450) millimetres AFFL.

l) The ER and TR shall have a finger tray (for storing patch and work area cords), which must be at least six hundred (600) millimetres long and able to accommodate cords of diameter 9 mm. The fingers of the tray shall be at least sixty (60) millimetres deep. The bottom of the finger tray shall be mounted at one thousand eight hundred (1800) millimetres AFFL.

m) The ER and TR shall not contain printers or other devices that produce dust.

n) No food or drink shall be taken into or consumed in the ER and TR.

o) Shall have a complete communications earth system incorporated as part of the design and provide common earthing/bonding connections for all applicable low voltage and high voltage earths. Appendix 6 *QH rack earthing methodology* indicates the preferred method.

2.7.3.4 Environmental provisioning

a) The designer shall:

   i. be responsible to inform the architect and mechanical engineer of these requirements and to do this early in the schematic design phase of the project.

   ii. where these design requirements cannot be met, the designer and the project manager shall prepare an ICT exemption, refer to section 2.4 *ICT exemption*.

b) The ER and TR should be maintained at a:

   i. temperature between eighteen (18) and twenty four (24) degrees Celsius

   ii. humidity between thirty (30) and fifty five (55) per cent non-condensing, measured at one thousand, five hundred (1500) millimetres AFFL.

c) The ER and TR cooling and ventilation shall be provided by a continuous (twenty-four (24) hour a day, three hundred and sixty five (365) days a year) air conditioner (using a refrigeration cycle). Refrigeration cycle air conditioners shall be designed and installed such that any leakage of liquids does not occur within the room. They shall provide a sufficient number of air changes to dissipate all heat generated from all active equipment within the room (both existing and planned future), and as a minimum, a complete change of air in the room each hour. The operational sound level shall be less than 60dB, measured outside but adjacent to the room with the doors closed.

d) The ER and TR cabinet design shall provide reliable heat removal with the capability to lower the cabinet temperature. By exhausting hot air from

the cabinet to the room, it allows conditioned air (entering through air intake grills) to cool the load:

i. The designer shall perform a detailed review of the cabinet cooling design provided by the mechanical engineer to ensure compliance to the cooling requirements for the cabinets.

e) N+1 redundancy design criteria shall be incorporated into all new ER and TR designs for the following plant systems:

i. electrical, including UPS

ii. mechanical

2.7.3.5 Electrical provisioning

a) The designer shall:

i. be responsible to inform the architect and electrical engineer of these requirements and to do this early in the schematic design phase of the project.

ii. where these design requirements cannot be met, the designer and the Project manager shall prepare an ICT exemption, refer to section 2.4 *ICT exemption*.

b) Room design shall incorporate emergency lighting such as spitfires, one in each aisle.

c) The ER and TR shall have a minimum of two (2) impact resistant fluorescent lights. Consideration should be given to having at least one of the lights mounted vertically on a wall. The lights shall be located so that they are separated from ICT cabling to comply with AS/ACIF S009.

d) The ER and TR average lightning level measured one (1) metre AFFL between cabinets shall be 500 lux. Light fittings shall be mounted at least 2.4 metres AFFL, unless otherwise specified. The light placement shall be coordinated with cabinets to provide the best lighting exposure while maintaining adequate clearance from telecommunication cable and cross-connects locations. The lighting control/s shall be located at the entrance door/s to the room, which may require 2-way and intermediate switching arrangements.

e) The ER and TR shall be provided with essential lighting, with at least fifty (50) per cent of lights connected to the essential supply. Light fixtures should be at least 2400 mm AFFL unless otherwise specified and not interfere with the door opening and closing.

f) The ER and TR power outlets shall have:

i. each outlet labelled with its originating electrical distribution board and circuit number identified on the outlet faceplate

ii. each outlet labelled to identify the essential nature of the outlet.

g) The ER and TR electrical distribution board installation or alteration shall comply with AS 3000 and in addition AS/ACIF S009 for the earthing of cabinets, frames and surge suppression devices within the room:

i. The designer shall ensure that cabinets/frame/surge suppression devices are properly earthed to comply with AS/ACIF S009.

h) The ER and TR shall provide:

i. for each floor mounted cabinet:

- two suitably rated, captive power outlets for the connection of the cabinet power distribution unit (PDU), which shall be:
    - mounted approximately two thousand three hundred (2300) millimetres AFFL above the rear of the cabinet.
    - identical to a Clipsal 56C332, or approved equivalent, and located on the wall if the cabinet is within three hundred (300) millimetres of the wall.
    - mounted to a structural support mechanism above the cabinet. This is achieved by the use of a Uni-Strut framework suspended below the ICT cable tray trapeze brackets. Power outlet housings may be mounted in a horizontal fashion to provide better working clearance.
    - supplied by a dedicated power circuit as follows:
        a. The first supply should be from a building, floor or room based UPS when available. If UPS supply is not available then an essential supply shall be used.
        b. The second supply should be from a separate section of the essential supply where available such that when power is not available from the UPS / primary essential feed an alternative supply is available within the cabinet.
    - labelled with the power circuit identification such that the label is clearly visible and legible when standing on the floor.
- the power cord of each cabinet PDU shall:
    - be fitted with a captive plug identical to a Clipsal 56P332 or approved equivalent.
    - enter the PDU at the top of the PDU.

ii. for each wall-mounted cabinet:

- a suitably rated, captive power outlet (or two as required):
    - mounted on the wall directly under the lower left side of the cabinet or to the side of the cabinet such that the opening of the cabinet on the swing frame is not restricted in any way
    - supplied by a dedicated circuit
    - labelled with the power circuit identification such that the label is clearly visible and legible.

iii. for each electronic service enclosure:

- a suitably rated, power outlet dedicated to each electronic service to meet the requirement of the device and shall be located every 1.8 metres along the plywood lined wall. Such equipment may include:
    - Service provider electronics
    - Nurse Call
    - Paging
    - DECT

- supplied by a dedicated power circuit.
- Labelled with the power circuit identification such that the label is clearly visible and legible.

iv. for each cabinet and enclosure a separate connection to the essential or UPS power supply as required by the system design.

v. for non-telecommunication equipment:

- at least two (2) suitably rated, double power outlet available for use with power tools, testing equipment etc. These outlets shall not be used to supply telecommunications equipment. The outlets should be placed at 1.8 metre intervals along the walls in the room. These outlets shall be coloured consistently with other outlets in the building and power outlets fed by a common circuit connected to the non-essential supply.

vi. The designer shall perform a detailed review of the electrical distribution board wiring design (for existing/new/remodel - provided by the electrical engineer) to ensure compliance to the telecommunications electrical requirements for the power outlets, rooms walls, all cabinets, and all stand-alone equipment.

vii. The designer shall ensure that the routing of electrical conduit and cable from the electrical distribution board to all room outlets adhere to the separation requirements of AS/ACIF S009.

viii. The designer shall develop a complete wall mounted cabinet design, including conduit and cable routing to the cabinet.

ix. The project manager shall provide to the local building, engineering and maintenance Service (BEMS) all electrical plans and shop drawings for new or altered electrical installations in the room.

i) The ER and TR cabinet design shall provide the capability to install and maintain separation between power and communication cabling within the cabinet to comply with AS/ACIF S009:

i. The designer shall ensure that the segregation of cabling in cabinets can be maintained to adhere to the separation requirements as per AS/ACIF S009.

j) The ER and TR shall have a communication earthing system (CES) to comply with section 7.4.4 *Communications earthing system* installed and Appendix 6 - *QH rack earthing methodology*.

2.7.3.6 Cabinets and layout

a) The designer shall:

i. provide full details of maximum rack weights, dimensions and rack feet positions and sizes to the structural engineer if required.

ii. be responsible to inform the architect and electrical engineer of these requirements and to do this early in the schematic design phase of the project.

If the above design requirements cannot be met, the designer and the project manager shall prepare an ICT exemption (refer to section 2.4 *ICT exemption*.)

b) The ER and TR cabinets shall comply with section 5.0 *ICT cabinets*:
   i. designer shall allow adequate space for both “Equipment Footprints” and “Clear Working Space.”
   ii. The designer shall discuss with the project manager the network electronics that will be hosted in each room and shall show this equipment on the cabinet elevation details in the plan drawings.
   iii. The designer shall obtain detailed equipment information from the architect and engineers, project manager, and other Queensland Health personnel as necessary to develop a detailed design layout for each equipment cabinet. The design shall identify the exact placement of all cabling panels, each unit of equipment identified by the architect and engineers and Queensland Health personnel, locations of electrical outlets etc.
   iv. The designer shall develop a complete cabinet design, including conduit and cable routing to the cabinet. Where a wall mounted cabinet is to be used, attention must be paid to the dimensions of the electronic equipment to be included to ensure the rack and swing frame provide suitable depth, and able to sustain the weight loading and be able to swing open without obstruction
   v. The designer shall discuss with the project manager the potential for future requirements for additional cabinets and identify future spaces on the plan drawings.
   vi. The designer shall determine the type, quantity, and length of patch cords for all backbone and horizontal cable connections for each cabinet. The designer shall ensure the lengths of patch cords reach the intended connections without excessive length. Note the combined length of all copper patch and work area cords within each channel shall not exceed ten (10) metres otherwise the horizontal permanent link length shall be reduced accordingly.

c) In situations where a cabinet shall be located in a public area, the cabinet shall have a “C” class rating and shall be installed to the requirements of this standard:
   i. The designer shall obtain detailed information from the project manager, and other Queensland Health sources as necessary regarding the equipment that will be located in the secure cabinet to perform cabinet design and to ensure HVAC and electrical requirements are met. This information shall include specific type of cabinets, size (RU’s if cabinet mounted), weight, lighting, placement location requirements, voltage and ampere requirements including specific electrical receptacles to match equipment plugs, single or dual power supplies, heat generated-kW’s, UPS requirements etc.
   ii. The designer shall be responsible to inform the architect and electrical engineer of this requirement and to do this early in the schematic design phase of the project.

d) In addition to the above requirements, the telecommunications cabinet design shall provide physical security to protect the contents and prevent unauthorised access:
   i. The cabinet shall be constructed of heavy gauge steel and be lockable.

ii. The construction and locking characteristics of the cabinet shall be appropriate for the security rating of the area in which it is installed,

iii. Any removable panels shall have tamper-proof screws

iv. Cabinets shall not have Plexiglas or glass panels

e) Earthing components shall be installed inside the cabinets in accordance with the *earthing section* of this standard

f) Installed power and telecommunications cables for equipment housed within the cabinet are to be contained within the cabinet

2.7.3.7 Earthing and electrical protection

a) The designer shall:

i. be responsible to inform the architect and electrical engineer of these requirements and to do this early in the schematic design phase of the project.

b) The ER and TR metallic cable shields, metallic conduits, equipment cabinets and exposed non-current carrying metal parts of telecommunications infrastructure and information technology equipment in the room and/or wall-mount cabinets shall be bonded to an appropriately designed and constructed earthing system located within the room, complying with section 7.4.4 *Communications earthing system (CES)*:

i. The designer shall perform a detailed review of earthing wiring design (for existing/new/remodel - provided by the electrical engineer) to ensure compliance with AS/ACIF S009 and AS3000.

ii. The designer shall ensure that the routing of the earthing cables adhere to the separation requirements of AS/ACIF S009.

iii. The project manager shall provide to the local BEMS all electrical plans and shop drawings for new or altered electrical installations in the room.

2.7.4 Additional requirements for equipment rooms

2.7.4.1 Location

a) The equipment room (ER) shall be sized using the design criteria identified below to accommodate future expansions based on the maximum build-out potential of the campus or Queensland Health-leased facility, the location of the equipment room can then be selected. To minimise both conduit and cable lengths, the ER shall be located as centralised as possible to the buildings on campus and incorporate the building and campus distributors where ever possible.

b) The ER, in new construction, shall be sized and provisioned to contain the major voice, data, and video equipment required to support the building or campus, and the other computer based and networked low voltage systems. In a renovation, remodelling or relocation project with existing facilities, every reasonable effort shall be made to co-locate these systems in a common equipment room.

c) If the server room is in a location other than the ER, all interconnections between the server room backbone and the campus distribution fibre optic backbone shall be located in the ER:

d) The designer shall be consulted to design appropriately sized fibre optic cables to route from the ER to the data centre.

e) The ER shall be located inside the secured area of a campus to restrict access to authorise personnel and to provide additional security to critical telecommunications equipment in the event of a physical and malicious attack and to provide greater control when having to activate business continuity plans. The building housing the M-ER and secondary S-ERs (if any) shall be designed such that they can be monitored as a part of the overall site security system:

f) Other major factors that affect the location of the ER are:

- Access for delivery and installation of large equipment into the ER
- Access by Queensland Health and service provider maintenance personnel
- Close proximity to service entrances for telecommunications and power
- Restrictions on unauthorised access
- Close proximity and centralised to the campus telecommunications distribution pathways (conduits and/or aerial distribution) to minimize the backbone cable lengths.

g) The ER shall not be located in any of the locations listed below:

- Outside secured areas
- Areas subject to water or steam infiltration, particularly basements. A floor drain (with a trap primer) is required if there is any risk of water entering the ER
- Areas exposed to excessive heat
- Areas exposed to corrosive atmospheric or environmental conditions
- Near or adjacent to potential sources of electromagnetic interference (EMI) or radio frequency interference (RFI) such as large electric motors, power transformers, arc welding equipment, or high power radio transmitting antennas. Refer to AS/ACIF S009 for clearance requirements.

2.7.4.2 Sizing

a) The ER shall be sized to match the functionality and size of the campus / building. A correctly sized room will accommodate present and future equipment, having enough space to upgrade and replace equipment on numerous occasions during its life with minimal service disruptions or costly alterations. AS/NZS 3084 requires the equipment room to have a minimum area of fourteen (14) metres^2 (for example 3.5m wide x 4m deep).

b) The ER shall not be shared with electrical installations other than those necessary for telecommunications. The ER may also serve as a BAS/LVE equipment room. Where BAS/LVE equipment is collocated with the ER:

i. The designer shall increase the ER size to accommodate the additional equipment and required additional working space.

ii. The designer shall ensure the clearances for equipment footprints and clear working space requirements as defined in this standard are incorporated.

c) Many Queensland Health buildings are not traditional commercial or office buildings and the sizing requirements of AS/NZS 3084 for special use buildings shall be adjusted to accommodate these buildings. When calculating the base size required for an ER in a Queensland Health building, the following steps shall be followed:

   i. The first step in determining the size required for the ER shall be to:

      - identify the systems that will be installed in the ER
      - identify the size of the area that will be served from the ER. The area might be a hospital ward, an administrative office suite, emergency department at a, a single building, or an entire campus at a health facility
      - identify the quantity, size and variety of systems to be installed to support the area and the space required for each of the systems.

d) Equipment, such as WAN equipment, LAN servers, SAN's, tape backup equipment, switches, and patch panels will require regular access, and shall be located where they are easily accessible.

e) When laying out the arrangement of the ER, the following requirements and issues shall be addressed:

   i. Equipment shall be grouped together with like equipment (i.e., voice, data for both LAN and WAN, video etc.).

   ii. Designate wall space and equipment cabinet space for each specific use, and allocate specific backboard space for the service providers' demarcation areas and any associated equipment (if required). The wall space allocated to the service providers shall be located adjacent to each other on a common wall and on a single aisle of equipment cabinets to concentrate the activities of service technicians in areas away from Queensland Health owned systems in other areas of the equipment room.

   iii. Provide a separate wall space area for demarcation of telephone cable pairs, inter-building backbone cables, and intra-building cables.

   iv. Allocate separate wall and equipment cabinet space for terminating and cross connecting campus distribution cables (both copper and fibre optic). These areas shall be located adjacent to the equipment providing the services, such as the PBX, voice mail system, and data network electronics.

f) The design and size of the ER shall readily accommodate the future growth requirements of the Queensland Health owned campus as determined in section 2.1.3 *Future growth* of this standard. The ER design shall readily accept increases to all telecommunications distribution infrastructure for the facility, such as (service provider pathways for entrance facilities, OSP maintenance holes and entrance pathways for conduits, internal expansion of cables, cross-connect fields, cabinets etc.), and also provide the necessary architectural, mechanical, and electrical provisioning capacity to support the future growth:

   i. Where a relatively large ER expansion could occur in the future, beyond what can be constructed initially, the ER shall be designed and constructed in such a manner that the future

building expansion can be constructed with the least amount of expense and disruption to the (24 x 7 x 365 operation) of the ER and the health care facility.

ii. Placement and sizing of the future telecommunications distribution infrastructure shall be incorporated into the current ER design.

g) The final size of the ER shall not be calculated until an acceptable equipment layout is developed based on the criteria listed above:

i. The project manager shall be involved in this process with the designer, and shall approve the final space requirements and design layout for the equipment and cabinets.

2.7.4.3 Architectural provisioning

a) The ER shall comply with the following height requirements:

i. When the base floor to ceiling height allows, taking into account other height requirements of this standard, the raised floor shall have a minimum of six hundred (600) millimetres clearance to the base floor and shall have a ramp entry with a 1:14 gradient.

b) Special security consideration of the ER shall be given to:

i. The material used for exterior walls

ii. The size and style of windows

iii. The use of heavier doors with heavy-duty locks

iv. The vents and roof-mounted HVAC units.

c) Where the ER door does not lead directly to the outside of the building, all doors in the most direct route to the outside of the building from the ER door shall be the same size, or larger. This sizing is necessary to accommodate delivery and installation of large equipment

d) The ER shall have a security system installed to detect and alarm the following three conditions at the facility's major control:

i. unauthorised access

ii. high temperature

iii. loss of electrical power.

e) If the ER is housed in a building that is separate from other occupied administrative buildings, the security system shall include alarm annunciation lighting mounted on the building exterior for the three conditions identified above.

2.7.4.4 Environmental provisioning

a) Electrical power provisions shall be made to allow the HVAC system to operate on essential supply power when commercial power is disrupted.

b) If the building HVAC system cannot assure continuous operation, a stand-alone (backup) HVAC unit shall be provided for the ER and connected to essential supply.

c) Where humidity levels exceed the limits specified, provide dehumidification or humidification equipment.

d) A high temperature alarm shall be provided and shall be connected to an annunciator located at the local and master control locations.

e) Where a fire suppression system is required in the ER a clean agent system shall be used.

f) An aspirated air smoke detection system shall be provided in the ER.

g) All sprinkler heads within the ER shall be removed.

h) If an external authority requires fire suppression sprinklers to be installed in the ER, the following shall be designed and installed:

   i. Sprinkler heads shall be high-temp, shunt, and dry-head type

   ii. A cut-off valve shall be installed and located outside the ER to keep the sprinkler heads dry and charged only in the event additional fire suppression is required after expression of the clean agent

   iii. Sprinklers shall be equipped with wire cages under the sprinkler heads to prevent accidental discharge

   iv. Sprinkler pipes shall not be routed above equipment cabinets. Main pipe routes are to be above aisles. End point sprinkler delivery where required to be above a rack shall be reticulated from the aisle directly to the sprinkler.

   v. Drainage troughs shall be placed under the sprinkler pipes to prevent leakage onto the equipment within the room

   vi. When sprinklers or other water handling equipment are located in the ER, or where the potential for ingress of water exists, a free-flowing floor drain shall be installed

   vii. No equipment shall be located directly below or within one thousand two hundred (1200) millimetres of any pipes containing water or liquid material.

2.7.4.5 Electrical provisioning

a) The ER shall have suitably rated, power outlets for each non-cabinet mounted equipment. The outlet(s) shall be fed by a separate circuit connected to the UPS supply where available, otherwise connected to the essential supply.

b) The ER may be equipped with an emergency power off switch: this shall have a hinged clear cover to prevent accidental activation and be located in a position to comply with the relevant standards. The switch shall disconnect power to all electronic equipment in the ER, and is to be used in the event of emergency (i.e. electrocution or fire) in the ER. There shall also be a similar means to disconnect the power to dedicated HVAC equipment serving the ER that shall also cause the fire/smoke dampers to close. Refer to the relevant standards and codes for further information.

c) A separate supply circuit serving the room shall be provided and terminated in its own electrical distribution board (“the board”) located in the ER. The board shall be designated accordingly and labelled to clearly identify its function. The board shall be used exclusively for supplying power to electronics equipment in the equipment room. Sizing of the board and the electrical power supply is dependent upon the equipment types and equipment load, and shall be calculated by the electrical engineer on a case-by-case basis, including sufficient spare capacity for future growth and redundancy.

d) The ER power circuits shall originate from the board, dedicated to serving the ER. The board shall not be used to supply power to sources of electromagnetic interference such as large electric motors, medical imaging or transformer equipment.

e) The board shall be linked to the standby generator power supply.

f) If a centralised uninterruptible power supply (UPS) is available to the facility, the UPS shall support the telecommunication and electronics equipment in the ER. The specification of, and operational requirements for, the UPS shall conform, as a minimum, to the following:

i. The UPS shall be compliant with the relevant standards and codes and shall be located in a room that is equipped to vent battery gasses. The UPS shall not be located within the ER that it serves. It shall provide a minimum of ten (10) minutes run time for the supported low voltage systems hardware identified by the electrical engineer.

ii. The designer shall request direction from the project manager regarding any specific needs for an increased UPS run time.

iii. Upon installation, a qualified contractor shall test the UPS units for correct voltage prior to connecting ER equipment. rooms housing the UPS systems shall have the same environmental provisioning as the ER.

iv. A dual telecommunications outlet shall be located adjacent the UPS system for use with a network interface card that will be provided with the UPS. The UPS will communicate via the network with servers and other equipment to orchestrate a graceful and safe shutdown of the equipment in the event of an extended power outage.

v. Designs where the UPS room is not equipped to vent battery gasses shall require a review and approval by the relevant Authority prior to design approval, and additional inspection after installation.

g) In all cases, power for critical network components such as servers, routers, switches, and telephone systems shall be provided through a UPS:

i. The electrical engineer shall perform a lifecycle cost analysis to evaluate the appropriateness of using of a centralised UPS and make a recommendation to the project manager.

2.7.4.6 Cabinets and layout

a) When designing the layout for the ER adequate space for both “Equipment Footprints” and “Clear Working Space” shall be allowed. Note that the cabinet spacing’s are based on the size of a one thousand two hundred (1200) millimetre deep cabinet:

i. All floor mounted cabinets located in the ER shall be 1200mm deep.

b) Where servers are housed in the ER space shall be provided for two people, one on each side of the cabinet, to lift the unit for installation due to the weight. This precludes placing the cabinet against a wall or other object where a server will be installed.

c) Other styles of equipment cabinets and cabinets might be used in the ER, some of which will be proprietary to a particular system or service provider. If approved, the ER layout shall make allowances for proprietary equipment and cabinets, and shall allow for room expansion for future equipment.

2.7.5 Additional requirements for telecommunications rooms

2.7.5.1 Location

a) There shall be a minimum of one (1) telecommunication room (TR) per floor.

b) Prior to placing the TR, the path length from any proposed TR location to the farthest point following the documented pathways shall be determined such that the entire perimeter of the building can be reached within 60m of path length. This allows for 15m within the communications room, 10m for path deviations and 5m to reach the TO. Pathways at the endpoint (catenary and horizontally installed conduit or duct) are included within the 60m. If the perimeter of the building cannot be reached, a second TR shall be provided to ensure the entire floor space can be reached within 90m. All pathways shall follow all designated hallways and shall not pass over any other type of room.

c) Radial measurements from TRs shall not be used as modern architectural design does not support radial measurements.

d) TRs shall be placed centrally within the service area and

   i. preferably opening onto a staff corridor

   ii. shall be outside sterile areas.

2.7.5.2 Sizing

a) The “final size” shall be determined after developing the TR design that accounts for all “equipment footprints” and incorporates all the defined “clear working spaces”, the following process shall be followed:

   i. Use the TR “base size” from the above calculation including the required “clear working spaces” for all systems designated for the TR.

   ii. If the TR door swings inward rather than outward, do not use the wall space behind the door swing for mounting panels, equipment, or placing wall fields.

   iii. If additional space is required to achieve a compliant layout, adjust the length or width of the TR, and if necessary, expand the number of square metres accordingly.

   iv. No “clear working space” requirements shall be eliminated or reduced. TR layouts with inadequate “clear working space” for equipment are not acceptable. Certain “clear working spaces” are a regulatory requirements under AS/ACIF S009.

   v. TRs shall serve an area no greater than 3000 square metres.

2.7.5.3 Environmental provisioning

a) Where possible fire suppression sprinklers should not be installed in the TR. If this in unachievable the following should be implemented::

   i. Sprinkler heads, bends and T-pieces shall not be installed directly above racks or wall mounted equipment

   ii. Sprinkler heads shall have cages fitted

   iii. Sprinkler heads shall face upwards

   iv. Sprinkler heads should have higher temperature shunts fitted where possible.

b) Fire detection systems shall be installed in the TR.

2.7.5.4 Cabinets and layout

a) When designing the layout for telecommunications rooms adequate space for both “Equipment Footprints” and “Clear Working Space” shall be allowed. Note that the spacing’s are based on the size of a nine hundred (900) millimetre deep cabinet:
    i. *All floor mounted cabinets located in the TR shall be either 900mm or 1200mm deep.*

b) Continuous cable raceways shall be specified from all cable ingress and egress points within the TR, above all telecommunications cabinets, and to/from any additional cabling locations within the TR as required:
    i. “Alternate space cable raceways” shall be specified above cabinets which are specifically designed for use over 19” wide cabinets (spaced to simplify horizontal to vertical alignment of “Cross Member Radius Drops”).

c) Cabinets shall not be braced to the wall and shall not support the cable raceway due to the potential for movement damage.

d) 19-inch floor standing enclosed cabinets shall be provided in the TR. Floor standing cabinets should be securely bolted to the floor.

e) For raised floors, all floor-standing equipment and equipment cabinets should be securely anchored to the sub floor. For concrete sub floors, concrete floor anchors shall be used.

f) Cabinets shall be equipped with an appropriate number and type of horizontal and vertical wire management modules both front and rear with strain relief brackets to insure proper bend radius and insure strain relief is maintained for “all” cables.

g) Some ICT equipment requires both front and rear mounting rails and such equipment shall be shown on the cabinet elevation details in the plan drawings.

h) Wall-mounted telecommunications cabinets shall only be permitted in Queensland Health category 5 and 6 site equipment rooms and any category of site telecommunication rooms:

i) The designer shall develop a complete cabinet design, including conduit and cable routing to the cabinet.

j) Category 5 and 6 sites should not justify a separate TR in addition to the ER.

k) All other new buildings shall be designed with TR’s and floor-mounted cabinets.

l) Wall-mount telecommunications cabinets shall meet the requirements of the 12RU cabinet section of this standard.

m) The cabinet design shall provide a Queensland Health approved means of mounting electronics equipment, including one or more LAN switches and UPS. Acceptable means are rails for cabinet mounting.

n) A detailed design layout for each equipment cabinet shall be provided. The design shall identify the exact placement of all cabling panels, each unit of equipment identified by the architect and engineer and Queensland Health personnel, locations of electrical outlets etc..

o) The cabinet shall house the switches, fibre optic breakout trays (FOBOT) and ICT cabling for the floor and shall have the minimum requirements specified in section 5 *ICT cabinets*.

p) The FOBOT and ICT cabling patch panels shall be mounted at the front of the cabinet.

2.7.6 Combined equipment and telecommunication room requirements

a) A combine ER/ TR room shall provide the same functionality as their dedicated counterparts. The most stringent of the specifications from either the ER or TR shall be applied to each of the functional elements of the combined room:

   i. The designer shall review the usage requirements for the ER with the project manager. Depending on the size and usage requirements of an ER, it may also need some or all of the design and construction requirements of a TR.

2.7.7 Entrance facility location

Entrance facility shall be at the perimeter of the building and is used solely to change from outdoor cable types to indoor.

a) The designer shall:

   i. be responsible to inform the architect and electrical engineer of these requirements and to do this early in the schematic design phase of the project.

   ii. where these design requirements cannot be met, the designer and the project manager shall prepare an ICT exemption, refer to section 2.4 *ICT exemption*.

b) The telecommunications entrance facility (EF) shall not be co-located within the ER. It may be located in the same physical room; however a separate location within the ER, including a secure separate zone, may be provisioned.

c) External service providers' contractors/technicians will need access to the EF. Such access is simplified if the facility entrance facility and equipment room are located outside of the secured area of the ER.

d) eHealth Queensland requires that carriage services be obtained directly from the serving carrier. In situations where the network boundary (demarcation point) for the WAN telecommunications circuit requires an extension to the location of the WAN equipment. In accordance with the Telecommunications Act 1997 extension of the carrier's demarcation point by a cabling contractor other than the serving carrier or their authorised contractor shall not be accepted unless the carrier's written authorisation is provided to the project manager at least five (5) working days prior to the work being undertaken:

   i. The designer shall coordinate with the various local service providers to determine their requirements for entrance facilities. These providers can include:

      - licensed carriers, for managed carriage services (i.e. Telstra, Optus etc.)

- licensed carriers, for dark fibre services: (i.e. Pipe Networks, UEcomm etc.)
- dark fibre service providers (i.e. CITEC etc.)
- Queensland Health installing dark fibre, applying either the '500 metre' or '5 kilometre' rule.

e) The cable pathways shall be underground conduit, with telecommunications maintenance holes or pits as necessary, and shall comply with ICTCS and those of the service providers.

f) Close coordination with each of the service providers is critical to determine that their requirements for entrance pathways are met. Where the service provider's requirements are in conflict with ICTCS:

g) The designer shall bring any issues to the attention of the project manager for direction.

h) Some service providers may not share conduit, maintenance holes or pits with other service providers.

i) The design shall include spare pathways sized to accommodate the future maximum build-out potential of the Queensland Health-owned campus as defined previously in section 2.1.3 *Future growth* of this standard, or at least a thirty per cent (30%) increase, whichever is greater:

   i. The designer shall design cable pathways (using at least one hundred (100) millimetres conduit/s) from the property line to the EF.

j) The use of aerial distribution for entrance facilities at Queensland Health-owned facilities is not the preferred option.

2.8 Intelligent patch panels

a) eHealth Queensland, at the time of the writing of this ICTCS, has placed the use of intelligent patch panels outside the scope of the ICTCS due to systems design and functionality requirements, and operational constraints, which are yet to be developed and standardised.

2.9 Air blown fibre

a) Where the network design requires flexibility in terms of topology, fibre core counts and fibre types an air blown fibre (ABF) system may be used. The ABF installation shall comply with regulatory standards AS/ACIF S008 and S009, relevant Australian and International standards.

3. Telecommunications cabling

3.1 Cabling compliance

All telecommunications cabling installed within Queensland Health sites shall meet the requirements of AS/CA S009 for outdoor cables (water penetration and UV resistance) and indoor cables (cable flammability). Compliance information shall show the level of compliance against each of the mandated criteria (water penetration, UV resistance and cable flammability) as 'pass', 'fail' or 'not tested'. Any compliance document that does not include this level of detail or does not detail compliance to AS/CA S008 shall not be accepted.

Evidence of compliance for each cabling product shall be made available by the cabling manufacturer to the installer immediately upon request. The cabling installer shall forward this compliance documentation to the Queensland Health project manager who shall have the information validated by eHealth Queensland Infrastructure Management Assurance.

The installation of any telecommunications cable for a purpose for which it is un-tested or non-compliant shall not be permitted at any time.

Note 2 of AS/CA S009:2013 section 16.1 does not apply to cables installed within Queensland Health premises due to the implementation of a hierarchical structured cabling system.

Gel filled cables shall not be installed vertically beyond a single building level.

IDC frames shall not be installed in any ICT rack.

3.2 Copper voice backbone tie cables

The telephony solutions used within Queensland Health sites consist of either TDM or IP telephony solutions. Business continuity plans in Queensland Health sites mandate the use of Analog / TDM services that utilise copper backbone voice cabling. The pair count for copper voice backbone cables shall be based on TDM technologies during the initial design. The responsible Queensland Health project manager shall confirm the type of telephony solution that is or will be deployed on site. Reductions in pair count shall be reviewed by an eHealth Queensland ICT cabling infrastructure specialist prior to final design being endorsed.

A hierarchical structured cabling system is used within Queensland Health sites. These are (in order of hierarchy):

- carrier demarcation point (MDF for Copper multi-pair cables)
- campus distributor (CD)
- building distributor (BD)
- IDF (for copper multi-pair cables)
- floor distributor (FD).

In addition:

- Each site with a TDM PABX shall have a test point frame (TPF) that utilises type II Disconnect modules. Other modules must not be used due to the wire gauge of modern PABX tails (0.32mm diameter)
- Each building shall incorporate an entrance facility (EF) to change from outdoor to indoor cable types.

Where space and cable types (outdoor and indoor) permit, the above elements may be combined (i.e. MDF / EF and CD, CD / BD / IDF / EF, BD / EF, CD and TPF).

3.3 Copper inter-building tie cables

a) Outdoor rated 0.64mm2 gel filled vermin resistant cabling shall be installed between the MDF termination frames or voice campus distributor and all building distributors.

b) All copper inter-building tie cables:
   i. Shall transition to internal cabling within an entrance facility at the perimeter of the building which it enters.
   ii. The cabling shall be terminated on appropriate IDC frames at both ends.
   iii. Backmount frames shall be used for all IDC Building distributors
   iv. All backmount frames shall be earthed for Lightning Protection in accordance with AS/CA S009
   v. The IDC termination “block” shall be type II disconnect modules.
   vi. Over-voltage protection shall be installed at both ends of the inter-building tie cables for each pair as detailed in *section 7.4.6*.
   vii. The sizing (pair count) of the cable shall be based on the services required with an initial 50% spare capacity. All pairs shall be terminated and tested.

c) All external underground cables shall be installed in conduit as per section 4.1 *External telecommunication outside cabling plant*

d) Direct buried cable shall not be allowed

3.4 Copper voice intra-building backbone cables

a) Category 3, (minimum) copper intra-building tie cables shall be included in the manufacturer’s warranty.

   In the case where:
   i. the telecommunications carrier lead in services enter the building, installed between the MDF or campus distributor and the floor distributors on each floor

      or

   ii. copper inter-building ties enter the building, installed between the voice building distributor and the floor distributors on each floor,

   the cables shall be terminated on appropriate:
   i. IDC modules at the MDF / BD / IDF, and

ii. Twenty-four (24) port patch panels in ICT racks

iii. For legacy wall mounted IDC frames (i.e. 110 systems or Belden frames found in larger sites), additional voice backbone cables may be installed to these frames.

b) The termination of the copper internal tie cables to the patch panels shall be made as follows:

i. The first patch panel shall be wired as two (2) pairs per port, with the last port (port 24) wired as four (4) pairs per port to allow for DECT and other multi-pair services.

ii. Each subsequent patch panel shall be wired as one (1) pair per port, with the last port (port 24) wired as two (2) pairs per port.

c) The sizing (pair count) of the cable shall be based on the services required with an initial 50% spare capacity. All pairs shall be terminated and tested.

d) Refer to Appendix 5 *Typical 45RU cabinet layout installation practices* for typical cabinet layout and cabling configurations installation.

e) An IDF shall be installed where the quantity of cable pairs reticulating to a floor distributor differ from the quantity of cable pairs terminating in the ICT racks or where the riser cables traverse fire compartments.

3.5 Telephone system cables

Queensland Health has two types of telephone system hardware as detailed in the following subsections.

Both types of deployments use a combination of patching to telecommunications outlets and patching to voice patch panels (PSTN services and telephone system services to other buildings).

The designer is responsible for ensuring the capacity of voice patch panels will accommodate all required services. This will be determined in consultation with key project stakeholders including an eHealth Queensland ICT cabling infrastructure specialist to ensure that the voice backbone cabling capacity is sufficient to meet the future capacity requirements of the site. Refer to section 3.4 for details in regards to the termination of voice patch panels in ICT racks.

3.5.1 RJ45 presentation on rack mounted equipment

RJ45 telephone systems are used on smaller sites (up to 90 end points) or to support IP telephony as a system interface component. Requirements are:

a) As a system interface component, the types of services to be connected are typically primary rate ISDN services, small quantities of TDM services (analog PSTN, analog extensions, TDM handsets or DECT base stations).

b) As a small telephone system the number of TDM services is significantly larger.

3.5.2 Equipment using system tails terminated on a test point frame.

Requirements are:

a) When copper system cables are specified by the telephone system manufacturer, they shall be terminated onto the test point frame (TPF) which shall be located within the same room as the telephone system.

b) Type II modules must be used on the test point frame. This is to accommodate the smaller gauge of the system tails which may be as fine as 0.32mm.

c) Data type wall frames (110 / 210 / Belden / Systimax) do not meet the criteria for a test point frame and will not accommodate 0.32mm conductors. Data type wall frames shall not be used.

d) The TPF shall not be mounted in the cabinet.

e) For secondary or tertiary sizes sites, 550 way or 600 way backmount frames including separate vertical jumper bars shall be used. (These are also known as MDF Frames and allow large volumes of jumpers to be reticulated appropriately)

f) The sizing (pair count) of the frame shall be based on the cabling capacity required plus an additional fifty per cent (50%) spare capacity. A minimum of one additional vertical shall be installed at initial installation with mounting hardware (i.e. uni-strut channel) installed for the remainder of the expansion capacity.

3.6 Fibre optic cables

Fibre optic (FO) cables within Queensland Health sites fall into three distinct functions:

1. LAN backbone cables which shall be optical single mode 2 (OS2).
2. Building services cables which shall be OS2 and / or optical multi mode 4 (OM4) depending upon the technological requirements and detailed design.
3. Equipment room design specific which shall be OS2 and / or OM4 depending upon the detailed design of the equipment room. Server room and data centre hardware is often utilising OM4 cabling to reduce interface hardware costs.

It is the responsibility of the designing engineer to consult with the specialist working parties and stakeholders to complete a full and detailed design that ensures the requirements of the technology to be installed are incorporated into the final design of each of these categories. Under no circumstances are the fibre types to be assumed except for Queensland Health LAN backbone cables (OS2 only).

The designing engineer shall determine the possibility of and gain written agreement for sheath sharing with all stakeholders.

All fibre optic cables shall have the following details recorded during installation and be provided to the Queensland Health project manager as part of the as-built documentation:

- Fibre designation (cable number)
- Fibre type (outdoor or indoor)
- Fibre mode (OS1, OS2, OM3 etc.)
- Core count
- Batch number
- Start meter measurement
- Finish meter measurement.

3.7 Fibre optic LAN backbone cables

a) Fibre optic backbone cables shall be run from each campus distributor to each telecommunications room (floor distributor). These cables may traverse, where installed, building distributors and/or building entrance facilities. They shall be OS2 cable with all cores terminated in FOBOT's at either end and be of pre-terminated construction or spliced to LC connectors.

b) The minimum core count for each fibre optic tie cable (Backbone Link) shall be:

   i. for TR's servicing less than five hundred (500) metre2 of usable floor space:

      a. 12 cores total for a site with a single campus distributor, or

      b. 12 cores to each campus distributor (24 cores total) for sites with dual campus distributors)

   or

   ii. for TR's servicing less than one thousand (1000) metre2 of usable floor space:

      a. 24 cores total for a site with a single campus distributor, or

      b. 12 cores to each campus distributor (24 cores total) for sites with dual campus distributors)

   or

   iii. for TR's servicing more than one thousand (1000) metres2 of usable floor space:

      a. 24 cores per one thousand (1000) metres2 or part thereof to the campus distributor for sites with a single campus distributor, or

      b. 12 cores to each campus distributor per one thousand (1000) metres2 or part thereof of usable floor space (24 cores) e.g. three thousand (3000)metres2 of usable floor space means 72 cores of fibre is required.

c) All fibre optic backbone cables shall be crossover as per AS/NZS 3080:2003.

d) Any building services requirements for optical fibre shall be in addition to the core counts detailed above unless agreed in writing by all stakeholders.

3.8 Fibre optic inter-building outdoor tie cables

a) All external cables shall transition to indoor cable in an entrance facility at the building perimeter unless they carry compliance for outdoor and

indoor use as shown on the compliance documentation in accordance with section 3.

b) External fibre optic, underground, rodent resistant cables shall be installed from the campus distributor(s) to each building distributor via an entrance facility in accordance with this standard. They shall be OS2 cables with all cores terminated in FOBOT's at either end and be either pre-terminated or spliced to LC connectors.

c) All gel filled fibre optic cables shall transition in an entrance facility.

d) All external underground cables shall be installed in conduit as per section 4.1 *External telecommunication outside cabling plant*.

3.9 Fibre optic indoor rated inter-building and intra-building backbone cables

a) Indoor optical fibre cable shall be used where cables will not be subject to outdoor conditions as defined in AS/CA S009. Examples are between buildings that are physically joined (share a wall) or cables are fully protected for example in an interconnecting walkway.

b) Indoor optical fibre cable shall be used where fibre reticulates vertically beyond a single floor.

3.10 Fibre optic equipment room cables

An equipment room is required to accommodate common functional equipment for a campus. Typical equipment types are servers, telephone systems, building services systems etc. The supporting network technology differs depending upon the equipment and enterprise requirements for the room. For this reason, the equipment room optical fibre requirements may differ between sites. A specialised working party must be assembled comprising the designer, an eHealth Queensland ICT cabling infrastructure specialist, an eHealth Queensland network design engineer, an eHealth Queensland service delivery unit representative and HHS stakeholders to develop the fundamental requirements for the room.

Optical fibre cable requirements to and within the room are dependent upon the network and system design. Server network hardware may use multimode optics to reduce price therefore the use of OM4 multimode cable within equipment rooms shall be specified by the working party for inclusion in a specification.

The use of MPO / MPT optical fibre cassettes and pre-terminated copper assemblies are recommended in these rooms once the design has been completed and ratified.

3.11 Balanced twisted pair cabling

The performance of balanced twisted pair cabling, in this standard, is referred to in terms of either its "Category" or "Class" and these terms are interchangeable. Irrespective of the term used the connecting plugs and sockets shall be an 8-way modular design. The category and class however, shall be equal and when tested shall provide the performance stated.

Category and classes of cabling shall not be mixed to provide overall performance ratings unless they are a solution designed, engineered and warranted by the cabling manufacturer to provide an installed link and channel compliant with the category and class which is intended.

Cat5 cabling (100Mb Ethernet) was introduced in the early 1990s and was replaced with Class D (1Gbit Ethernet) in the mid-1990s. Category 6 cable was ratified in 2003 supporting 1Gbit Ethernet. Category 6_A was ratified in 2008 to support 10Gbit Ethernet. Modern computing devices are now appearing with 10Gbit interfaces as standard and within 5 years 10Gbit Ethernet support on enterprise LAN edge switch equipment will start to become mainstream.

3.12 Selection of cable type

a) All horizontal cable types shall comply with the relevant standards and shall be rated to equal the connecting hardware unless otherwise specified.

b) In any new leased or non-leased premises that are to be occupied by Queensland Health, the horizontal cabling system shall be installed to a minimum of Class E_A F/UTP. Class E_A S/FTP may also be used.

c) For leased non-clinical premises that are to be occupied by Queensland Health the use of an existing Class E horizontal cabling system may be used however it is important to note the following:

   i. Most existing cabling systems have a number of faults caused predominantly by users with others caused by poor installation practices of the time. Typically, 10% of an existing cabling system will be faulty upon occupation.

   ii. The cabling warranties on Class E cabling have little remaining life and Class D cabling systems are no longer within the installation warranty period covered by the cabling manufacturer.

   iii. Class D and Class E cabling are typically unshielded therefore are unlikely to support widespread use of higher Power over Ethernet devices.

   There is the potential that Category 6_A unshielded twisted pair (UTP) cabling will not perform to specification, for example due to EMI, Alien Near End Cross Talk (ANEXT), or in areas where EMI may be a concern such as teleradiology, telemedicine, nuclear medicine etc.

   As Power over Ethernet (PoE) wattages increase over time, unshielded cables have less tolerance in regards to the effects of additional power dissipation within the cable bundles. Due to the expected lifespan of cabling infrastructure within Queensland Health buildings (Cabling in service for 20 years is becoming common) the use of unshielded cabling in hospitals shall not be used.

d) Optical fibre shall be used in situations where:

   i. the distance between the patch panel and the telecommunications outlet is greater than ninety (90) metres.

   ii. the cabling is run external to a building.

e) In situations where there will be more than one application utilising different pairs of the same sheathed cable Pairs in Metal Foil (PiMF) S/FTP cable, Class F, F_A or optical fibre shall be used.

3.13 Category 5 cabling, Class D

a) Class D cabling shall not be re-used if the cabling is to be disturbed in any way. If the outlets or patch panels are to be re-terminated due to building works, then the outlet location shall have new Category 6_A shielded outlets installed with the required number of outlets as detailed in section 6 *Work areas*.

3.14 Category 6 cabling, Class E

a) Only existing Category 6, Class E cabling that complies with AS / NZS 3080:2003 and AS / NZS IEC 61935.1:2006 shall be reused in non-clinical spaces. Where refurbishment works occur in a clinical campus then the cabling shall be tested prior to disturbance to determine the quality of the installed link. Any Category 6, Class E non-compliant cabling shall be replaced with compliant cabling as detailed in section 3.12.

3.15 Category 6_A cabling, Class E_A

a) Category 6_A, Class E_A cable. For design criteria and Queensland Health requirements refer to section 3.12 *Selection of cable type* and eHealth Queensland Infrastructure Management Assurance.

3.16 Category 7 cabling, Class F

a) Category 7, Class F cable. For design criteria and Queensland Health requirements refer to section 3.12 *Selection of cable type* and eHealth Queensland Infrastructure Management Assurance.

3.17 Category 7_A cabling, Class F_A

a) Category 7_A, Class F_A cable. For design criteria and Queensland Health requirements refer to section 3.12 *Selection of cable type* and eHealth Queensland Infrastructure Management Assurance.

3.18 Wiring sequence

a) All distribution frames, patch panels, telecommunications outlets, patch and work area cords shall be wired using the T568A pair assignments.

3.19 Transition points

a) Transition points shall not be used for horizontal cabling.

3.20 Consolidation points

a) Consolidation points shall not be used to extend the length of or redirect the ends of existing cables.

b) Consolidation points shall be designed to meet specific needs for Queensland Health. These specific needs are:

i. Change of cable type to stranded cabling for movable objects such as Medical Services Pendants and other moveable mountings for outlets.

ii. In open office areas where re-arrangement of outlets will occur within ten years of occupation, or

iii. In the case where horizontal cables traverse several firewalls after exiting the floor distributor a consolidation point may be installed to accommodate future expansion without the need to disturb the fire walls when future installations occur.

3.21 Telecommunications outlets

a) The cabling densities defined in this standard are recommended for use in the design of all new and refurbished Queensland Health sites.

b) All Telecommunications outlets (TO) shall be treated as if they are frequented by small children and as such, comply as per the requirements of AS: ACIF S009.Section 15.2. All Telecommunications outlets shall be shuttered or equivalent to meet AS: ACIF S009.Section 15.2.

c) Queensland Government QGEA ICT cabling infrastructure policy and technical standard define the minimum standards for ICT cabling in all Queensland government facilities. At present the standard lists six (6) classes of work location. These location definitions, whilst useful in a general office environment, do not address the needs of specialised work locations commonly found in hospitals and other health care facilities.

d) In addition to these specialised work location requirements, the use of ICT infrastructure based on integrated cabling systems for distribution of other ancillary services within Queensland Health premises (such as patient alarm, security, intercom, entertainment, voice over internet protocol (VoIP) and picture archiving communication systems (PACS) requires the definition of new location types if costly cable additions and moves are to be avoided in new installations.

e) The minimum cable length for a TO shall be 15 physical metres, unless the cable manufacturer approves shorter lengths and those shorter cables meet or exceed all testing criteria as stated in this standard.

4. ICT Infrastructure Pathways

Queensland Health clinical environments have a high focus on continual and sustainable patient care. One aspect of this care is for minimal disruption to work areas when works are carried out beyond the initial installation of infrastructure in a live environment. For example, to undertake cabling works in an operating theatre can take that theatre out of service for several days whilst the theatre undergoes sterilisation. Other areas have similar impacts due to disruption of activities within the area of works. For this reason, several of the requirements in this section have been clarified to minimise impact to business areas once initial works are complete.

4.1 External telecommunication outside cabling plant

a) All communications pits not installed flush into a footpath or roadway shall have a flush, one hundred (100) millimetre minimum reinforced concrete border installed as a “mowing strip” which will also prevent the pit wall from accidental damage.

b) All communications pits installed in locations where vehicles (including self-propelled mowers) may impact the integrity of the completed pit with damage by crushing shall have a bollard installed adjacent to pit.

c) Conduits shall not be installed in the sides of communications pits unless provision is made to do this by the manufacturer of the pit.

d) Pit sizes for Queensland Health sites shall be:

   i. For one conduit at each end of the pit:

      - a type P3 plastic pit with the following dimensions, length six hundred and sixty-three (663) millimetres, width two hundred and forty-three (243) millimetres and depth five hundred and seventy (570) millimetres with concrete cover with the word “Communications” on it.

   ii. For two conduits maximum at each end of the pit:

      - a type J6 plastic pit with the following dimensions, length one thousand two hundred and seventy (1270) millimetres, width four hundred and sixty (460) millimetres and depth six hundred and twelve (612) millimetres with concrete cover with the word “Communications” on it.

   iii. For more than two conduits at any one end:

      - A pit constructed to meet the conduit capacity requirements including a minimum of 1 spare conduit per end in accordance with the requirements of AS/NZS ISO/IEC18010:2002 telecommunications pathways and pathways for commercial buildings. For the number of conduits to be installed.

e) The type P3 pit shall be used when there is only a requirement for one (1) external conduit to be installed at each end. Conduits shall not be installed in the sides of P3 pits.

f) The type J6 pit shall be used when there is a requirement for two (2) external conduits to be installed at each end. Conduits shall not be installed in the sides of J6 pits.

g) All external conduits entering pits shall be connected to the pit-wall with a Bell-mouth adapter.

h) To allow drainage of the pit, drainage holes shall be provided and the pit shall be bedded on:

   i. one hundred (100) millimetres of fine sand

   ii. a layer of Hessian underlay

   iii. one hundred and fifty (150) millimetres of gravel.

i) An example of the pit installation requirements is attached in Appendix 2 *Pit installation*, showing the installation of one hundred (100) millimetres conduits.

j) Trenching minimum depths are:

   i. three hundred (300) millimetres from the ground surface to top of the conduit in non-trafficable areas

   ii. a minimum of 450 millimetres in trafficable areas

   iii. Where the depth requirements specified in i (ii) above are not achievable, the following shall apply. Cables under roadways and other vehicular traffic areas shall be enclosed in a concrete casing. The casing shall be continuous and protrude at least three hundred (300) millimetres beyond either kerb line. The construction of the casing shall incorporate reinforcing bars along its base to withstand live or dynamic loads reasonably expected by a normal traffic flow within the Queensland Health facility. The casing shall be capable of re-entry and passing through at least two (2) UPVC one hundred (100) millimetre inner ducts.

k) Trenches shall be backfilled with fine sand, such that the sand provides a minimum one hundred (100) millimetre bed around the entire circumference of the installed conduit, and:

   i. ACMA approved PVC marker tape is to be laid on top of the sand prior to filling in the trench (minimum one hundred and fifty (150) millimetres above conduit)

   ii. all open trenches shall be guarded by approved safety barriers

   iii. restored by filling and compacting

   iv. all surfaces restored to original condition.

l) Where appropriate, under-boring should be considered as a cost effective alternative to trenching.

m) The fill rate of external conduits shall not exceed forty per cent (40%) at the completion of the initial installation and sixty per cent (60%) for the life of the installation.

n) All external conduits either above (within covered walkways etc.) or below ground shall be white rigid only UPVC 4.5mm wall thickness, self-supporting to AS 2053, and:

   i. one hundred (100) millimetres diameter along all main conduit routes and not less than fifty (50) millimetres diameter for branch lines

   ii. conduit fill rates shall not be exceeded

   iii. change in conduit size shall be at a pit for underground installations and a suitably sized enclosure aboveground

iv. all UPVC joints shall be glued with external – blue PVC cement
v. conduit ends shall be fitted with a white UPVC conduit flare (bell-mouth) installed flush with the wall surface
vi. shall be installed in complete lengths
vii. ends shall be cut square and all burrs removed so that conduits are completely clean inside
viii. shall be installed such that water does not accumulate
ix. shall be capped and sealed until used to ensure that the conduits remains free of all material and moisture
x. all exposed UPVC conduit installed above ground level to height of two thousand four hundred (2400) millimetres shall be provided with a “hat section” cover. This will eliminate accidental damage to the conduit and ICT cabling within. In high risk areas steel pipe should be considered.

o) A nylon draw rope shall be installed and left in each conduit and shall have sufficient strength to withstand a pulling tension of greater than 4000N (Newtons) and installed in one continuous length.

p) All outside cabling plant should be readily accessible.

To effectively minimise the risk that damaged may be done to existing underground service, the contractor shall ensure that coordination is undertaken with Dial before you dig service before commencing on site work by telephoning 1100. A copy of all information provided in response to the enquiry shall be included in the cabling documentation.

4.2 Internal pathways

Pathways through or in the building structure associated with the ICT cabling infrastructure shall be made in accordance with the requirements of the follow clauses of the ICTCS:

a) All ICT cables are to be reticulated via main passageways to allow future access to the cable pathways without entering rooms. Negotiation with architects for cable pathway access shall occur in the earliest design phases to ensure that the building can be easily maintained in the future.

b) Under no circumstances shall cables be reticulated sequentially through rooms whilst there is access to any of the rooms from a passageway. The exception to this rule is for operating theatres and procedure suites where the cable pathway may traverse the associated induction or clean-up room to enter the operating theatre.

c) If the maximum length of 90m of horizontal cable is in jeopardy then an alternate location for the floor distributor shall be sought.

d) Any cable pathways installed under an elevated building shall be re-enterable and vermin proof.

e) Ceiling hangers shall not be used as support for cabling or cable pathways.

4.2.1 Cable tray / basket

An cable tray or cable basket shall be used where the quantity of cables to an area exceeds 18 cables at initial installation or where backbone cables are to be reticulated. No more than 24 cables shall be installed on a catenary at any time.

In areas that will have inaccessible ceiling pathways, cable tray or basket shall be installed including access hatches at periodic intervals irrespective of the expected quantity of cables to be installed to allow initial and future installation works to occur without significant impact to the site.

The choice between cable tray or cable basket shall meet site and stakeholder requirements.

a) All cable trays / baskets shall:
   i. have no sharp edges.
   ii. be securely fixed to structural members of the building.
   iii. be fitted with manufacturer supplied bends, drops and tees at changes of direction and shall maintain the cable manufacturer's specified bend radii for the cable.
   iv. Each section of the cable tray / basket shall be earthed via a dedicated earthing circuit connected to the CES at the CET in accordance with section 7.4.4 *Communications earthing system*.
   v. have an actual fill rate capacity of no more than 50% at completion of initial installation. The cable tray shall be no more than $^{1}/_{2}$ full at initial install.

      Note: The intent of this item is to ensure that there is at least 100% of spare capacity at completion of initial installation, e.g. if the cable tray height is 100mm, then there will be at least 50mm of spare space above the finished amount of cable lying in the cable tray.
   vi. have a minimum side height of 50mm
   vii. be sized on total floor area to be serviced by the ER and TR when fully occupied.

b) Horizontal cable trays / baskets shall be installed in all locations where there are more than eighteen (18) four (4) pair balanced twisted pair cables being run into the same room, the same general area or the same general direction at initial installation.

c) Cable tray / basket shall to be run from the data cabinet outwards and shall be installed above the main passageways (to enable easy access for the accredited installer to perform moves, adds and changes.

d) In buildings that have access floors, the tray shall be installed in the access floor plenum. Telecommunications rooms with access floors shall have a detailed design completed (including mechanical and electrical) to determine if ICT cabling reticulates in the access floor plenum or above the ICT racks.

e) To enable work on a horizontal cable tray a minimum clearance above of one hundred and fifty (150) millimetres and preferably at least three hundred (300) millimetres is required. Equipment that encroaches on this space shall be allowed if all of the following conditions are met:

i. No more than twelve hundred (1200) millimetres of continual encroachment
ii. Is accessible for one meter on each side of this encroachment
iii. No more than 20% of the individual cable tray run of the overall length is encroached
iv. Future MAC work can be easily accomplished when running new cabling through the cable tray
v. Safety of future installation staff will not have additional risk.

f) Cables shall be loosely fixed with minimum twelve (12) millimetres wide Velcro cable ties for:
i. vertical cable tray / basket runs on average every three hundred (300) millimetres, and
ii. at changes of direction for horizontal runs, and
iii. as required elsewhere on horizontal runs.

g) Ceiling mounted trays shall be supported by hanging brackets equivalent to “Trapezium” brackets manufactured by Uni-Strut Australia.

h) Floor and vertically mounted trays shall be supported by either:
i. L type brackets equivalent to “Cantilever” brackets manufactured by Uni-Strut Australia or
ii. A robust mounting system consisting of channel equivalent to Uni-Strut brand with appropriate manufactured attachment fitting

i) Where the cable tray is exposed it shall be enclosed to afford the protection specified in section 7.3.6 *Mechanical protection*.

4.2.1.1 Catenary cable

a) No more than eighteen (18) four (4) pair balanced twisted pair cables shall be supported by each catenary cable at completion of the installing project. Up to an additional six (6) four (4) pair balanced twisted pair cables may be installed during future service works for a maximum of twenty four (24) four (4) pair balanced twisted pair cables supported by each catenary. If the initial project installs more than eighteen (18) four (4) pair balanced twisted pair cables on a catenary during the initial installation the catenary shall be replaced with cable tray / basket prior to completion of the installing project.

b) Mixed cable types (4 pair, multi-pair and optical) shall not be run on the same catenary at any time. If mixed cable types are required in the same direction then cable tray / basket shall be installed.

c) Catenary cable may be used in all buildings with a fully accessible ceiling void (grid ceiling).

d) Where inaccessible ceilings are to be installed continuous cable pathways shall be installed prior to the ceiling being completed:
i. cable tray, basket or duct
ii. conduit with suitable capacity for initial and future needs

e) Where inaccessible ceilings exist, the requirements of this cabling standard shall be met in regards to the installation of cable pathways to meet the capacity requirements. Where continuous cable support such as cable tray / basket or correctly installed conduit pathways an exemption request shall be initiated for an alternate cable pathway design.

f) Catenary cable shall:

i. be seven (7) strand galvanised or zinc coated steel wire or or equivalent rated to 1600N / 163kg or greater

ii. be securely anchored and supported to the ceiling slab or structural members of the building and tensioned using retensionable devices (for example turnbuckles or gripple strainers and clamps)

iii. be attached using eye bolts or eyelets

iv. be clamped at catenary ends

v. have ends covered by sleeving to protect installation staff

vi. not be run over sharp un-protected surfaces

vii. not be attached using saddles

viii. not be attached to any support mechanism for or any other service

ix. not have catenary ends attached to cable trays / baskets or the supports thereof

x. be earthed via a dedicated earthing circuit connected to the Communications Earth Terminal (CET) The method of attaching an earth to the catenary is with a 2 screw tunnel type connector in lieu of the brass line clamp

xi. be supported by jack chain at distances of no more than three (3) meters.

xii. All fixings and fixture of the catenary wire support system shall be galvanised equivalent to hot dip galvanising or an approved equal.

g) Cables shall be loosely fixed with a minimum of twelve (12) millimetres wide Velcro cable ties on average every three hundred (300) millimetres with the actual distance between fixings to be random between two hundred and fifty (250) and three hundred (300) millimetres.

h) Where cables leave a catenary, they shall be supported in PVC rigid conduit and/or an additional catenary and then the conduits. The conduits will be fastened to the catenary and then at every change of direction in a workmanship like manner. Corrugated conduits should be used as a last resort and should not lay about in ceiling spaces. Refer to section 7.4.8.2 Conduit requirements for cable end points

4.2.1.2 Conduits

This section includes a focus on future serviceability of work areas which have little to no forethought about future servicing. Requirements are:

a) Intermediate wiring joints shall not be permitted in conduit or wiring ducts.

b) All bends shall be fixed at no more than one hundred (100) millimetres from each change of direction.

c) All PVC conduit and their fittings shall be jointed using PVC jointing cement, to the manufacturer's directions.

d) In long continuous conduit runs an expansion joint shall be installed at least every twelve (12) metres.

e) All conduit ends shall be reamed or filed free of burrs and conduit threads entering junction boxes or fittings shall be at least ten (10) millimetres long.

f) Any conduit cast in-slab should protrude the surface of the slab a minimum one hundred (100) millimetres, and located as close as practical to sidewalls, and should exit the slab perpendicular to the surface.

g) Suitable draw cords shall be provided in all conduits housing optical fibre cables. The installer shall install at least one draw cord for every draw cord used.

h) Be no more than half full at completion of initial installation.

i) Customer telecommunication cables shall not be enclosed in conduit of a colour specified in AS 1345 for hazardous services, e.g. orange for electricity and yellow-ochre for gas, except for, the instances specified in *ACA TS 008 - 1997, 5.1.14* and *5.1.15.*

j) Where the fixing surface of a conduit run either changes level or direction adequate support shall be provided to the conduit to relive any stress.

k) Where conduits are:

   i. visible from the floor, or

   ii. installed below 2400mm, or

   iii. installed in a location where they may be used as a hand hold (either intentionally or unintentionally),

   The conduit run shall be fixed at maximum intervals of five hundred (500) millimetres for conduit fifty (50) millimetres diameter and above: all other conduit shall be fixed at maximum intervals of three hundred (300) millimetres.

l) Where conduits are installed in concealed locations and not subject to any of the conditions in point k) above, the conduits may be fixed at maximum intervals of 1300mm (i.e. against a ceiling slab, along a wall surface inside a ceiling).

m) All conduit shall be securely fixed to its supporting structure using full saddles, with effective anchorage provided and installed through the saddle each side of the enclosure. Unless physically constrained by the only available fixing location, single sided saddles shall not be used, for example, hard up against the ceiling on a wall. Single sided saddles shall not be used where intentional or unintentional use as a hand hold is possible.

n) Spring girder clips may be used to fix conduit to flanges of building structural members where the member is not readily accessible and at least four (4) metres above floor level.

o) Conduit saddles shall be metallic with corrosion protection equivalent to galvanising if installed in locations exposed to weather

p) When installed above ground, PVC conduits shall be protected from exposure to direct sunlight for the entire length of the run.

q) Where conduit is run external to a building and is separate from a supporting structure, i.e. a covered walkway it shall be galvanised electrical conduit for the entire length of the run.

r) Flexible conduit shall be used only where rigid is not practical.

4.2.1.3 Service columns, umbilical drops, conduit, ducted screens and ducted workstations

a) Service columns, umbilical drops, conduits, skirting duct, ducted screens and ducted workstations shall:

i. have a minimum of two (2) channels (one (1) for ICT cabling and one (1) for power) with the power cabling in flexi-conduit when entering or exiting the ducting
ii. be designed to ensure the minimum bend radius of ICT cabling is not exceeded (especially when the channel is full) with particular attention to be paid at the junction between different components (e.g. service pole to ducted screen etc.)
iii. have no sharp edges
iv. have no protrusions of rivets or screws into the channels
v. have removable panel(s) for entry to each channel for access to the cabling (umbilical cords are exempt from this requirement)
vi. be no more than half full at completion of initial installation. If it is a direct conduit/duct run for a single group of TO's, i.e. a triple outlet then the spare capacity shall meet the manufactures installation instructions
vii. be coloured to match the workstation / existing office décor
viii. be located where they are inconspicuous, where possible.

b) Individual surface trunking (surface mounted conduit) to each individual outlet is not acceptable.

c) If there is a requirement to install surface mounted conduit due the nature of the construction, or heritage listing of the building, prior to installation, approval shall be obtained in writing from eHealth Queensland.

d) The accredited installer has to determine the maximum fill for ICT cabling for each component of the pathway taking into account the minimum bend radius of the cable and the minimum cross sectional area of the ducting, paying particular attention to entry / exit points and junctions between different components (e.g. service column to ducted screen etc.). Typically the maximum fill for ICT cabling is around half the cross sectional area of the duct unless it has been specifically designed for ICT cabling.

4.2.2 Perimeter skirting duct

a) Perimeter skirting duct shall:

i. be minimum 200mm high X 50mm deep with a minimum of two (2) segregated cable channels. The outlet mounting shall be in the centreline of the duct.
ii. be sized to meet the installation requirements of the cabling vendor with particular emphasis on the cable bend radius.
iii. be filled to no more than 40% at initial installation.

4.2.3 Joinery, short wall and under window concealed pathways

Pathways running through joinery, low height walls or under windows shall allow easy access for servicing for the duration of the location (expected to be a minimum of 20 years) and the following requirements shall be adhered to and exemptions shall not be granted. Some of these requirements are intended to mitigate the legal liability and requirement for structured cabling endorsements, ACMA registration or electrical licenses on service personnel that do not need to work on structured cabling systems:

a) Under no circumstances shall structure cabling, non-structured cabling and power outlets be mounted on the same physical surface if that surface is removable. Joinery panels where this installation situation exists shall be cut into separate sections such that the following conditions are met:

   i. Under no circumstances shall any removable panel require the removal of any other panel.

   ii. A separate panel adjacent the cable entry to the joinery shall not contain any outlets at any time and shall be separately removable.

   iii. Power outlets shall be on a separate panel from all other telecommunications outlets (for example nurse call, duress / security, ICT outlets).

   iv. Telecommunications outlets that are part of the same structured cabling system are permitted to share a removable panel.

   v. Telecommunications outlets that are from independent structured cabling systems (i.e. security cables into the security panel and ICT outlets) shall not share the same removable panel. This is to reduce the legal liability and requirement for structured cabling endorsements on service personnel that do not need to work on structured cabling systems.

b) All power outlets and electrical switch plates shall have shrouds installed at the rear.

c) All power cables in close proximity to a telecommunications outlet or outlet plate shall have conduit installed to meet segregation requirements

d) All telecommunications cables shall be run in a continuous conduit pathway (conduit) from the ceiling space to the outlet location and meet the following criteria:

   i. No more than two 90 degree bends shall be installed.

   ii. One additional 45 degree sweep (a sweep is defined as having a 200mm minimum radius) is permitted at the top of the wall and one additional 45 degree sweep is permitted at the end partition where the conduit terminates.

   iii. Flexing of the conduit (without a formed bend or sweep) are permitted at any point in the run.

   iv. The conduit shall be white telecommunications conduit.

   v. Flexible conduit shall not be used.

   vi. Shall be no more than $^{2}/_{3}$ full to allow a minimum of one additional cable to be installed in the future.

   vii. The conduit shall be of minimum 32mm diameter unless the quantity of cables requires a larger capacity conduit (2 x 25mm may be substituted for 1 x 32mm conduit).

   viii. Conduit shall not be larger than 50mm.

   ix. Conduits shall be dedicated to a single outlet location (or back to back locations if on opposite sides of the wall).

x. A conduit pathway plan shall be developed with the architects and builder to ensure that pathways can be installed such that the structural integrity of the joinery is not compromised.

xi. If a removable panel (hereon referred to as an access panel) is installed adjacent to the feeding vertical wall, then the following may apply:

Large capacity (50mm max) conduits may be run down the wall and into the section behind this access panel such that:

a. all segregation requirements of AS/CA S009 shall be met.
b. feeder conduits then reticulate to each outlet location.
c. the conduit entries and exits are arranged into technologies (structured, security etc.) to allow service works on relevant systems without the requirement for registration / licensing for any other trade.

5. ICT Cabinets

5.1 General

a) It is the responsibility of the designer to ensure:

i. that sufficient space exists to install the cabinet into its final location. If there is insufficient space an alternative can be sought through the ICT exemption process.

ii. that the configuration of the cabinet will require with the Queensland Health information security requirements for co-location with and segregation from other services.

iii. that all ICT cabinets shall have a welded integral earth bolt (earth terminal). If a cabinet is supplied to site without an earth terminal and its fitments, it shall be considered not fit for purpose and shall be rejected. The cabinet earth terminal shall be supplied and fitted with two nuts, a flat washer, an earth lug, and a star washer. The installer shall attach the earth conductor to the earth terminal using a nut, flat washer, earth lug, star washer and nut in that order.

5.2 Enterprise data centre ICT cabinets

Enterprise data centre cabinets are a specialised component that must be engineered within the overall design of the enterprise data centre and as such their specific design elements are excluded from this document.

5.3 Equipment room ICT cabinets

g) The equipment room ICT cabinets shall have the following minimum requirements:

i. Forty-five (45) RU high

ii. Minimum seven hundred and sixty (760) millimetres wide, preferably 800mm, to provide space for vertical cable management and twelve hundred (1200) millimetres deep

iii. Have a full height copper earth bar from the bottom of the cabinet to the top of the cabinet installed. Earth bar to have pre-drilled attachment points, one per RU of cabinet. Option is to have a 2 bolt, 24 tunnel dual screw earth bar.

iv. Dedicated cable zones for vertical cable management

v. The captive power plug shall be able to be fitted through an opening in the cabinet for connection to a socket.

vi. Locate the front rails one hundred and fifty (150) millimetres from the front of the cabinet

vii. The distance between the cage nut interface of the front and rear rails shall be 720mm

viii. Top panel

ix. Earth bonding terminal

x. One hundred (100) cage nuts and one hundred (100) matching bolts of twenty (20) millimetres length

xi. Fully lockable, including fully removable side panels.

xii. The ability to connect/integrate with each other in a row without side panels

xiii. Provision for micro switches to be installed on both doors for future connection to environmental management system

xiv. Minimum of 62% fully perforated doors, front and rear to allow airflow

xv. Plinth or mullion for bottom of cabinet cable access

xvi. Fitted with levelling feet. Feet shall be at their minimum length to achieve level installation

xvii. Top of cabinet cabling access and accessories, including full length access holes directly above the cable zones on either side

xviii. RU labelling to be placed on front and rear mounting rails

xix. Two (2) full height cable trays of a minimum of 300mm wide, preferably 450mm, mounted outside the 19inch rails on opposite sides of the cabinet

xx. One (1) fixed vented shelf able to support a minimum of forty five (45) kilograms, if required

xxi. Two (2) vertical power rails complete with at least six (6) 10A three pin Australian sockets, eight (8) C13 and four (4) C19 IEC socket outlets each fitted with a single phase 32 Amp minimum captive power plug to match site design requirement or the ability to mount other manufacturer's rails.

xxii. Vertical cable management equivalent to Ausrack vertical cable management ringers, 45RU, post mount – ARVCMF45U, shall be the same make as the cabinet manufacturer, and shall require a minimum depth of at least 90mm

xxiii. 14 only horizontal cable managers (13x 1RU + 3x 2RU) fitted in locations as detailed on the cabinet layout detail drawings. Horizontal cable managers shall be at least 90mm deep with spatial capacity for 48 twisted pair patch cables and shall be the same make as the cabinet manufacturer.

xxiv. 10 cable management rings equivalent to Ausrack ARPCMR2S fitted at locations as detailed on the cabinet layout detail drawings.

5.4 Telecommunication room ICT cabinets

a) The telecommunication room ICT cabinet shall have the following minimum requirements:

i. Forty-five (45) RU high

ii. Minimum seven hundred and sixty (760) millimetres wide, preferably 800mm, to provide space for vertical cable management and nine hundred (900) millimetres deep

iii. Have a full height copper earth bar from the bottom of the cabinet to the top of the cabinet installed. Earth bar to have pre-drilled attachment points, one per RU of cabinet. Option is to have a 2 bolt, 24 tunnel dual screw earth bar.

iv. Dedicated cable zones for vertical cable management

v. The captive power plug shall be able to be fitted through an opening in the top of the cabinet for connection to a socket
vi. Locate the front rails one hundred and fifty (150) millimetres the front of the cabinet
vii. Rear rails mounted 100mm inside the rear of the cabinet
viii. Top panel
ix. Earth bonding terminal
x. One hundred (100) cage nuts and one hundred (100) matching bolts of twenty (20) millimetres length
xi. Fully lockable, including fully removable side panels
xii. The ability to connect/integrate with each other in a row without side panels
xiii. Provision for micro switches to be installed on both doors for future connection to environmental management system
xiv. Minimum of 62% fully perforated doors, front and rear to allow airflow
xv. Plinth or mullion for bottom of cabinet cable access
xvi. Fitted with levelling feet. Feet shall be at their minimum length to achieve level installation
xvii. Top of cabinet cabling access and accessories, including full length access holes directly above the cable zones on either side
xviii. Two (2) full height cable trays of a minimum of 300mm wide, preferably 450mm, mounted outside of the 19 inch rails on opposite sides of the cabinet
xix. RU labelling to be placed on front and rear mounting rails
xx. One (1) fixed vented shelf able to support a minimum of forty five (45) kilograms, if required
xxi. Two (2) vertical power rails complete with at least six (6) 10A three pin Australian sockets, eight (8) C13 and four (4) C19 IEC socket outlets each fitted with a single phase 32 Amp minimum captive power plug to match site design requirement or the ability to mount other manufacturer's rails.
xxii. Vertical cable management equivalent to Ausrack vertical cable management ringers, 45RU, post mount – ARVCMF45U, shall be the same make as the cabinet manufacturer, and shall require a minimum depth of at least 90mm
xxiii. 15 only horizontal cable managers fitted in locations as detailed on the cabinet layout detail drawings. Horizontal cable managers shall be 1RU high and at least 90mm deep with spatial capacity for 48 UTP twisted pair patch cables. Shall be the same make as the cabinet manufacturer.
xxiv. 10 cable management rings equivalent to Ausrack ARPCMR2S fitted at locations as detailed on the cabinet layout detail drawings.

5.5 ICT 12 RU cabinet

a) ICT 12 RU cabinets shall only be used when the following are met:
   i. For satellite buildings only that have up to forty-eight (48) telecommunications outlets maximum.

ii. Used in non-clinical and non-critical areas where the business agrees the ICT requirements will be best effort and there will be no minimum of timeframe for rectification of ICT faults.

iii. Should be wall mounted so the top of the cabinet is at a maximum height of one thousand eight hundred (1800) millimetres above finished floor level. The BEMS manager shall sign off the installation height to ensure all OH&S issues are met.

iv. The FOBOT and ICT cabling patch panels shall be mounted at the top front of the cabinet.

v. The captive power outlet, voice frame shall not be mounted under or above the cabinet and shall be located to the side of the cabinet on the non-swung side.

b) The 12 RU cabinet shall have the following minimum requirements:

i. Six hundred (600) millimetres wide and six hundred (600) millimetres deep excluding the swing frame

ii. The swing frame shall be a minimum of one hundred (100) millimetres deep and rear mounted to the cabinet (the total internal depth of the cabinet and the frame is to equal a minimum of seven hundred (700) millimetres)

iii. Be installed on a twenty (20) millimetre AC grade plywood backboard, with the smooth side out. It shall be secured to at least two wall studs, fixed at top and bottom to each stud (typically eight hundred (800) millimetres x eight hundred (800) millimetres) for mounting of the cabinet swing frame, suitably affixed to ensure the cabinet will not separate from backboard or wall.

iv. Have a full height copper earth bar from the bottom of the cabinet to the top of the cabinet installed. Earth bar to have pre-drilled attachment points, one per RU of cabinet. Option is to have a single bolt, 12 tunnel dual screw earth bar mounted on in an accessible location at the rear of the swing frame.

v. Vented top and bottom panels to allow airflow

vi. Perforated door to allow airflow

vii. Fully lockable, including side panel

viii. Micro switches installed on front door

ix. Top of cabinet cabling access and accessories

x. Fan (two (2) fan unit) installed with built in thermostat set to operate at 26C to provide airflow through cabinet.

xi. One (1) vented cantilever shelf if required

xii. One (1) horizontal power rail complete with eight (8) AS/NZS socket outlets and 10 amp captive plug

xiii. Front rails to be set back one hundred (100) millimetres from open door.

5.6 Fibre optic breakout trays

a) Fibre optic breakout trays (FOBOT) shall have:
   i. a sliding splice tray
   ii. the provision to secure the backbone cables at their point of entry fitted with the appropriate cable glands
   iii. lugs or posts for mechanically securing cable strength members or an equivalent securing mechanism
   iv. splice management cassettes capable of containing a minimum of 48 cores of fibre per 1RU FOBOT
   v. dust-caps supplied for all terminations and fitted on all unused terminations
   vi. laser warning safety label to be affixed to front of each FOBOT
   vii. adequate labelling space to identify all ports, fibre type and fibre destination as part of the FOBOT. Each individual port shall be labelled. If the FOBOT does not have adequate space for this labelling then a laminated A4 sheet detailing all of the required labelling elements shall be affixed to the inside of the cabinet door.

b) FOBOTS greater than 1RU shall contain pre-terminated fiber only (no splicing shall be installed in FOBOTS greater than 1RU).

6. Work areas

6.1 Standard work areas

a) The work areas shown in *Table 4 Outlet distribution density (balanced twisted pair) – standard work areas* are based on those identified in QGEA ICT Cabling Infrastructure Policy. The densities listed in this table shall be applied to the functional areas in Queensland Health facilities. Note that the density for some areas have been upgraded from those listed in QGEA ICT Cabling Infrastructure Policy.

Table 2 Outlet distribution density (balanced twisted pair) – standard work areas

Functional Area	Sub Areas	Densities (balanced twisted pair cabling)	Typical use of outlets
Warehouse	Single occupant office	1 x dual TO (Telecommunications Outlet)	PC and phone
Factory/Workshop	Open plan offices	1 x dual TO per 10 square metres	PC and phone
Factory/Workshop	Store area, workshop floor	1 x dual TO per 100 square metres, to a maximum of 5 per building	PC and phone
Open Plan Office		2 x triple TOs per 25 square metres or 1 triple outlet per workstation 100% wireless coverage	PC /phone /printer /photocopier /fax machines /WAP or PC /phone /printer /WAP /PoE /desktop device universal power outlet
Fixed Floor Plan Office		1 x triple TO per occupant 2 x triple TOs per office 100% wireless coverage	PC /phone /printer /photocopier /fax machines /WAP or PC /phone /printer /WAP /PoE /desktop device universal power outlet
Computer / Operations Room/ Utility Room		1 x dual TO per 5 square metres	PC and phone

6.2 Specialised Queensland Health work areas

a) The work areas shown in the below are specialised work areas particular to Queensland Health facilities. The balanced twisted pair cabling densities listed in Table 5 below shall be applied to these areas.

b) The specialised Queensland Health work areas cabling densities, listed in Table 5 Outlet distribution density (balanced twisted pair cabling) – specialised Queensland Health work areas are based on the approved Gold Coast University Hospital: Major New Hospitals – Cabling Density Exemption, Reg No. 09/000.

c) With the exception of requirements detailed in the site specific document and tables 4 and 5, telecommunications outlets are to be dual outlets. The telecommunications outlets shall be located adjacent to the workstation or bed, so that the equipment requiring connection (typically a telephone or computer) can be connected using a cord no longer than three (3) metres.

d) The telecommunications outlet faceplate and jack shall be white and flush mounted wherever possible. The top of the telecommunications outlets shall be mounted either three hundred (300) millimetres above the finished floor level or two hundred (200) millimetres above desk height (to comply with Workplace Health and Safety guidelines) or to match electrical outlets.

e) For hospital wards, telecommunications outlets shall be located in the services panel behind each bed, location of which is to be coordinated with the local / project representative.

f) All conference and training rooms shall have a minimum of three (3) triple TOs to allow for the room/s to be used as disaster management areas or emergency work stations.

Table 3 Outlet distribution density (balanced twisted pair cabling) – specialised Queensland Health work areas

Facility area / room function	Minimum Densities (balanced twisted pair cabling)	Comments
General Wards / Private rooms	1 x dual TO (Telecommunications Outlet) at bedside for patient monitoring 1 x dual TO at bedside for data 1 x single TO patient terminal from ceiling mounted on swing arm pendant 100% wireless coverage	
General ward entry/ exits and birthing, paediatrics, mental health etc.	1 x dual outlet per entry/exit for choke points for RTLS tracking systems.	Area alarms for potential patient or asset monitoring
General Ward Nurses Station	1 x triple TO per person location 2 x dual TOs for non-ICT systems 100% wireless coverage	
Administration areas	1 x triple TO per person location 1 x triple TO per work group area 100% wireless coverage	Workgroup area is a group of up to 8 desks

Facility area / room function	Minimum Densities (balanced twisted pair cabling)	Comments
Emergency Resuscitation Bays	2 x triple TOs on swinging pendant arms, one on each side of bed 2 x dual outlets on Medical services panel at bed head where present 1 x triple outlet at workstation location (side wall) where workstation is present 1 x triple outlet at Telehealth service location. 100% wireless coverage	
Emergency/ Short Stay	1 x dual TO at either side of bed or 2 x dual TO at one side of bed 100% wireless coverage	
General Consulting rooms / Private Practice Surgery	1 x triple TO at clinician's desk 1 x dual TO at bedside 100% wireless coverage	
Offices and Individual Work Areas	1 x triple TO per person location Head of Department or Director offices: 1 additional triple TO on opposite wall 100% wireless coverage	
Acute Recovery Bays	1 x triple TO on medical panel left to side of bed 1 x triple TO on medical panel right to side of bed 100% wireless coverage	
Reception	1 x triple TO per person location 2 x dual TOs + ports as necessary for queuing systems 100% wireless coverage	
Waiting Area	Reception described above. TOs as necessary for kiosks. 1 x single TO for TV 100% wireless coverage	
ICU/CCU/HDU Nurses Station	1 x triple TO per person location 3 x dual TOs for patient monitoring displays / pathology 100% wireless coverage	
ICU bedside	1 x quad TO on pendant arms from ceiling left to side of bed 1 x quad TO on pendant arms from ceiling right to side of bed 1 x triple TO on adjacent wall 1 x dual outlet on pendant at foot of bed (where pendant is installed) 1 x triple outlet on wall for telehealth	

Facility area / room function	Minimum Densities (balanced twisted pair cabling)	Comments
	100% wireless coverage	
NICU bedside	1 x quad TO on medical service panel to left of NICU crib 1 x quad TO on medical service panel to right of NICU crib One triple TO on wall for telehealth 100% wireless coverage	
CCU	1 x triple TO on pendant arms from ceiling left to side of bed 1 x triple TO on pendant arms from ceiling right to side of bed 1 x dual TO for monitoring 1 x single TO patient terminal from ceiling mounted on swing arm pendant 100% wireless coverage	
Cardiology/ECHO Rooms	2 x dual outlet at bedside 100% wireless coverage 1 x triple outlet at staff workstation where present	
EEG	2 x dual outlet at bedside 1 x quad outlet at staff workstation where present 100% wireless coverage	
HDU/MDU bed unit (General)	2 x dual TOs at bedside for data 1 x single TO at bedside patient phone (Except Mental Health HDU) 1 x single TO patient terminal from ceiling mounted on swing arm pendant 100% wireless coverage	
HDU/MDU bed unit (Psychiatric)	2 x dual TOs at bedside for data 1 x single TO at bedside patient phone 1 x single TO for patient terminal 100% wireless coverage	Requires Consultation
Clinic Room without desk	1 x ~~triple~~ Dual TO at bedside 100% wireless coverage	
Anaesthetic Induction Room	1 x Dual TO on MSP 2 x dual TO on wall for AARK monitors 100% wireless coverage	
Clinical Measurement, Pathology, Medical Imaging Rooms	To be specified in conjunction with user groups. Will vary in quantity with each of these departments 100% wireless coverage	Requires extensive consultation with senior users and equipment suppliers

Facility area / room function	Minimum Densities (balanced twisted pair cabling)	Comments
Operating Theatres	6 x TO on pendant 1 for surgeon 6 x TO on pendant 2 for anaesthetist 1 x dual TO on perfusion pendant (Cardiac Theatre) 1 x triple TO on wall for workstation 1 x single TO for telephone 1 x single TO for clock **Additional 6 cables to Consolidation point for future use** Internal wiring to equipment cupboard as specified by equipment vendors. 100% wireless coverage	Requires extensive consultation with operating theatre vendor and senior users to determine final requirements. Integrated operating theatres will require half a rack per theatre close to each theatre. **The close proximity is related to AV cabling distances and may be solution specific. Consult with Vendor for specific details and design.**
Research Laboratories	To be specified in conjunction with user groups 100% wireless coverage	Requires Consultation
ENT, Ophthalmology	1 x triple outlet at clinician's desk 1 x dual outlet at bedside / chair 100% wireless coverage	
Renal	1 x triple outlet at clinician's desk 2 x dual outlet at renal chair (one either side) 100% wireless coverage	
Endoscopy / Gastroenterology	Per operating theatre plus One link between pendants Requires system specific AV cabling 100% wireless coverage	Requires extensive consultation with Endoscopy system Vendor
Scanning rooms (CT Scan, medical imaging, general x-ray)	1 x triple outlet per control room position 1 x dual outlet per control room 100% wireless coverage if appropriate	Requires extensive consultation with imaging vendor
DECT Base stations	One Single TO per location DECT base stations are required at one per 250m2 and are to be installed in corridors (walls)	Survey is to be conducted by voice vendor
Remote DECT Base Stations	Pole Mounted or remote to the building containing a FD or using external cable 1 x 4 pair voice grade cable to Voice BD	

Facility area / room function	Minimum Densities (balanced twisted pair cabling)	Comments
Wireless Access Point (internal)	1 x single TO per location. Wireless is required to meet site requirements. Planning is at one per 50m2	Survey is to be undertaken by specialists and locations to be advised to cablers. eHealth Queensland Infrastructure Management Assurance is to be consulted at initial design as technology changes may require 1 x dual TO per location.
Wireless Access Point (pole mounted or separate to the building containing the TR)	4 core OS2 per pole location. Upstream end to be determined by network designers.	Survey is to be undertaken by specialists and locations to be advised to cablers
Staff rooms	1 x dual TO per 20m2 to a maximum of 3 x dual TO	
Dental Surgery (open plan)	2 x dual TO per dental surgery or chair 100% wireless coverage	
Dental Laboratory	To be specified in conjunction with user groups 100% wireless coverage	Requires Consultation
Dental Surgery (room)	1 x triple at PC location 1 x dual on ceiling for monitor	May require AV cable from PC to ceiling
Dental Imaging Rooms	2 x dual TOs	As Required, Consult with imaging supplier for locations
Nursing Home Wards / Private rooms	2 x dual TO per resident as • 1 dual TO per bed 1 dual TO at each resident desk	Must be NBN Service compliant
Stores Area	1 x triple TO per person location 1 x dual for distribution stores for delivery docket printers 100% wireless coverage	Requires Consultation for number of receiving and despatch work area / printer locations
Dispensing Area	1 x triple TO per person location 1 x dual outlet at each fridge 100% wireless coverage	Requires Consultation
Factory / Store area, workshop floor	To be specified in conjunction with user groups 100% wireless coverage	Requires Consultation
Conference and Training Rooms (Can be used as disaster management or emergency offices)	3 x triple TOs minimum, additional points depending upon conference room size 1 x dual TO in ceiling for projector cabled to equipment cabinet in room 1 x dual TO in ceiling for IP based AV equipment to floor distributor 100% wireless coverage.	Requires Consultation

Facility area / room function	Minimum Densities (balanced twisted pair cabling)	Comments
Staff Quarters (On campus only) - Flats/Units/Houses	Refer to stakeholder interviews for requirements	Requires Consultation Must meet NBN requirements for services: Private ADSL, Private phone and QH telephone extension
Canteen	To be specified in conjunction with user groups. 1 x triple TO at each register 1 x triple TO at desk 100% wireless coverage.	Requires Consultation
Library	1 x triple TO per librarian location. 1 x triple TO per work group area 1 x dual per visitor workstation location. 100% wireless coverage.	Requires Consultation
Digital information display units and kiosks	1 x dual TO per display	
Physio Gymnasiums	1 x triple TO per workstation location 2 x dual TOs minimum to support gymnasium equipment	
Vaccine and blood products storage refrigerator	1 x dual TO per general fridge/freezer 1 x dual TO per blood or vaccine fridge	
Staff resource area (photocopy/printer)	1 x triple TO per device location	1 fax, 1 printer, 1 spare

6.3 Copper patch and work area cords

a) Patch cords are for use in the equipment / telecommunications rooms. They shall:
   i have an anti-snag device fitted.
   ii be long enough to reach their proposed location utilising horizontal and vertical cable management with no more than three hundred (300) millimetres of excess length.

b) Work area cords are for connection at the telecommunications outlet.

c) Patch and work area cords shall have an outer sheath of the following colours:
   i yellow for voice
   ii blue for data (including VOIP)
   iii red for crossover
   iv orange for carrier services
   v green for management
   vi pink for keyboard mouse monitor as required

vii purple for medical equipment networks
viii grey is reserved
ix white is for Wireless Access Points
x black for secondary data.

Note: Where these colours cannot be met by the manufacturer, a suitable colour identification scheme shall be used.

d) Voice cords shall be a minimum of Category 3 or equal to the category of cable installed. If the voice solution is IP Tel then the minimum category of cable shall be equal to the category of cable installed.

e) The equipment supplier may provide voice work area cords.

f) Data cords for all sites shall be the same category and manufacturer as the horizontal cabling system.

6.4 Fibre optic patch and work area cables

a) All fibre optic cords shall be:
   i crossover
   ii two (2) core.

b) Fibre optic cords shall be the following colour:
   i. 50 / 125 micron OM3 / OM4 LC terminated cords – aqua
   ii. 9/125 micron OS1/OS2 LC terminated cords – yellow.

c) For replacement only of existing fibre optic cords:
   i. 62.5 / 125 micron SC terminated cords – orange
   ii. 50 / 125 micron OM2 SC terminated cords – grey
   iii. 50 / 125 micron OM3 SC terminated cords – aqua
   iv. 9/125 micron OS1/OS2 LC terminated cords – yellow.

6.5 Non-standard work area cables

a) Any media conversion shall be performed in the work area and shall not, under any circumstances, take place in the horizontal permanent link (HPL).

b) The HPL cabling shall not be made or installed to be non-compliant with this standard to accommodate an appliance/device/equipment.

7. Installation

7.1 General

a) This document shall be read in conjunction with any other specific installation, maintenance or operation instructions, issued by Queensland Health, in writing and these shall be incorporated with the ICTCS to form the minimum requirements for the installation of Queensland Health ICT cabling.

b) The following installation requirements shall apply:

7.2 Standards and codes

7.2.1 References

a) The applicable editions (or versions) of the documents referred to in this standard are classified as referenced documents. If these documents refer to another document, the other document shall be classified as a sub-referenced document. Where the edition (or version) of the sub-referenced document is uniquely identified in the reference document, then that edition (or version) applies. Where the edition (or version) of the sub-referenced document is not uniquely identified in the referenced document, then the applicable edition (or version) of a legislated document is that which is current at the date the referenced document is legislated under the applicable regulatory framework or otherwise comes into effect, or for a non-legislated document, the date upon which the document is published by the relevant standards or code organisation.

b) Where this standard expressly requires materials and/or workmanship of a higher standard than those applicable under either referenced or sub-reference documents, this standard shall be followed.

c) The contractor shall advise the project manager of all referenced or sub-reference documents referred to in development, design, installation and maintenance or otherwise in support of the Queensland Health ICT cabling infrastructure.

d) Where a discrepancy arises between this standard and a referenced or sub-referenced document, section 1.1 *Precedence of documents* of this standard shall apply.

7.2.2 Authorities

a) All work shall comply with the requirements of the appropriate authorities having jurisdiction over cabling work and associated materials and workmanship.

7.2.3 Security

a) All security and external access is to comply with the Queensland Health security requirements and all ICT security standards. Where an access device is issued to a person that person shall sign for the receipt of the device and shall be responsible for its safekeeping, appropriate use and

return (either on completion of the project or on demand, in writing, by the project manager).

7.2.4 Uniformity

a) Uniformity of type and manufacture of each individual fitting or item of equipment shall be maintained throughout the installation.

b) When a particular manufacturer has been adopted for fittings or equipment, all such fittings and their components shall be uniform throughout the installation.

7.2.5 Accessibility

a) Cabling plant both indoors and outdoors should be readily accessible and shall be in accordance Workplace Health and Safety requirements.

7.3 Materials, equipment, components, devices and workmanship

7.3.1 Supply and installation

a) Cabling materials, equipment, components and devices supplied and installation shall include the following:

i. All minor items, incidental work, equipment, accessories and materials may not be specifically mentioned but shall be required for the proper completion of the installation and use of the equipment in accordance with the true intent and meaning of this standard.

ii. All necessary safety devices for the protection of personnel against injury and the protection of materials and equipment against damage including effective earthing, overvoltage surge and lightning protection etc.

iii. Where possible, clearly visible and robust manufacturer's nameplates permanently fitted to each and every item of cabling equipment and showing the manufacturer's name, type and/or model number, serial number and all essential operating data.

iv. Where necessary or required by legislation appropriate warning notices shall be prominently fixed to equipment, components or devices where harm may occur as result of improper use or misadventure. For example, uncovered optical fibre terminations at eye level.

b) Provision for the inspection of all cabling materials, equipment, components and devices, by the contractor or their agent, at least once during the course of the installation. Such inspections shall be arranged as and when required by Queensland Health.

7.3.2 Unused and current

a) Unless specified all cabling materials, equipment, components and devices shall be new and unused, of current manufacture, first quality and the best of their respective kind.

7.3.3 Manufacturer's performance and recommendations

a) All cabling materials, equipment, components and devices shall operate satisfactorily within the parameters warranted by the manufacturers.

b) All manufactures designs and/or instructions shall be followed as per AS/CA S009:2014, section 5.2.

c) If a manufacture has written instructions, then these instructions shall be followed

d) Any design and/or installation departures from these written instructions shall only take place when the manufacture has updated these written instructions in totality and released them to the industry.

7.3.4 Consistency

a) When a particular manufacturer has been adopted for fittings or equipment, all such fittings shall be consistent throughout the installation and wherever possible, all components shall be manufactured and by the same manufacturer.

7.3.5 Conflicts with the ICTCS

a) All ICT cabling work is to be installed as per the manufacturers' requirements. Should these requirements conflict with the requirements detailed in this standard, the accredited installer is to provide details to the project manager or nominated representative, in writing, within one (1) working day. The project manager or nominated representative will then take up the issue with the manufacturer. Once a solution is reached, both the project manager or nominated representative and the manufacturer will inform the accredited installer in writing. If a solution is not reached within three (3) working days, the project manager or nominated representative will provide, in writing, a course of action for the accredited installer to follow (to enable the accredited installer to complete the project).

7.3.6 Mechanical protection

a) The cable system shall be adequately protected where it is reasonable to expect that any part or all of it might be damaged, caused to malfunction, be tampered or interfered with, resulting from: misadventure, vandalism, mechanical injury, exposure to the weather (including direct sunlight), water, excessive dampness, corrosive fumes, an accumulation of dust, steam, oil, high temperature, or any other adverse conditions and/or contaminates which may be reasonably encountered during its use.

b) The accredited installer shall be responsible for familiarising themselves with the cabling environment at the site and shall provide adequate protection to the cabling system to protect it from the impact of that environment.

7.3.7 Temperature

a) All cabling materials, equipment, components and devices shall be rated for the ambient temperature, by which is meant the maximum average temperature over any eight (8) hour period within its immediate enclosure without the aid of air conditioning.

b) Unless specified otherwise, where the area is air conditioned, it shall be assumed for this purpose that the air conditioning runs at its highest temperature condition.

7.3.8 Voltage and frequency

a) All cabling materials, equipment, components and devices shall be rated for use on the voltage and frequency specified in the relevant Australian standard.

7.3.9 Vibration

a) Where vibration is present, all cabling materials, equipment, components and devices, which could be affected by vibration, shall be selected and installed to ensure satisfactory operation and protection of an approved manner.

7.3.10 Stability

a) Unless portability is required all cabling equipment, components and devices shall be solidly fixed in position, square and true.

7.3.11 Suitability

a) Cabling materials, equipment, components and devices supplied and installed shall be suitable for the application and the arrangements shown on the drawings. Notwithstanding this, the materials and equipment offered shall comply in every respect with the requirements.

7.3.12 Electronic displays

a) Where displays form an integral component of the cabling these shall be designed and installed to provide consistent clear visibility in the surrounding level of illumination and shall not be obstructed in their operation by any part of the cabling. Examples of such displays are those incorporated in intelligent patch panels.

7.3.13 Best practice

a) Workmanship shall be of the highest standard using the best current practices.

b) Workmanship and warranty shall be verified on 100% of the channels by the manufacturer. Partial testing will not be allowed. Manufacturer shall have a full time local employee capable of performing onsite inspections as required by eHealth Queensland.

7.4 General requirements

a) The drawings provided as part of the documentation for a project shall show the location and route of all components of the ICT cabling infrastructure. These details are approximate unless a specific measurement is shown.

b) The actual location of ICT cabling pathways shall be determined by the accredited installer on site. This shall be as close as possible to the

proposed location, taking into account hazardous situations (electrical and non-electrical), EMI and obstructions. Where the proposed and actual locations vary by more than one thousand (1000) millimetres, the accredited installer shall inform the project manager in writing. The project manager or nominated representative shall reply in writing within one (1) working day detailing what course of action is to be followed.

c) The actual location of outlets shall be coordinated with the installers of electrical services and workstation furniture. Where the proposed and actual locations vary by more than five hundred (500) millimetres, or where there is a dispute, the accredited installer shall inform the project manager in writing. The project manager or nominated representative shall reply in writing within one (1) working day detailing what course of action is to be followed.

d) If not specified in the documentation, work shall be performed in normal working hours, with any cutovers of services that may disrupt customers, to be performed at a time agreed with the customer representative.

7.4.1 Excavation

a) Any civil works required in relation to the installation of the ICT cabling system shall be performed in accordance with the relevant civil engineering codes and ordinances of Commonwealth, State and Local Statutory Authorities.

b) Excavation shall be the responsibility of the contractor unless otherwise agreed.

c) The contractor shall be responsible for all excavation, cable protection, back fill, surface restoration and the installation of cable markers.

d) Before proceeding with any excavation work, the contractor shall ascertain details of any underground services in the area.

e) Where excavations are required near footings, foundations, and concrete floors etc., the contractor shall ensure that the earthworks do not interfere with these structures and backfill is well consolidated.

f) Unless otherwise agreed by the project manager, the contractor shall arrange the installation so that all trenches are excavated and backfilled on the same day.

g) The contractor shall ensure that WH&S practices are observed at all excavations, providing safety barriers, warning notices, shoring etc., and any other items as deemed necessary by the project manager.

h) Where the works are likely to cause major disruption and inconvenience to, or pose a safety problem for, the site the contractor shall seek and obtain written approval, from the project manager, within ten (10) working days before commencing.

i) All surfaces shall be made good to the same standard as before the commencement of excavation works.

7.4.2 Building works

a) Any building works required in relation to the installation of the ICT cabling system shall be performed in accordance with the relevant building codes and ordinances of Commonwealth, State and Local Statutory Authorities.

b) Only suitably qualified lightning protection engineers shall perform the risk assessment and their full contact details shall be shown on the risk assessment form to allow for future consultation.

c) Any building works required in relation to the installation of the ICT cabling system shall be the responsibility of the contractor unless otherwise agreed in writing from the project manager.

d) The contractor shall be responsible for the supply and installation of any building signage and labelling required in relation to the installation of the ICT cabling system. (This includes temporary signage and labelling required during construction and permanent signs and labels at the completion of construction).

e) Before proceeding with any building work, the contractor shall obtain the appropriate approval for the works from the project manager.

f) Where the works are likely to cause major disruption and inconvenience to, or pose a safety problem for, the site the contractor shall seek and obtain written approval, from the project manager, within ten (10) working days before commencing.

g) The contractor shall ensure that workplace health and safety practices are observed on all building works, providing safety barriers, warning notices and as well as any other items deemed necessary by the project manager.

h) The contractor shall make good all surfaces affect by the building works to the same standard as before the commencement of the building works. Where applicable the penetration and the fire stopping of fire rated walls shall be in accordance with the relevant building codes and Queensland fire service regulations.

7.4.3 Heritage environment

a) The contractor shall be responsible for determining whether a Queensland Health building is heritage listed. For those buildings listed the contractor shall make available to the Australian Heritage Commission (AHC), plans detailing the work to be performed in or on the listed building and this includes its environs. The contractor shall abide by the guidelines set by the AHC for the installation.

7.4.4 Communications earthing system

a) The preferred earthing method for Queensland Health facilities is a communications earthing system (CES) this is a dual purpose earthing system used for both functional and protective purposes and shall use green /yellow insulated earthing conductors as defined in AS/ACIF-S009:2013.

b) For a schematic representation of the CES refer to Figure 3 of AS/ACIF-S009:2013 “Typical CES for commercial premises with distributed cabling”.

c) The main earthing conductor shall be a yellow/green building wire (minimum size 6.0mm²) terminated and clearly identified at the communications earth terminal (CET) and earth bar of the electrical distribution board or main switch board on the same floor and building of the ICT cabling horizontal sub-system.

d) The main earthing conductor shall connect to a CET located:

i. in a convenient and readily accessible location, or

ii. in the recommended location from AS/ACIF-S009:2013, adjacent to the switchboard to which it is connected, and NOT be installed on / within an electrical switchboard or distribution board.

e) The MDF and IDF shall be earthed using a green /yellow building wire (minimum size 6.0mm²) to allow for the use of surge suppression devices as required by section 7.4.6.4 *Earthing*.

f) All communications cabinets, catenary cables, cable tray, metallic IDC frames etc. shall be electrically earthed as per AS3000:2007 and AS/ACIF-S009:2013.

g) Green /yellow building wire (minimum size 2.5mm²) shall be used for earthing metal structures (communications cabinets, catenary, cable tray, frames etc.).

h) Where surge suppression devices are mounted within a communication cabinet, the earth conductor associated with the electrical circuit supplying power to the cabinet shall not be used to provide the earth required under section 7.4.6.4 *Earthing*.

i) Connection to catenaries shall be by way of a brass or copper line tap. Connections to cable tray or metal structures shall be via a suitably sized closed hole terminal lug, and serrated washer, ensuring that any paint is scraped back to bare metal.

j) No more than one (1) earth wire shall connect into any one (1) connection point.

k) In cabinets, the connection from the CET shall be directly to the earth bar located in the cabinet. All other equipment located within the cabinet, i.e. patch panels, the cabinet earth lug, and other equipment, shall have its earth connection to the earth bar.

7.4.5 Telecommunications reference conductor

a) The telecommunications reference conductor (TRC) is a low noise telecommunications earthing system used specifically for signalling and other functional purposes, which may include equipment reliability. The TRC status is indicated by the use of earthing conductors with violet insulation. For new installations, a TRC would normally only be used where a CES is too noisy for the intended application.

b) The preferred earthing system of Queensland Health is a *Communications earthing system (CES)*, if a TRC is required an ICT exemption shall be submitted to eHealth Queensland for approval before installation.

7.4.6 Communications overvoltage/surge protection

a) Users and equipment shall be protected from communication system overvoltage that may exist between the operational environment and the communication facilities in that environment. Examples of overvoltage conditions may include:

i. contact with Alternating Current (AC) mains power through customer equipment failure or cabling faults

ii. surge currents and induced voltages through power system faults or lightning

iii. power feeding.

b) In situations where the overvoltage condition is due to remote power feeding by carriers and where users are required to be in the vicinity to these feeds the necessary precautions shall be taken to ensure their safety and that of others. Details regarding carrier remote power feeding can be found at:

http://archive.acma.gov.au/webwr/telcomm/industry_codes/codes/c559-2012_part_1.pdf.

c) The provision of communication overvoltage protection shall be assessed in accordance with AS 4262.1:1995 and AS 4262.2:1999.

7.4.6.1 Surge suppression devices (carrier and non-carrier voice grade services)

a) Over voltage (lightning) protection modules shall be fitted to all IDC 10 pair modules and frames directly connected to the lead-in cable, on customer's side of the network boundary, or other external copper cabling (e.g. inter building tie cabling connections) that have, or will have, carrier or telephony present.

b) Over voltage protection shall:

i. be ACMA compliant

ii. be modular protecting each pair individually

iii. automatically restore service once fault is corrected

iv. be maintenance free.

c) All over voltage protection modules shall be electrically connected to back mount or frame.

d) The back mount or frame shall be earthed in accordance with AS/ACIF S009:2006.

e) Surge protection shall be provided where voice grade twisted pair cabling is provided to, or between, buildings or structures, either owned or leased by Queensland Health, in accordance with AS 4262.1:1995.

f) In the case of inter-building ties the surge protection shall be installed on each pair of the cable/s at both ends of the run (each building).

g) The decision to install surge protection on the cabling at or before the network boundary is the responsibility of the carrier.

7.4.6.2 Surge suppression devices - data (non-voice grade services)

a) Under no circumstances shall 4 pair data cables reticulate from one building to another. If data services are required in an adjacent building, they shall be connected using optical fibre cabling and the adjacent building shall have a dedicated floor distributor regardless of building size.

b) Prior to the installation of any cables, a risk analysis shall be performed using calculation procedure outlined in lightning protection (LP) AS/NZS 1768:2007. The risk analysis needs to be applied separately to each building under consideration. Where the two buildings are co-located and the main (feeder) building is fitted with LP, some level of protection may be offered to the second building. In this situation AS/NZS 1768:2007 provides guidelines as to how to calculate the level of protection offered and this will vary on a site-by-site basis.

7.4.6.3 Electrical surge protection

a) The provision of surge protection on reticulated power cables is the responsibility of the BEMS engineer.

7.4.6.4 Earthing

a) Surge suppression devices for connection between communications line conductors and earth and installed in customer cabling shall be connected to the earthing system of the electrical installation or CES using a minimum 6.0mm² green/yellow conductor, and additional requirements as per *AS/ACIF S009:2006 20.20.*, and *AS3000:2000 section 5.0.*

7.4.7 Workplace health and safety

a) The accredited installer shall, prior to working on site:
   i. attend a Workplace Health and Safety (WH&S) induction course.
   ii. inspect the building management plan prior to working on site.
   iii. produce a WH&S plan which shall be forwarded to the site WH&S officer prior to the commencement of work on site. The WH&S plan shall incorporate the Queensland Government *"Building and Construction Industry Workplace Health and Safety Guide"*. The guide is available for download from http://www.justice.qld.gov.au/.
   iv. report to the WH&S representative on site.

b) The accredited installer shall adhere to the building management plan at all times while on site.

7.4.8 Hook and loop cable ties

a) All cable ties shall be hook and loop type, with a minimum width of twelve (12) millimetres. The cable ties shall be loosely fixed, where loosely fixed is defined as the ability to insert one (1) additional cable through the Velcro tie without the need to loosen.

7.4.9 ICT cabling

a) All ICT cabling shall:
   i. make use of ceiling, wall or floor voids.
   ii. utilise cable tray, catenary cable and other authorised supports wherever possible.
   iii. be segregated from power as per AS/ACIF S009:2006.
   iv. have a 'gooseneck' (instead of a coil) of one (1) metre at any entry point to a vertical channel (e.g. service column, plaster board wall etc.), unless manufacture installation instructions allow a coil.
   v. have, wherever possible, three hundred (300) millimetres of slack at the telecommunications outlets to allow for re-termination. It is appreciated that this may not be possible in some types of workstation / skirting duct.
   vi. be kept away from extremes of temperature (e.g. adjacent to a tin roof) since these affect performance and minimise maximum allowable cable length.

vii. enter the mounting space at and run only in the same horizontal plane as the termination location. Refer to the drawing in Appendix 10 *Data cabinet cable dressing*.

b) All ICT cabling shall NOT be:

i. anchored to the false ceiling supports (the calculated maximum loading of these supports does not take into account the additional weight of cabling).

ii. creased / kinked at any point (even temporarily when being drawn from the manufacturer's container). The straightening of the cable after being creased / kinked will not remove the problem.

iii. 'combed' to make them look neat and tidy except at the cabinet end from the patch panel until they enter the ceiling void / conduit. When the cables are combed, they run parallel to each other for long distances inducing alien crosstalk interference which minimises performance. The request for the cables to look neat and tidy at the cabinet end is for aesthetic reasons only.

iv. section 7.4.9, b iii above does not apply to FTP or S/FTP cables as these are not as affected by alien crosstalk.

v. visibly exposed.

vi. sagging in the mounting space within the ICT cabinet.

vii. pulled-in using motorised 4WD winches or motor vehicles.

c) The accredited Installer shall:

i. inspect the cabling path prior to pulling the cable to ensure bending radii of the cable will not exceed the cable manufacturer's requirements and ensure the appropriate equipment used to draw-in the cable does not exceed the pulling tensile-loading limit specified by the cable manufacturer.

ii. use specialised external cable grips and stockings with swivel attachments fitted in conjunction with the cable's load bearing strength members, when a mechanical advantage is required to pull-in the cable.

iii. use a suitable lubricant where a single person applying reasonable effort without mechanical advantage is unable to pull-in the cable without exceeding the manufacturer's tensile-loading specification for the cable.

iv. use cable lubricants that are polymer-based for copper cables and silicon-based for optical fibre cables. Oil, wax and power based electrical cable lubricants shall not be used on low-density polyethylene insulated telecommunication cables.

v. be responsible to ensure that all persons on site are aware of the delicate nature of ICT cabling. The accredited installer is responsible for protecting the cabling from any deliberate or accidental damage by any person during installation. If evidence of such damage is identified (e.g. footprints on the cable) the cable is to be replaced at the accredited installer's expense.

vi. All fibre optic cables shall have the following details recorded during installation and be provided to the Queensland Health project manager as part of the as-built documentation:

- fibre designation (cable number)

- fibre type (outdoor or indoor)
- fibre mode (OS1, OS2, OM3 etc.)
- core count
- batch number
- start meter measurement
- finish meter measurement

7.4.10 Telecommunications outlets

a) All heights specified in this standard are measured to the centre of the telecommunications outlet

b) All telecommunication outlets shall be installed to a structural part of the building unless specified elsewhere in this standard. Under no circumstances shall outlets be installed such that there is movement in the mounting for the telecommunications outlet.

c) The accredited installer is responsible for informing the project manager in writing (prior to completing any work) of any telecommunications outlets scheduled for installation which do not have one dual power outlet installed or scheduled for mounting adjacent (within five hundred (500) millimetres).

d) Telecommunications outlets shall be mounted at the same height as existing outlets. If there are none, in office and administration areas they shall be mounted so the top of the outlet is as close as possible to two hundred (200) millimetres above desk or three hundred (300) millimetres above floor height and in a ward or acute care area on the medical services panel with approval from the project manager and BEMS.

e) Power outlets shall be mounted as close as possible to the height of telecommunications outlets, allowing for segregation.

f) Telecommunications outlets shall be installed in a readily accessible location.

g) All telecommunication outlets shall be treated as if they are frequented by small children and as such, be installed to meet the requirements AS: ACIF S009.Section 15.2 (shuttered outlets).

7.5 Specialised telecommunication outlet locations

a) Queensland Health facilities require the installation of telecommunications outlets in areas not necessarily found in commercial fit-outs. These locations have specific design and installation.

b) The cabling scope of works or construction documentation shall specify for each specialised outlet details, criteria or additional works (such as the requirement to mount antennas or install an enclosure).

c) Outlet mounting shall also be in accordance with the requirements for the specified location as outlined in the following sections

7.5.1 Wireless access points

Queensland Health uses a mixture of wireless access point (WAP) models and brands. The mounting points for brackets are different between brands

and models therefore in some instances specific instructions will be provided in a scope of works or construction documentation to allow installers to complete their works in an efficient and accurate manner. The weight of access points in use at the release of this standard are less than 2kg.

Wireless coverage is based on the requirements of the facility which may be different between sites. Determining the location of WAP's uses software tools, experience and specific skills. Placement of WAP's requires a four-stage process under ideal conditions:

1. A desktop predictive survey that provides an indicative placement for telecommunications outlet(s).
2. An on-site active survey prior to installation to validate / modify the locations identified in the predictive survey. This uses WAP's attached to tripods which are placed in the proposed locations to simulate installed WAP's.
3. Installation of the telecommunications outlet(s) and WAP's in the locations confirmed by the validation survey and
4. A final active survey to confirm that there are no wireless dead spots. This survey may identify new or modified WAP locations to provide the required wireless coverage.

All wireless survey activities are conducted by eHealth Queensland or its contracted representative. Under no circumstances are unauthorised personnel permitted to modify the survey locations. This process leads to the installation requirements as identified below:

a) Telecommunications outlet(s) shall be installed at each WAP location and shall reticulate from the same telecommunications room.

b) Cables shall be run to the location identified in the initial predictive survey and cables secured with 10m of spare cable securely stored and fastened to prevent damage to the cables

c) Final outlet locations shall be in accordance with the validation survey report. A scope of works or contract documentation shall specify all installation requirements for each location. The remainder (or up to 10m) of spare cable shall be retained at the outlet end when terminating and shall be securely stored and fastened to the cable support or structural element of the building in accordance with manufacturer's instructions

d) If the outlet cables at the farthest locations are greater than 90m then the project manager shall be notified immediately to provide a resolution.

e) WAP's and DECT base stations cannot be installed within 2.5m of each other. This is to avoid interference between services. Notify the project manager immediately to allow the determination of a new location for one of the services.

f) WAP's and their antennas shall not be installed in close proximity to any type of detector. Notify the project manager immediately to allow the determination of a new location for the telecommunications outlet

g) Telecommunications outlet(s) shall not be installed within 1m of emergency exit signage. Notify the project manager immediately to allow the determination of a new location for the telecommunications outlet

h) Unless specified in an eHealth Queensland wireless design document, no WAP telecommunications outlet shall be installed at a height greater than 3.3m above finished floor level.

i) Outlet numbers for WAP's shall be sequential.

j) Outlet mounting shall be in accordance with the requirements for the specified location.

7.5.1.1 WAP enclosures

WAP enclosures are often required to mitigate security, patient wellbeing, aesthetics, environmental or infection control requirements.

Enclosures designed for installation into a grid ceiling require no additional works by building trades. Enclosures designed for installations in ceilings of solid construction are to be installed by a qualified tradesperson to ensure the structural integrity of the ceiling is maintained and are usually installed during the initial construction or refurbishment of an area.

a) The telecommunications outlet(s) to be installed within the WAP enclosure during final fitting of the enclosure to allow cables to be reticulated into the enclosure prior to it being secured in place.

b) A secondary outlet identification label shall be installed on the flange of the enclosure that is readable from floor level. In this instance, the site code can be omitted from the label such that the label contains only the room, rack and outlet identifier.

7.5.1.2 WAP locations within solid ceiling void

In some scenarios, the WAP is required to be installed within the ceiling void. In these instances, the WAP will have an accessory antenna fitted. The cabling scope of works shall specify the installation requirements for the outlets, WAP and any accessory antennas. In all cases, an access hatch is required to provide service access to the WAP.

a) The telecommunications outlet(s) for the WAP's shall be located adjacent the opening of the maintenance hatch such that the outlets are no higher than 200mm above the height of the ceiling support structure.

b) A secondary outlet identification label shall be installed on the flange of the access hatch such that is readable from floor level. In this instance, the site code can be omitted from the label such that the label contains only the room, rack and outlet identifier.

c) The cabling scope of works or construction documentation shall clearly indicate any additional works required such as mount an antenna or install a support structure to mount both the telecommunications outlet enclosure and the WAP. In this instance, the mounting requirements for the WAP

bracket shall be contained in the statement of works (SOW) or construction documents.

7.5.1.3 WAP locations on a solid ceiling or surface

This is one of two standard installation locations for a WAP. In this instance, the WAP and data outlets are mounted adjacent on the solid ceiling.

a) The telecommunications outlet(s) for the WAPs shall be on the solid ceiling such that the WAP can be mounted on any side of the outlets.

b) The cabling SOW or construction documentation shall clearly indicate any additional works required such as mount an antenna. These requirements shall be contained within the SOW or construction documentation.

7.5.1.4 WAP locations on a ceiling grid (aka T-bar ceiling)

This is the second of two standard installation locations for a WAP. In this instance, the WAP is attached to the underside of the ceiling grid and data outlets above the ceiling grid.

a) The telecommunications outlet(s) for the WAP's shall be installed no higher than 200mm above the top of the ceiling grid.

b) The telecommunications outlet(s) shall be mounted to a structural element of the building. If walls within the ceiling space are proposed then permission to install in the proposed location must be obtained from:

   i. BEMS for existing sites (via the Queensland Health project manager)

   ii. the construction fire certifier in a construction site via the RFI process.

c) Within one meter of the required WAP location and:

   i. in a location such that a tile containing another service does not require removal to access the telecommunications outlet(s).

   ii. the cabling SOW or construction documentation shall clearly indicate any additional works required such as mount an antenna. These requirements shall be contained within the SOW or construction documentation.

7.5.1.5 WAP locations on a high vertical surface

Some locations require a WAP to be installed on a high foyer or passageway wall. In these locations, a right-angle mounting bracket will be used to secure the WAP at a specified height typically no greater than 3000mm AFFL. There are two models of bracket available – a right angle bracket where the outlets are installed above the bracket and a box style bracket that has a position within the bracket to install a standard outlet plate on the mounting surface or space to install a mounting block behind the outlet plate.

a) If the bracket is specified to be installed by the cabler,

i. it shall be installed at the height specified in the SOW, construction documentation or at a maximum of 3000mm AFFL, and

ii. it shall be securely fastened to the wall and will not be dislodged when the WAP is installed, in service, or during maintenance activities.

b) The telecommunications outlet(s) shall be installed such that the outlets are contained within the bracket (enclosed brackets) or up to 200mm above the bracket.

c) The telecommunications outlet(s) shall not be installed above a doorway unless specified in the SOW or construction documents.

7.5.1.6 Pole mounted WAPs

External wireless coverage is required at some sites. The following additional criteria are to be implemented in addition to the previous clauses:

a) Pole mounted WAPs shall be connected via optical fibre cable.

b) The cabling SOW or construction documentation shall clearly indicate any additional works required such as to mount an antenna. These requirements shall be contained within the SOW or construction documentation.

7.5.2 DECT base stations

DECT is used widely within Queensland Health facilities for voice mobility, mobile duress and mobile messaging. DECT base stations are wall mounted approximately 2.4-2.7m AFFL. There are several sizes and types of DECT base stations, each with a specific set of installation criteria inclusive of mounting and telecommunications outlet position relative to the DECT base station. Determining the location of DECT base stations requires experience in DECT surveying. Placement of DECT base stations is a four stage process under ideal conditions:

1. A desktop predictive survey that provides an indicative placement for telecommunications outlets
2. An on-site active survey prior to installation to validate / modify the locations identified in the predictive survey. This uses portable equipment, which is placed in the proposed locations to simulate installed DECT base stations.
3. Installation of the telecommunications outlets and DECT base stations in the locations confirmed by the validation survey and
4. A final active survey to confirm that there are no DECT dead spots.

All DECT survey activities are conducted by eHealth Queensland or its contracted representative. Under no circumstances are unauthorised personnel permitted to modify the survey locations. This process leads to the installation requirements as identified below:

a) One telecommunications outlets shall be installed at each DECT base station location.

b) Cables shall be run to the location identified in the initial predictive survey and cables secured with 10m of spare cable securely stored and fastened to prevent damage to the cables.

c) Final outlet locations shall be in accordance with the validation survey report. A scope of works or contract documentation shall specify all installation requirements for each location. The remainder (or up to 10m) of spare cable shall be retained at the outlet end when terminating and shall be securely stored and fastened to the cable support or structural element of the building in accordance with manufacturer's instructions.

d) If the outlet cables at the farthest locations are greater than 90m then the project manager shall be notified immediately to provide a resolution.

e) WAPs and DECT base stations cannot be installed within 2.5m of each other. This is to avoid interference between services. Notify the project manager immediately to allow the determination of a new location for one of the services.

f) DECT base stations and their antennas shall not be installed in close proximity to any type of detector. Notify the project manager immediately to allow the determination of a new location for the telecommunications outlet.

g) Unless specified in an eHealth Queensland wireless design document, no DECT telecommunications outlet shall be installed at a height greater than 3.3m above finished floor level.

h) Outlet mounting shall be in accordance with the requirements for the specified location.

i) DECT base stations not mounted within or on a building shall be connected via voice grade cable to a voice building distributor to permit the installation of surge protection.

7.5.2.1 Standard DECT base stations

Standard DECT base stations are mounted directly on a wall such that the top of the DECT base station is 200mm below ceiling height up to a maximum of 3.3m AFFL.

a) A scope of works or contract documentation shall specify all installation requirements for each standard DECT location.

b) The telecommunications outlet shall be installed on the wall 200mm below ceiling height up to a maximum height of 3300mm AFFL.

7.5.2.2 DECT base stations within enclosures

When specified, DECT base stations are mounted in enclosures for environmental or security reasons.

a) A scope of works or contract documentation shall specify all installation requirements for each enclosure inclusive of size and outlet position within the enclosure.

b) All enclosures for DECT base stations shall have a clear lid. Opaque lids shall not be used as they attenuate the RF signals.

c) The enclosure shall be installed as part of the ICT cabling works.

d) The telecommunications outlet shall be installed within the enclosure at the nominated position.

e) The rear of the enclosure shall be sealed to the mounting surface.

f) If mounted on an external surface of a building, the cable entry to the enclosure shall be fully sealed with a cable gland or cable manufacturer approved sealer to prevent build-up of humidity and resultant issues due to condensation.

g) It the enclosure is mounted on an external surface, the IP rating of the enclosure shall be appropriate for the installation location.

h) If the enclosure is mounted on the outside of the building containing the floor distributor then voice grade surge protection shall be installed within the enclosure to allow connection of the DECT base station via the surge protection prior to connection to the horizontal outlet.

7.5.2.3 Pole mounted DECT base stations

a) A scope of works or contract documentation shall specify all installation requirements for each pole mounted DECT location.

b) Cable shall be voice grade and fit for purpose for the cable pathway used.

c) Cable shall run to a voice building distributor to allow surge protection to be installed.

7.5.3 Medical services pendants

Medical services pendants (MSP) are a fundamental piece of hardware located in critical patient care areas such as operating theatres, procedural rooms such as endoscopy suites, resuscitation bays in emergency departments and intensive care areas. MSPs may contain other forms of cables for video and audio or other point to point cabling requirements depending upon the purpose of the room. These other cables shall be specified by the room designer.

A key point to note is that if a data outlet failure occurs during in-service use of the pendant that essential medical equipment may not be able to function as intended resulting in additional staff and workload being required to complete the current procedure. Subsequent repairs to cabling and components for these areas is problematic, can place surgery or treatment calendars in jeopardy and will require both a cabler and a medical services pendant technician and will result in the area being out of service for quite some time as repairs are made, the installation is recertified and the hospital undertakes

all infection control measures to ensure the pendant and surrounding area are sterile afterwards.

Key criteria must be met when installing outlets in MSPs:

1. Queensland Health considers the installed link to be from the patch panel to the outlet on the MSP.
2. The cabling manufacturer must certify the installation without reservation to Queensland Health
3. The cabling in the pendant arm must be stranded to withstand use over 20 years of movement.
4. The components used within the link must be robust to mitigate breakage or failure over 20 years of use
5. The cabling must be installed to meet all requirements of AS/CA S009

Queensland Health proposes that the consolidation point methodology (with a couple of variations) is utilised to meet the requirements as outlined above:

a) A consolidation point is installed at the maintenance hatch location for the MSP that caters for the number of outlets at the MSP.

b) Equipment leads are reticulated in the pendant arm such that the plugs of the equipment leads are at the CP with 300mm of slack.

c) Standard outlets are terminated at the outlet end.

d) The link is tested as follows:
    i. A test from patch panel to CP to confirm that the CP segment is fully functional.
    ii. A commissioning test from patch panel to outlet.

e) Labelling is applied at the following locations:
    i. patch panel
    ii. patch panel horizontal cable sheath
    iii. consolidation point horizontal cable sheath (patch panel side)
    iv. on the CP port position
    v. within the MSP just prior to the outlet termination
    vi. the MSP outlet (visible to user)
    vii. a length measurement from patch panel to CP is applied to the outside of the CP
    viii. A maximum cordage length measurement is applied to the outside of the CP.

7.5.4 Difficult to access locations

Some locations are considered difficult or complex to access after construction when future servicing is required. Such locations are operating theatre areas mental health inpatient areas, emergency departments and any high

dependency location. It is important that the end cable pathway is accessible in future to allow maintenance and additional cables to be installed in future whilst minimising additional invasive trade works such as plaster works or additional maintenance hatches.

The following requirements are applicable to new construction and refurbishment where the wall cavities and ceiling spaces area accessible. These areas shall use solid conduit pathways as follows:

a) From the outlet location within walls to an accessible location in the ceiling space. All fire certification requirements shall be adhered to.

b) In rooms where all stakeholders agree not to install the required outlets, conduits shall be installed to meet future outlet requirements. These shall be installed to match room functions (i.e. inpatient room etc.).

c) In operating theatres and procedure rooms, an additional number of conduits (32mm) shall be installed from up to four nominated locations where outlets may be useful in the future. These conduits shall reticulate to the CP location in at the MSP maintenance hatch location and be labelled appropriately. As built drawings shall contain location and size information. Heights shall match other wall mounted outlets within the room.

7.5.5 Copper patch cords

a) RJ45 style plugs shall have all eight (8) contacts installed. Under no circumstances shall any RJ45 style plug with less than eight (8) contacts be inserted into a data outlet. This applies to any cords (voice or data).

b) No connector apart from an RJ45 shall be plugged into RJ45 telecommunications outlets. This is especially true of telephone cords terminated in RJ11 or RJ12, which can damage the RJ45 telecommunications outlet and void the warranty.

c) Hybrid patch cords are acceptable e.g. a Class F to RJ45 patch cord for a Class F cabling solution. These cords will not plug into an RJ45 outlet.

7.5.6 Fibre optic patch cords

a) The connectors on fibre optic cords shall be cleaned immediately prior to being patched / repatched to remove dust, dirt or fingerprints which can affect performance.

7.6 Associated works

7.6.1 Removal of abandoned cabling and equipment

Removal of abandoned/redundant cabling is a regulatory requirement under AS/ACIF S009 and the building code of Australia:

a) When removing cabling materials, equipment, components and devices no longer required in service – seal any holes in walls, floor, ceiling etc.

b) Installed communications cable that is not terminated on both ends or tagged for future use (abandoned cabling) shall be removed, upon the written request from Queensland Health.

c) Communication to the eHealth Queensland project manager of all the removed channels is required for documentation purposes.

d) The contractor is responsible for all recycling fees and removal from site of abandoned cables.

7.6.2 Handling of asbestos

a) The contractor shall, before commencing work on the site, meet with the site's nominated officer to examine the site's "Building Management Plan" to ascertain the presence of asbestos. If asbestos is registered in the "Building Management Plan", the contractor shall contact Queensland Health who will authorise for the necessary work (as detailed by the contractor) to be carried out. The contractor shall ensure that the site building management plan includes references to "Low Density Fibre Board" (LDB). This product was previously classified as non-hazardous but is now classified as a Class A product.

b) Under no circumstances shall the contractor or their approved sub-contractors undertake work where it is known to involve asbestos, without a written request from Queensland Health to do so. Only personnel who are appropriately trained, or if required by the *Work Health and Safety Act 2011* licensed, to carry out work with asbestos shall be used. If a licence is required, proof of this licence shall be given to the customer. Any work carried out by the appropriately trained and/or licensed personnel shall be carried out in accordance with *Workplace Health and Safety Regulation 1997, Part 11, the Asbestos Advisory Standard 2004 and the* Department of Housing and Public Works *Asbestos Management and Control Policy for Government Buildings.*

c) If the site's "Building Management Plan" does not indicate the presence of asbestos and asbestos is discovered once work commences, The contractor shall:

   i. clear and contain the site in accordance with the *Workplace Health and Safety Regulation 1997, Part 11, the Asbestos Advisory Standard 2004*

   ii. Contact Queensland Health immediately who will authorise further action or completion of the job.

d) The contractor shall comply with all reasonable instructions and/or directions issued by the Queensland Health or the Department of Housing and Public Works regarding asbestos present or suspected on a Site.

e) The contractor shall assume the role of the principal contractor in accordance with the Work Health and Safety Act.

7.6.3 Painting and corrosion protection

a) The contractor shall be responsible for corrosion protection and the painting treatment of all metal enclosures, threads, brackets, supports, cable trays and ladders, weather shields etc. being supplied and/or installed by the contractor. The contractor shall also be responsible for the restoration to the original finish (or a matched equivalent) of paintwork to enclosures, structures, equipment and accessories.

b) Where painting is undertaken for corrosion protection the paint shall be equivalent to a cold galvanising preparation.

c) Other painting and corrosion protection e.g. cubicles shall be in accordance with the main painting specification for the particular plant area.

d) Where painting is required for building services and utility enclosures e.g. electrical, fire alarm etc. painting shall be to the relevant Australian standards.

e) Where no special painting procedure is specified, all metal surfaces shall be wire brushed (or equivalent) to remove all traces of rust, scale, grease etc., and prime coated with one coat of an approved rust inhibiting paint. The finishing coats, including colour and type of paint, shall be advised by the project manager.

f) Where an enclosure is required under a regulatory or an Australian standard to be manufactured a particular colour, painting the enclosure in an attempt to comply shall not be allowed.

g) If wooden support structures are used in the installation and they are exposed to the weather, then they shall be painted.

7.6.4 Penetrations

a) Penetrations through or in the building structure associated with the ICT cabling infrastructure shall be made in accordance with the requirements specified in the following sub-sections.

7.6.4.1 Acoustic sealing

a) Wherever services penetrate walls, floors or ceilings, acoustic sealant shall be supplied and installed to maintain a degree of acoustic separation at least equal to the materials penetrated.

7.6.4.2 Air tight seals

a) All penetrations of trays, risers and/or ducts through the building fabric of chambers subject to suction or pressurisation shall be sealed in accordance with relevant Australian standards and to the satisfaction of Queensland Health.

7.6.4.3 Core drilling

a) Approval from the local BEMS engineer shall be obtained prior to undertaking any core drilling of building structural members.

7.6.4.4 Fire stopping

a) Where cabling penetrates fire rated barriers, those penetrations shall be sealed (fire stopped)

b) The accredited installer is responsible for ensuring all penetrations through fire rated partitions within the scope of works are fire-stopped as per the requirements of the building code of Australia (BCA) and re-certified.

7.6.4.5 Roofing

a) Wherever services penetrate the external roof or walls, continuous welded weather collars for over flashing shall be supplied and installed for all external ducts and pipes forming part of the cabling work and sealed with an approved sealant, to the relevant building codes and standards.

7.6.4.6 Vermin proofing

a) All opening, voids, entries to conduits, equipment, components and device enclosures etc. shall be effectively plugged and sealed to prevent the entry of vermin. The sealant shall be durable, long lasting and allow re-entry to the space and not prevent the effective re-sealing of the opening.

7.6.4.7 Waterproofing

a) All penetrations of floors, trays, risers and/or ducts shall be made weatherproof during and after construction of the cabling works to prevent weather damage or effects of internal flooding within the facility.

7.6.5 Plywood backboards

a) Plywood backboards shall be a minimum of nineteen (19) millimetre AC grade plywood. The plywood shall be painted on both sides with primer and two coats of white paint, and mounted with the A grade exposed. A fire certifier shall indicate if the paint is to be fire retardant. The plywood shall not be fire retardant (paint tends to flake off of fire retardant plywood). The plywood shall be kiln dried and shall have a maximum moisture content of fifteen per cent (15%) to prevent warping. In a dry wall constructed ER or TR, the plywood shall be securely fixed to sufficient wall framing members to support both the static and dynamic load reasonable expected plus a safety factor of 2.0. The plywood shall extend from FFL to a height of 2400mm AFFL.

7.6.6 Securing/fixing of materials, equipment, components and devices

a) Securing of the materials, equipment, components and devices associated with the ICT cabling infrastructure in the building structure shall be made in accordance with the requirements specified in the follow sub-sections.

7.6.6.1 Attachment

a) Where devices are required for attaching materials, equipment, components and devices to the building approved metal expansion devices shall be used when and where approved by Queensland Health. Wooden plugs shall not be permitted.

7.6.6.2 Anchors

a) Cadmium plated expanding metallic type masonry anchors shall be used for fixings in concrete, clay or concrete brickwork. Except in fire isolated stairways and tunnels where conduits may be saddled to walls and ceilings using "Tappits" or similar fixing devices.

7.6.6.3 Screws

a) Bolts or machine screws with nuts, washers and anti-vibration devices shall be used where necessary for fixings into metal.

7.6.6.4 Fixing holes

a) Holes shall be drilled by electric or compressed air drills wherever possible. Explosive charge fixing devices may be used following all requirements of the Workplace Health and Safety legislation and in negotiation with Queensland Health.

7.6.6.5 Plugs

a) Plugs may be used for screw fixing to fibrous plaster and Gyprock work. Hole insets and plugs equivalent to "Expandet" brand are acceptable.

7.6.6.6 Protective coating

a) Appropriate plating of bolts, screws and washers that best suits the fixing environment shall be used.

7.6.6.7 Approval

a) Notwithstanding the above, all methods of fixing and types of fasteners proposed shall be fit for their purpose.

8. Labelling requirements

Queensland Health has adopted a labelling scheme in compliance with QGEA ICT Cabling Infrastructure Policy and Technical Standard – technical supplement, where every port and cable within Queensland Health has a unique identifier. Recent changes in service platforms within Queensland Health dictate a change in the site identifier where:

- Greenfield sites will have a 5 character plus 2 numeric code and
- Existing sites will have an existing 5 character code *plus* a 5 plus 2 character numeric code. For existing sites, the 5 character identifier shall be maintained unless the entire site is being re-labelled inclusive of cable sheath labels.

The appropriate identifiers are as follows:

a) Each **site identifier** (site short name) has either
    a. five (5) characters comprising up to three (3) characters for the facility location and two (2) characters for the type of facility (e.g. RBWHS for the Royal Brisbane and Women's Hospital – this is the existing site code format) or
    b. five (5) characters for the facility location and type *and* two (2) numbers representing the unique identity within the site type. An example is Mt Isa has three community health sites. The first site is ISACH01. The second is ISACH02. This labelling format is only to be used for greenfield sites.

    In both cases, the project manager will supply this identifier to be used as part of the project.

b) Each **building identifier** has two (2) alphanumeric characters (e.g. AA for the Royal Brisbane and Women's Hospital Building AA) or may follow local convention, if comprises 2 alphanumeric characters. In large Campus such as RBWH, three characters are permitted.

c) Each **floor identifier** has two (2) alphanumeric characters (e.g. B1-B9 for basement levels, GR for ground floor, L1-L9 for levels one to nine and 10 to 99 for levels ten to ninety nine).

d) Each **room identifier** has one (1) letter – starting with 'A' and working forwards through the alphabet. 'A' for the first room on a floor, 'B' for the second, 'C' for the third etc. OR alternatively "N" for North, "S" for South, "E" for East or "W' for West.

e) For server / multi-row equipment rooms, each **row of cabinets** has one number for the row of cabinets starting at 1.

f) Each **cabinet identifier** has either:
    a. for **multi-row server/equipment rooms,** each cabinet has three numbers starting with the row number and 01 and working upwards or
    b. **for single row telecommunications rooms** each cabinet has a single letter starting with Y and working backwards through the alphabet ie 'Y' for the first cabinet, 'X' for the second and 'W' for the third etc.

g) Each **IDC frame identifier**, the floor distributor vertical has one (1) letter – starting with 'A' and working forward through the alphabet. 'A' for the first vertical on the frame, 'B' for the second, 'C' for the third etc.

h) Each **telecommunications outlet identifier** contains the cabinet identifier and three numbers. The number starts from 001 to 336 for cabinets.

8.1 Non-enterprise data centre (server room)

a) Queensland Health has adopted a labelling scheme in compliance with QGEA ICT Cabling Infrastructure Policy and Technical Standard – technical supplement, where every port and cable within Queensland Health has a unique identifier. The appropriate identifiers are as follows:

   i. Each **site identifier** (site short name) has five (5) characters comprising up to three (3) characters for the facility location and two (2) characters for the type of facility (e.g. RBWHS for the Royal Brisbane and Women's Hospital). The project manager will supply this identifier as part of the project.

   ii. Each **building identifier** has two (2) alphanumeric characters (e.g. AA for the Royal Brisbane and Women's Hospital Building AA) or may follow local convention, if comprises 2 alphanumeric characters. In large campus such as RBWH, three characters are permitted.

   iii. Each **floor identifier** has two (2) alphanumeric characters (e.g. B1-B9 for basement levels, GR for ground floor, L1-L9 for levels one to nine and 10 to 99 for levels ten to ninety nine).

   iv. Each **room identifier** has one (1) letter – starting with 'A' and working forwards through the alphabet. 'A' for the first room on a floor, 'B' for the second, 'C' for the third etc. OR alternatively "N" for North, "S" for South, "E" for East or "W' for West.

   v. Each **row of cabinets** has one number for the row of cabinets starting at 1.

   vi. Each **cabinet identifier** has three numbers starting with the row number and 01 and working upwards.

   vii. Each **IDC frame identifier**, the floor distributor vertical has one (1) letter – starting with 'A' and working forward through the alphabet. 'A' for the first vertical on the frame, 'B' for the second, 'C' for the third etc.

   viii. Each **telecommunications outlet identifier** contains the cabinet identifier and three numbers. The number starts from 001 to 336 for cabinets.

b) The accredited installer is responsible for all labelling. All face plate labels shall be self-adhesive, typed (not hand-written) using nine (9) millimetres white label tape, with black type and Arial font.

c) For existing sites that are installing new higher category cabling, whilst retaining and using the existing lower category cabling, the telecommunications outlet identifier for the lower category cabling will commence at 001, with the new higher category cabling commencing at 101.

d) If the existing lower category cabling installation has more than one hundred (100) outlets, the new higher category cabling numbering will commence from the next free hundred range, (i.e. 201 if existing lower category cabling installation has less than two hundred (200) outlets).

8.2 Enterprise data centre

a) Enterprise data centres are outside the scope of this document however the labelling convention in section 8.1 shall be followed where possible.

8.3 ICT cabinets

a) The equipment / telecommunications room data cabinet shall be labelled with a TNA-RI-15318-QH or TNA-RI-22824-QH laser engraved or Queensland Health approved equivalent label at the centre of the top on the patch panel side, with the following identifiers:
   i. site
   ii. building
   iii. floor
   iv. room
   v. cabinet.

b) The label shall be a minimum of eighteen (18) millimetres high with a font size of at least twelve (12) millimetres (TNA-RI-15318-QH),, and preferably be twenty-four (24) millimetres high with a font size of eighteen (18) millimetres (TNA-RI-22824-QH).

c) The label shall be fitted to the front of cabinet chassis at the top of the cabinet, e.g. RBWHS-AA-LA-A-Y.

8.4 Patch panels

a) Patch panels shall be labelled on the front indicating the:
   i. category of link (for example Cat 5 (TNA-C5-259-QH), Cat 5_E (TNA-C5e-259-QH), Cat 6 (TNA-C6-259-QH) etc.) at the left
   ii. purpose of the panel (for example Voice (TNA-V-259-QH), Data TNA-D-259-QH, Inter-Floor (TNA-IF-509-QH), Floor Outlets (TNA-FO-509-QH) etc.) at the right.

8.5 Voice patch panel outlets

a) Voice patch panel outlets shall be labelled with TNA-VP-949-QH or Queensland Health approved equivalent on the front with the following identifiers:
   i. service
   ii. outlet.

b) An example for a) above is:

   V001 to V024 for the first (top) patch panel and V025 to V048 for the second patch panel etc.

8.6 Intra-floor cabling

a) Intra-floor cabling appearances shall be labelled with TNA-IAFP-509-QH or Queensland Health approved equivalent with the following identifiers of the far end:
   i. floor - (including the room where applicable)
   ii. frame/cabinet
   iii. two numbers starting with "01" for the first port with the number incrementing by one as you progress to the next portlike TNA-IAFP-949-QH or Queensland Health approved equivalent.

b) An examples for a) above are:

i. GRAY01 to GRAX12 for Intra-floor cabling between cabinets Y and X in the same telecommunications room on the ground floor TNA-IAFP-509-QH or Queensland Health approved equivalent

ii. GRBY01 to GRCY12 for Intra-floor cabling between cabinet Y in telecommunications room 2 and cabinet Y in telecommunications room 3 both on the ground floor

iii. GRAA01 to GRBC12 for Intra-floor cabling between vertical A in telecommunications room 1 and vertical C in telecommunications room 2 both on the ground floor.

8.7 Inter-floor cabling

a) Inter-floor cabling appearances shall be labelled with TNA-IRFP-509-QH or Queensland Health approved equivalent with the following identifiers of the far end:

i. floor - (including the room where applicable)

ii. distributor/cabinet

iii. two numbers starting with "01" for the first port with the number incrementing by one as you progress to the next portlike TNA-IRFP-949-QH or Queensland Health approved equivalent.

b) An examples for a) above are:

i B1AY01 to GRAY12 for Inter-floor cabling between cabinet Y in Basement 1 and cabinet Y on the ground floor TNA-IRFP-509-QH or Queensland Health approved equivalent

ii B1AY01 to GRBY12 for Inter-floor cabling between cabinet Y in the basement 1 telecommunications room 1 and cabinet Y in telecommunications room 2 on the ground floor

iii B1AA01 to GRBC12 for Inter-floor cabling between vertical A in the basement 1 telecommunications room 1 and vertical C in telecommunications room 2 on the ground floor.

8.8 Horizontal cables

a) All horizontal cables shall be labelled with the TNA Industries JMS install kit or Queensland Health approved equivalent identifiers detailing the patch panel / IDC end of the link. Horizontal cables shall be labelled at the:

i. patch panel

ii. both sides of the consolidation point (if applicable)

iii. telecommunications outlet.

b) The label is to be between fifty (50) and one hundred and fifty (150) millimetres from the end of the sheath, and clearly visible. The label is to contain the following identifiers:

i. floor

ii. communications room

iii. cabinet

iv. outlet

v. Colour coded numbered consecutively system broken down into groups of 24.

8.9 Backbone cables

a) Each backbone cable is to be labelled with a unique identifier as per QGEA ICT Cabling Infrastructure Policy and Technical Standard – technical supplement: which states:

i. All backbone cables have an identifying number. For example, a 100-pair backbone cable can be identified as cable “4005, 1-100”, “4005” refers to the cable number and “1-100” relates to the 100 pair in that cable.” All backbone cables are labelled at both ends using the TNA-CM-86-QH for copper and the TNA-CM-76-QH for fibre or Queensland Health approved equivalent.

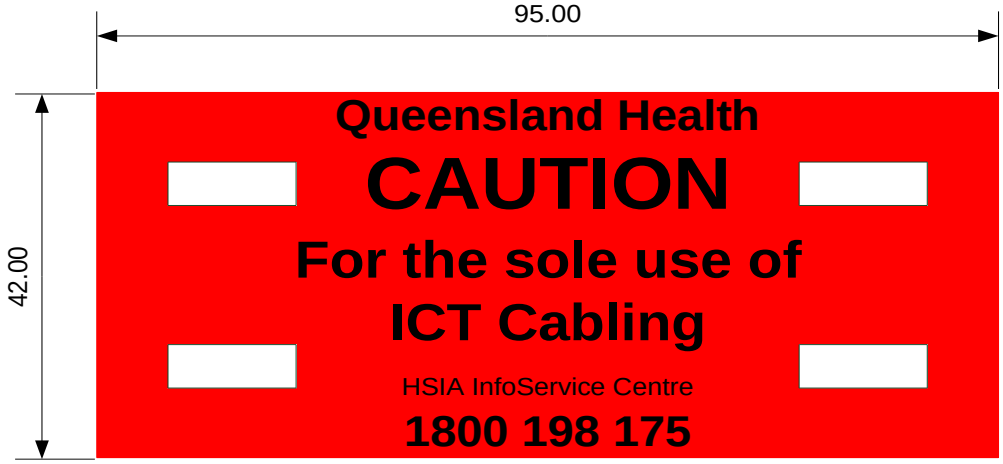
ii. All backbone cables are to be clearly labelled at every pit, access hole, maintenance hole, riser appearance on each floor and at 10m intervals along the length within a ceiling space using the TNA-CM-86-QH for copper and the TNA-CM-76-QH for fibre or Queensland Health approved equivalent.

iii. All fibre optic cables shall have the following details recorded during installation and be provided to the Queensland Health project manager as part of the as-built documentation:

- fibre designation (cable number)
- fibre type (outdoor or indoor)
- fibre mode (OS1, OS2, OM3 etc.)
- core count
- batch number
- start meter measurement
- finish meter measurement.

8.10 Pathways

a) All cable pathways (cable tray and catenary) shall be labelled with TNA-PM-9452-QH or Queensland Health approved equivalent labels as shown below:



b) These labels shall be installed:

i. no more than four (4) metres apart

ii. at key intersections

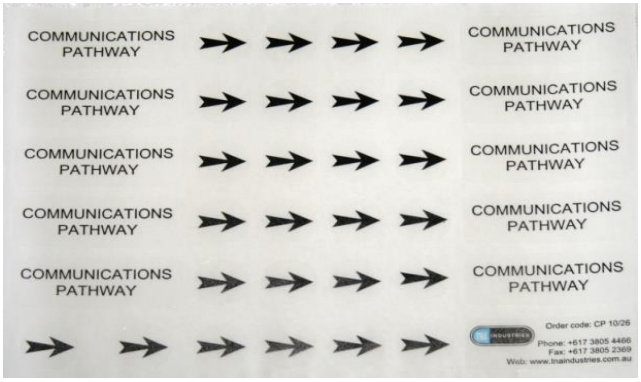
iii. so they are visible from one hundred (100) millimetres above the false ceiling (if a false ceiling is installed).

c) Where T-bar ceilings are present TNA-CP-10/26-QH or Queensland Health approved equivalent shall be installed on the underside of the T-bar on all main runs:

i. no more than 4.8m apart

ii. at key intersections

iii. arrows are to be used where catenary wires branch off the main runs showing their direction and followed in their entirety with spacing no more than 4.8m apart:



8.11 Telecommunications outlets – faceplates and ports

a) Telecommunications outlet faceplates and ports shall be labelled with identifiers detailing the far (patch panel) end of the link.

b) Telecommunications outlet faceplates shall be labelled on the front with TNA-OID-509-QH or Queensland Health approved equivalent with the following identifiers:

i. short site name

ii. building

iii. floor

iv. distributor / telecommunications room

An example for b) above is:

- 'RBWHS-AA-L4-A' for Royal Brisbane and Women's Hospital building AA, Level 4, A for distributor / telecommunications room.

c) Each port on the faceplate is to be labelled with TNA-TOX-XXX-QH or Queensland Health approved equivalent on the front with the following identifiers (first x denotes number of ports with the xxx denotes label size):

i. cabinet

ii. outlet.

Examples or c) above are:

- 'Y-001' for the telecommunications outlet connected to the first port on the first patch panel in Cabinet Y.
- 'Y-048' for the telecommunications outlet connected to the last port on the second patch panel in Cabinet Y.

d) Telecommunications outlets mounted below desk height shall be labelled such that the identifiers are visible horizontally and from above.

e) All face plate labels shall be self-adhesive, typed (not hand-written) using nine (9) millimetres white label tape or laser engraved acrylic, with black type and Arial font.

f) An example of telecommunications outlet labelling is attached in Appendix 1 – *Sample telecommunications outlet labelling*.

9. Testing

This testing section shall form part of the installer's quality plan required by AS/NZS 3080 and-ISO/IEC 14763-3. The requirements of this section may be added to but shall not be reduced or removed within the Installer's quality plan.

9.1 ICT cabling installation testing requirements

a) Testing shall be carried out to demonstrate compliance with the ICT cabling documentation including all specifications and referenced documents including AS/NZS3080 and this document.

b) The contractor shall utilise test equipment that has a test equipment manufacturer's verified training course, or other training course, approved by eHealth Queensland. The minimum requirement is that the training course provides validated qualifications in the form of a certificate issued by the test equipment manufacturer.

c) The test equipment to be used shall be capable of storing test result plot data, and if the tester supports the option of extended format this shall be enabled, for use in the validation of test results to Australian and International Standards. The test results provided by the tester shall be in the test equipment manufacturer's native format only and be able to be viewed using the test equipment manufacturer's software package. The test results shall be able to be statistically analysed by using the test equipment manufacturer's software.

d) Test equipment shall be capable of testing to the class and standard specified, have a current calibration certificate and have the latest cabling manufacturer approved hardware interfaces, software and firmware installed prior to performing the certification test.

9.2 ICT cabling installation testing technician

a) The ICT cabling installation shall be tested by a technician certified by the test equipment manufacturer or other training course, approved by eHealth Queensland in the use of the specific level IV (Twisted Pair), light source and power meter (LSPM) and/or optimal time domain reflectometer (OTDR) test equipment. The technician shall be required to provide evidence of having completed a validated training course in the form of a certificate or identification card bearing the name of the technician and the test equipment manufacturer. Where the installation company does not have appropriately certified test technicians the installation company shall, at its own expense, engage suitably qualified technicians to carry out the testing.

b) Technicians who have successfully completed the relative Fluke Networks certified cabling test technicians (CCTT) training course for the DTX or DSX cable analyser series of equipment shall be deemed to comply with the training requirements twisted pair, OTDR and LSPM testing when the associated discipline is included on the certificate of completion. Where the contractor does not have suitably certified test technicians, the contractor shall at their own expense, engage appropriately qualified technicians to perform the testing.

9.3 Provision of competency evidence

a) Evidence of operator competency for the field testing instrument to be employed shall be requested by the nominated project manager. This evidence shall be provided by the contractor to the nominated project manager prior to commencement of testing operations.

9.4 Cable tester requirements and set-up

a) The tester requirements and setup shall include but not limited to the following:
   i. edition of firmware (this shall be, as a minimum, the latest edition available thirty one (31) days prior to testing)
   ii. the tests to be undertaken
   iii. the applicable performance level
   iv. the applicable standard
   v. the applicable test configuration
   vi. embedded mated connectors within the link or permanent link
   vii. company details
   viii. cable construction type for twisted pairs
   ix. testing operators name
   x. site details
   xi. time and date
   xii. Nominal velocity of propagation (NVP) for twisted pair - this shall be correct for the cabling system installed
   xiii. reflective index for optical fibre
   xiv. marginal pass indication shall be active if available
   xv. full outlet identifier.

b) All test results shall be provided with the correct labelling of outlets tested, including the correct labelling and setup of functional elements, i.e. site, building, floor, room, cabinet. An example is shown on Appendix 14 *Cabling test results*.

9.5 Twisted pair (UTP, FTP, PiMF, S/FTP) test equipment

a) Test equipment shall comply with the requirements of ISO/IEC 61935.1. The tests shall be undertaken with testing devices specifically designed to test the installed class of cable and connecting hardware. Utilise the latest version of AS/NZS3080 test parameter firmware, if AS/NZS 3080 parameter for the test to be undertaken is not available on the tester, ISO/IEC 11801 requirements shall be utilised. Actual test results shall be tabulated and compared against the requirements of the referenced standards for links and permanent links. The test equipment shall meet or exceed the requirements of ISO/IEC 61953-1 (latest version), level IV field tester standard for operation and test format. The test equipment shall be independently verified by Underwriters Laboratories (UL) or other tester, approved by eHealth Queensland as meeting the requirements of ISO/IEC 61935-1.

9.6 Light source and power meter testing

a) Test equipment shall utilise the latest version of AS/NZS3080 test parameter firmware, if AS/NZS 3080 parameter for the test to be undertaken is not available on the tester, ISO/IEC 11801 requirements shall be utilised.

b) 100% of links and permanent links shall be tested.

c) Testing and test documentation shall conform to ISO/IEC 14763.3. and AS/NZS3080

9.7 Optical time domain reflectometer testing

a) Additional optimal time domain reflectometer (OTDR) testing shall be carried out on all cable runs over one hundred (100) metres.

b) All OTDR tests shall include the appropriate tester configuration and connectivity to include the extended test group as listed in AS/NZS ISO/IEC 14763.3 for permanent links or links as defined in AS/NZS 3080.

c) All OTDR traces shall be reported in “Telcordia Bellcore” (*.SOR) format

d) All OTDR testing shall use suitable length launch and tail leads

e) The dynamic range, averaging duration and laser pulse width utilised for testing shall allow for analysis of conformance requirements.

9.8 Final cable testing

a) All testing shall be done with all components of the cabling system in their final positions (e.g. telecommunications outlets mounted in the walls, cables attached to the catenary, all fiber fully installed in FOBOTS, with the FOBOT in its final position in the rack etc.). If a cable is moved (e.g. a telecommunications outlet faceplate removed to check the back of one jack) all cables effected (e.g. All outlets on the telecommunications outlet faceplate) shall be retested. All links or permanent links that fail or have a marginal pass (i.e. *PASS for twisted pair tests) shall be regarded by Queensland Health as failures. All links or permanent links that fail shall be rectified and re-tested by the installer until they pass at which time the test results for all outlets within the scope of works shall be provided.

b) 100% of all links and permanent links shall be tested for installation conformance to AS/NZS 3080

c) Conduct all testing to the requirements of sections 9.5, 9.6 and 9.7 of this document.

d) The accredited testing technician shall test fibre optic cable at both wavelengths and in both directions

e) OTDR testing shall use a pulse width no greater than 40ns and a range not exceeding twice the combined length of the launch, installed and tail cable.

f) 100% of cables installed shall be verified by the cabling manufacturer for warranty purposes. Any links not performing to the manufacturer’s requirements shall be rectified and re-tested prior to final payment to the contractor.

9.9 Test result review certification

a) All test results shall be reviewed by a certified testing technician employed by or contracted by the installation company to ensure that the test result data to be submitted for verification contains only the test results to be verified and that those test results comply with the requirements of this document and the quality plan developed by the installer.

b) Test certification body:

   i The test certification body (TCB) shall be a National Association of Testing Authorities (NATA) accredited inspection agency or an equivalent, approved by eHealth Queensland Infrastructure Management Assurance.

c) An independent review of the test results (both twisted pair and optical fibre) shall be undertaken by an approved TCB. All installations having twenty-four (24) or greater UTP, FTP, S/FTP copper outlets/system tails or any amount of fibre links shall be reviewed by the TCB. The TCB shall review and report on the test results in accordance with the following requirements:

   i. Conformance to performance and test documentation requirements of AS/NZS3080 of links and permanent links
   ii. Installation conformance testing requirements contained within the Test Procedure Annex of AS/NZS3080
   iii. Conformance to the requirements of the quality plan in accordance with ISO/IEC14763-2 and this document.
   iv. Provide commentary on the tester firmware version used at the time of testing.
   v. Calibration status based on the embedded information in the supplied test result of the test equipment used to generate the test results and provide additional commentary to meet AS/NZS ISO/IEC 17020 reporting requirements.
   vi. Conformance to AS/NZS ISO/IEC 14763.3.treatment of test results for Light source and Power meter testing
   vii. Conformance to AS/NZS ISO/IEC 14763.3. treatment of test results of the extended test group results for OTDR testing
   viii. That there are no unexpected embedded events in the OTDR results >0.1db
   ix. Verification that each cable test result is for a unique cable
   x. Any additional reporting requirements to ensure conformance to AS/NZS ISO/IEC 17020 and additional NATA reporting obligations have been met.
   xi. The TCB shall provide Queensland Health with a courtesy copy of all NATA reports at time of generation

d) In case of a discrepancy between reporting styles of data submitted for verification the raw data shall be used for assessments (e.g. TST).

e) The test results shall be accompanied by a statement of compliance from TCB. A review report and the associated statement of compliance shall be provided by the inspection body to the contractor and eHealth Queensland following the review of the test results. The contractor shall include all costs associated with the independent review of the test results, including:

   i The costs for completion of the work by the third party organisation
   ii Postage and handling
   iii Other related costs.

f) The contractor shall be responsible for any re-testing required to overcome identified deficiencies in the test results and for any retesting required/recommended by the report. eHealth Queensland reserves the right to access the independent review report directly from the accredited inspection agency.

g) Electronic test results shall be provided in the tester native format for all test equipment that has an electronic reporting function. Where the tester supports an extended data function, this shall be included within the results. A licensed version of the viewing software will be provided at no additional charge. All fibre results shall be provided with a completed link/loss budget calculation based on the values contained in AS/NZS 3080 and AS/NZS 14763.3 and additionally shall be provided electronically in the tester native format directly to the third party review organisation:

   i one copy of the test results (electronic format)

   ii copy of the executable program and set-up program required to view the results

   iii completed VTI Services standardised fibre reporting sheet

   iv forms TCA1 and TCA2

   v test equipment calibration certificate.

   vi copy of certificates of completion of tester courses for testing technicians

h) A copy of the items listed in section 9.9 c) *Test Result Review Certification* shall also be provided to eHealth Queensland. Once testing and review have been successfully completed, provide one typed and signed copy of completed acceptance testing/inspection schedule results, witnessed by the project manager, prior to practical completion. Provide two copies of the results on separate electronic storage media with a licensed copy of the executable program and set-up program required to view the results included with each copy. Provide two hard copies of the test results, signed and dated by the installation company and properly bound, one in the communications room applicable and the other for the project manager.

9.10 Testing of voice tie cables

a) All voice tie cables shall be tested with a pair scanner capable of reporting in electronic format (where the test equipment supports the length of the cable under test) the wire map and continuity of the installed links. Where such equipment does not support the length of cable to be tested, all pairs shall be tested for continuity and wire map using a device such as a 'Little Wizard'[2] or an Ohm Meter with appropriate test plugs to test each wire. Any faults shall be fixed and re-tested. The testing technician shall provide a statutory declaration detailing the results of the testing including the loop resistance of the cable.

[2] Little Wizard testers are no longer manufactured

9.11 Earth continuity testing

a) All earth connections (pathways, CES, cabinets etc.) shall be tested by a licenced electrician to meet AS3000:2007 and sign off documentation is to be completed by the licensed electrician and provided as part of handover

9.12 Testing requirements for electrical equipment and cords

a) The electrical cables and cords used or intended for use to supply, distribute or control electrical power to ICT cabinets and its installed equipment shall be inspected, tested and tagged to AS/NZS 3760: 2003.

10. Site audit and inspection

10.1 Auditing

a) An approved ICT cabling inspector shall conduct a comprehensive audit on the completion of all ICT cabling works in Queensland Health facilities, as per the QGEA ICT Cabling Infrastructure Policy and Technical Standard and the Queensland Health ICTCS requirements. This also meets the Workplace Health and Safety requirement to ensure all workplaces are safe before occupation.

b) Any project that meets the requirements of section 2.3. *Project design requirements* shall be required to have at least one progress audit and a final inspection audit completed at the projects expense. If the cabling installation is scheduled for more than 3 months, then a progress audit shall be completed at least once a month until the completion of the installation works.

10.2 The site audit

a) The audit shall be carried out by an accredited auditor and shall meet the requirements of section 1.3.9 Accredited auditors.

b) The accredited auditor shall provide the level of detail required by the site audit included in section 10.3 *Site audit tasks*. The audit shall form the basis for the compilation of a site profile.

c) The site profile shall be a tabular document profiling:

i. details of existing carrier services terminating at the site

ii. copies of the site cabling records (where available)

iii. the size and suitability of the existing lead-in and campus distributor

iv. the size and suitability of existing cables and terminated distribution racks/frames, including both the backbone and horizontal cabling sub-systems

v. the suitability or otherwise of existing equipment accommodation space, including the PBX

vi. asbestos or heritage listing issues specific to the site

vii. The identification of the communication cabling vendor(s) in the campus and building backbone, and horizontal cabling sub-systems.

10.3 Site audit tasks

a) The accredited auditor shall perform the following site audit tasks, including, but are not limited to:

i. review existing cabling records and make two (2) copies

ii. establish if any asbestos related issues exist (sight the facility's building management plan)

iii. establish if any heritage listing issues exist

iv. establish if any issues exist regarding PBX accommodation

v. campus distributor:

vi. determine lead-in capacity and current usage:

- document rack/frame size and spare capacity
- document all working services terminating via the lead-in
- draw a plan of the communications room/equipment space showing layout of infrastructure/equipment
- draw a site-specific cabling schematic plan

vii. backbone cabling:

- document the cabling installed to every building/floor
- document working services utilising the cabling infrastructure, if record books are available
- document rack/frame size and spare capacity
- conduct visual inspection of cabling routes to buildings/floors to identify anomalies with cable, conduit, and pits
- check for presence of crush terminal frames, screw terminal boxes and tag strips
- determine if buildings/floors require cabling upgrade
- determine size of new cables, conduits and frames
- determine route of new cables and size of new racks/frames
- draw a site plan of cabling routes between buildings

viii. horizontal cabling:

- inspect all horizontal cabling that will support new extension requirements to identify any anomalies that may exist
- determine route of new horizontal cabling and location of new telecommunications outlets
- Draw individual plans for each building/floor indicating cable routes, rack/frame locations and locations of new and retained telecommunications outlets.

10.4 Progress audit

a) The project manager shall exclude the accredited installation company completing the work on the installation from performing the progress audit.

b) The inspection activities shall involve inspection and reporting on:

i. adherence to ACMA regulatory requirements
ii. adherence to the ICTCS
iii. general standards of workmanship refer 7.3.13 *Best practice*
iv. compliance to section 1.3.7 *Accredited installation companies*
v. Compliance to section 1.3.8 *Accredited installers*.

c) Results of the inspection shall be documented in a report format to be prescribed by the project manager, refer to Appendix 13 – *Site inspection checklist*.

d) Exceptional circumstances identified as part of the inspection shall, where it is practicable to do so, be photographed and a digital image forwarded with the inspection report.

10.5 Final inspection audit

a) The project manager shall exclude the accredited installation company completing the work on the installation from performing the final inspection audit.

b) The inspection activities shall involve inspection and reporting on:

   i. adherence to ACMA regulatory requirements

   ii. adherence to the ICTCS

   iii. General standards of workmanship refer 7.3.13 *Best practice*.

c) In addition, where the installation of cabling has occurred, inspection activities shall include:

   i. level IV testing of a minimum of twenty per cent (20%) of the ICT cabling installation, randomly sampled across the installation

   ii. provision of test results in the test equipment manufacturer's native format only and be able to be viewed using the test equipment manufacturer's software package

   iii. Provision of documentation as specified in the section 11 *Final documentation*.

d) Results of the inspection shall be documented in a report format to be prescribed by the eHealth Queensland project manager, refer to Appendix 13 – *Site inspection checklist*.

e) Exceptional circumstances identified as part of the inspection shall, where it is practicable to do so, be photographed and a digital image forwarded with the inspection report.

11. Final documentation

11.1 Submission and storage

a) For all work undertaken on Queensland Health sites, the following shall be sent to the project manager or nominated representative, prior to payment:
   i. the test results in native format and database format
   ii. an as-built floor plan
   iii. a warranty certificate from the manufacturer covering all ICT cabling for a minimum of twenty (20) years
   iv. telecommunications cabling advice TCA1 and TCA2 form
   v. the TNA Industries JMS job progress/record card shall form part of the records on site and a copy shall be submitted in the TCA manuals
   vi. re-certification of any fire-rated penetrations
   vii. the third party audit results
   viii. The backbone / optical fibre meter marking details.

b) The project manager shall submit /upload the aforementioned documentation to the site information database.

11.2 Test results

a) Test results shall be provided as detailed in the section 9 *Testing* of this standard.

b) Test results for all outlets shall be provided to the customer. Outlets that originally failed a test before being fixed and retested successfully shall be documented and provided to the customer.

c) For installations having twenty-four (24) or greater UTP, FTP, S/FTP copper outlets/system tails and any amount of fibre outlets, the test results shall be accompanied by a statement of compliance from the TCB.

11.3 As-built floor plan

a) The floor plan shall be provided in the Queensland Health approved electronic graphical format and shall contain all information as detailed in QGEA ICT Cabling Infrastructure Policy and Technical Standard.

b) For all works, floor plans for works undertaken with cable pathways and types, details of consolidation points and telecommunications outlets and numbering shall be provided to the project manager in either AutoCad or Microsoft Visio format.

c) For existing buildings, Microsoft Visio / AutoCad format floor plans will be provided by the project manager for mark up by the accredited installer. The accredited installer shall mark up the drawings to reflect locations, numbering etc. and return them to the project manager.

d) The project manager shall provide the drawings to the site information database manager for inclusion into the database.

11.4 Warranty certification

a) The accredited installer is responsible for ensuring:

i. The manufacturer provides a warranty covering all system components, system performance and labour for a period of not less than twenty (20) years.

ii. The original certificate confirming warranty and an electronic copy is to be forwarded to the project manager. The electronic copy will be stored in the site information database and the original sent to eHealth Queensland.

iii. A copy of the warranty certificate is laminated and attached to the campus distributor document holder upon receipt.

12. Glossary

Terms, abbreviations and acronyms	Definitions
ACIF	Australian Communications Industry Forum - now called Communications Alliance Ltd (see www.commsalliance.com.au/)
Access Floor	a system of removable floor panels supported above the slab by pedestals
Accredited Installation Company	ICT cabling contractor company which is accredited with an approved manufacturer to a level where the manufacturer has provided to the agency documentary evidence that the manufacturer is willing to offer a minimum fifteen year warranty on all work performed by the accredited installers employed by the cabling contractor.
Accredited Installers (also known as Certified Installers)	In conjunction with the terminating hardware equipment manufacturer's warranty, it is a requirement under current Australian Government regulation administered by the Australian Communications and Media Authority to ensure that the cabling plant is installed by appropriately registered installers. Also, most terminating hardware equipment manufacturers require that these same installers undergo supplier specific training in order to maintain the quality and performance of their proprietary systems. These specially trained installers are known as 'Accredited Installers'. The accreditation is specific to the terminating hardware equipment manufacturer's systems for which they have undertaken training, because terminating hardware equipment manufacturers each have a different approach to ensuring their equipment is properly installed. From a terminating hardware equipment manufacturer's perspective, utilising accredited installers enables them to provide the long-term equipment, system and applications warranties sought by government and other large customers. Accordingly the Queensland Government, in support of their requirement for terminating hardware equipment manufacturer's warranties, requires that installation of cabling and connecting hardware be done by installers who have been accredited by the terminating hardware equipment manufacturer.
ACMA	Australian Communications and Media Authority. The authority formed through the merger of the Australian Broadcasting Authority and the Australian Communications Authority on 01 July 2005.
Administration	The method for labelling, identification, documentation and usage needed to implement moves, additions and changes of the telecommunications infrastructure
AFFL	Above finished floor level
Agencies	Queensland Health.
AHC	Australian Heritage Commission
Amp	Ampere (measurement)
Application	Any combination of hardware and software that requires the use of a structured cable link or channel to function.
Approved	If not detailed, approval is by eHealth Queensland
Approved inspector	ICT cabling inspector approved by eHealth Queensland to inspect ICT cabling work and / or test telecommunications outlets for the agency. The approved inspector should be an accredited installer/designer and be a BICSI RCDD or RPE.

Terms, abbreviations and acronyms	Definitions
Approved cabling system	RJ45 patch panel ICT cabling system from an approved manufacturer that meets the requirements of this standard.
Approved manufacturer	A manufacturer whose terminating hardware ICT cabling solution is approved for installation at agency sites as detailed in the agency specific component of this document.
Approved technician	Individual who is an accredited installer and is employed by an approved cabling company.
AS	Australian Standard
Backbone cabling	The vertical or riser cabling of a multistorey building (Building Backbone) or inter building cabling of a multi building site (Campus Backbone).
Balanced twisted pair cabling	Two or more insulated pairs of wires – identical in composition, size, and length – each pair uniformly twisted together
BICSI	Building Industry Consulting Services International An international telecommunications association offering training, conferences, publications and registration programs for cabling distribution designers, as well as commercial and residential installers.
Building Distributor (BD)	Distributor in which the building backbone cable(s) terminate(s) and at which connections to the campus backbone cable(s) may be made. (ISO 11801)
C	Centigrade (measurement)
Cable ladder	Generic term for cable ladder / basket / tray / trough.
Cabling Authority	A function performed within eHealth Queensland, Queensland Health
Cabling infrastructure	Cabling infrastructure includes the horizontal and vertical cabling distribution system based on copper and/or fibre cabling, plus the supporting equipment such as racking, panels, patch leads, conduits, pathways, and traying. This also includes the documentation, records, diagrams, as-built drawings, schematics, labelling, management packages, test results, certifications, and warranty details.
Calculated fill ratio	The calculated fill ratio of a cable tray typically represents 200% of the actual fill ratio. For example, where the requirement calls for 40% calculated fill ratio, the actual fill ratio will be 80% of the capacity of the cable tray.
Campus cabling	Cabling on a premises containing more than one building.
Campus Distributor (CD)	Distributor from which the campus backbone cabling starts. (ISO 11801)
CAPEX	CAPital EXpenditure
Category 5 / Class D UTP	Cabling components and complete solutions that meet the requirements of AS3080:2003 and AS3087:2000. These are commonly referred to in the industry as Enhanced Category 5 (or Cat 5e) due to their more comprehensive test parameters than the original Category 5 requirements as defined in AS3080:1992
Category 6 / Class E UTP	Cabling components and complete solutions that meet the requirements of AS3080 and AS3087. Category 6 cable was designed to perform at frequencies of up to 250 MHz and transmission of data at speeds up to 1 Gbps
Category 6_A / Class E_A S/FTP	Cabling components and complete solutions that meet the requirements of AS3080 and AS3087. Category 6_A cable was designed to perform at frequencies of up to 500 MHz and transmission of data at speeds up to 10 Gbps

Terms, abbreviations and acronyms	Definitions
Category 7 / Class F S/FTP	Cabling components and complete solutions that meet the requirements of AS3080 and AS3087. Category 7 cable was designed to perform at frequencies of up to 600 MHz and transmission of data at speeds up to 10 Gbps
Category 7_A / Class F_A S/FTP	Cabling components and complete solutions that meet the requirements of AS3080 and AS3087. Category 7_A cable was designed to perform at frequencies of up to 1000 MHz and transmission of data at speeds up to 40 Gbps
CCM	Communications Cabling Manual This manual includes the following Handbooks (HBs) 29, 243 and 252. AS/ACIF S008 and S009 AS/NZS 3080, 3084 and 3085.1 AS/NZS IEC 61935.1 and 61935.2 AS/NZS ISO/IEC 14763.3, 15018 and 24702
Certified installers	See accredited installers.
CES	Communications Earthing System Is a dual purpose earthing system used for both functional and protective purposes and shall use green /yellow insulated earthing conductors as defined in AS/ACIF-S009.
CET	Communications Earth Terminal A terminal provided for the purpose of equipotential bonding of the Communication Earth Service to the main earthing bar, main earthing conductor or sub-main earthing conductor of the electrical installation. (AS/ACIF S009)
Channel	The end-to-end transmission path connecting any two pieces of applications specific equipment. Includes equipment and work area cables.
Component redundancy	A configuration designed into a system to increase the likelihood of continuous function despite the failure of a component. We achieve component redundancy by designing and deploying a secondary component so that it replaces an associated primary component when the primary component fails.
Computer room	An architectural space whose primary function is to accommodate data processing equipment.
Concurrently maintainable and operable	A configuration where system components may be removed from service for maintenance or may fail in a manner transparent to the load. There will be some form of state change and redundancy will be lost while a component or system is out of commission.
Consolidation point	Connection point in the horizontal cabling subsystem between a floor distributor and a telecommunications outlet. (ISO 11801) A location for interconnection between horizontal cables that extend from building pathways and cables that extend into work area pathways.
Cord	Cable, cable unit or cable element with a minimum of one termination. (ISO 11801)
Cross-connection	A method of providing for flexible interconnection of cabling elements, primarily by means of patch cords or jumpers. (AS/ACIF S009)
Crossover	A means of reversing polarity between Data Communications Equipment (DCE).

Terms, abbreviations and acronyms	Definitions
Designer	A designer is a Registered Communications Distribution Designer (RTDD) who is currently in good standing with BICSI or a Registered Professional engineer who maintains their registration for the duration of any Queensland Health ICT Cabling Project they are working on and have at least three (3) years relevant communication distribution design experience.
Design document	The record that details the design intent.
Design intent	Design intent is a detailed technical description of the ideas, concepts, and criteria defined by eHealth Queensland to be important
Direct connect cabling	Cabling from the Switch / Server to the FD (8 way modular connector to IDC).
Duplex connector	See 'SC'
ECG	ElectroCardioGram A test that records the electrical activity of the heart.
EDA	Equipment Distribution Area. The racks/cabinets that hold the computing and storage equipment
e.g.	Exempli Gratia Latin, translates to ‘for the sake of example’ or more commonly ‘for example’
EMI	ElectroMagnetic Interference.
Employee	All temporary and permanent staff, consultants, contractors, students or any other person who provides services on a paid or voluntary basis to Queensland Health.
Employee	All temporary and permanent staff, consultants, contractors, students or any other person who provides services on a paid or voluntary basis to Queensland Health.
ER	Equipment Room Room dedicated to housing distributors and applications specific equipment. (ISO 11801) Room dedicated to housing servers and PABX. This room usually houses the Building Distributor (BD) and may house the Campus Distributor (CD).
Facility availability	The characteristic uptime performance of one component of the critical IT infrastructure. A quantitative measure of the total uptime needed in a facility without regard to the level of quality required in the IT functions carried on during that uptime. it applies to GM's scheduled uptime. Facility Availability is expressed in terms of one of four Availability Tier Levels. This classification reflects the interaction between the level of criticality and the availability of operation time.
FD	Floor Distributor. Distributor used to connect between the horizontal cable and other cabling subsystems or equipment. (ISO 11801)

Terms, abbreviations and acronyms	Definitions
Ferrule	A ferrule is a component (usually a rigid tube) used to align and protect the stripped end of a fibre. A ferrule is used together with the connector that connects the fibre cable either to another cable or to a transmitter or receiver. The ferrule keeps the fibres accurately aligned within the connector. Ferrules can be made of glass, plastic, metal, or ceramic material. Ceramic is currently considered the best material for a number of reasons. For example, ceramic bonds well to glass and its expansion coefficient are close to that of the glass fibres, making it environmentally stable. (*http://searchnetworking.techtarget.com*)
Fire detection	The means of detecting the occurrence of heat, smoke or other particles or products of combustion.
Fire protection	The active means of detecting and suppressing fires occurring within the data processing facility.
Fire Suppression	The means of extinguishing an active fire.
FO	Fibre Optic
FOBOT	Fibre Optic Break Out Tray
Frame	A general term to describe any assembly of cabling hardware providing for termination and cross connection of cabling by means of jumpers or patch cords.
FT	Feet (Measurement)
FTP	Foiled Twisted Pair. Also known as F/UTP.
HDA	Horizontal Distribution Area. Where the horizontal cross-connect resides
Hessian	A coarse woven material
Horizontal cable	Cable connecting the floor distributor to the telecommunications outlet(s). (ISO 11801)
HVAC	Heating, Ventilation and Air Conditioning
ICT	Information and communications technology describes technologies used for accessing, gathering, manipulation, presentation or communication of information. ICT replaces IT (Information Technology) within Queensland Government as a general descriptor of services, products and organisations.
ICT Officer	An agency employee who is engaged in the direct provision or maintenance of ICT services.
ICTCS	Information and Communications Technology Cabling Standard Queensland Health's ICT cabling standard
ICU	Intensive Care Unit
IDC	Insulation Displacement Contact / Connector International standard method of conductor termination for telecommunications cabling.
IDF	Intermediate Distribution Frame
IEC	International Electrotechnical Commission
Indirect Connect Cabling	Cabling from the switch / Server to the FD termination module followed by a patch cable (IDC to IDC) at the FD to connect the service.
In writing	Letter, memorandum, facsimile or electronic mail (e-mail).

Terms, abbreviations and acronyms	Definitions
IS	Queensland Government Information Standard.
ISO	International Organization for Standardization (sic) – (see www.iso.org)
IT	Information Technology
ITSIMM	Information Technology Systems Installation Methods Manual
ITSM	Information Technology Service Management
Jumper	A cable, cable unit or cable element without connectors used to make a connection on a cross-connect (ISO 11801). Also describes the action of connecting a jumper.
kg	Kilogram (measurement)
LAN	Local Area Network
LC	Lucent Connector A fibre optic connector.
Link	The transmission path between any two interfaces of generic cabling. It excludes equipment cables and work area cables.
Low Voltage	The term “low voltage” is used, in this standard, as general classification for the operating voltage of communication signalling systems: and does not supersede the voltage classifications specified in AS/ACIF S009 and AS/NZS 3000 which shall apply in the relevant sections of this standard.
LP	Lightning Protection
Lux	The SI unit of illuminance and luminous emittance. It is used in photometry as a measure of the *apparent* intensity of light hitting or passing through a surface.
Manufacturer	Terminating hardware equipment manufacturer. A manufacturing company which produces (either solely or in conjunction with partners) a complete cabling infrastructure system, for which it offers as a minimum a fifteen year parts, labour and application warranty when installed and documented in accordance with its procedures.
MDA	Main distribution area. Is the hub of the cabling system and is located inside the computer room.
MDF	Main Distribution Frame - A distributor that provides, or is intended to provide, an electrical termination point for a carrier's lead-in cabling (AS/ACIF S009).
Mechanical room	An enclosed space serving the needs of the HVAC system
mm	Millimetre(s) (unit of measure) 1×10^{-3} m or one thousandth of a metre
Modular connector, eight position	Eight position modular connector conforming to IEC 603-7 specification. Refer to RJ45 for more detail.
MTRJ	Mechanical Transfer Registered Jack - A small form factor fibre optic connector.
MUTOa	Multiple User Telecommunications Outlet assembly. A grouping, in one location, of several telecommunications outlets / connectors.
nm	Nanometre (unit of measure) 10^{-9} m or one millionth of a millimetre
NZS	New Zealand Standard.
OM1, OM2, OM3	Optical Multimode Category of fibre optic cable.

Terms, abbreviations and acronyms	Definitions
OS1/OS2	Optical Singlemode Category of fibre optic cable.
OTDR	Optical Time Domain Reflectometer.
P3 Pit	An underground service pit. Dimensions 780mm(L) x 345mm(D) x 630mm(H) and Lid Aperture 735mm(L) x 300mm(W)
PABX	Private Automatic Branch Exchange (telephone system).
PC	Personal Computer
Performance test	A series of tests for specified equipment or systems, which determine that the systems are installed correctly, start up, and are prepared for the functional performance tests. Often these tests are in a checklist format. The pre-functional test checklists may be completed as part of the normal contractor start-up test.
Performance verification	The process of determining the ability of the system to function according to the design intent.
Pigtail	A pigtail is a length of cordage with a connector fitted at one end only. The other end is free for terminating or splicing to customer equipment or customer cabling. (AS / ACIF S008).
PoE	Power over Ethernet
Practical Completion	When all cabling is fully installed and has been successfully tested, and commissioned by the contractor to the satisfaction of the project manager or his nominated representative.
Project	A temporary endeavour undertaken to create a unique product, service or result.
PVC	PolyVinyl Chloride
QGCIO	The Queensland Government Chief Information Office within the Department of Housing and Public Works provides strategic leadership, management and advice to ensure that whole-of-government information and communication technology (ICT) initiatives are maximised.
QH	Queensland Health
Project Manager	An agency employee who is engaged to project manages the provision of ICT services.
Readily Accessible	Capable of being reached quickly and without climbing over or removing obstructions, mounting upon a chair, or using a movable ladder, and in any case not more than 2.0m above ground, floor or platform.
RCDD	Registered Communications Distribution Designer. A designation for individuals who demonstrate expertise in the design, integration and implementation of telecommunications transport systems and their related infrastructure components.
Registered Professional Engineer	A person who has been assessed as meeting the relevant competency standards, takes responsibility for the delivery of professional engineering services, and is registered in Queensland under the *Professional Engineers Act 2002*
RJ45	Registered Jack 45. Eight position modular connector conforming to IEC 603-7 specification. The incorrect term 'RJ45' comes from the United States of America where RJ45 is the Universal Services Ordering Code (USOC) for Registered Jack 45 (circuit configuration 45), which is an eight position modular connector BUT is not wired to T568A wiring assignments. Also called

Terms, abbreviations and acronyms	Definitions
	telecommunications outlet / connector.
RPE	A professional engineer registered under the *Professional Engineers Act 2002*
RU	Rack Unit (measurement)
SAN	Storage Area Network (SAN) is a high-speed network of shared storage devices. A SAN permits storage devices attached to the SAN to be used by servers attached to the SAN.
SC	Subscriber Connector - A fibre optic connector utilising a push / pull 'snap in' concept.
Shielded Foil Twisted Pair S/FTP	S/FTP consists of four foil-shielded twisted pairs surrounded by an overall braided shield. This fully shielded cable is often referred to as PiMF (pairs in metal foil), or STP. With shielded systems, the foil shield shall maintain continuity throughout the entire system.
Shall	A mandatory requirement.
Small Form Factor (SFF)	A high density fibre optic connector assembly giving double the patching density of the SC duplex connector.
Star topology	An arrangement of cabling where cables are distributed from a central point
Standard Offer Arrangement (SOA)	In the case of ICT Cabling the HIT1093 Panel
Straight Tip (ST)	A fibre optic connector featuring a physically contacting non-rotating 2.5 millimetre ferrule and a bayonet connector.
T568A pair assignments	The preferred pair sequence for new installations or refurbishments in Australia and detailed in AS / NZS 3080.
Infrastructure Management Assurance	A unit of eHealth Queensland, Department of Health
TCA	Telecommunication Cabling Advice The requirements for a cabler to complete a TCA1 form for every cabling job are specified in the *Telecommunications Cabling Provider Rules 2000*. These rules are mandated under the *Telecommunications Act 1997* TCA2 is an optional addition to the TCA1 Telecommunications Cabling Advice form. It may be used by registered cablers to alert the customer or building manager of any non-compliant cable installations that are outside the contracted scope of work The TCA2 form is mandatory for any Queensland Health work.
Telecommunications Outlet (TO)	Fixed connecting device where the horizontal cable terminates. (ISO 11801)
Telecommunications Room (TR)	Enclosed spaces for housing telecommunications equipment, cable terminations, interconnect and cross connect. (ISO 11801) It is the recognised cross connect between the backbone and horizontal cabling and usually houses the Floor Distributor (FD).

Terms, abbreviations and acronyms	Definitions
Terminating hardware equipment manufacturer's Accreditation	Terminating hardware equipment manufacturers certify that installing personnel maintain a standard of installation which would uphold the quality and performance of the cabling infrastructure being installed. Minimum standards for accrediting such training shall be: • formal 'classroom' instruction conducted by the terminating hardware equipment manufacturer or their representative that includes product knowledge and installation practices for all hardware for which the accreditation shall be given. • written certification of the individual on successful completion of the instruction. • terminating hardware equipment manufacturers shall provide ongoing periodic 'follow up' training to ensure that accredited installers have up to date product knowledge.
Thermostat	A device for regulating the temperature of a system so that the system's temperature is maintained near a desired setpoint temperature.
TNV	Telecommunications Network Voltage
TO	Telecommunications Outlet
UPVC	Unplasticised PolyVinyl Chloride
Useable floor space	Net lettable area as detailed in lease or shown on floor plans. See section 2.4 on ICT exemption for non-office floor space.
UTP	Unshielded Twisted Pair
Visio	Microsoft® software used to create business and technical drawings
WAP	Wireless Access Point
WH&S	Workplace Health and Safety
Working day(s)	Monday to Friday excluding Brisbane public holidays.

Appendix 1 – Sample telecommunications outlet labelling

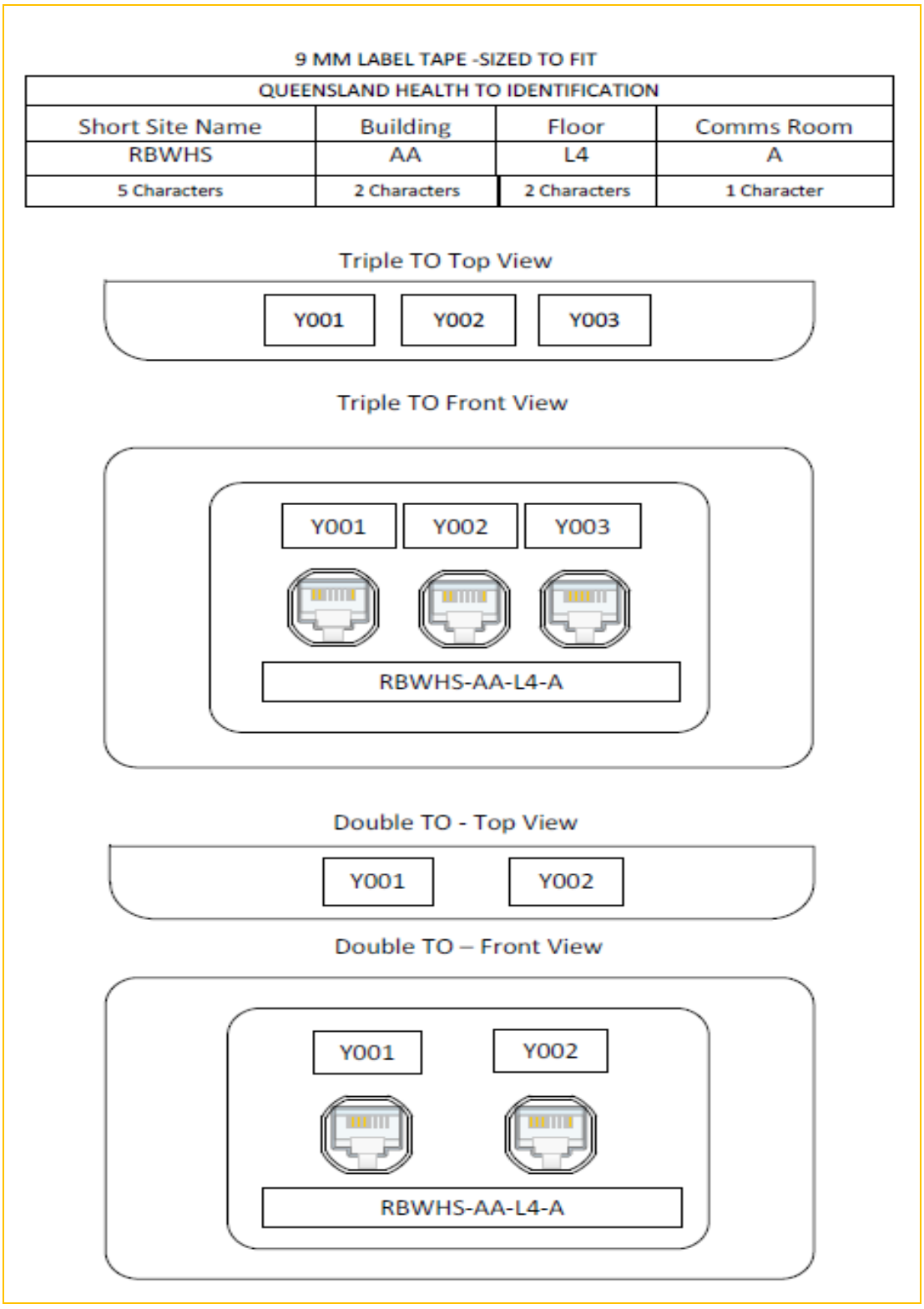


Figure 1 Sample telecommunications outlet labelling

Appendix 2 – Pit installation

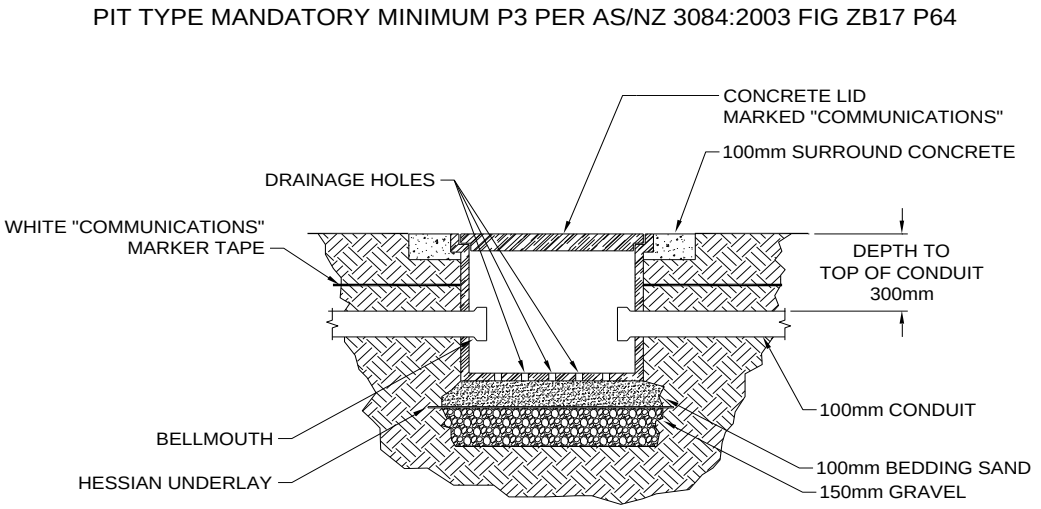


Figure 2 Cross sectional view of a pit installation

Figure 3 An approved pit bollard

Appendix 3 – Sample floor plan

Figure 4 Sample floor plan

Appendix 4 – Sample campus plan

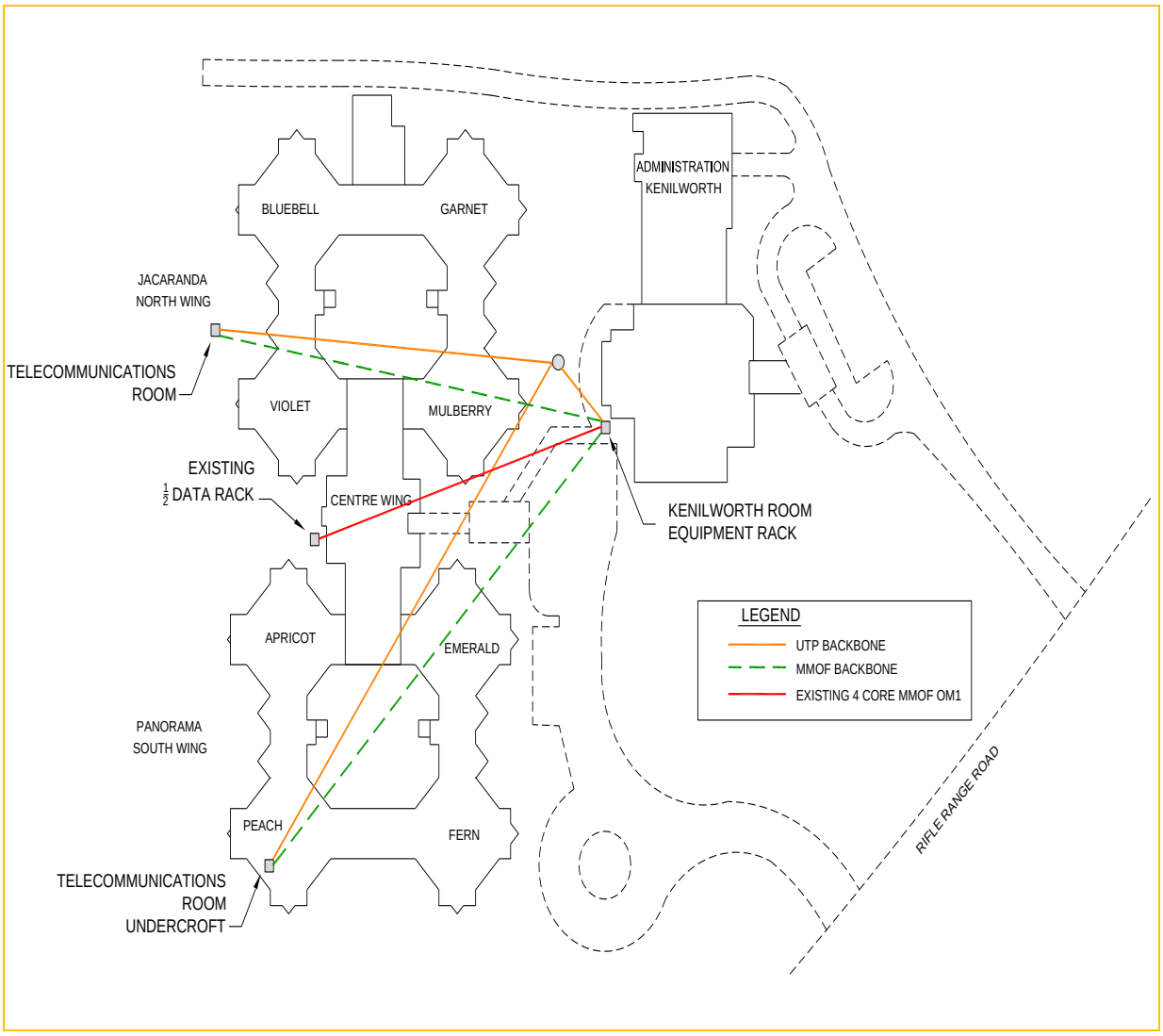


Figure 5 Sample campus plan

Appendix 5 – Typical 45RU cabinet layout installation practices

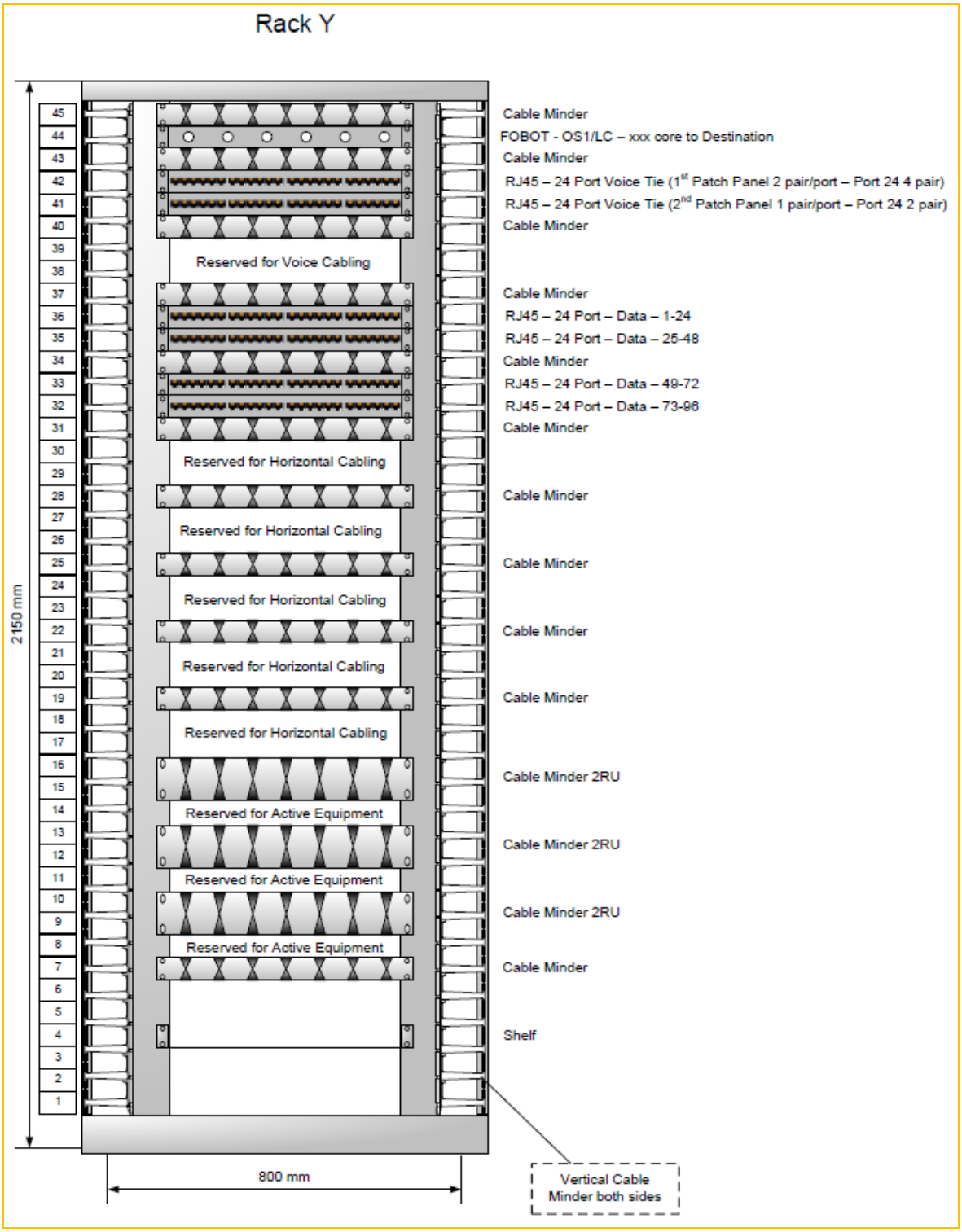


Figure 6 Typical 45RU cabinet layout with floor mounted UPS

Note: For illustration purposes only - floor distributor primary and secondary health care facility sites.

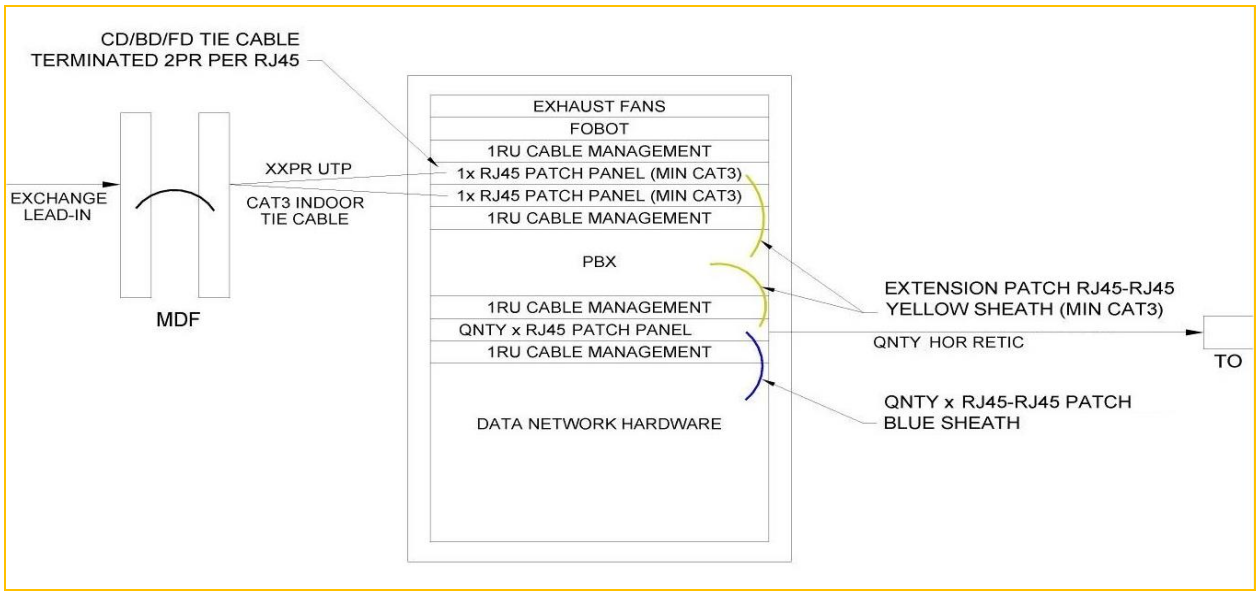


Figure 7 PBX mounted in cabinet with MDF located in the same room

Note - When the MDF is in a different room, an IDF shall be installed in accordance with section 4.3 Private Branch Exchange (PBX) voice backbone cables

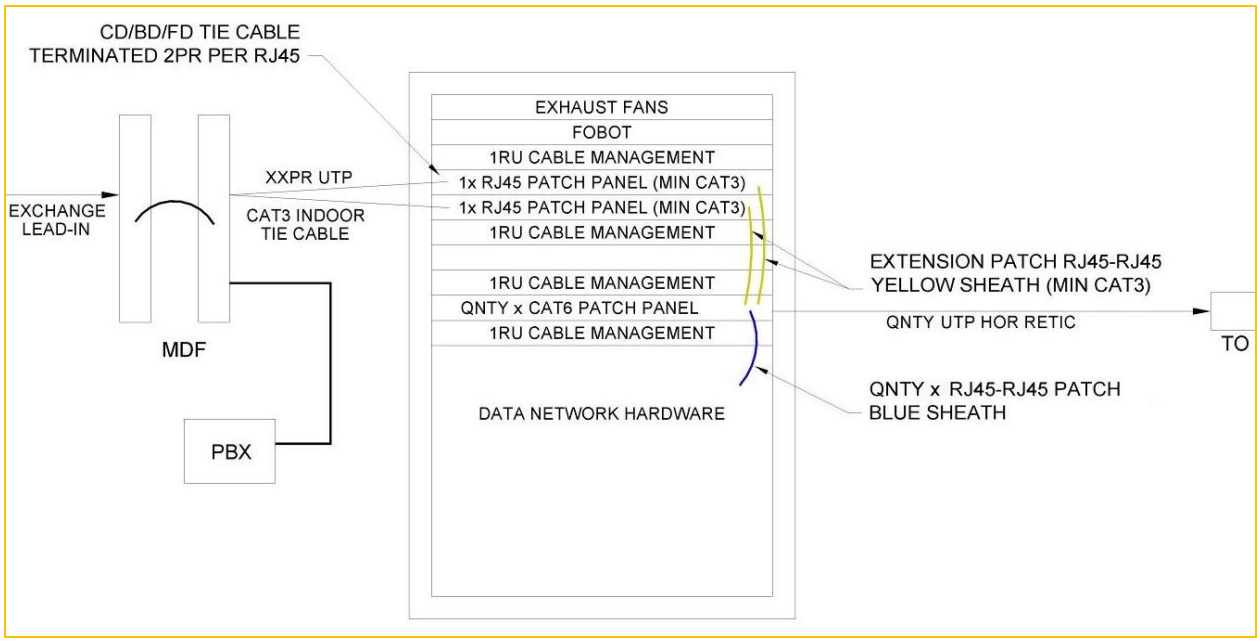


Figure 8 PBX mounted outside cabinet with MDF located in the same room

Note - When the MDF is in a different room, an IDF shall be installed in accordance with section 4.3 Private Branch Exchange (PBX) voice backbone cables

Appendix 6 – QH rack earthing methodology

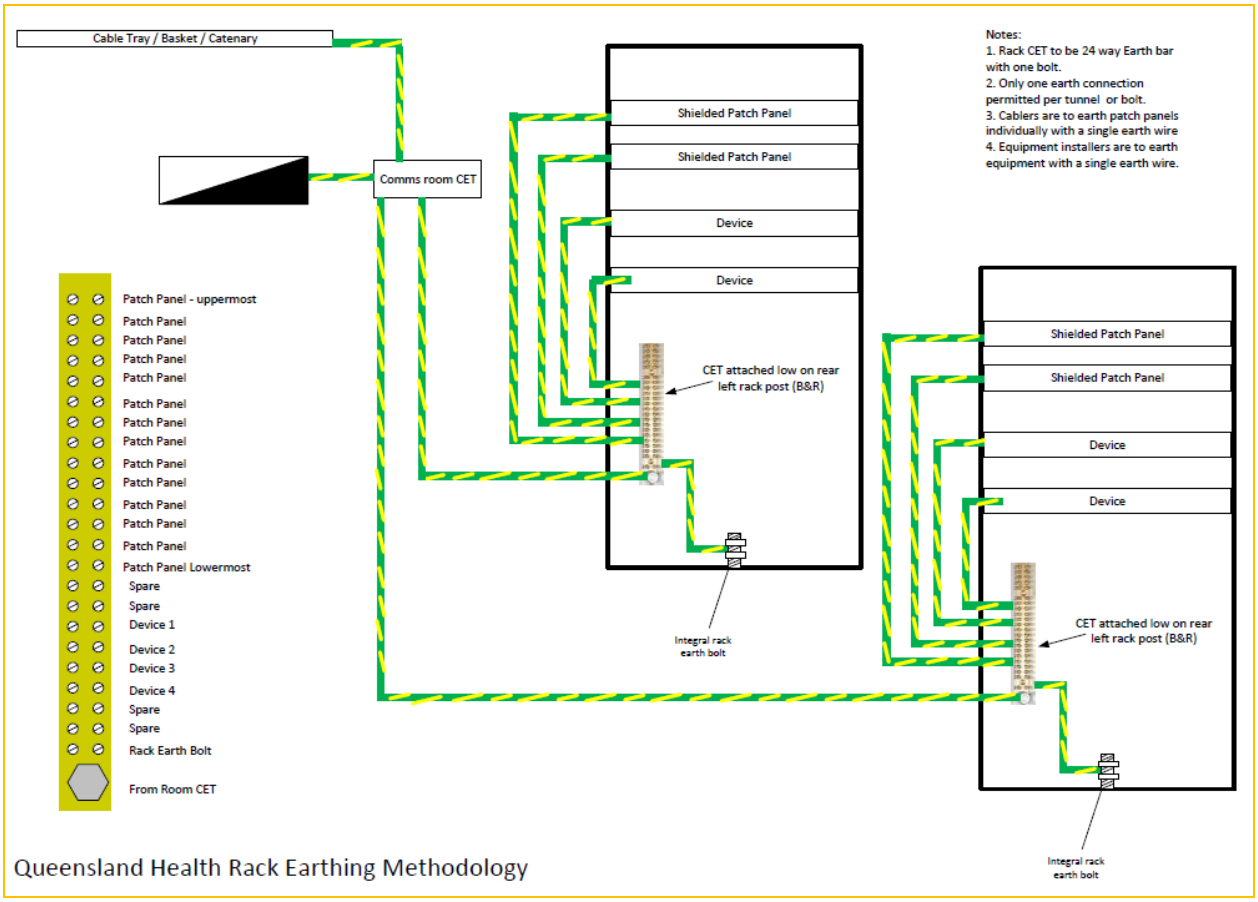


Figure 9 Queensland Health rack earthing methodology

Appendix 7 – Design review report format

Table 1: Review report format

Comment	General	Reviewer's Comments per General	The Designer Response
G1		General: Comments or suggestions with references to applicable Standards, Codes or ICTCS clauses etc.	Accept
G2			Suggest another Alternative
G3			Reject per ICTCS paragraph number
Comment	**Spec**	**Reviewer's Comments per ICTCS**	**The Designer Response**
S1		Specification: Comments or suggestions with references applicable Standards, Codes or ICTCS clauses.	Accept
S2			Suggest another Alternative
S3			Reject per ICTCS paragraph number
Comment	**Drawing**	**Reviewer's Comments per Drawings**	**The Designer Response**
D1		Drawing Sheets: Comments or suggestions with references applicable Standards, Codes or ICTCS clauses.	Accept
D2			Suggest another Alternative
D3			Reject per ICTCS paragraph number

Table 2: Minimum scope of design review
All design reviews shall include, but not be limited to the components and issues listed in Table 2

	Components to be Reviewed	Issues to be Considered
Pathways	Horizontal Conduit	Sizing, Sweep Radius, Pull Points, EMI Clearance, Grounding and Bonding
	Catenaries	Loading and Cable Trying, Grounding and Bonding, Drop Supports, Structural Fixing.
	Horizontal Innerduct	Sizing, Type
	Cable Tray	Sizing, Sweep Radius, Drop Supports, EMI Clearance, Grounding and Bonding, Support Structures
	Riser Conduit	Sizing, Sweep Radius, Pull Points, EMI Clearance, Grounding and Bonding
	Riser Innerduct	Sizing, Sweep Radius

	Components to be Reviewed	Issues to be Considered
	Riser Sleeves	Sizing, Location
	Outside Plant Duct Banks (typically lead-ins)	Sizing, Sweep Radius, Depth, Slope, Pull Points, EMI Clearance, Grounding and Bonding, Labelling
	Outside Plant Innerduct	Sizing, Type
	Outside Plant Pits and Manholes	Sizing, Location, Elevation Relationships with Buildings, Sealing, Grounding and Bonding, Security, Drainage, Racking, Cable Routing, Signage
Spaces	Main Equipment Rooms	Same as TR/ER below, plus Generator Capacity, Raised Floor
	Telecommunication and Equipment Rooms	Location, Cabling Distance Limitations, Racks, EMI Clearance, Cable Protection and Termination, Grounding and Bonding, Clear Working Space, Labelling, Approved Components, UPS Capacity, Electrical and HVAC, Lighting, Fire Suppression/Stopping, Water Issues, Building works certification.
	Riser Shafts	Grounding and Bonding, fire stopping, EMI Clearance
Cable Plant	Outside Plant	Multi-pair Copper, EMI Clearance, Fibre Optic, Pits and Pipes
	Horizontal	4-PR UTP Copper, EMI Clearance, Fibre Optic, Support Structures.
	Riser	4-PR UTP Copper, EMI Clearance Fibre Optic, Support Structures.
	Testing and Administration	Copper, Fibre Optic, Labelling Plan

Appendix 8 – Typical TR / ER layout diagrams

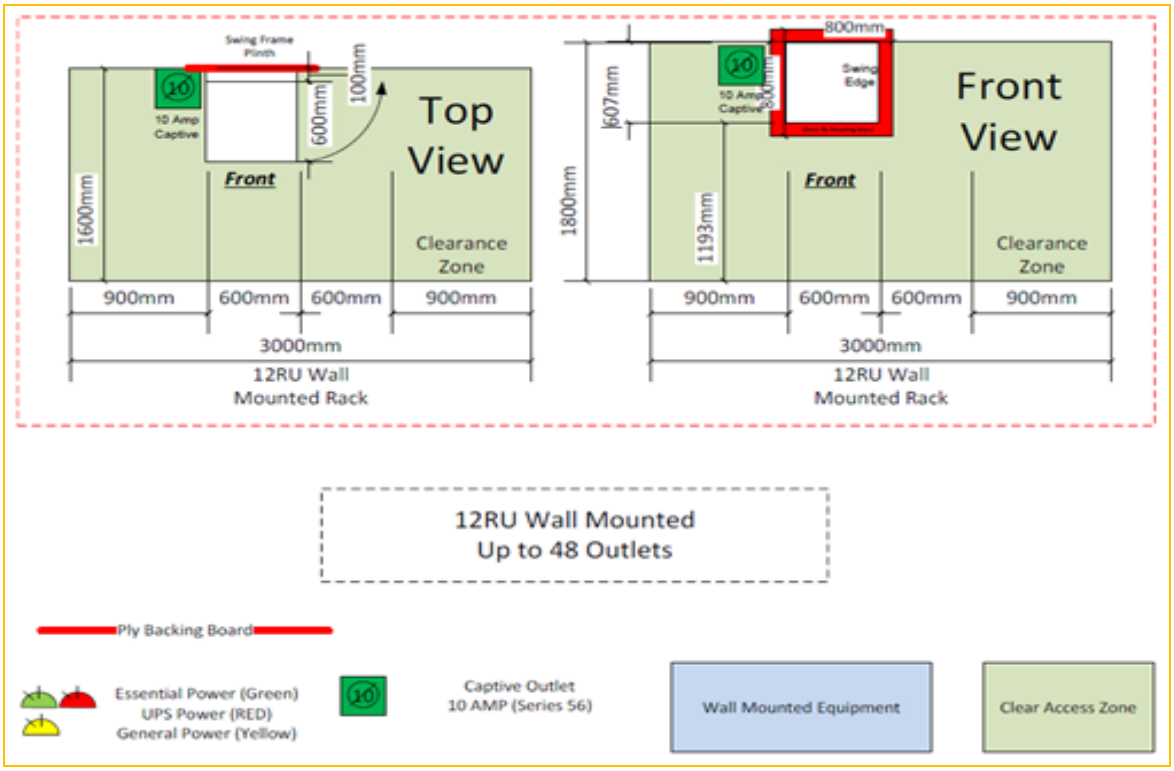


Figure 10 TR – 12RU wall mounted up to 48 outlets of usable floor space

Notes:

1. Noise is a significant issue if situated in a common room.
2. HVAC is required to be on 24/7. This can be an issue if situated in a common room.

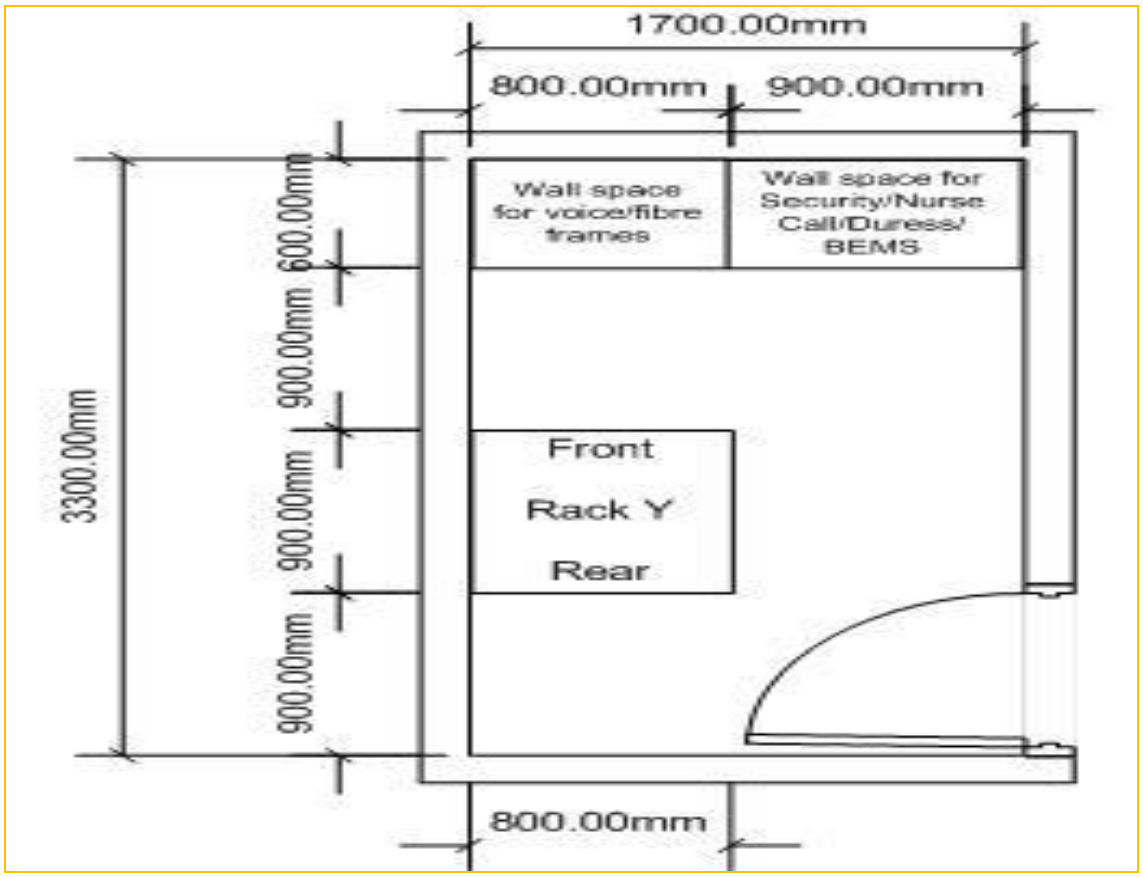


Figure 11 TR servicing up to 500sqm of usable floor space

Notes:

1. Batteries for UPS preferred to be installed in another room.
2. UPS preferred to be stored in another room.
3. Typical load would be a 3-6Kva for power and 3-6Kva for HVAC.

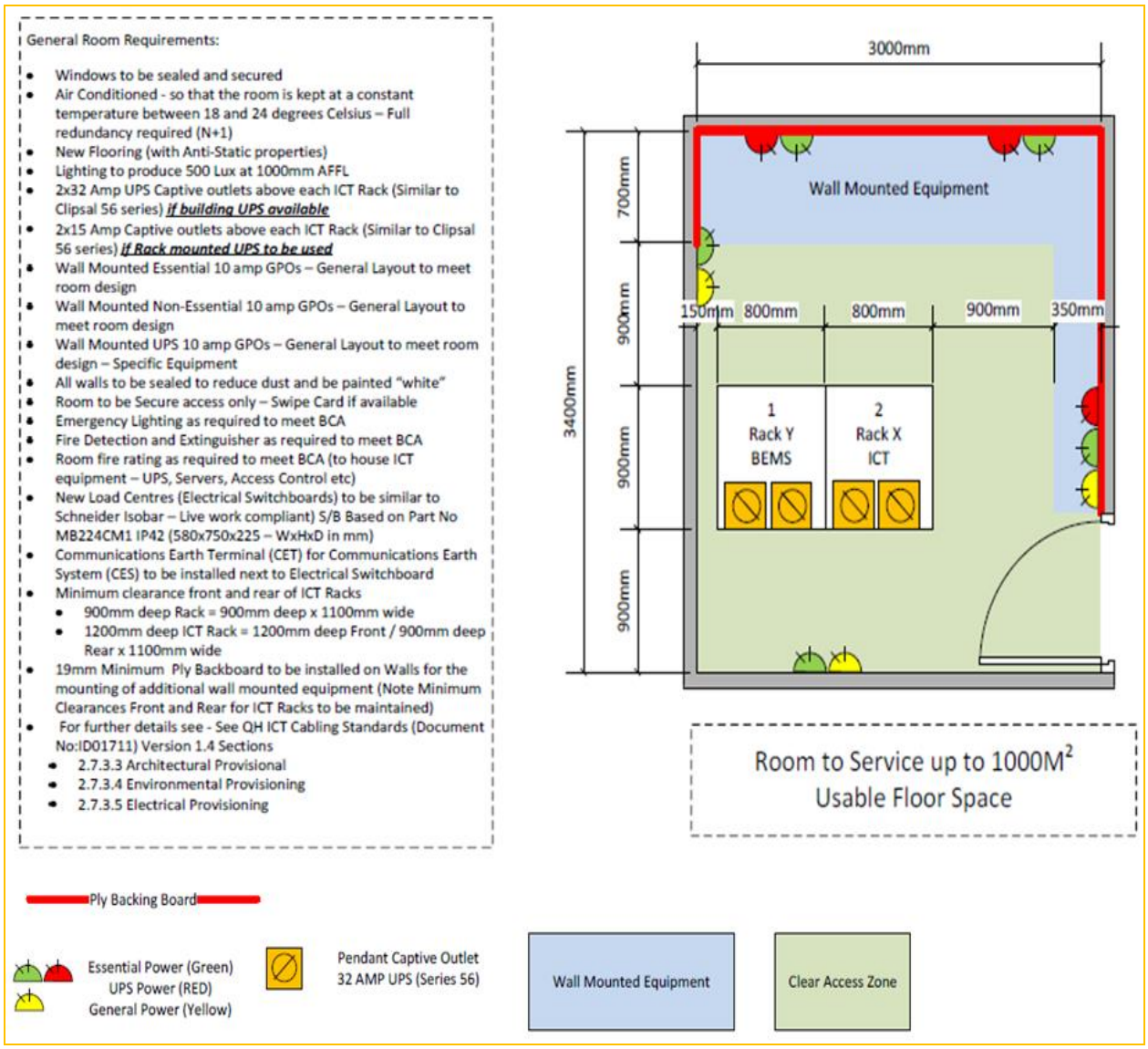


Figure 12 TR servicing up to 1000sqm of usable floor space

Notes:

1. Batteries for UPS preferred to be installed in another room.
2. UPS preferred to be stored in another room.
3. Typical load would be a 3-6Kva for power and 3-6Kva for HVAC.

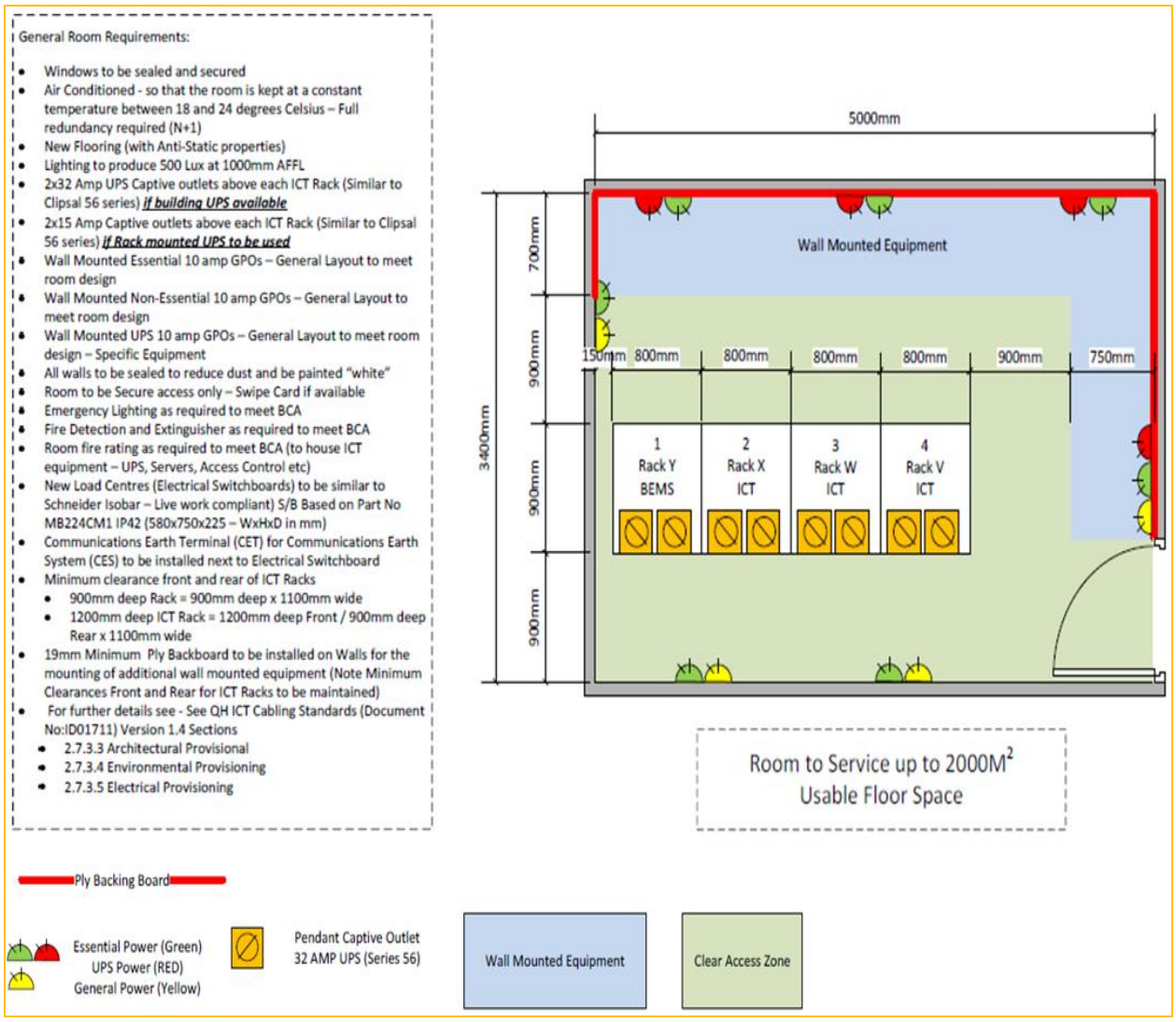


Figure 13 TR servicing up to 2000sqm of usable floor space

Notes:

1. Batteries for UPS preferred to be installed in another room.
2. UPS preferred to be stored in another room.
3. Typical load would be a 9-12Kva for power and 9-12Kva for HVAC.

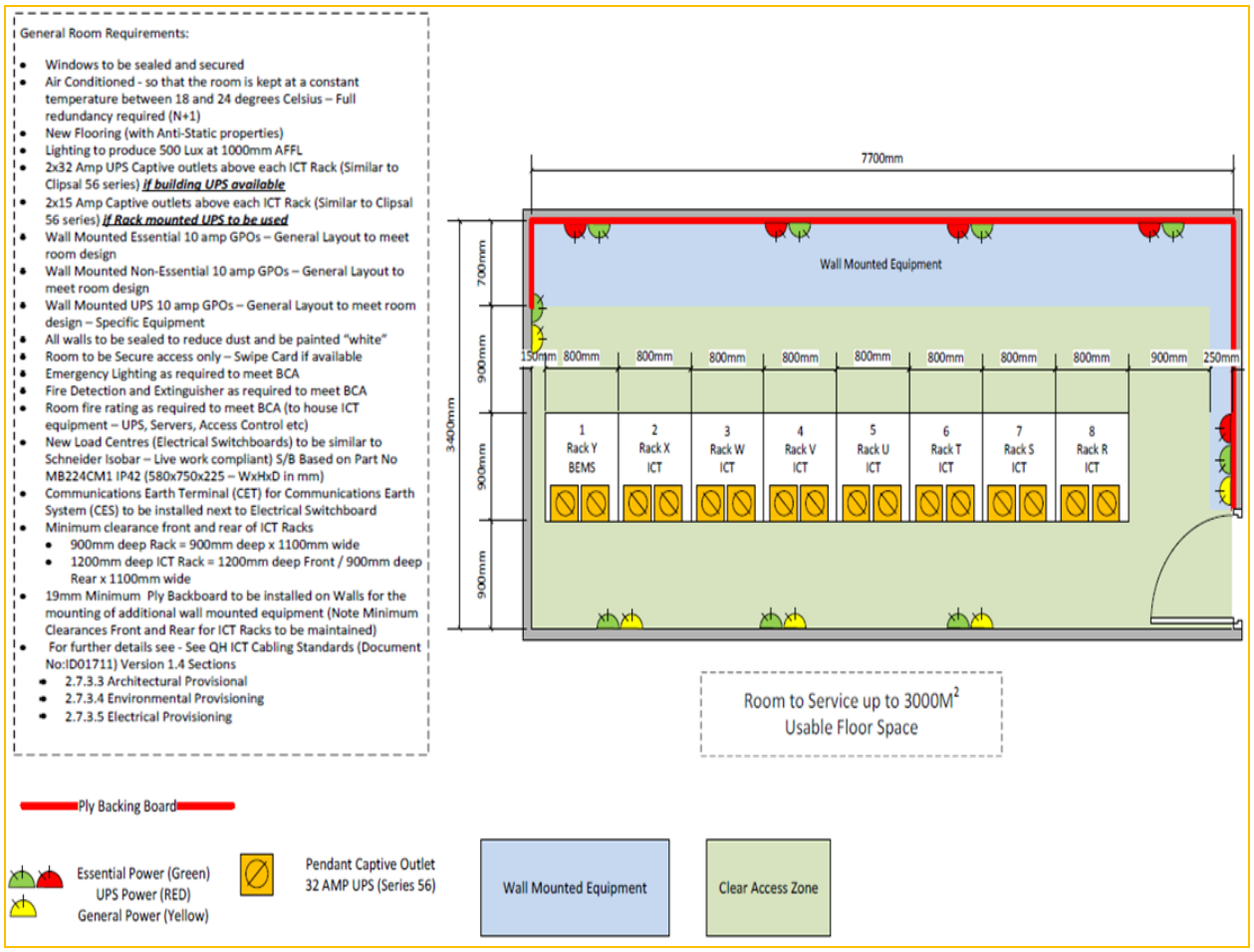


Figure 14 TR servicing up to 3000sqm of usable floor space

Notes:

1. Batteries for UPS preferred to be installed in another room.
2. UPS preferred to be stored in another room.
3. Typical load would be a 12-18Kva for power and 12-18Kva for HVAC for Queensland Health data side of room only.

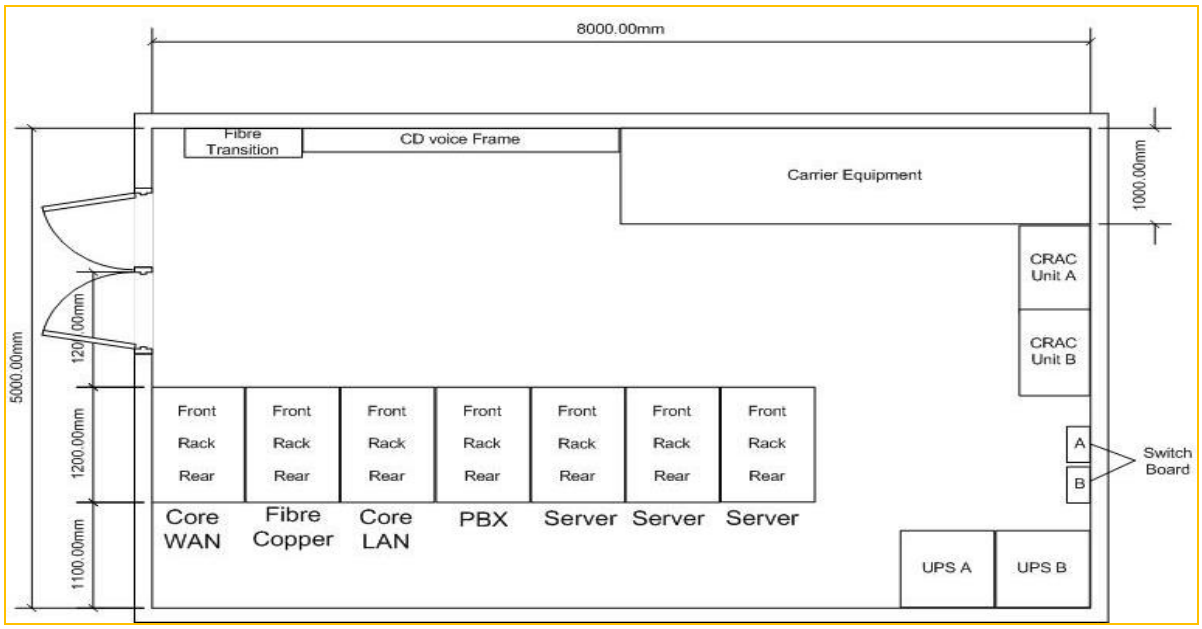


Figure 15 ER (large primary) combined carrier lead-in room and campus distributor room

Notes:

1. Batteries for UPS preferred to be installed in another room.
2. UPS preferred to be stored in another room.
3. Carrier equipment space provision is dependent on carriers requirement and shall be confirmed with carriers. Queensland Health generally has up to four carriers for voice /data.
4. Typical load would be 20Kva for power and 20Kva for HVAC.

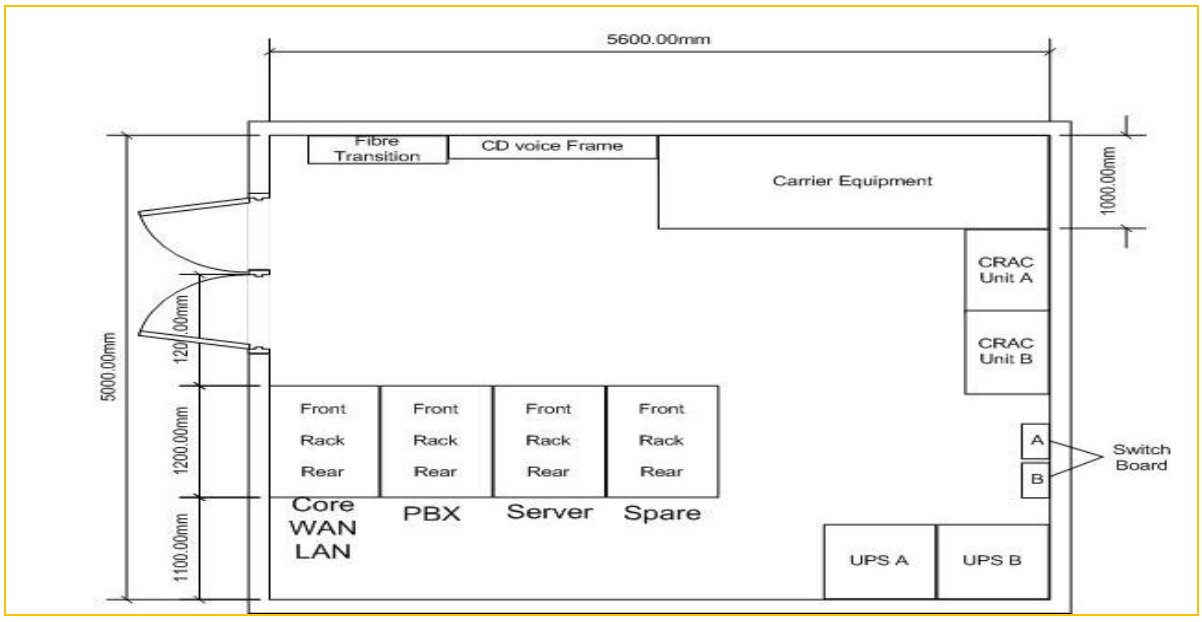


Figure 16 ER (primary) combined carrier lead-in room and campus distributor room

Notes:

1. Batteries for UPS preferred to be installed in another room.
2. UPS can be stored in another room.

3. Carrier equipment space provision is dependent on carriers requirement and shall be confirmed with carriers. Queensland Health generally has up to four carriers for voice /data.
4. Typical load would be 15Kva for power and 15Kva for HVAC.

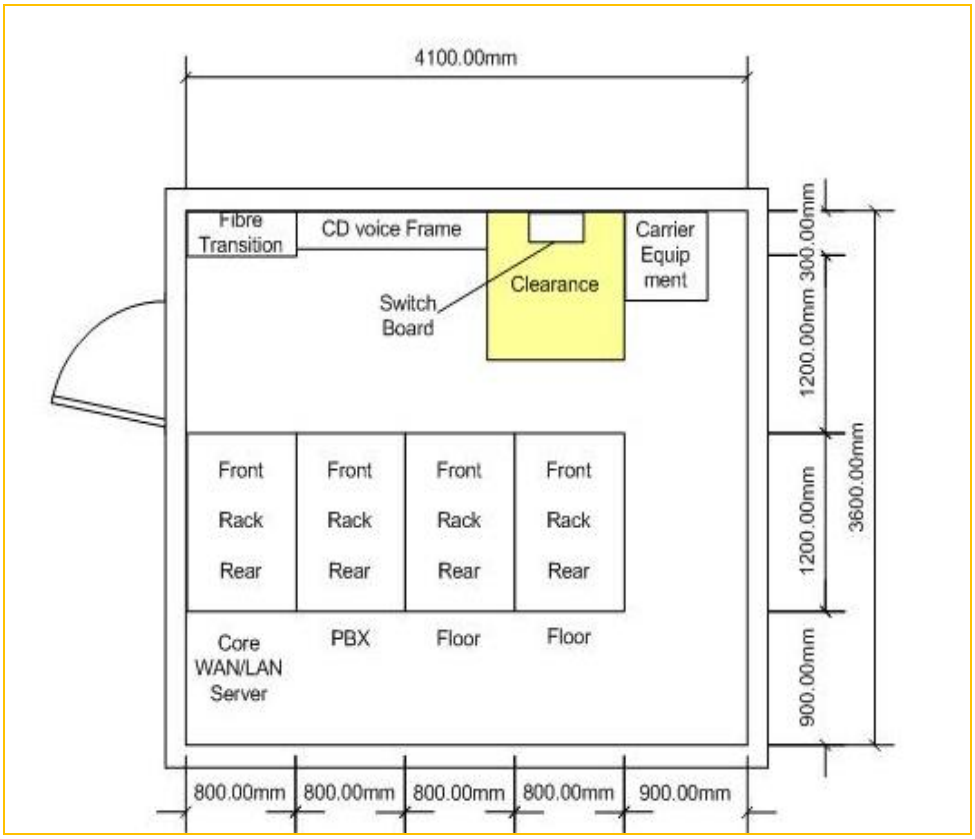


Figure 17 ER (small primary) combined carrier lead-in room and campus distributor room

Notes:

1. UPS and Batteries rack mounted. If UPS is room based more space is to be provided.
2. UPS can be stored in another room.
3. Carrier equipment space provision is dependent on carriers requirement and shall be confirmed with carriers. Queensland Health generally has up to four carriers for voice /data.
4. Typical load would be 12Kva for power and 12Kva for HVAC.
5. HVAC typically cassette ceiling mounted. If CRAC required, more space is to be provided.
6. If there is a requirement for ER sizing to be less than 14m^2, an ICT exemption has to be provided to eHealth Queensland for approval prior to installation, as per section 2.4 of this standard.

Appendix 9 – Cabling architecture

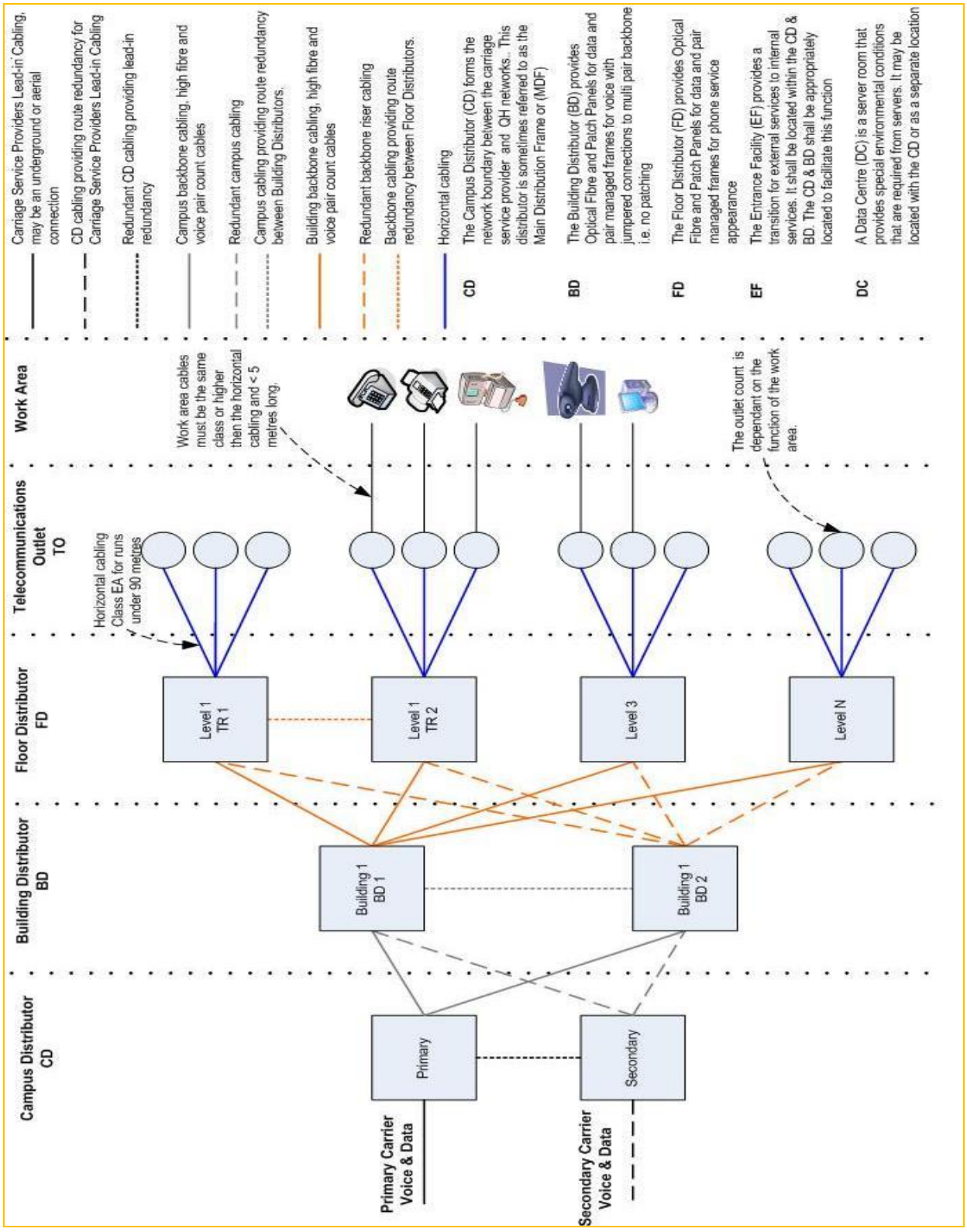


Figure 18 Cabling architecture

Appendix 10 – Data cabinet cable dressing

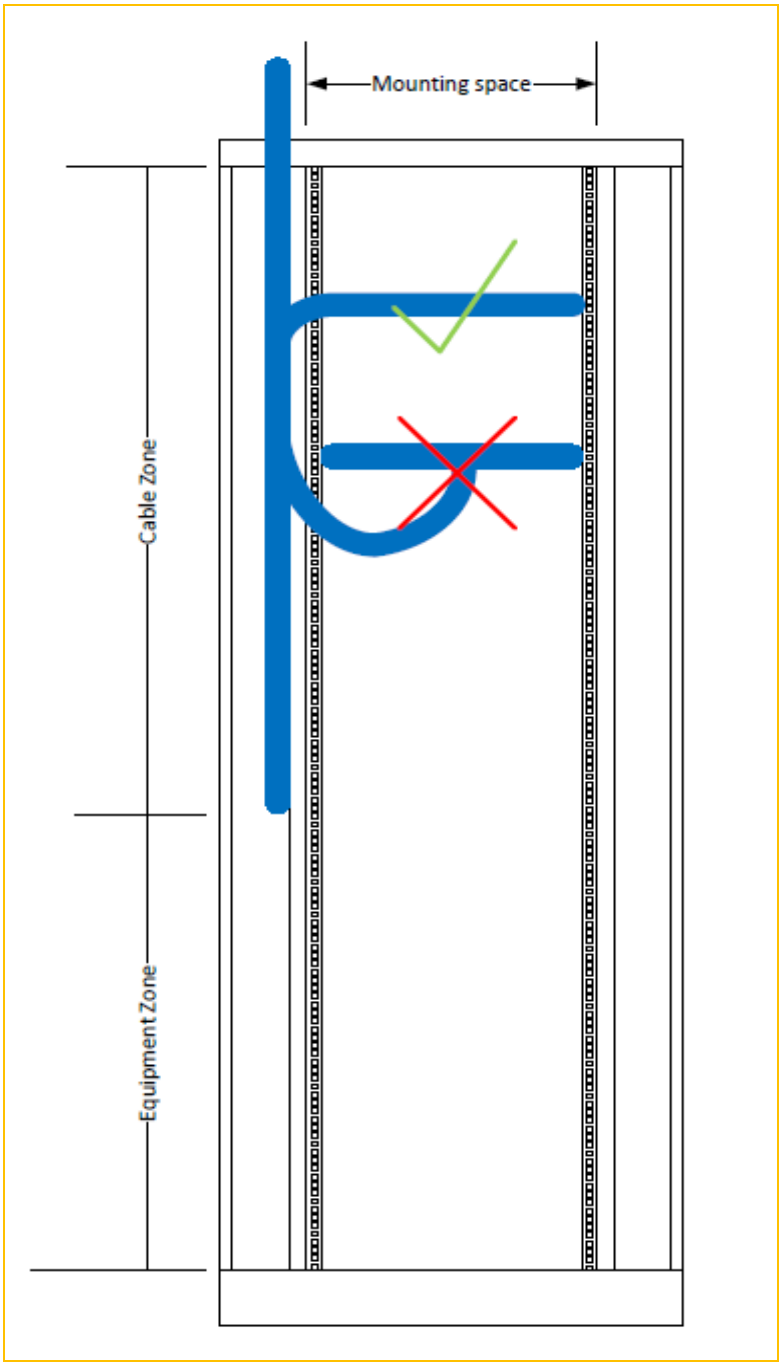


Figure 19 Data cabinet cable dressing

Appendix 11 – ICT standards exemption request questionnaire and checklist

Superseded by the ICT Policy Dispensation Process (refer to https://qheps.health.qld.gov.au/ehealth/policy/ict-policy-dispensation)

Appendix 12 – ICT standard exemption recommendation

Superseded by the ICT Policy Dispensation Process (refer to https://qheps.health.qld.gov.au/ehealth/policy/ict-policy-dispensation)

Appendix 13 – Site inspection checklist

October 2013

A.	Equipment Rack	Yes	No		B.	Cabling	Yes	No
1.	Physical damage to rack	☐	☐		1.	Physical damage to any cabling components	☐	☐
2.	Rack size as per Detailed Design	☐	☐		2.	Cable runs correctly supported	☐	☐
3.	Rack colour as per Detailed Design	☐	☐		3.	Cables segregated from power cables and other services	☐	☐
4.	Rack located as per Detailed Design	☐	☐		4.	Bend radii of cables compliant with AS/NZS3080 and manufacturer	☐	☐
5.	Rack level and secured to floor	☐	☐		5.	Cables correctly terminated to ICTCS and Industry Standards	☐	☐
6.	All components supplied and fitted as per Detailed Design and Standards	☐	☐		6.	Cables correctly labelled at both ends where applicable	☐	☐
7.	Antistatic vinyl supplied and fitted as per Detailed Design and Standards	☐	☐		7.	Only hook and loop velcro cable ties used	☐	☐
8.	Internal cable tray aligned with cable entry to rack	☐	☐		8.	Patch panels correctly labelled	☐	☐
9.	Front equipment rails located 100 mm from rack front	☐	☐		9.	Outlets correctly labelled	☐	☐
10.	Rear equipment rails located 100 mm from rack rear	☐	☐		10.	Outlets located as per Detailed Design	☐	☐
11.	Equipment located in rack as per Rack Layout drawing	☐	☐		11.	Installation quality as per ICTCS and manufacturer's requirements	☐	☐
12.	Doors and panels open and close without obstruction	☐	☐		12.	Cabling protected from any sharp edges, (e.g. entering the rack)	☐	☐
13.	Vertical finger duct installed where fibre cabling present	☐	☐		13.	gooseneck (instead of coil) of one (1) metre at any entry point to a vertical channel	☐	☐
14.	Protective earth correctly installed and terminated	☐	☐		14.	Fibre cable cores populated into panel as per colour code	☐	☐
15.	Baying kit used where adjacent racks installed	☐	☐		15.	Fibre cable core sequence as per AS/NZS3080	☐	☐
16.	Correct power rails supplied (qty, vertical, horizontal)	☐	☐		16.	Dust caps fitted to unused fibre panel ports	☐	☐
17.	Cable management fitted as per Detailed Design	☐	☐		17.	Correct colour patch cords provided	☐	☐
18.	Correct rack labelling	☐	☐		18.	Correct length patch cords provided	☐	☐
19.	Cable chimney / lid access secured with security screws	☐	☐		19.	Patch cord slack correctly stored	☐	☐
20.	Security warning notice fixed to outside of rack doors	☐	☐		20.	Record book provided	☐	☐

A.	Equipment Rack	Yes	No		B.	Cabling	Yes	No
21.	Record book holder provided inside the rack	☐	☐		21.	Records correctly completed	☐	☐
22.	Cabling to door lock tongue state sensor managed ('C' Class rack only)	☐	☐		22.	Lead-in cabling has been secured where required	☐	☐
23.	Cabling to door lock state sensor mechanism managed ('C' Class rack only)				23.	MDF is internal to the building and installed to ACIF Regulations	☐	☐
24.	A3 and A4 document holders fitted to wall	☐	☐					
25.	Patch cord holder fitted	☐	☐					
26.	GPOs installed as per Detailed Design	☐	☐					
27.	Mains power connected to individual RCD circuit and essential power where present	☐	☐					
C.	**Digital Photographs**				**E.**	**Cable Support System**		
1.	Photograph Checklist provided and completed	☐	☐		1.	Cable tray size / type as per Detailed Design	☐	☐
D.	**Digital Photographs**				2.	Clearances and components as per QH requirements	☐	☐
1.	Cable Vendor certification	☐	☐		3.	Only manufacturer supplied parts, e.g. bends, joins, Ts used	☐	☐
2.	ACMA licence	☐	☐		4.	No sharp edges exist	☐	☐
3.	Testing equipment calibration	☐	☐		5.	All cable support securely attached to building structure	☐	☐
4.	Tester certification	☐	☐		6.	Capacity not exceeded (e.g. <24 cables/catenary wire)	☐	☐
5.	Re-certification of any fire rated penetrations	☐	☐		7.	Correctly connected to protective earth	☐	☐
6.	TCB statement of compliance	☐	☐		8.	Correctly labelled	☐	☐

Site Name: .....

Inspected by: .....

Inspection Date: .....

Further inspection required ☐ ☐

Severity, definitions and examples for use in the defect List

Severity	Defect Description	Example
1	System / component down or unusable or codes/legislation violated – critical impact, no alternative available.	*Server cannot be reached or communicated with - preventing testing of the function. Reportable breach to Qld ESO or ACMA.*
2	Component down / degraded or unusable – critical impact, alternative / bypass available.	*Testing can continue but only by bypassing the section*
3	Component degraded or difficult to use – no critical impact but restricted in terms of functionality and some operational impact.	*Door lock on rack bent and difficult to operate with key*
4	Component useable / circumvention possible – no operational impact, no critical impact, deferred maintenance acceptable.	*Component not as specified but will still function*
5	Enhancement or nice to have to promote / compliment existing functionality – no operational or functional impact on use of application.	*Incorrect colour patch cord/s used*

Defect List		
Item No	**Severity**	**Defect Description**

Appendix 14 – Cabling test results

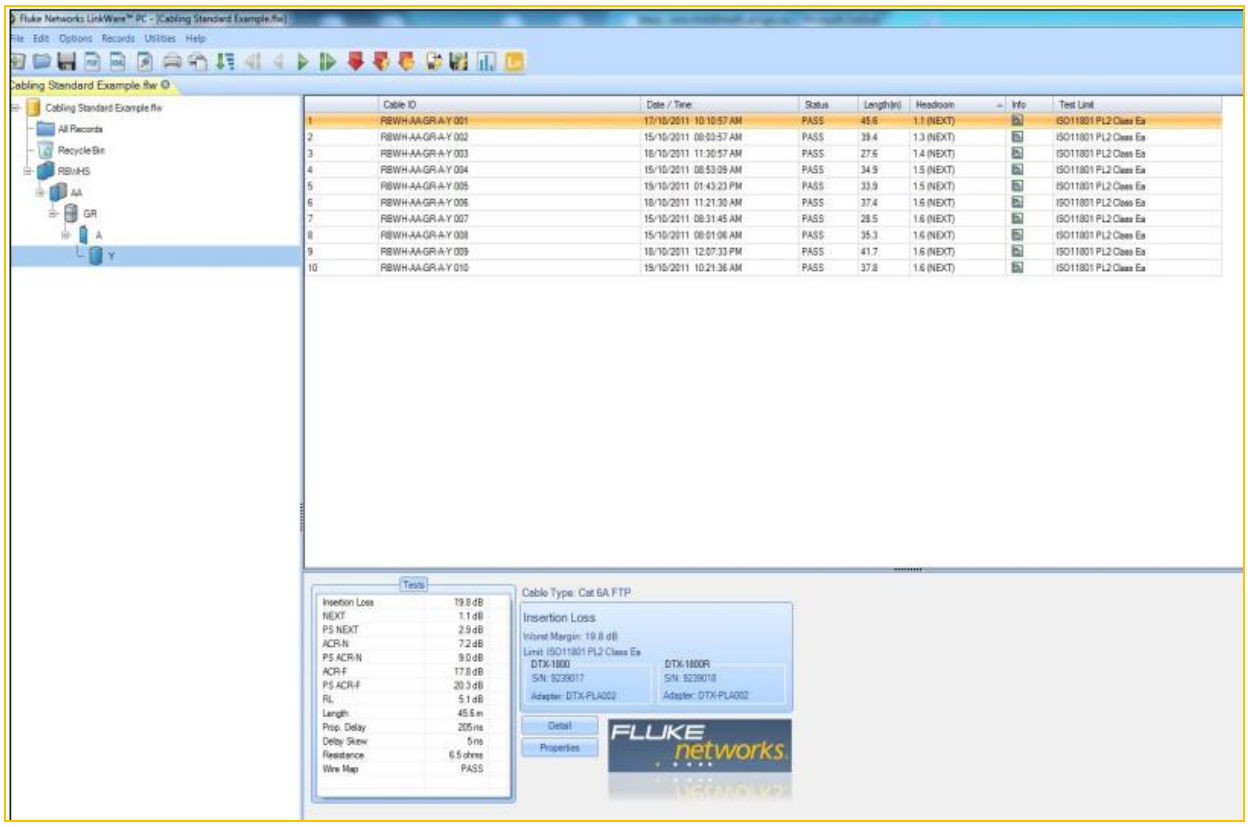


Figure 20 Cabling test results

Appendix 15 – Queensland Health site categories

Refer to the eHealth Queensland telecommunications site categorisation technical specification.