4. COMMUNICATIONS

Introduction

4.1.00. GENERAL

In a health care facility, a range of communication facilities are provided to meet the various functional needs of staff and patients. The primary objectives of providing the various communication facilities include the following;

- to improve work efficiency;
- to assist all staff in their duties by making clinical and other information more readily available; and
- to assist with the patient post-treatment recovery process by providing telecommunication facilities to access relatives and friends and television entertainment facilities.

The types of communication facilities available in a health care building generally include the following:

- Communications cabling system
- Telephone system(s)
- Intercom system(s)
- Dictation/Transcription system(s)
- Data communication system(s)
- Nurse call system
- Emergency Warning and Intercom System (EWIS)
- Public Address System(s)
- Pocket Paging System(s)
- MATV signal distribution system

Some of the above facilities are subject to regulatory control. These include:

EWIS: Required as a mandatory requirement of the BCA (Building Code of Australia) for health facilities exceeding a minimum area. The technical requirements are specified in the Australian Standard AS 2220.1, AS 2220.2. and EWIS guidelines are not covered in this document.

Communications cabling for voice and data systems, security panels and fire panels connected to the public networks. These are covered by the Austel Technical Standards.

Telephone systems and data equipment connected to the public networks. These are to conform to Austel Technical Standards. Public address, paging and MATV signal distribution systems are not covered in this section of the guidelines.

In addition to the above mandatory requirements, NSW Health has issued an Interim Standard for a structured cabling system for all new and renovated buildings based on AS 3080 - Telecommunications installations – Generic cabling for commercial premises

This document is not intended to negate statutory requirements but to target areas of the prevailing standard practice where cost efficiency could be improved. They are also targeted to refine the current NSW Health Interim Standard for a structured cabling system.

Communication systems in health care facilities are subject to considerable change over the lifetime of the building. Designers are to plan flexibility into the communications infrastructure, i.e. space and capacity to expand, change and upgrade the communications system. In planning communications cupboards or rooms, generous space is to be provided for change and communications designers need to allow for easy upgrade of the cabling system between communications cupboards and outlets

4.1.05 GLOSSARY OF TECHNICAL TERMS

A Glossary of Technical Terms is in Section 10 Appendix 1 of this document.

4.1.10 OBJECTIVES

The primary objectives of the design guidelines for voice and data communications facilities are to:

- Provide a uniform basis for the determination of the extent of voice and data communication facilities and type of equipment appropriate for health care buildings,
- Provide refined design parameters and future provision requirements for designers to achieve industry wide cost efficiency,
- Provide a catalyst for further improvements and individual design innovation,
- Ensure important communication facilities design and planning issues which have impact on the building design and other building services design are properly addressed, with appropriate solutions adopted at the early scheme design stage of the project development, and provide a better defined delineation between the building construction budget and equipment budget.

4.1.15 APPLICATION

This document will be used for the planning and design of a structured cabling system for all health care buildings.

Voice and Data Outlet Density per HPU

4.2.00 GENERAL

Refer to the Health Briefing System (NSW Health Facility Guidelines) when preparing Room Data Sheets and Room Layout Sheets.

This document provides a summary requirement on a HPU (Health Planning Unit). basis for the purpose of quantifying the scope and extent of future provision that may allowed for in the planning and design of the structured cabling system for new and refurbished buildings.

Room Data Sheets generally exclude information on the overall communications systems. Designers should clarify the communications systems requirements and have a communications brief prepared by the users which fully describe the communications systems requirements.

4.2.05 VOICE (TELEPHONE) OUTLET DENSITY

Includes systems such as intercoms, facsimile machines, dictation/transcription systems, data systems that use low speed connections (e.g. modems, ADSL lines), security and fire panel connections to the public networks.

The provision of telephone services in hospitals is generally via the hospital's PABX system to individual telephone outlets located at various parts of the hospital building(s). The majority of telephone extensions are assigned for staff use.

Because of high community expectations together with the availability of efficient telephone call cost accounting systems, many hospitals are now offering bedside telephone service for patients. Therefore from the planning view point for the structured cabling system, a system capacity for one telephone outlet per ward bed should be allowed for.

Patient telephone services are normally provided on a cost recovery basis. Individual hospital management normally determines whether this facility is to be provided and how the cost is to be recovered.

The locations where voice outlets are required would include:

Inpatient Units / ICU/CCU
- Patient beds (paediatric and psychiatric facilities need to be considered as to whether or not voice outlets are required)
- Staff Station
- All Offices
- Patient Lounge
- Staff Room

Operating Suites
- Operating rooms (via reception or nurse station)
- CSSU
- Staff Station
- Reception
- Offices
- Staff Room
- Relative/Interview
- Anaesthetic Workroom
- Recovery

Day Procedure Unit
- Reception
- Staff Station
- Interview Rooms
- Consultation/Examination Rooms
- Recovery
- Assembly/Work Area
- Offices
- Issue

Delivery Suite
- Birthing Rooms
- Reception
- Staff Station
- Staff Room
- Offices

Medical Imaging
- Staff station
- Staff room
- Reception
- Offices
- Waiting room
- Report room
- All imaging rooms
- Film processing area

Emergency Department.
- Reception / Triage
- Relative Interview
- Resuscitation
- Procedures
- Staff Station
- Offices

Other Areas
- Offices
- Bulk stores
- Engineering workshops (internal only)
- Plantrooms (internal only)
- Foyer near Emergency (Pay phones)
- Public waiting areas (Pay phones)

Based on the above voice outlet allocation criteria, the number of outlets and density per hospital unit will be as set out in the room data sheets (project specific) and the HFGs or as

set out in the Table below. The capacities of the PABX system and the backbone cabling system are to be planned for the present requirement and the recommended spare capacity as indicated. The outlet density is expressed in terms of square meters of nett briefed area per outlet point.

In conjunction with the data requirements, when all outlets needs have been identified, the outlets can then be grouped into single, dual and triple 'communication outlets' as required in each location.

4.2.10 TABLE

H.P.U.	DEPARTMENT	NETT AREA	TELEPHONE OUTLETS			
			QTY	SPARE CAP %	TOTAL QTY	m2/pt
INP	Medical / Surgical Ward (3O beds)	690	35	35	40	17
ORT	Orthopaedic Ward	650	35	15	40	15
KID	Paediatric Ward	547	10	10	12	50
ONS	On-call accommodation	64	4	15	5	10
REH	Rehabilitation Ward	738	31	15	36	20
ALL	Allied Health Unit	1484	20	30	26	40
PSY	Psychiatric Ward	645	22	15	25	20
PGE	Pschogeriatric Ward	962	11	15	13	70
ONC	Oncology Unit	212	12	12	14	15
BIO	Biomedical Engineering	62	1	0	1	50
XRA	Medical Imaging	591	10	25	13	40
CAS	Emergency	838	10	50	15	40
MRD	Medical Records	143	3	33	4	30
PHA	Pharmacy	210	3	25	4	50
NUC	Nuclear medicine	190	4	25	5	30
LAB	Pathology	153	6	25	8	20
RED	Blood Donor Unit	210	5	15	6	20
LIB	Medical Library	156	1	0	1	150
DAY	Day Procedure Unit	223	5	25	6	30
CUT	Operating Suite	920	12	25	15	60
CSS	Central Supply Department	276	2	50	3	90
ICU	Intensive Care Unit	573	15	25	20	30
MCR	Mortuary	130	2	0	2	60
LIN	Linen Handling	162	1	0	1	150
STR	Regional Store	73	2	0	2	30
SAM	Engineering Maintenance	136	2	50	3	40
KIT	Kitchen	544	3	33	4	150
EAT	Staff Cafeteria	189	2	50	3	60
EDC	Education	229	4	50	6	30
ACH	Main Entrance & Foyer	346	1	100	2	150
ADC	Admission/Discharge	48	4	25	5	10
ADM	General Administration	532	26	25	33	15
STF	Staff Amenities	172	0	-	0	0
ENV	Environmental Services	177	1	0	1	150
HOS	Hospital Control	47	1	0	1	50

4.2.15 DATA OUTLET DENSITY (Outlets for DTE - Data Terminal Equipment)

The primary function of data outlets in a hospital is for the connection of DTEs in various hospital units to the hospital network.

DTEs will generally comprise the following:

- Computer terminals
- PC. computers connected to the network
- Distributed file servers installed throughout the hospital connected to the network.

- Outlets for imaging equipment from Medical Imaging Departments
- Engineering control systems
- Photocopiers, facsimile machines and printers
- Other equipment or systems requiring interconnections via the network which carry digital signals.

Due to the high quality imaging requirements for medical imaging, the signals will generally require high speed, high band width and high noise immunity requirements. In considering the application of these systems onto the network, close liaison is necessary with the equipment supplier in regard to the network requirements. Category 5 outlets will generally be sufficient although some systems may require optical fibre facilities.

The provision of data outlets shall be as per room data sheets (project specific).

In conjunction with voice requirements, when all the outlet needs have been identified, they can then be grouped into single, dual and triple Communications Outlets' as required at each location.

4.2.20 HEALTH DEPARTMENT BUILDING STANDARD

The provision of voice and data outlets shall be as per room data sheets.
The structured cabling system shall be planned and provided based on the respective voice and data outlet density recommended in Room Data Sheets for each HPU.

Backbone and Horizontal Cables

4.3.00 GENERAL

The generic cable system comprises a structured backbone comprising both copper and optical fibre cables and a horizontal cable system generally of copper cabling. The generic cable systems will carry all communications services including voice and data.

Generally, all health care facilities will require both copper and optical fibre cabling systems. Health care facilities will vary widely in size and structured cable system requirements from very small having a single Campus Distributor (CD) and star topology from this single point, to large campus facilities comprising the CD, BDs (Building Distributor) and FDs (Floor Distributor).

The type of backbone and horizontal cables and performance specifications for voice and data outlets are specified in the Health Department Building Standard for Telecommunications Pathways and Spaces and in AS/NZS 3080 – Telecommunications installations–Generic cabling for commercial premises.

Token Ring
Ethernet
Low Rate
Token Ring
Cable Type
Data 100 ohm UTP
Data 100 ohm STP
Data 150 ohm STP
Optical Fibre
Data
Data
Data
100 ohm UTP
100 ohm STP
150 ohm STP
Coax 50 ohm
Data 100 ohm UTP
Data 100 ohm UTP
Voice 100 ohm UTP
Voice 600 ohm UTP/STP Voice 120 ohm STP

4.3.05 COPPER BACKBONE CABLING UNIT - GENERAL

The function of the backbone cabling is to provide interconnection between the distributors CD, BD and FD comprising the cabling system.

The backbone wiring shall use a hierarchical star topology where the CD is connected to each BD and each BD is connected to the relevant FDs.

Note the systems such as PABXs, intercoms etc can be attached at any distributor. Campus-wide systems would generally be attached to the CD.

The cabling system will be installed and commissioned in accordance with the Australian Communications Authority Technical Standards (mandatory) and the Australian Standards on premises cabling and vendor standards to achieve a 15 year certification of the installation.

The backbone wiring consists of transmission media (cables), intermediate and main cross-connect. (distribution frames) and mechanical terminations.

The backbone wiring shall use the conventional hierarchical star topology wherein each telecommunication closet is wired to the building's main cross-connect.
For a multi-building campus with a central PABX system individual building main cross-connect is wired to the campus main cross-connect also using star topology.

All cables shall be terminated in an approved manner and tested in accordance with the recommendations of AS/NZS 3080, as well as the Australian Commission Authority Technical Standard, and Australian Standards on Premise Cabling. All back bone cables shall be installed in a suitable and readily accessible location and shall remain accessible after completion of the initial installation.

4.3.10 COPPER BACKBONE CABLING UNIT - VOICE BACKBONE

The type of cable for copper backbone wiring shall be as follows:

Cat 3, voice 100-ohm UTP multipair copper cable.

The number of pairs of backbone cables shall be determined by the outlet density plus 30% spare for the future requirement.

4.3.15 OPTICAL FIBRE BACKBONE NETWORK

The function of the backbone cabling is to provide interconnection between the distributors CD, BD and FD comprising the cabling system.

The backbone wiring shall use a hierarchical star topology where the CD is connected to each BD and each BD is connected to the relevant FDs.

Note that systems such as Computer Rooms, distributed PABX systems, file servers, routers etc can be attached at any distributor. Campus-wide systems would generally be attached to the CD.

The cabling system will be installed and commissioned in accordance with the Australian Communications Authority Technical Standards (mandatory) and the Australian Standards on premises cabling and vendor standards to achieve a 15 year certification of the installation.

The type of cable for the optical fibre backbone will generally be 62.5/125 micron multi-mode optical fibre. The use of 9 micron single mode optical fibre shall be restricted to campuses where the distances require this cable to support Gigabit Ethernet and other high speed protocols such as fibre channel.

The number of fibres to be included in a bundle should be a minimum of 6 for multi-mode and 4 for single mode. Quantities above this should be subject to a needs analysis.

4.3.20 HORIZONTAL CABLING NETWORK - GENERAL

The horizontal wiring is the portion of the telecommunications wiring system that connects the voice and data outlets in the work area to the assigned CD, BD or FD's. The horizontal wiring shall also be a star topology with each outlet connected to the assigned CD, BD or FD.

All cables shall be terminated in an approved manner and tested in accordance with the recommendations of AS/NZS 3080, Australian Communications Authority Technical Standards and the Australian Standards on Premises Cabling.

4.3.25 HORIZONTAL CABLING NETWORK - HORIZONTAL CABLE TYPE

The type and number of pairs of cable for data horizontal wiring shall be as follows:

Cat 5, data 100-ohm UTP, 4-pair copper cables.

Cable requirements including Cat 5 should be justified on a needs analysis.

Cross Connection Equipment

4.4.00 GENERAL

The backbone and horizontal wiring connection hardware is used to provide a means of:

- Connecting and cross connecting wiring systems.
- Connecting the building wiring system to equipment and to the public telecommunications network.

The type of connection equipment to be used should induce minimum impairments to the signals passing through the connecting hardware.

The connecting hardware for horizontal and backbone wiring shall meet the physical and electrical requirements of AS/NZS 3080, the Australian Communications Authority Technical Standards and the Australian standard on Premises Cabling.

4.4.05 DISTRIBUTOR EQUIPMENT - GENERAL

The type of hardware used to terminate the horizontal and backbone cables shall be of the insulation displacement contact (IDC) type.

Connecting hardware based on modular jacks shall be provided for terminations of horizontal cables and copper backbone cables in two separate groupings.

Interconnection between the horizontal and backbone cabling shall be by means of patch cables. The capacity of termination hardware shall be as follows:

The numbers of required horizontal cables for the specified communications outlets plus 30% spare capacity.

The number of required backbone cables plus 30% spare capacity.

Interconnection between horizontal cabling and local communications equipment shall be by means of patch cables.

The interconnections between backbones cables at a CD or BD shall be by means of cross connect jumper wires.

The capacity of the termination equipment shall be the number of required copper backbone cables plus 50% spare.

4.4.10 DISTRIBUTOR EQUIPMENT - OPTICAL FIBRE CABLES

Optical fibre breakout and termination frames will be required to terminate all cores of the installed optical fibre backbone cables.

The interconnection shall be provided by 'SC' type connectors unless an existing 'ST' connector regime exists in the Health Service.

Patch leads shall be provided to provide interconnection between backbone cables and to local communications equipment.

The capacity of the optical fibre termination equipment shall be the number of planned backbone cores plus 50% spare.

Outlet Connectors

4.5.00 GENERAL

Communications outlets shall be securely mounted on wall plates at planned locations. Communications services shall be grouped together in common wall plates. Wall plates will comprise one, two or three outlets depending on the requirements.

All outlets shall be identified with an indelible number.

Generally, Health Services will have in place outlet numbering regimes which will be incorporated in the design. Where no numbering regime exists, the outlet should be numbered in a way which identifies the Telecommunication Cupboard (TC) to which the outlet is connected and the location on the distributor equipment e.g. 12RA24. This would show that the outlet is connected to TC 12 and to room outlet distributor A position 24.

4.5.05 OUTLET CONNECTOR TYPE (VOICE)

All communications services should use 8 pin modular plug/jacks as specified in the Australian Standards for Premises Cabling and which comply with the Australian Communications Authority Technical Standards.

The Australian Standard allows for two pin/pair arrangements.

Health facilities should use the pin/pair arrangement defined in Figure 13 (a) Preferred (T568A; RJ545 or similar).

Telecommunication Closet / Cupboard (TC)

4.6.00 GENERAL

Telecommunications cupboards (TCs) or rooms are areas within a building specifically for the use of communications and other equipment used in the area. They shall be planned in the early stages of a building design for the accommodation of distributor equipment and a range of communications equipment including central intercom equipment, nurse call, MATV, engineering data and other digit systems that may use the network.

One or more TCs will be required in each building, the quality and spatial allowance for each TC being in accordance with this guideline. In all instances, sufficient room shall be provided to allow access to all technical equipment for maintenance and operation.

4.6.05 MAIN CROSS CONNECTION TC

The TC containing the CD or BD will be required to house a number of items. These will include:

- The distributor to terminate the carriers' connections. Allowance should be made as there is often more than one carrier providing services to a premises. Carriers can connect using both optical fibre and copper underground and/or aerial cables or via microwave radio equipment. Quite small sites can require a substantial amount of space for carrier termination.

- The distributor to terminate the telephone equipment. The TPF may also be incorporated in the distributor. The TC may also have to house the telephone equipment and

associated customer administrator terminal equipment if a separate PABX room is not provided on the premises.

- The distributor to terminate the copper and optical fibre backbone cables.
- The distributor to terminate the local horizontal cables.
- The housing of data communication equipment.
- The housing of file server(s) if there is no dedicated computer room on the premises.

Note: For premises that only have one distributor, this room will be required to house all communication equipment, including MATV, nurse call, duress alarm, security panels and intercom systems as well as the equipment mentioned above.

In laying out the room the mandatory clearances required by the Australian Communication Authority Technical Standards shall be maintained.

For larger premises where a CD and BD/FDs exist, the non-CD TCs shall be sized appropriately. Allowance for technicians undertaking maintenance work shall be made. If the TC is arranged as a cupboard i.e. the technician has to work in the corridor, then allowance shall be made for the fact that the TC doors may be open for a significant period of time. Staff and public access along any corridor should not be hindered by the open doors.

To comply with the Australian Standard, the maximum distance from the distributor to the wall outlet (i.e. the link) must not exceed 90 m.

Therefore, one TC shall be established to serve communications outlets within a radial distance of not more than 75 m to allow for the cable run.

For multi-storey buildings, telecommunications closets should be vertically aligned and connected by a fire-isolated riser which is used to provide backbone cabling vertically through the building. Consideration can be given for the provision of one TC for 2 floors. However the telecommunications cupboard will need to be enlarged to accommodate the additional termination equipment.

Cable tray having ample spare space for additional future services shall be used to support horizontal and vertical cable systems. The cable tray system needs to be fully accessible.

For single storey buildings, TCs shall be located in a readily accessible position.

With the exception of the main cross-connect TC, other TCs could be provided in a form of a cupboard with suitably sized doors.

The telecommunications cupboards shall be used for housing cross-connect hardware and active hubbing devices.

For planning purposes, the internal dimensions of the cupboard should be 1800mm x 900mm deep. The ceiling space above the cupboard shall be free of other building services, in particular free of pressurised water piping and drainage piping.

The equipment within the cupboard, rack or cabinet shall be arranged into their logical functional grouping. All items of equipment shall be wall mounted. The cupboard doors shall be of size and be arranged so that they do not impede access to the equipment. Doors shall be lockable by master keying system.

Separate physical areas within the cupboard shall be allocated for:
- incoming cables (backbone)
- horizontal cables
- optical fibres (if provided)
- active devices (hubs) and patch panels.

Adequate natural or mechanical ventilation shall be provided to remove heat generated by the active devices inside the TCs. The ventilation provision shall be capable of limiting the ambient temperature inside the cupboard to not more than 35^{o} Celsius.

Devices

4.7.00 GENERAL

The backbone and horizontal cable networks follow a star topography and allow for flexible connection of equipment and services on the network. Equipment and services can be connected at any point in the network to provide a campus-wide service.

4.7.05 CAMPUS DISTRIBUTOR (CD)

The Campus Distributor (CD) is the source node of the cable network but does not need to be the connection point of campus-wide systems or services. Equipment and services that would normally be connected to the CD include:

- Carrier Services - the services provided from internal service providers such as Telstra, Optus. These generally are voice (telephone) and ISDV facilities.
- Alarm Facilities - these are monitored services providing direct connection to the monitoring providers and include fire alarm, security and equipment maintenance, and modem facilities.
- PABX facilities
- External microwave links services.
- Wide Area Networks (WAN) external to facility.

4.7.10 INTERNAL DISTRIBUTOR (Building & Floor - BDs and FDs)

These distributors provide communication nodes throughout the campus network as part of the star topology. Major equipment and services can be connected to any of the network nodes to provide campus-wide communications facilities and would generally include:

- Central dictation services
- Digital Service Encoding data networks, LANs
- Intercom services
- Serial data services
- Nurse call systems
- Paging
- Text terminal networks
- Security systems
- Access central systems
- Contact closure services
- Duress alarms
- Pager interface
- Video systems – campus wide
- Internal microwave system
- Fire alarm, security, equipment maintenance modem source signals to CD for external line connection to providers.

Nurse Call and Emergency Call Systems

4.8.00 Nurse call systems shall be hard wired and designed and installed in accordance with AS 3811 – Hard-wired patient alarm systems. It is highly recommended that nurse-activated emergency call buttons are separate from the patient call button.

Paging System

4.9.00 A paging system may be used to supplement the hospital telephone system for contact with key staff members. This facility may include arrangements for assistance call and other emergency signals. Automatic interface with the fire alarm system and hospital emergency calls is recommended.
Paging may be of the self-contained radio frequency type which produces full alpha/numeric

message information.

Paging facilities shall be maintained in the event of a major power failure in accordance with AS/NZS 3009 - Electric installations - Emergency power supplies in hospitals.