VOLUME 4: SPECIFICATION FOR INFORMATION COMMUNICATION TECHNOLOGY INSTALLATIONS

1 GENERALLY

ICT installations include but are not limited to physical and wireless data, video and voice transmission mechanisms that will enable communication between systems in a wide environment. The systems installation is expected to be integrated and secure based on industry standards.

1.2 STANDARDS AND CODES OF PRACTICE

1.3.1 The following standards shall be used throughout the design;

a) ANSI/TIA-1179

b) ANSI/TIA 568-C.0, TIA 568-C.1, TIA 568-C.2

c) TIA 569, TIA 570, TIA 568-C.3

d) TIA/EIA 568A & 568B, ETL & UL

e) TIA 606, TIA 942, TIA 568-C.4, TIA 607, TIA 1005

f) TIA 758, TIA 862

g) IEEE 802.11

h) IEEE 802

i) IEEE 802.1ag

The ANSI / TIA 1179 shall take clear precedence whenever there is need to choose a method of action.

1.3 PATHWAYS AND SPACES

1.3.1 Standards

a) ANSI / TIA –1179, TIA 569

1.3.2 Cable separation

There should be separation of data cables in tray from ducts containing gases and fluids. All data cable running under the ceiling should run through PEplastic pipe size 1-inch or 2 inch size depending on the volume for added protection from rodent attack.

All data and service cables shall run in the cable tray separate from electrical cabling and other transmission ducts that could cause EMI.

The cable pathways and spaces must be concealed from the surface of the walls / ceilings and only revealed at the telecommunication outlet.

The contractor shall ensure that there is separation of services in two separate IDFs within each TR in each quadrant. The IDF (Intermediate Distribution Frame) houses all the premise-owned data and all low-voltage cabling, which is secure and only accessible by internal I.T.

The External IDF (EIDF) contains all the outside services, such as TV, A/V, CCTV, and Distributed Antenna System (DAS) which is accessible to the service provider vendors.

1.3.3 Electro Magnetic Interference

Efforts must visibly be done to minimize effects of Electromagnetic Interference especially in the vicinity of magnetic resonance scanner, x-ray machines and other equipment in the intensive care unit.

1.4 CABLING

1.4.1 Cabling Standards

a) ANSI/TIA 1179

b) ANSI/TIA 568A / 568B

c) ANSI /TIA 568-C.2, 568-C.3, 568-C.4

1.4.2 Backbone cabling

Expected bandwidth for industry standard backbone cabling is 2.5- 40Gbps Multimodefiber.

1.4.3 Horizontal cabling

The industry standard cable for the horizontal span shall be gigabit speed cable preferably fiber optic cable

1.4.4 Color coding

Separation of services through color coding of cable: blue cable for data cabling, white for the telephone cable, yellow for physio monitoring, green for TV and orange for nurse call and the RLTS system.All data cables in basket tray.

1.4.3 Cable termination

Fibre cable end to end termination shall be done by an appropriate technology ensuring link budget lossof less than -1db loss.

1.4.4 Cable loss

Link budget computation should leave a safety net of at least -3db. The maximum tolerance on end to end of fibre optic cable should be maintained.

1.4.4 Patch cables

The contractor shall provide industrial prepared patch cables 3 mtrs in length for all the telecommunication outlets in the building. And 1mtr for fiber patch panel.

1.5 WORK SPACE

1.5.1 Standards

ANSI / TIA 1179

1.5.2 Work space density

The work space densities shall be according to the health care network infrastructure design standards in ANSI / TIA 1179.

The work areas are classified into Low, Medium or High density work areas based on the

a) Patient Services							
Administration	Registration	Patient Room	Family Lounge	Waiting Room	Nurses Stations	Library	Consultation
M	M	H	L	L	H	M	L

b) Surgery/Procedure/Operating Rooms							
Patient Prep	Patient Holding	Patient Recovery	Sterile Zone	Sub-Sterile Zone	Intensive Care Rooms	Operating Room	Anesthesia Offices
M	M	M	L	L	H	H	M

c) Emergency				
Ambulance Bay	Evaluation	Observation	Exam Rooms	Procedure Rooms
L	M	H	M	H

d) Ambulatory Care						
Procedure Rooms	Out-Patient Surgery Rooms	Mammography	Biopsy	Exam Rooms	X-Ray	Patient Holding
M	H	M	L	M	L	L

e) Women's Health				
Ultrasound	Lactation	Labor / Delivery Room	Infant Bays	Nursery
L	L	H	H	M

f) Diagnostic and Treatment					
Magnetic Resonance Imaging (MRI) & Control Room	Simulator & Control Room	Linear Accelerator & Control Room	CT Scanner & Control Room	Procedure Rooms	Operating Rooms
H	H	H	H	H	H

Fluoroscopy	Radiograph	X-Ray	Radiation Processing	Lab
L	L	L	L	H

g) Caregiver				
Exam Room	Clean Utility	Soiled Utility	Nourishment	Charting
L	M	L	M	M

Nurse Station	Workroom	Galley	Read Room
H	M	L	M

h) Service/Support		
Blood Bank Area	Pharmacy Area	Anesthesia Area
M	M	H

activities to take place in the area. Table below high-lights the classification;

Work area densities:

i) Facilities				
Janitor Closet	Electrical Rooms	Communication / Technology Rooms	Building Utility Rooms	Elevator Machine Rooms
L	L	L	L	L

Mechanical Rooms	Security Office Command Center	Fire Command	Specialty Storage (e.g. battery, chemicals)
L	H	M	L

j) Operations					
Administration	General Storage	Cafeteria	Food Service	Locker Rooms / Showers	Laundry
M	L	L	M	L	L

Central Sterile	Lounge	On Call Suite	Retail Areas	Conference Rooms	General Office Areas
M	L	L	L	M	L

k) Critical Care		
ICU	Neonatal ICU	Recovery
H	H	H

Fig 1. Work area densities

1. 5.3 Wireless / Wi Fi connectivity

Wireless standards: IEEE 802.11b, IEEE 802.11g, IEEE 802.11n

The contractor shall install wireless WiFi in all office administration areas with low data connection densities. Places for Wi Fi include the terraces, the entire office blocks, administration building and the theatres.

1.6 NETWORK TOPOLOGY

1.6.1 Generally

The topology shall be that which gives flexibility in modification both during network extension andnetworkdisconnection. The star topology shall be used throughout the implementation.

1.6.2 Multiple Paths

The topology provides multiple transmission paths for zones serving critical parts of the network. There should be dedicated cable runs to the critical areas such as the theatres and the ICU.

1.7 Bandwidth

1.7.1 Bandwidth planning is expected

Backbone: 40 Gb/s core—redundant 20 Gb/s to every IDF, 10 Gb/s to every access layer Horizontal: 1+ Gb/s to each workstation outlet including Category 5e for voice and Category 6 for data and other IP services (nurse call, real-time location systems, physio monitoring). 10 GB/s to special locations through multimode fiber.

1.7.2 100% growth factor

The bandwidth planning should factor future network growth to 100% in the next 10 years.

1.8 Equipment Containment Areas

1.8.1 Generally

The contractor shall utilize the spaces providedfor installing equipment around the premises. The contractor shall ensure that installation is done to world healthcare standards. Preparation of the equipment area to create a conducive environment for the systems to be installed shall be the role of the contractor. All equipment shall be housed in standardized 42U racks. A not less than 2 unit rack build shall be acceptable.

The contractor shall ensure that the TR – Telecommunication room and all the equipment there in are not exposed to Electro Magnetic Interference (EMI) and chemicals resistance in areas prone to chemical emissions.

1.8.2 Equipment room (ER)

The equipment room shall be at least 12 square-meters or larger – in a secure part of the hospital central to all horizontal connections. The equipment room shall be prepared with a 100% growth factor planning.

The power systems in the ER shall be protected by an independent power protection and backup from the rest of the building. The power-backup should be able to last not less than 8hrs without recharging.

1.8.3 Telecommunication Room (TR) and Telecommunication Enclosures (TE)

There shall be a minimum of two TR / or TE on every floor of every block. In each TE all cross-connect termination shall be contained.

The Data connections shall be contained in a different closet from the rest of the services as indicated above under "**separation of cabling**"

1.9 Electrical installation

The power source to the data backbone equipment shall be designed in circuit separate from that of the rest of the building. The contractor shall ensure that ICT backbone equipment circuit is one, different and protected from spikes, blow-outs, black-outs and power fluctuation.

The ICT equipment circuit shall have centralized power protection and management originating from the Equipment room. Power back up should last not less than 8 hours without recharging.

2.0 NETWORK SECURITY

The best practices of implementation shall be used to ensure that security of communication is taken into account as is expected in a highly sophisticated healthcare environment.

Network security shall be implementable at the data-link layer and the network layer. All equipment installed at the cross-connect and network perimeter should support, Access Control List and VPN implementation at the data link layer.

3.0 ICT SOLUTIONS

3.1 Network Capability

The network infrastructure configuration must be designed ready to run the services and systems below in 22.1. The contractor shall ensure that the systems below are fully operational with the telephony fully installed to the end point and end-point devices supplied.

3.2 The Interoperability and Integration of Software solutions

All software solution proposed by the contractor should provide flexibility for integrating with other systems to share related data. The systems should be database driven and should provide web-access capability.

3.3 Implementation and Training

ICT solutions proposals should include an implementation and user initiation / training on operation and usage.

Mini User-training per system is 20 hours.

3.4 Warranty

Minimum hardware warranty is 1 year for all software and hardware installation.

Minimum service level warranty is 1 year for all software and hardware installation.

3.5 Products

3.5.1 Enterprise and Domain setup/ configuration

The domain controller and BDC hardware (server) shall be provided by the contractor and the necessary configuration to enable the enterprise connectivity.
User management throughout the enterprise using AD.
Highest levels of security planning during implementation are expected.

3.5.2 Voice over IP connectivity

Voice connectivity shall cover the entire building complex. All connections should satisfy the latest IP communication capability.
The communication should enable easy corroboration features, voice recording and voice archiving to mention but a few.

Unified wireless IP phones (End-point phone working over Wi-Fi) .Coverage over awide spectrum is critical to enable mobility of users.

State of the art video conferencing facilities 1 board room, 2 lecture theatres.
The boardroom and lecture theatres shall be installed with a suspended projector screen, suspended projector of atleast 3500 lumens. Remote controlled room blinds to control the light in the room.

3.5.3 Integrated Access Control & Surveillance System

Expected features for the Integrated Access Control & Surveillance System;

a) entralized control and monitoring of security installations
b) Closed Circuit Television (CCTV) for both interior and outside surroundings of the complex. All access areas including entrances and exits. Minimum number of cameras is 0.
c) Access and intrusion control features
d) Intrusion Alarm for secure installations
e) Architecture and technical requirements, including security, accessibility, compatibility with specific databases, Web technology, reporting, record management
f) Capture Time attendance
g) It should offer multiple data capture options including bio-metrics (finger print, card reader)at all designated entrances
h) Guard clocking functionality
i) Multi-vendor compatibility eg. Galaxy, Elid, Cisco, Vivotek, HID, Samsung etc.
j) IP driven connectivity.
k) Pro-Watch Capability – Automated remote locking of access doors.
l) Remote accessibility
m) Interoperability with other systems and databases such the human resource and payroll

n) Multiple location control capability

3.5.4 Nurse Call System

The Nurse Call system to manage and monitor activities related to patient care. Features and specifications for the nurse call system should be included as below;

a) Touch screen consoles and panels
b) Corridor lights
c) Communication management software
d) Resident check in
e) Wireless device connectivity
f) Enterprise wise reporting
g) Bed management functions

3.5.5 Queuing systems

The queuing system is expected to have the following features and specifications.

a) Pre-arrival (Appointment systems, calendar
b) Arrival (Customer service points, Reception solutions, Floorwalker modules, Ticket printers, SMS, pagers, Signage)
c) Queuing and waiting(Digital.Mediasolutions - queuing information mixed with entertainment and targeted messages, Signage (LED displays), Barriers, Ticket message, Pre-recorded vocal messages)
d) Serving (preparing), Customer history information, Skilled based routing
e) Serving (Customer identification, Skilled-based routing, Queue optimization, Signage on where to go, Multiple integrated service point solutions)
f) Post serving(Feedback units, Touch screens, Service point solutions)
g) Managing (operational), Alerts and alarms via email, on-screen pop-ups, displays, monitors, pagers or sms, Reporting tool, Dashboard application).
h) Web-based management access
i) Database driven architecture
j) Multiple reporting features

4.0 EQUIPMENT SPECIFICATIONS

4.1 Fibre Optic Patch Cable - LC to LC, 50/125m OM2

General	
Technology	Fibre optic
Features	Halogen-free , zipped, ceramic connectors
Length	1 m
Network Cable Type	Patch cable - OM2
Core / Cladding Diameter	50 / 125 micron
FibreQty	2
Type of Fibre Optics	Multimode
Manufacturer Warranty	
Service & Support	10 years warranty
Miscellaneous	
Compliant Standards	RoHS
Connectivity	
Connector(s)	2 x LC multi-mode - male

4.2 Fiber 1000BASE-SX GBIC Module

General	
Form Factor	Plug-in module
Device Type	SFP (mini-GBIC) transceiver module
Expansion / Connectivity	
Compatible Slots	1 x SFP (mini-GBIC)
Interfaces	1 x Ethernet 1000Base-SX - LC multi-mode
Networking	
Features	Full duplex capability
Connectivity Technology	Wired

Data Link Protocol	Gigabit Ethernet
Compliant Standards	IEEE 802.3z
Data Transfer Rate	1 Gbps
Cabling Type	1000Base-SX
Miscellaneous	
Compliant Standards	UL 1950
Environmental Parameters	
Min Operating Temperature	0 °C
Max Operating Temperature	40 °C
Humidity Range Operating	10 - 90%
Dimensions & Weight	
Width	1.3 cm
Depth	6.5 cm

Wireless Access Point

Product Description	Wireless Access Point with PoE
Device Type	Radio Access Point
Form Factor	External
Connectivity Type	Wireless
Data Link Protocol	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n
Interfaces	5 x network - Ethernet 10Base-T/100Base-TX - RJ-45 1 x Hi-Speed USB - 4 PIN USB Type A
Features	Power over Ethernet (PoE), Wireless Distribution System (WDS) support, firmware upgradable, MIMO technology,

	Wi-Fi Multimedia (WMM) support, DHCP server, Multiple SSID support
Dimensions (WxDxH)	11.2 cm x 4.1 cm x 13.2 cm

4.3 6U Fixed Wallmount Cabinet

Product Description	6U Fixed Wallmount Cabinet
Device Type	
Form Factor	External
Connectivity Type	
Physical Components	Top and Bottom removable cable slots Glass front door with built in lock
Features	2 Sets of adjustable mounting rails (adjusting in 1 Inch increments), Removable/lockable side panels, Cage nut style mounting rails, Fan Assembly kit , Racks Screws, Cage nuts
Dimensions (WxDxH)	Depth - 23 Inches (Maximum Mounting Depth 3.5 Inches) Rail Width - 19 inch EIA Compliant, Height - 15 Inches

4.4 42U Fixed Wallmount Cabinet

Product Description	**42U Standard 19" Vented Rear Door Glass Front Door**
Device Type	
Form Factor	External
Connectivity Type	
Physical Components	Top and Bottom removable cable slots Glass front door with built in lock

Features	• 2 Sets of adjustable mounting rails (adjusting in 1 inch increments) • Removable/lockable side panels • Cage nut style mounting rails • Top and bottom removable cable slots • Glass front door/Vented Rear door • Maximum Weight Capacity 1300 pounds • Power Distribution Unit • Cable management • Four fun system
Dimensions (WxDxH)	Depth - 37.75 Inches (Maximum Mounting Depth 36 Inches) □ Width - 23.5 inches □ Rail Width - 19 inch EIA Compliant □ Height - 80.5 Inches

4.5 48port Patch Panel

Product Description	Cat6A Shielded High Density Patch Panel, 1U 48 Port
Compliance	ANSI/TIA/EIA 568 C.2 10G
Form Factor	External
Mating/Unmating Test	750 Cycles - Plug/Jack
T568A & T568B	Wiring Compatibility
Operation Temp	-10°C - 60°C
Features	Cat 6A Ethernet Data Number of Ports 48
Dimensions (WxDxH)	**Dimensions:** (1U) Conforms to Standard 19" Rack Mount Units: 19"(482.6mm) Width x 1.73"(44.0mm) Height x 5.62"(142.8mm) Depth

4.6 24-port Patch Panel

Product Description	Cat6A Shielded High Density Patch Panel, 1U 24 Port
Compliance	ANSI/TIA/EIA 568 C.2 10G
Form Factor	External
Mating/Unmating Test	750 Cycles - Plug/Jack
T568A & T568B	Wiring Compatibility
Operation Temp	-10°C - 60°C
Features	Cat 6A Ethernet Data Number of Ports 24
Dimensions (WxDxH)	**Dimensions:** (1U) Conforms to Standard 19" Rack Mount Units: 19"(482.6mm) Width x 1.73"(44.0mm) Height x 5.62"(142.8mm) Depth

4.7 Tele Presence Content servers

This server will be used to manage voice and video conferencing from the theaters to the conference and training rooms

Feature	Benefit
Design features	• Appliance-based architecture for easy deployment and high reliability • One rack unit (1RU) rack-mountable • Built-in, easy-to-use, web-based management interface • Built-in web-based content library • Ability to interoperate with a range of complementary multivendor products

Application features	• Live and on-demand streaming • Scheduled and impromptu call support with dial-in and -out capabilities • Ability to record and stream video and H.239 dual-stream presentations from any H.323 or Session Initiation Protocol (SIP) video conferencing unit • Content creation from anywhere using Cisco TelePresence Expressway technology • Compatibility with all major streaming formats, including Windows Media, Flash, and QuickTime • Support for major distribution servers and corporate web portals • Editing and library features for simple content creation and retrieval • Support for download of content to PC, Mac, and portable media devices
Performance features	• Hosts up to five concurrent calls (up to 10 calls with Additional Five Port Option), up to two of which can be streamed live • Video-conference bandwidth up to 4 Mbps (with premium Resolution Option) • Synchronized streaming of video and presentation in live and on-demand modes • Unicast and multicast streaming support • Internal and external storage capabilities • Support for Active Directory authentication through Lightweight Directory Access Protocol (LDAP) • Call configuration and access rights management • Ability to cluster up to 10 content servers • Support for SQL Server 2008 with Content Server clusters

	• Ability to export and import recordings from one Content Server to another

4.8 Endpoint voice Specs

Minimum specifications for the endpoint voice telephones – to enable intra communications in the hospital complex.

- Supports fixed keys for hold, redial, and call-waiting
- Offers a message-waiting and incoming-call indication LED on its handset
- Supports two concurrent incoming calls when using the call-waiting feature
- Provides transfer and conference capabilities through a hook-switch (users simply tap the hook-switch to transfer a call)
- Enables easy viewing angles on desks using a folding foot stand; can also be wall-mounted with third-party wall-mount plates
- Offers seven user-adjustable ringtones

4.9 Wireless IP endpoint phones

Product Description	Wireless IP endpoint phones
Compliance	Support for 802.11a, b, and g protocols
	• A 2-in. (5.1 cm) 176- x 220-pixel color display for easy viewing • Built-in full-duplex speakerphones for high quality, hands-free communications • High-fidelity voice for exceptional voice quality • Dedicated Mute and Volume buttons • Support for 802.11a, b, and g protocols • Fast roaming and extension mobility

	• XML-enabled applications such as displayed text and graphics-based messages and push-to-Talk for a walkie-talkie-like experience • "Office extend", which enables you to access the same set of Cisco Unified Communications features you enjoy at work when you are at home • Quality-of-service (QoS) assurance • Robust wireless and voice security features with multiple standards

4.10 Projector system

Product Description	Projector -
Compliance or better	• High brightness of 3500 ANSI Lumens • Contrast Ratio: • 2100:1 Typical (Full On / Full Off) • Resolution: • WXGA (1280 x 800) • CONNECTIVITY • Power: AC power input socket • Computer Input: two D-sub for analog/RGB component, HDTV input signals • Computer Output: one 15-pin D-sub • Video Input: one composite video RCA and one S-video • USB Input: one USB slave for remote support and firmware upgrade • Audio input: one phone jack (Diameter 3.5mm) and one parir of RCA connector; one microphone input

- HDMI Input: one HDMI 1.3 (HDCP compliant)
- RS232: One mini-DIN RS232 for wired remote projector control from PC
- 1.28 (wide) ~ 1.536(tele)
- 2 Years Warranty
- Projector Ceiling Mount and Projector Suspended Ceiling Plate
- Lamp Life Cycle3:
- Up to 3000-hour Typical
- Up to 4000-hour Eco-Mode
- Multimedia Audio:8W Speaker
- VIDEO COMPATIBILITY
- S-Video/Composite Video: NTSC [J, M, 4.43, supports Closed Captioning (CC1~CC4)], PAL (B, D, G, H, I, M, N, Nc, 60), SECAM (B, D, G, K, K1, L)
- Component Video (via VGA) & HDMI (HDCP Compliant) - 480i/p, 576i/p, 720p, 1080i/p PC (VGA, HDMI): Refer to 3.10 Computer Compatibility Modes
- Power Cable
- VGA Cable
- Carrying case
- CD User's Guide
- Remote Control with 2 AAA Batteries
- Quick Setup guide & Product Information guide
- KEYSTONE CORRECTION
- Vertical: +40° / -35°
- Uniformity:
- 85% Typical (Japan Standard - JBMA)
- Image Size:
- 92.20 ~ 919.48 cm (36.3" ~ 362") (diagonal)

- Project Distance: 1.2 - 10m
- Projection screen:

4.11 Enterprise Server

Product Description	Domain controller, Mail Server, high end processing server
Compliance or better	• 1Uor 2U rack mountable 2.5" Chassis with up to 8 Hot Plug Hard Drives • Intel C600 series chipset or better • Memory : (4) 12GB RDIMM, 1333 MHz, Low Volt, Dual Rank, x4 and support Up to 192GB (12 DIMM slots):Atleast16gb • 2 PCIe slots: One x16 PCIe slot with x16 bandwidth, half-length, half-height One x16 PCIe slot with x16 bandwidth, half-length, full-height OR One x8 PCIe slot with x4 bandwidth, half-length, half-height One x16 PCIe slot with x16 bandwidth, half-length, full-height • Intel® Xeon® E5-2407 2.20GHz, 10M Cache, 6.4GT/s QPI, No Turbo, 4C, 80Watleast Duo processor • Drive Bays : Up to eight 2.5" hot-plug SSD, SAS, or SATA or up to four 3.5" hot-plug SAS, SATA, or SSD • Maximum Internal Storage: Up to 12TB1 • 3Yr Parts Only Warranty

- On-Board Broadcom 5720 Dual Port 1GBE
- iDRAC7 Enterprise System Management
- Bezel
- PERC H310 Integrated RAID Controller, Mini-type
- (3) 1TB, Near-Line SAS 6Gbps, 2.5-in, 7.2K RPM Hard Drive (Hot Plug)
- DVD+/-RW, SATA, Internal
- Sliding Rails With Cable Management Arm
- Dual Hot Plug Power Supplies 550W
- (2) Rack Power Cord, C13 to C14, PDU Style, 12A, 2M/6.5Ft