

The specialist sub-contractor shall prepare fully detailed operation and maintenance manuals for every individual item related to the installation.

22.2.21 DATA AND COMMUNICATION SYSTEM

The data and communication systems shall be IP based.

Briefing:

Telecommunication

The entire development will be provided with suitable IP Telephone networking facility –First and second Fix – i.e., MDF, ODF, IDF, Telephone junction Boxes, conduiting, and Telephone outlets, cables suitable to support State of the Art Communication System. The development shall be provided with a Dedicated Q-Tel room. Main distribution frame will be located in the Q-Tel room.

The entire installation will be designed according to the Qatar Telecom directives and requirements.

The project will have designed provisions for Q-Tel connectivity with all the required external manholes and ducting to received Telephone connections.

The telephone hardware installations like PABX, Telephone Instruments and Block wiring will have to be sourced by the occupier according to their requirements directly from the Q-Tel.

Outlet boxes shall be provided where shown on drawings. Pull boxes shall be provided according to Q-tel regulations and wherever needed to facilitate the pulling-in of wires.

All internal telephone conduits shall be 25 mm. unless otherwise specified. All distribution boxes shall be connected to each other by minimum 200 mm. GI Trunking, or as shown on drawings.

PVC conduit, trunking, boxes and accessories shall comply with the relevant clauses of these specifications.

Telephone junction boxes shall be lightweight steel box with removable or reversible hinged doors. Dimensions of each junction box shall be determined as per total number of lines that shall pass through each junction box

Manholes shall be installed as per Q-TEL approved drawings and as per Q-TEL specifications. These specifications shall be well-known to contractor that is approved by Q-Tel

Manhole covers for telephone manholes shall be heavy duty type of a manufacturer and shape approved by Q-TEL.

Computer Networking

Services buildings will be provided with suitable computer networking LAN / WAN facility –First and second Fix – i.e., Computer junctions, conduiting, Computer outlets, cables suitable to support CAT6a cabling.

The necessary software and hardware for the system will have to be sourced by the occupier according to their requirements.

Minimum Contractor and Manufacturers Qualifications

All equipment and all work under this section shall be furnished and installed by a certified telecommunications contractor- certified by Q-Tel, hereafter referred to as the contractor.

The contractor shall have the following qualifications in Telecommunication Systems installation:

- a. Contractor shall have a minimum of five years experience in application, installation and testing of the specified systems and equipment.
- b. All supervisors and installers assigned to the installation of this system or any of its components shall have factory certification from each equipment manufacturer that they are qualified to install and test the provided products. General electrical trade staff (electricians) shall not be used for the installation of the premises distribution cables and associated hardware.
- c. All installers assigned to the installation of this system or any of these components shall have a minimum of five years experience in the installation of the specified copper and fiber optic cable and components.

The equipment and hardware provided under this contract will be from manufacturers having a minimum of five years experience in producing the types of systems and equipment specified.

STRUCTURED CABLING

1. General

Equipment Criteria

- A. All cables connectors, outlet points, sub-distribution frames and patch cords shall meet or exceed the latest requirements on EIA/TIA, for category 6a transmission at 250MHz.
- B. All cabling from the main distribution frame MDF located in the Qtel equipment room and server room to the intermediate, sub-distribution frames IDF shall be 2Nos fiber optic cable multimode OM3 and two 4 core cat 6a cables. The cables shall run through the cables trays indicated in floor plans

All cabling between the IDF's and each outlet points shall be 4 pair UTP category 6a cables at 1000 MHZ enclosed in GI trunking.

Generally telephone / computer sockets shall be 4 (four) gang outlet RJ45 type suitable for category 6a equipment and mounted within a suitable face plate to match the power accessories. Each outlet shall be c/w labeling facility for identification of each socket.

1.1 Quality Assurance

- A. Manufacturers Qualifications: Firms regularly engaged in the manufacture of structured cabling system of types, and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Standards Compliance: Comply with the latest editions of the requirements of applicable local codes, and the following standards:
 - 1. Electronic industries association (EIA), Telecommunications industries Association (TIA) for commercial buildings.
 - 2. The institute of electrical and electronic engineers, Inc. (IEEE).
 - 3. International organization for standardization (ISO).
 - 4. American National Standards Institute (ANSI).
 - 5. International Electromechanical Commission (IEC).
- C. Service Manufacturer must have a factory warehouse at which spare parts are stocked were a field service engineer who is a permanent, full time employee of the manufacture, factory trained and qualified individual whose primary duty is field service resides.
- D. All work must be installed by system manufacturer's certified system installers/vendors who are certified and experienced in implementing the selected data cabling system and to perform related testing programs.

1.2 Submittals

- A. Product Data: Submit manufacturers' data and installation instruction details for structured cabling system.
- B. Shop Drawings: Submit dimensional layout on architectural background drawings.
- C. Samples: Submit samples from all accessories, fittings and cabling.

1.3 Equipment Warranty

- A. The system manufacturers shall provide a minimum TEN (10) year warranty on all passive components included in the structural cabling system. These warranties shall be provided in written certificate form.
- B. The system manufacturers shall provide in writing to the Owner that in event of the demise or failure of the installing certified system installer/vendor, the manufacturer shall be responsible for providing another certified system installer/vendor to fulfill the remainder of the warranty conditions.
- C. The Contractor shall provide a guaranteed twenty-four (24) hour response time to any warranty claims.

2. Cables

2.1 Category 6a Cables

- A. All horizontal cat 6a cabling shall be EIA/TIA standards compliant throughout, terminated to 1000BaseT specifications.
- B. All cables shall be high performance 4 pair category 6a UTP UL listed consisting of 23 AWG, 100 ohm characteristic impedance, solid conductors formed into four individually twisted pairs and enclosed by PVC jacket.
- C. Cables shall be run from the user outlet to the cabling rack (as indicated on drawings) without any transition points.
- D. All UTP cabling must be tested using a level III field tester by the supplier and full documentation must be provided to demonstrate that the cabling meet the industry standards (i-e IEEE 802.3, EIA / TIA 568 – B.2-1).
- E. Category 6a defines four-wire twisted –pair UTP copper cable that can transmit data and proven support for 100 Mbps fast Ethernet, 1000 MHZ Broadband Video, Gigabit Ethernet 1000BASE-T and 155 Mbps ATM.
- F. The Cat 6a cable shall be of low–capacitance and exhibits low crosstalk. However, all figures of the cable must be Category 6a compliant.
- G. The cables short term bending radius is 6 times the cable diameter in operation and 10 times the cable diameter in installation.

2.2 Multi-Mode Fiber Optic Cables

- A. 4 cores, 50/125 μm multi-mode OM3 fiber optic cables shall be installed from each IDF up to the main data rack.
- B. The cable shall be suitable for indoor and outdoor use in ducts and risers, rodent resistance type with LSZH – flame retardant outer sheath.

- C. Fiber Optic Cables shall be suitable for 10/100/1000 BaseF and to be tested @ 850 and 1300 nm, Full OTDR tested shall be performed before and after installation.
- D. The cable shall be with tight buffer structure, glass yarn reinforcement and water-blocking elements
- E. Low friction jacket for ease of pulling through ducts.
- G. The cables short term bending radius is 10 times the cable diameter in the no load condition and 20 times the cable diameter when under load.

2.3 RJ-45, CAT 6a Outlet

- A. The outlet shall be category 6a eight - position angled RJ-45, T568B pinned and modules mounted within the service floor outlet box or on wall flush mounting. The cabling contractor should coordinate with the electrical contractor to ensure compliance and matching between the RJ-45 data connectors with the floor boxes and face plates.
- B. The presentation of the outlets shall be provided for labeling and identification. The outlet shall be complete with a transparent window to protect the labeling tag.
- C. All conductors of the 4-pair cat 6a horizontal cable shall be terminated on the respective contacts. To avoid installation errors, the wire organizer of the snap-in connector should be identified by the same standard color coding as the cat 6 cable wires.
- D. Each connector shall provide both T-568A and T-568B color code identification for the pins at the rear of the connector. The punched down should be in accordance with the T-568B color code.
- E. Each outlet to receive one 4 pair cable. Submit sample of the socket for review and approval.
- F. Outlets shall be supplied Complete with Faceplate from the same Wiring Devices Manufacturer.

2.4 CAT 6a Copper Patch Panel

- A. All cat 6a cables shall be terminated on Cat 6a patch panels which shall be rack mounted type.
- B. The presentation of the patch panel shall be provided for labeling using printed numbering system.

- C. The cat 6a patch panel shall provide both T-568A and T-568B color code identification for the pins at the rear of the panel. The punch down is to be in accordance with the T-568B color code.
- D. All conductors from the 4 pair cable shall be terminated on the respective contacts. To avoid installation errors, the wire organizer of the snap-in connector must be identified by the same standard color coding as the wires of cat 6 cables.
- E. Each patch panel shall be provided complete with a holder to locate and clamp the incoming cables without causing damage to the cable or affecting the performance of the link.
- F. In the rack cabinet, the patch panels shall be separated by metallic patch-guides to protect the patch cords. The height of these guides shall be 1HU or 2HU depending on the rack space.

2.5 CAT 6a Copper Patch Cords

- A. A category 6a copper patch cords shall be provided to connect between the patch panels and switches. The number of the Cat 6a copper patch cords shall be equal to the number of outlets.
- B. Patch Cords shall be supplied in various colors to match purpose of outlet ie Grey for Data, Blue for Voice.
- C. The length of the patch cord to determined by the contractor based on the arrangement of the equipment inside the cabinet rack, but in any case it shall not be less than 1.2m.
- D. The characteristic impedance of the pairs must be identical to that of the horizontal cat 6 cables.
- E. The patch cords shall have a guaranteed performance level of greater than 750 insertions without degradation to the performance level of the solution.

2.6 Fiber Optic Patch Panels

- A. Fiber optic patch panels shall be rack mounted with 12 duplex SC ports and shall take no more than one unit of vertical space on the rack cabinet, the patch panel shall be complete with splicing tray.
- B. The patch panel shall be equipped with a mechanism that ensures the retention and support of the incoming fiber optic cables.
- C. The patch panel shall be designed with a sliding mechanism enabling front installation and maintenance work to be carried out without having to remove the entire panel. The patch panel shall be delivered complete with top cover.

- D. The patch panel shall provide facilities to recess the front connector plate deeper than the front of the 19" rails of the cabinet. This will provide sufficient bend radius for the patch cords once connected to the panel. This shall also prevent damage to the patch cords when the cabinet door is closed.
- E. Cable management unit shall be provided with the fiber optic patch panel.
- F. Fiber Optic Patch Panels Shall be supplied complete with all SC connectors needed for terminating the Multi Mode Fiber Cables.
- G. One, 12 Duplex SC, Fiber Optic Patch Panel Shall be provided in each Qtel Distribution Rack at each Qtel Room in addition to Main Fiber Optic Patch Panel Which shall be provided in the Main Qtel Room Located at the first basement Level, the Capacity of the Main Fiber Patch Panel shall be sufficient to connect all of the Riser Fiber Optic Cables to all of the Qtel distribution rooms in addition to 10% Spare Capacity, Main Fiber Optic Patch Panel Shall be housed in 19" Rack Cabinets which shall have at least 50% Free Space for any needed Active Equipment.

2.7 Equipment / Patching Racks

The contractor shall provide the following equipment racks within the equipment IT rooms. The racks and their configuration shall be as follows:

42 U rack cabinets (80x80 cm) with front plexiglass door and rear metal door for LAN services requirement, complete with all required mounting hardware, label kits, silent type ventilation fans, Velcro style fasteners and all needed ancillary devices. Rack shall be complete with side panels lockable glass front access door and lockable rear metal door, the rack shall be able to support cable entrance from both top and base.

Each rack shall have a power distribution strip unit mounted at each side for full height of rack complete with a minimum of ten outlets. Provide adequate cable management facilities within the racks to support the cables and ensure that cables are properly secured to prevent stress.

Adequate air flow within rack is required to maintain the expected levels of equipment to be located within each rack, therefore fan assemblies are to be supplied.

The contractor shall provide all necessary cable management units, brackets, required accessories and labeling required for complete installation.

The rack shall be equipped for electrical grounding to meet EIA/TIA 606 standards with fans and power strip unit.

Each rack shall have at least 50% free Space for installing of Active Equipments.

2.8 Telephone Terminal Cabinets -Approved By Qtel-

- A. 110 connect cross connect blocks (Cat 5E) shall be provided in each QTEL Distribution Room with capacity sufficient to connect both the Riser Multi-pair Cables and the Horizontal Telephone Cables.
- B. The connection blocks shall be suitable for telephone cables termination, i-e accept 24 AWG (Cat 5E) telephone cables.
- C. The connectors shall be installed inside the 19 inch Rack Cabinets

2.09 Main Distribution Frame

- A. The main distribution frame (MDF) shall be of free standing type enclosure and shall consist of three parts
 - 1. The first part is to connect all incoming trunk lines of the Building plus 10% spare.

All circuits of this part shall be protected against over voltage and over current.
 - 2. The second part is to connect all of the Riser Multi-Pair Cables to all IDF's with at least 10% Spare Capacity.
- B. Terminals shall be identified by numbered tags corresponding to the respective lines or extensions. The contractor shall submit the proposed numbering scheme for prior approval by the Engineer
- C. Two sets of the special tools required for MDF wiring (e.g. IDC insertion tool) as well as test cords shall be provided with the main distribution frame.
- D. In addition, 42U rock cabinets shall be provided for the main fiber patch panel which shall connect all of the riser fiber optic cables.

3. EXECUTION

3.1 Inspection

- A. Examine conditions under which structured cabling are to be installed. Notify Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Install commission and test to work structured cabling systems in accordance with the manufacturer's recommendations and telecommunications service providers regulations.

3.2 Cable Installation

- A. Plan and install all structured cabling systems in accordance with the cable manufacturer's recommendations. Label and record all data communication cables.
- B. All Installation shall be as per Qtel Recommendation, Contractor shall be responsible to provide Qtel approval for the Site Work.
- C. Install optical fiber cables in accordance with BS 7718 and all other standards.
- D. Handle, store and install equipment and components of the structured cabling systems in accordance with the manufacturer's recommendations.
- E. Obtain all equipment and components from a single approved structure cabling manufacturer.
- F. Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective. If a cable fails its tests and has to be replaced then all cables in the same bundle must be retested.
- G. All copper \ Fiber cables shall be installed without splices or cuts to ensure the elimination of reflections, discontinuities, impedance mismatches, etc.
- H. The maximum length from the data outlet and voice outlet to patch panels shall not exceed 90 m.
- I. Wiring shall be mechanically protected by cable trunking.
- J. Installation of Outlets

Each cable shall be tested and identified with the face plate.

All outlets shall be installed as shown on the drawings, exact location shall be coordinated with the ID drawings.

- K. Separation of Data / Telephone Communication Cables from Sources of Electromagnetic Interference

All communication cables shall be separated from sources of electromagnetic radiation in accordance with EN 50174 part 1-3.

- L. Installation of Racks

Provide enclosed racks with front and rear doors where shown on drawings and secure to wall/floor/ceiling as equipped.

In locations where more than one rack is required, butt multiple racks together.

All wiring shall be run neatly bundled with wiring management channels.

Properly ground racks and equipment to room ground bus.

- M. System Identification

A complete identification system shall be provided that clearly designates the following:

1. The horizontal cable.
2. The workstation (or faceplate).
3. The horizontal/passive patch panel port.
4. The patch cords.

- Cable Identification

Horizontal UTP cables for both data and telephone systems shall be permanently identified at both ends.

- Faceplate Identification

Faceplates shall be labeled.

- Patch panel And Patch Cord Identification

Patch panel ports shall be identified in simple numeric form.

Patch cords shall be identified at both ends in simple numeric form, not necessarily corresponding to port numbers.

- Identification Log

All cable and workstation identification shall be recorded in a hard copy "CABLE IDENTIFICATION LOG" which is to be handed over to the Owner after cable testing and certification is complete. A duplicate copy is to be forwarded to the Project Manager.

N. Co-Ordination with Network Integrator

Co-ordinate work with the work of the Owner's Network Integrator.

The Network Integrator must be present on site to witness and co-ordinate the required system testing. The cabling Contractor and the Network Integrator must together perform a job walk through upon completion of testing, together sign the cabling test reports to verify that network cabling is properly installed and performs to acceptable standards.

O. Cable Testing And System Certification

The structured cabling system certification shall include 100% cable testing and verification according to the standard.

The verification of each cable shall be performed by the contractor and shall be documented on a cable testing sheet which shall form part of the hard copy documentation supplied at the end of the installation.

Testing Procedures

Testing shall be performed as per the enclosed sample cable test documentation sheet. Testing shall include, but not be limited to the following:

- Cable length
- Attenuation
- Near end crosstalk (next)
- Noise
- Resistance
- End to end continuity
- Opens or shorts
- Pair polarity

Any cable not passing the testing procedure shall be replaced in its entirety. No splicing is permitted in the repair of any defective cable.

21.2.22 LIGHTING/DIMMING CONTROL SYSTEM

General

This shall be part of the low voltage programmable lighting management system (comprising of intelligent switching, dimming and scene control).

- a. A two wire control bus cable shall link all the system devices (input, output, system support and networking) to each other. The bus cable shall be of standard CAT6a type, and must be mains rated since it terminates at the lighting DB which carries mains power within it. The bus cable shall transmit data communication between all connected system devices. It shall also carry DC power to each device. The system should support free wiring topology. Each network should be maximum of 1000m in distance, and must pack a maximum of 100 system devices depending on the network loading parameters. The network should be designed in such a way that even in case of a short circuit, the devices are not effected due to over current. The network should also be capable of working on a TCP/IP backbone (riser), with a TCP/IP device at the node connecting a network to the riser. The TCP/IP device shall be a part of the lighting management system. The riser shall either be of copper or Optic Fiber.
- b. Every device constituting the system shall be addressable. Addressing shall be in the form of unit address (device address), group address (channel address) and area address (zoning). System communication will be duplex (issuing a command and checking status), by broadcasting data across the networks. System architecture will be a single layer, and communication – peer to peer. Every device constituting the system shall have its own non-volatile memory that stores its designated program. Every device shall have a LED status indicator depicting that it is active (powered up), and communicating within the system.
- c. All system devices shall conform to CE standards, and should be manufactured in accordance with appropriate EMC guidelines.