



UT TECHNOLOGY

SMART BUILDING INFRASTRUCTURE GUIDELINES

UTT Design guide requirements for Smart City Services

Version 11

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1 UTT DESIGN GUIDELINES FOR FIBER TO THE HOME REQUIREMENTS IN NEW BUILDINGS

1.1 INTRODUCTION:

Telecommunications is now an integral part of the social, economic and political issue of the world. Networks and integrated smart systems of the future will be digital and intelligent and will offer high transmission capacity, reliability and security, they will be easily accessed and connected while its services will be personal and tailored to individual needs. They will allow us to interact in ways previously not possible - available at any time and any place. In addition to providing entertainment and business services, networks of the future will provide education, health and other public services.

Major advances in integrated Smart Technology have substantially widened the range of services carried by the network. The pace of technological change is increasing while the magnitude of demands the future will make on our creativity and capacity to adapt is great. Customers will demand more than just state-of-the-art technology; they will want convenience and increased control over their lives that easy and affordable information access can provide while businesses will look for total Smart Infrastructure solutions that will not only enable them to remain productive and compete globally but will also give them a competitive edge.

Ubiquitous Telecommunication Technology (UTT) can be well-placed to meet these challenges ahead and meet the varied needs of our local and international customers and pave the way for the region's new dynamism in the Smart City Concept well into the 21st Century.

With technology advancements at a fast pace, a broad approach to suit all future type of services will have to be born in mind, while designing the infrastructures for the buildings. A properly designed building with Smart Infrastructure will contribute to the UAE's mission to be a global leader in Smart Cities.

UTT Smart Building Solutions complement, rather than replace, existing building management systems and enterprise environmental management systems by adding a variety of benefits and capabilities:

- Advanced measurement and verification: to measure the impact of energy efficiency initiatives.
- 24/7 centralized remote monitoring: to maintain optimal building operation across a company's real estate portfolio.
- Predictive analytics: to help ensure proactive maintenance and optimization of equipment operation levels.
- Supervisory control capabilities: to help building operators automatically rectify issues via keystrokes, based on pre-defined business rules.

The present booklet is to provide guidelines for consultants, contractors the details on the in-building facilities required to be considered at the design stage.

The details provided are a general insight and the minimum requirements of UTT for new buildings, primarily to develop and deploy a Smart Building Infrastructure leading to a Smart City.

1.2 INTRODUCTION TO FTTH (FIBER TO THE HOME)

The FTTH is simply the 100 percent deployment of optical fiber in the access network. It is commonly deployed in two specific configurations, as below:

- **Point-to point. (PTP) network** - Fiber is dedicated to each user in the access network.

PTP networks are characterized by the use of one fiber and laser per user. A dedicated fiber is terminated at the subscriber and active devices at the central office (CO) for a telecommunications provider.

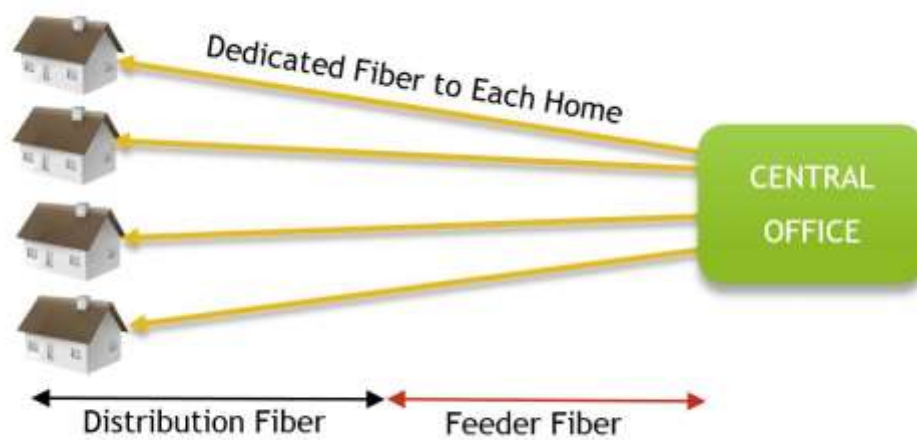


Figure 1.1 (Point to point (PTP) network)

- **Passive optical network (PON)** - A single fiber is shared (via a splitter) among a set number of users, typically thirty-two.

PONs are characterized by the "splitting" of the same optical fiber along the way, resulting in the sharing of the optical fiber among multiple users

The fiber in a PON is designed to share between 2 to 128 users, depending upon the availability of splitters.

A PON will have less optical reach than a PTP network, which does not use splitters. Typically a PON is capable of reaching subscribers 20 kilometers (km) from the OLT, which will cover most of the population.

GPON promises 2.5/1.25 Gbps asymmetrical operation. GPON supports ATM, Ethernet and WDM using a superset multi-protocol layer.

GPON requires supporting a multiple protocols through translation to the native Generic Encapsulation Method (GEM) transport layer that through emulation provides support for ATM, Ethernet and WDM protocols.

The important characteristics of each PON technology are defined by two important standards bodies, the IEEE and the ITU.

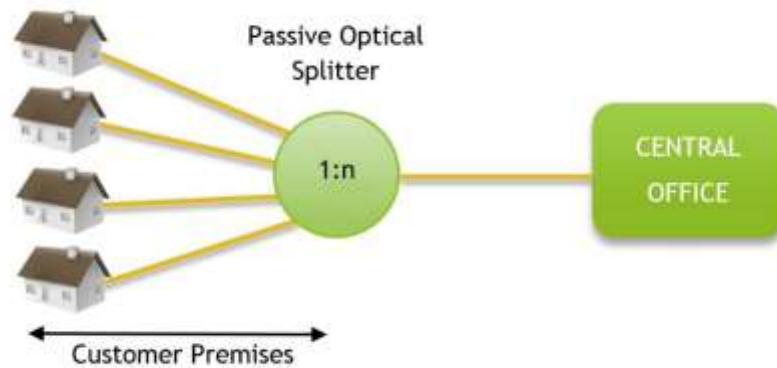


Figure 1.2 (Principle layout of passive optical network)

1.3.2 Access Control System (Utility Rooms):

Generally access control system facilitates resident's access to their premises & control unauthorized access.

UTT personnel will have their access authorization to enter the Main Telecom Room & Other facility rooms related to Smart City Services

General access control topology:



Figure 1.3.2 (Principle Access Control Layout for Common Areas)

1.3.3 Intercom System:

Intercom System offers audio visual communication within the premises, can be used to control the entry, visitor management, internal communication with security & facility management personnel.

General audio/video intercom structure:

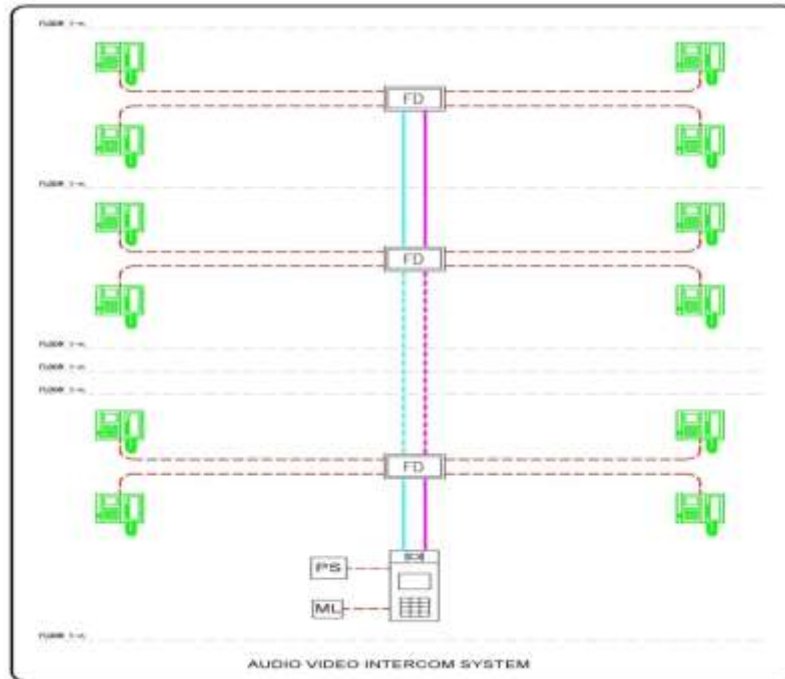


Figure 1.3.3 (Principle layout of A/V Intercom System)

1.3.4 Gate Barrier & Parking Management System:

Used to control vehicle exit/entry to the building parking & controlled by access control system.

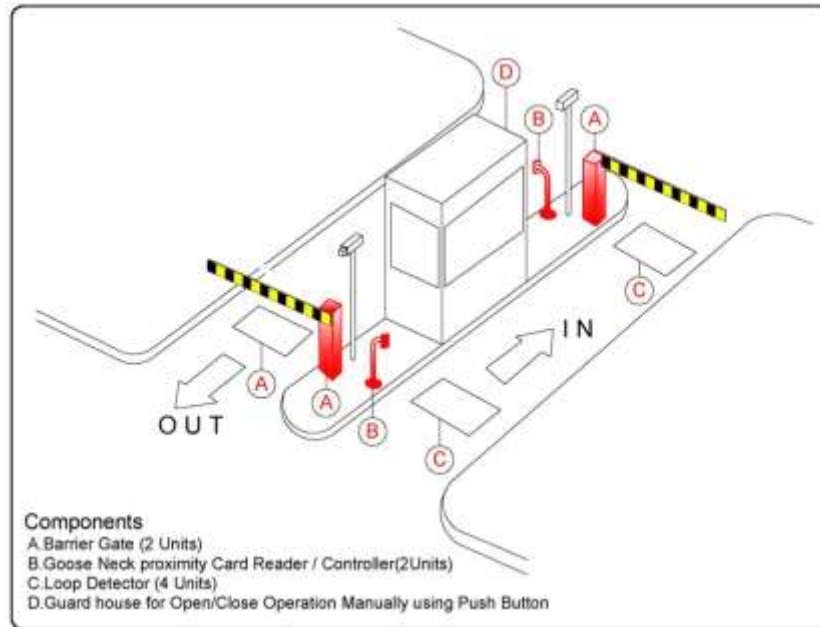


Figure 1.3.4 (Principle layout of Gate Barrier System)

1.3.5 Pedestrian Gates:

Used to control pedestrian exit/entry to certain controlled areas, and operated by access control system.



Figure 1.3.5 (Different types of Pedestrian Gate Designs with ACS)

1.3.6 Digital Signage System:

Digital Signage System is used to run multimedia content over varied LED TV in common areas, DSS shall be implemented in common areas in all building types.

The Digital signage system can effectively communicate the promotion, notice, upcoming event, advertisement, sponsored programs and events to residents and customers. It can also post any informational material for residents, specific to hall or apartment complex.

Each building shall have a digital sign at or near the front desk or main lobby area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well.

At each DSS points a 13 AMP fused socket shall be supplied & SCS point shall be supplied

1.3.7 Home Security:

An advance level of living for the residents of Reem Island & Rawdhat Abu Dhabi, Providing comfortable & secure home with the touch of fingertip.

Efficiency in controlling power consumption towards green building & power saving, insuring the safety within the home, protecting residents lives & assets

2 BUILDING CONTRACTOR GUIDELINES

2.1 GENERAL ELV SYSTEM REQUIREMENTS

The ELV system requirements are varied according to building function, i.e.: hotels and hotel apartments may need to have an dedicated CCTV room where other building functions such as residential tower do not required separate CCTV room.

ELV services which will fall under any Abu Dhabi authority, the regulation of concerned authority strictly has to be followed in co-ordination with UTT guidelines.

2.1.1 CIVIL REQUIREMENTS APPLICABLE IN ALL TYPES OF BUILDINGS

2.1.2 MAIN ELV ROOM (MER)

Main ELV room is recommended to be provided either on the ground floor or basement or in the first floor or Mezzanine floor of the building for the purpose of terminating ELV Communication Cables.

- The room must be easily accessible to UTT Personnel 24 Hr. / Day, (all days including weekends). The room must be clean, dry, and free from dust and secured from unauthorized entry.
- Adequate lighting should be provided.
- Anti-Static PVC Flooring (Slip Resistant Surface)
- The room must be provided with a good earth of not more than 5 Ohms.
- The door opening for the room shall swing outwards having the minimum size of 900mm x 2200mm, labeled as "Main ELV Room".
- Main ELV room must be equipped with access control system & covered by CCTV camera
- The room must be provided with an emergency light, a smoke detector and a fire alarm.

MEP Requirements for MER:

1. Each ELV service has to have dedicated AC Electric Power Sockets 13A –Nos to be determined during the Design Stage .
2. Air-conditioning: Dedicated Air-conditioning system required to maintain room temperature at $21^{\circ}\text{C} \pm 1^{\circ}\text{C}$ as per the room layout/space.

2.1.3 FLOOR ELV ROOM (FER):

Floor ELV Room is recommended on each floor for the purpose of accommodating internal conduit from every ELV Service, routing or terminating ELV Cables and to accommodate the ELV equipment, if required. Floor ELV room shall contain its own riser.

- All floor ELV rooms recommended to be vertically aligned.
- Adequate lighting and minimum of two 13 Amp 240 volt AC Mains outlet should be provided.
- 1 set of 2x40 W Fluorescent lamps are to be provided.
- The room must readily be accessible to UTT Personnel and equipment 24hr/day, either equipped with access control system & under CCTV camera coverage.
- The room must be air-conditioned.
- A handheld firefighting extinguisher must be available 24hr/day in the room.
- A Single conduit of at least 25 mm internal diameter, black and of uPVC material should be provided from each floor ELV room to the each ELV service point.
- The door opening for the room shall swing outwards having the size of 900mm x 2200mm labeled as "Floor ELV Room".

2.1.4 RISERS FROM MAIN ELV ROOM THROUGH FLOOR ELV ROOMS

The risers are required in all kinds of buildings for the installation of ELV cables from Main ELV Room to other floors, as detailed below:

- Galvanized slotted iron cable trays as specified in table-I of HDRF (Heavy Duty, Return Flange) shall be provided from the main ELV room, to each floor ELV room and extended up to the last floor ELV room.
- The risers to each floor shall be symmetrical and vertically in line from the Main ELV Room. However, where the Main ELV Room, Floor ELV Room are not located one below the other in vertical line, a continuous cable tray /conduits to be provided with pull boxes/access panels at every turning point and at interval of 15 meters each, up to the Main ELV Room.
- If a building consists of more than one tower, all the above specified requirements are applicable in each tower. The towers must be inter-connected at the Main ELV Room, by separate cable trays of minimum 1 x (300mm x 50mm) or through floor raceways passing through a common area between the two buildings. The size of the floor raceways to be decided at the design stage by UTT. The same requirements also apply to Mezzanine and Penthouse floors. The ELV communication cable trays should have adequate separation from electrical cable trays. Electrical cable trays should not cross the ELV or Telecom cable trays.
- The risers shall contain 1 x (300mm x 50mm) cable trays for the ELV communication cables

2.1.5 PEST CONTROL

All ELV rooms and pathways must be pest controlled using the best available practices to prevent rodents damaging the cables & equipment. Special care should be taken to prevent rodents from entering the ELV rooms & pathways. All cable entries should be properly sealed before & after laying cables. Cable trays may be provided with removable covers & sealing the ends.

2.2 GENERAL TELECOMMUNICATION REQUIREMENTS

There are several types of buildings. The infrastructure for each type of building according to the function of the building for provision of Smart City Services i.e. Commercial offices/buildings, Residential Towers, Warehouses, Medium High rise in a campus, Labor Camps, Mosques, Petrol Pumps, hotels, private residential villas/multi-tenant villas complexes and hospitals, internal concealed pipes and other associated requirements will vary accordingly.

The Architects/Consultants and Designers, Building Owners, Builders, Property Developers, and Contractors shall liaise with UTT at the design stage and obtain UTT approval on the final design drawings, shop drawings and final inspections. It is vital that the NOC/BCC process be adhered to in order for UTT to be able to provide subscribers with robust and reliable Smart City services within their required timeframe.

2.2.1 CIVIL REQUIREMENTS APPLICABLE IN ALL TYPE OF BUILDING

2.2.2 ENTRY BOX:

Entry Box is an underground joint box built, exclusively to allow installation of UTT underground cable network to the customer's premises.

- The Entry Box is a reinforced concrete structure, with a **heavy duty Ductile Iron Frame and Cover of rating Grade 'A'**. The cover shall have marking as "Telephones".
- The location of the entry box depends on the location of existing/Proposed UTT External Line Plant.
- The Entry box shall be constructed at a maximum distance of 1 meter from plot line. Within the plot (customer premise) if it is not practical, then outside the plot, touching with the boundary wall.
- Due to the variables involved, it is essential to consult UTT at the design stage, to decide the location of the Entry Box and Entry Pipe. The Consultants/Contractors shall not deviate from the stipulated location
- An earth rod must be provided at the Entry Box. The required earth resistance should not exceed 5 Ohms.
- ✓ For Entry Box size details refer to Table No. 13.0

2.2.3 ENTRY Ducts: (Lead-in ducts)

The entry pipes are uPVC ducts. These ducts are to be extended from the entry box towards UTT line plant location. Two lead in ducts to be provided in separate route for main and redundancy cables.

- Entry pipes should be laid at a depth of 60cm from the proposed finished paving level. The Entry pipe shall be protected with concrete, to prevent damages.
- Entry pipe should be extended to the entry box and beyond to the nearest existing UTT plant location.
- The Entry pipe should be of uPVC material and of black color.
- The open ends of the entry pipe shall be properly sealed, to prevent entry of sub soil materials and ingress of water.
- Location of Entry pipes, shall be clearly marked, above ground for easy location
- Building contractors shall be responsible to locate the installed entry pipes on site, if requested by UTT.
- No right-angled sharp bends shall be installed throughout the duct length, except one wide-angle, long radius bend (factory made) at the terminating end of the duct, inside the Main Telecom Room. Alternatively, at the location of the wide angle bend, a Cable Pull Box of minimum size 60(L) x 60(W) x 80(D) cm (**internal**) shall be provided.
- Cable trays may be provided in the basement from location of lead in ducts entering the basement to main telecom room of the building for both main & redundancy route. Both cable trays shall be routing from the entry to the main telecom room in two different routes far from each other. End of the ducts should be properly sealed to prevent ingress of water.
- Cable trays should be 300mm x 50mm with heavy duty return flange (HDRF) type. Minimum clearance of 2.4m should be maintained from the floor level. Cable trays should be provided through common areas & should not pass through any utility room, pump room, stores and etc...
- Entry pipes shall be assigned, exclusively for UTT Telecommunication & Smart City Services.
- Entry pipes shall be provided with a draw rope made of nylon of minimum 6mm in diameter.

- ✓ For the number and size of entry pipes, for the various types of buildings, refer to Table I3.0.

2.2.4 MAIN TELECOMMUNICATION ROOM (MTR):

Main Telecom room recommended to be a dedicated room. This is to be provided either on the ground floor or basement or in the first floor or Mezzanine floor of the building for the purpose of terminating Telecommunication Cables and to house the present & future Smart City equipment. The room shall be exclusively for UTT use.

- The room must be easily accessible to UTT Personnel 24 Hr. / Day, (all days including weekends). The room must be clean, dry, and free from dust and secured from unauthorized entry.
- Adequate lighting should be provided.
- Anti-static "raised floor" of minimum 30 cm to be determined during design stage.
- The room must be provided with a good earth of not more than 5 Ohms.
- The door opening for the room shall swing outwards having the minimum size of 900mm x 2200mm, labeled as "UTT Main Telecom Room"
- The floor, roof and surrounding wall of the Telecom room, shall be free of any concealed water/drainage pipes, high pressure water pipes, FCU, BUS bars and air-conditioning ducts passing through.
- The room must be provided with an emergency light, a smoke detector and a fire alarm.
- The room must be equipped with 2XCO2 Cylinder Extinguisher.
- The Duct entry to building shall be sealed air and water tight.

- ✓ For the Main Telecom Room size, refer Table No. I3.0

- Layout of the room shall be submitted to UTT showing the overhead raceway for patching between the building distribution cabinet and UTT incoming cable cabinet. The installation of the cable trays shall be the responsibility of the contractor upon obtaining UTT's approval for the room layout.

MEP Requirements for MTR:

- 1 2 number of 40A TP isolator fed with dedicated feeder from essential power supply.
- 2 Electric Power sockets fed from normal Building supply on spurs with dedicated circuit breakers rated at 20A.
 - ✓ Twin electric AC sockets 13A – 4 Nos.
3. Grounding earth bar
 - ✓ Dedicated AC clean earth & DC clean Earth bar – 2 Nos. each

4. Air-conditioning

- ✓ Dedicated Air-conditioning system required to maintain room temperature at $21^{\circ}\text{C} \pm 1^{\circ}\text{C}$ as per the room layout/space.

2.2.5 SECONDARY TELECOMMUNICATION ROOMS (STR) / GSM ROOMS

Buildings with more than 20 stories must have a Secondary Telecom Room at each 10th floor. This requirement is essential to overcome the distance limitations for the purpose of terminating Telecommunication Cables and to house the GSM equipment

- The Secondary Telecommunication Room at each 10th floor must be easily accessible to UTT Personnel 24hr/day, (all days including weekends). The room must be clean, dry, and free from dust and secured from unauthorized entry.
- Adequate lighting should be provided.
- The room must be provided with a good earth of not more than 5 Ohms.
- The door opening for the room shall swing outwards having the size of 900mm x 2200mm labeled as UTT Secondary Telecom Room
- The floor, roof and surrounding wall of the Telecom room, shall be free of any concealed water/drainage pipes, high pressure water pipes, FCU, BUS bars and air-conditioning ducts passing through.
- The room must be provided with an emergency light, a smoke detector and a fire alarm.
- The room must be equipped with handheld firefighting device.
- The size of the room is 3 (L) x 3 (W) x 3(H) Meters.
- The room should be near the floor telecom room with two nos. of (300mm x 50mm) of cable trays to be provided for the interconnection with the Floor Telecommunication Room and the Main Telecommunication Room

MEP Requirements for each STR:

1. 2 x 63A TP isolator fed with dedicated feeder from essential power supply.
2. Electric Power sockets fed from normal Building supply on spurs with dedicated circuit breakers rated at 20A.
 - ✓ Twin electric AC sockets 13A – 4 No
3. Grounding earth bar
 - ✓ Dedicated AC clean earth & DC clean Earth bar – 2 No each
4. Air-conditioning
 - ✓ Dedicated Air-conditioning system required to maintain room temperature at $21^{\circ}\text{C} \pm 1^{\circ}\text{C}$

2.2.6 FLOOR TELECOMMUNICATION ROOM (FTR):

Floor Telecommunication Room is a dedicated room and required on each floor for the purpose of accommodating internal conduit from every flat termination, routing or terminating Telecommunication Cables and to accommodate the Telecom equipment, if required. Floor telecommunication room shall be located close to the risers. This room should be exclusively for the use of UTT.

- All floor telecommunication rooms shall be vertically aligned
- If floor telecommunication room cannot be provided directly above the Main telecommunication room, then the distance between the floor telecommunication room and the main telecommunication room shall not exceed 10m
- Adequate lighting and minimum of two 13 Amp 240 volt AC Mains outlet should be provided.
- 1 set of 2x40 W Fluorescent lamps are to be provided.
- The room must readily be accessible to UTT Personnel and equipment 24hr/day, all the days, round the clock and the room, clean dry, and free from dust and secured from unauthorized entry.
- The room must be air-conditioned
- The floor, roof and surrounding wall of the Telecom room, shall be free of any concealed water/drainage pipes, high pressure water pipes, FCU, BUS bars and air-conditioning ducts passing through.
- The floor Telecom room should be provided with good earth of not more than 5 Ohms.
- A handheld firefighting extinguisher must be available 24hr/day in the room
- A Single conduit of at least 50mm (2 inch) internal dia., black and of uPVC material should be provided from each floor telecom room to the Indoor equipment cabinet of each office, residence, flat and other independent areas in the same floor.
- The door opening for the room shall swing outwards having the size of 900mm x 2200mm labeled as UTT Floor Telecommunication Room
- UTT shall be consulted to enhance the requirements, if the building is designed for commercial use.
- For the floor telecom room size, refer Table No. 13.0

2.2.7 ROOF TOP TELECOMMUNICATION ROOM (RTR):

Roof Top Telecommunication room is a dedicated room to be provided on the roof top of the proposed Multi-stories buildings, exclusively for UTT use and secured from unauthorized entry.

- The Secondary Telecommunication Room at the roof floor must be easily accessible to UTT Personnel 24hr/day, (all days including weekends). The room must be clean, dry, and free from dust and secured from unauthorized entry.

- The room shall be near the floor telecom room with 2 no of (300mm x 50mm) of cable trays to be provided for the interconnection with the Floor Telecommunication Room and the Roof Telecommunication Room
- The location of the Room, shall be within the vertical structure of the building, with due considerations for load safety provisions and to extend related facilities required such as Air-conditioning, 3-phase power (Distribution Board) D.B, earthing less than 5 Ohms, adequate lighting and one telephone socket.
- The door opening for the room shall swing outwards having the size of 900mm x 2200mm labeled as UTT Roof Top Telecommunication Room
- The floor, roof and surrounding wall of the Telecom room, shall be free of any concealed water/drainage pipes, high pressure water pipes, FCU, BUS bars and air-conditioning ducts passing through.
- The room must be provided with an emergency light, a smoke detector and a fire alarm.
- The room must be equipped with 2xCO2 Cylinder Extinguisher.
- The minimum size of the room is 3 (L) x 3 (W) x 3 (H) Meters.
- The floor loading of this area must be maximum possible, to support future installation of Telecommunications equipment.
- An opening of size 60x40 cm to be provided on the wall of the room, facing the Terrace, 50 cm below the room ceiling.
- Anti-static "raised floor" of minimum 30 cm to be determined during the design stage
- The room shall have adequate lighting

MEP Requirements:

1. 2 x 63A TP isolator fed with dedicated feeder from essential power supply.
2. Electric Power sockets fed from normal Building supply on spurs with dedicated circuit breakers rated at 20A.
 - ✓ Twin electric AC sockets 13A – 4 No
3. Grounding earth bar
 - ✓ Dedicated AC clean earth & DC clean Earth bar – 2 No each
4. Air-conditioning
 - ✓ Dedicated Air-conditioning system required to maintain room temperature at $21^{\circ}\text{C} \pm 1^{\circ}\text{C}$

2.2.8 RISERS FROM MAIN TELECOM ROOM THROUGH FLOOR TELEPHONE ROOMS

The risers are required in all kinds of buildings for the installation of Telecom Fiber Optic cables from Main Telecom Room to other floors, as detailed below:

- Galvanized slotted iron cable trays as specified in table-I of HDRF (heavy duty, return flange) shall be provided from the main telephone room, to each floor telephone room and extended up to the Roof telephone room.
- The risers to each floor shall be symmetrical and vertically in line from the Main Telecom Room. However, where the Main Telecom Room, Floor telephone closet/ Room and roof telecom rooms are not located one below the other in vertical line, a continuous cable trays/conduits to be provided with pull boxes/access panels at every turning point and at interval of 15 meters each, up to the Main Telecom Room. Right angle or sharp bends are to be avoided.
- If a building consists of more than one tower, all the above specified requirements are required in each tower. The towers must be inter-connected at the Main Telecom Room, by separate cable trays of minimum 1 x (600mm x 50mm) or through floor raceways passing through a common area between the two buildings. The size of the floor raceways to be decided at the design stage by UTT. The same requirements also apply to Mezzanine and Penthouse floors. The telecom cable trays should have adequate separation from electrical cable trays. Electrical cable trays should not cross the Telecom cable trays.
- The risers shall contain 1 x (600mm x 50mm) cable trays for the telecommunication cables and 1 x (300mm x 50mm) for GSM cables

2.2.9 DISTRIBUTION INSIDE THE FLATS (From ONU Enclosure)

- An ONU enclosures shall be of minimum size 24 U and width 600mm and depth 150mm (from the approved vendors of UTT) to house the Optical network unit (ONU), power sockets and patch panel. The cabinet shall be flush mounted on wall in an easily accessible location for technicians.
- The cabinet shall be dedicated per each office/residential flat and to be sited in a secured place.
- The location of the cabinet shall be at a common point, where all the internal conduits meet and the structured cabling system (SCS) on a star topology can be installed. However, the farthest socket shall not exceed 90 meters from the Cabinet.
- 2 x 13Amp power sockets are required, inside ONU enclosure, for powering the Optical Network Unit and Installed active equipment.
- The ONU enclosure location should not be adjacent to any electrical distribution or bus bars but it should have an access to it through a duct pipe.
- The ONU enclosure should be installed at a minimum height of 100 cm above the finished floor level.
- All Internal conduits shall be of diameter not less 2 of 25mm (1 inch) to extend the structured cables from ONU to SCS each dual Socket locations.
- For duplex flats, ONU enclosure will be provided at lower level & a junction box at the upper levels. All conduits of the upper levels to be connected with ONU enclosure through a minimum of 2 numbers of PVC conduits, each of 50mm diameters.

2.2.10 DISTRIBUTION IN VILLAS (From ONU Enclosure)

- An ONU enclosure shall be of minimum size 24 U and width 600mm and depth 150mm (from the approved vendors of UTT) to house the Optical network unit (ONU), power sockets and patch panel. The cabinet shall be flush mounted on wall in an easily accessible location for technicians.
- A secured Pull Box of size 30 (L) x 30 (H) x 15 (W) cm flush mounted on wall is required in every floor of the villa, for distributing SCS, from the ONU enclosure.
- The pull-box should be kept at a convenient and easily accessible location where the floor distribution conduits are terminated. It should be installed at a height between 40 cm and 120 cm above the finished floor level.
- The pull boxes on different floors of a villa should be connected through a minimum 2 numbers of PVC conduits, each 50mm diameter.
- The pull box should have one 50 mm (2-inch) conduit to the Rooftop of the villa, from the cabinet or from the telephone entry duct location, in order to provide access to cables from the antenna.

3 UTT Smart Building Infrastructure Requirements

3.1 INTRODUCTION:

The tables below, gives details of the different recommendations for the various types of buildings and recommended ELV services accordingly.

	Single Villa	Complex of Villa	Building up to G+20	Building more than G + 20	Shopping Mall	Palaces, Hospitals & Hotels	Group of shops and sheds
Main ELV Room	Not Required	Yes *	Yes *	Yes *	Yes *	Yes *	Yes *
Floor ELV Room	Not Required	No Required	Yes *	Yes *	Yes *	Yes *	Yes *
ELV Raiser	Not Required	No Required	Yes *	Yes *	Yes *	Yes *	Yes *
Floor Distribution Boxes	Yes *	Yes *	Yes *	Yes *	Yes *	Yes *	Yes *
IP CCTV	Not Required	Yes *	Yes *	Yes *	Yes *	Yes *	Yes *
Access Control System	Not Required	Yes *	Yes *	Yes *	Yes *	Yes *	Yes *
Intercom System	Yes *	Yes *	Yes *	Yes *	Not Required	Not Required	Yes *
Gate Barrier	Not Required	Yes *	Yes *	Yes *	Yes *	Yes *	Yes *
Pedestrian Gate	Not Required	Not Required	According to building functionality	According to building functionality	Yes *	Yes *	Not Required
Digital Signage	Not Required	Not Required	Yes *	Yes *	Yes *	Yes *	Yes *

Table 3.0 (UTT ELV Recommendations)

3.1.1 SINGLE VILLA:

- IP CCTV, Access Control System & Gate Barrier: it is not required in single villas to have any of these ELV systems installed, and it is developer/owner decision to implement these systems or not.

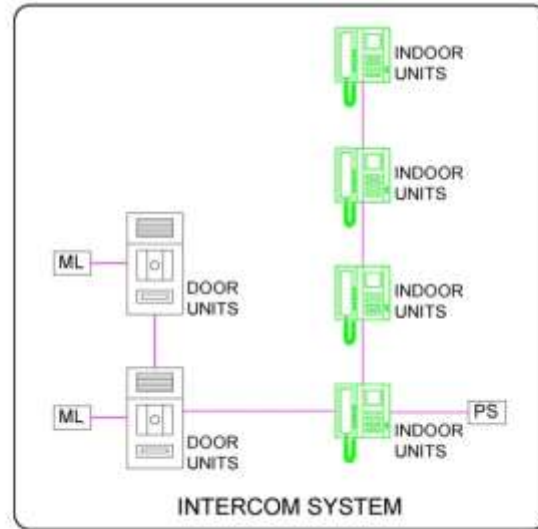


Figure 3.1.1 (Principle layout of Intercom System in a Single Villa)

3.1.2 COMPLEX OF VILLA:

- IP CCTV systems to be implemented in villas complex; CCTV coverage recommended in the following areas:
 - Main entrance & Exits – Indoor & outdoor (Identification Level).
 - Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
 - Emergency Doors & Exist (Identification Level).
 - Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
 - Parking Area full coverage (Detection Level)
 - Coverage at entrances of Utility Rooms like Communication Rooms /IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).
 - Main Point of entry for all vehicles to Client Premises recommended to be covered by LPR Cameras (Identification Level)

All CCTV material, communication cables, active network equipment to be chosen according to UTT approved vendor list.

For time recording refer to Storage part at Technical Requirements Section.

- **Access Control System (Complex of Villas):** access control system is recommended to be installed in the following areas:

- Main villa complex entrance to control gate barrier and/or pedestrian entrance

-MTR/MER door recommended to equipped with ACS

ACS containment, communication cable, material & power requirement to be coordinated & approved by UTT in early design stage.

ACS has to have the capability of integration with guard tour management, visitor management & facility management.

- 13 Amp single socket required at each ACS installation point.

- **Gate Barrier:** gate barrier is recommended to be installed in main complex exit/ entry & to be controlled by ACS in both directions

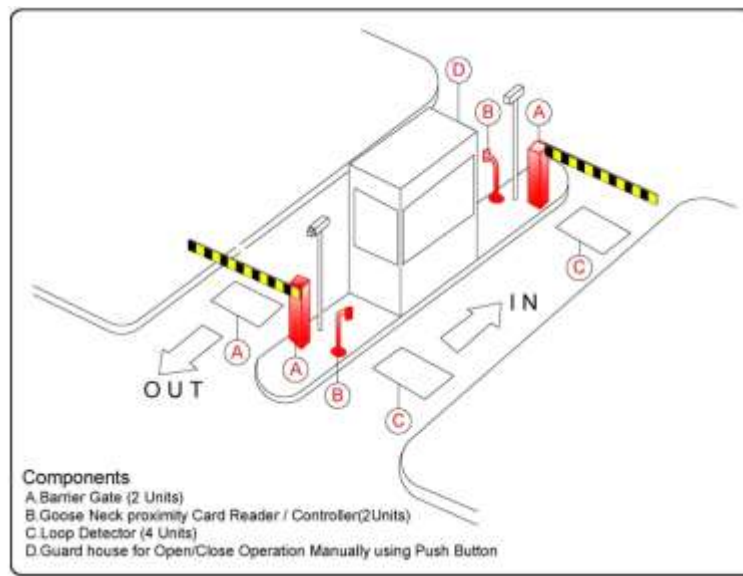


Figure 3.1.2c (Principle layout of Gate Barrier System)

Safety requirement has to keep in consideration loop detectors, safety photo cells, and ground earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

-Intercom System (Complex of Villas):

The intercom system in villa complex allows audio/video communication from each unit/villa to the main complex entrance.

Communication cables in proper containment have to run from each unit/villa to the main entrance, all details related to design, products, containments & power requirements have to be submitted during the design stage.

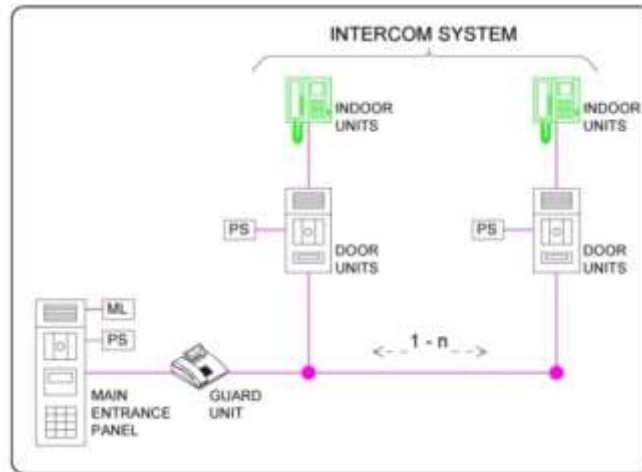


Figure 3.1.2d (Intercom System in a Complex of Villa's)

3.1.3 Building up to G+20:

- **IP CCTV:** all residential & commercial buildings up to G+20 require a CCTV system; the following areas recommended to be covered:

- Main entrance & Exits – Indoor & outdoor (Identification Level).
- Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
- Emergency Doors & Exist (Identification Level).
- Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
- Parking Area full coverage (Detection Level)
- Coverage at entrances of Utility Rooms like Communication Rooms / Telecom Rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).
- Main Point of entry for all vehicles to Client Premises are recommended to be covered by LPR Cameras (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

- **Access Control System (G+20):** Access control recommended to cover the following areas:

- Main building entrance

- Main car park entrance/exit
- All building exit/entry except fire exit doors
- MTR, STR, MER doors
- FTR, RTR & FER

ACS containment, communication cable, material & power requirements to be coordinated & approved by UTT in early design stage

ACS has to have the capability of integrate guard tour management, visitor management & facility management.

Gate Barrier: gate barrier to be installed in main Building exit/ entry & to be controlled by ACS in both directions

Safety requirement has to keep in consideration loop detectors, safety photo cells, and earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

Pedestrian Gates: according to building functionality pedestrian gate to be implemented to control exit/entry of pedestrians to controlled areas.

These gates shall be controlled by the access control system in both directions, 13 Amp fused socket shall be provided at each gate location.

Containments, communication cables, design layout and products to be coordinated with UTT in earlier stage and as per UTT approved vendor list.

Digital Signage System:

Each building recommended to have a digital sign at or near the front desk or main lobby area and other common area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well.

At each DSS points a 13 AMP fused socket shall be supplied & SCS data point shall be supplied

Installation height, positioning & other fixture requirements to coordinated with UTT at design stage.

-Intercom System:

The intercom system allows audio/video communication from each unit/flat to the main building entrance.

Communication cables in proper containment have to run from each flat to FER, all horizontal intercom cables will be terminated at intercom distribution box in FER.

Intercom vertical cables will run through ELV raiser to the MER, MER facilitate the connection with main entrance & concierge unit.

All details related to design, products, containments & power requirements has to be submitted with UTT team during the design stage.

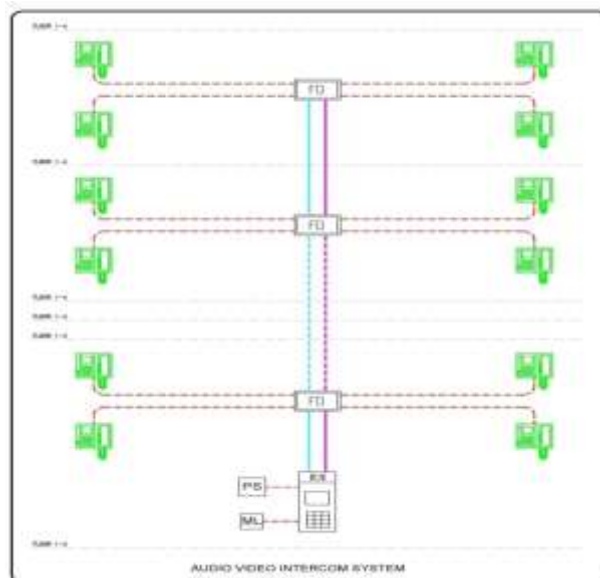


Figure 3.1.3a (Principle layout of Intercom System in Towers)

3.1.4 Building more than G+20:

- **IP CCTV:** all residential & commercial building more than G+20 require a CCTV system; the following areas recommended to be covered:

- Main entrance & Exits – Indoor & outdoor (Identification Level).
- Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
- Emergency Doors & Exit (Identification Level).
- Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
- Parking Area full coverage (Detection Level)
- Coverage at entrances of Utility Rooms like Communication Rooms /Telecom Rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).
- Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

-For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

- **Access Control System:** with ACS we recommended to be able to control the following areas:

- Main building entrance
- Main car park entrance/exit

- All building exit/entry except fire exit doors
- MTR, STR, MER doors
- FTR, RTR & FER

ACS containment, communication cable, material & power requirements to be coordinated & approved by UTT in early design stage

ACS has to have the capability of integrate guard tour management, visitor management & facility management.

Gate Barrier: gate barrier is recommended to be installed in main Building Exit/Entry & to be controlled by ACS in both directions

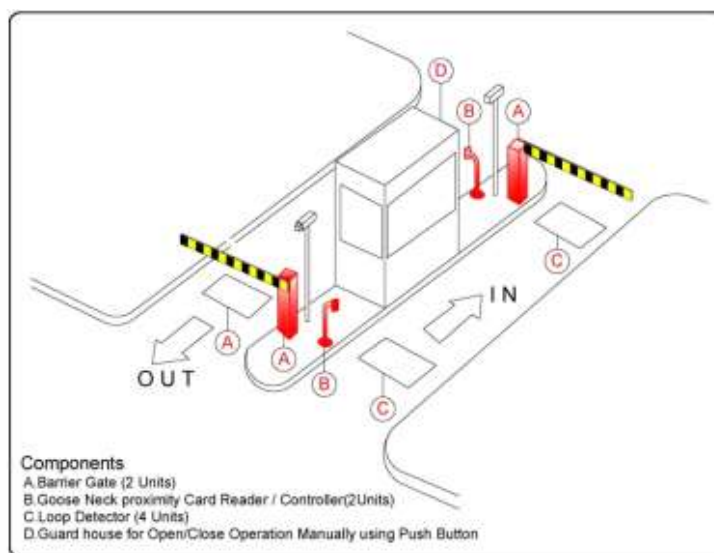


Figure 3.1.4a (Principle layout of Gate Barrier System)

Safety requirement has to keep in consideration loop detectors, safety photo cells, and earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

Pedestrian Gates: according to building functionality pedestrian gate to be implemented to control exit/entry of pedestrians to controlled areas.

These gates shall be controlled by the access control system in both directions, 13 Amp fused socket shall be provided at each gate location.

Containments, communication cables, design layout and products to be coordinated with UTT in earlier stage and as per UTT approved vendor list.

Digital Signage System:

Each building recommended to have a digital sign at or near the front desk or main lobby area and other common area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well.

At each DSS points a 13 AMP fused socket shall be supplied & SCS point shall be supplied

Installation height, positioning & other fixture requirements to coordinated with UTT at design stage.

-Intercom System:

The intercom system allows audio/video communication from each unit/flat to the main building entrance.

Communication cables in proper containment have to run from each flat to FER, all horizontal intercom cables will be terminated at intercom distribution box in FER.

Intercom vertical cables will run through ELV raiser to the MER, MER facilitate the connection with main entrance & concierge unit.

All details related to design, products, containments & power requirements has to be shared with UTT team during the design stage.

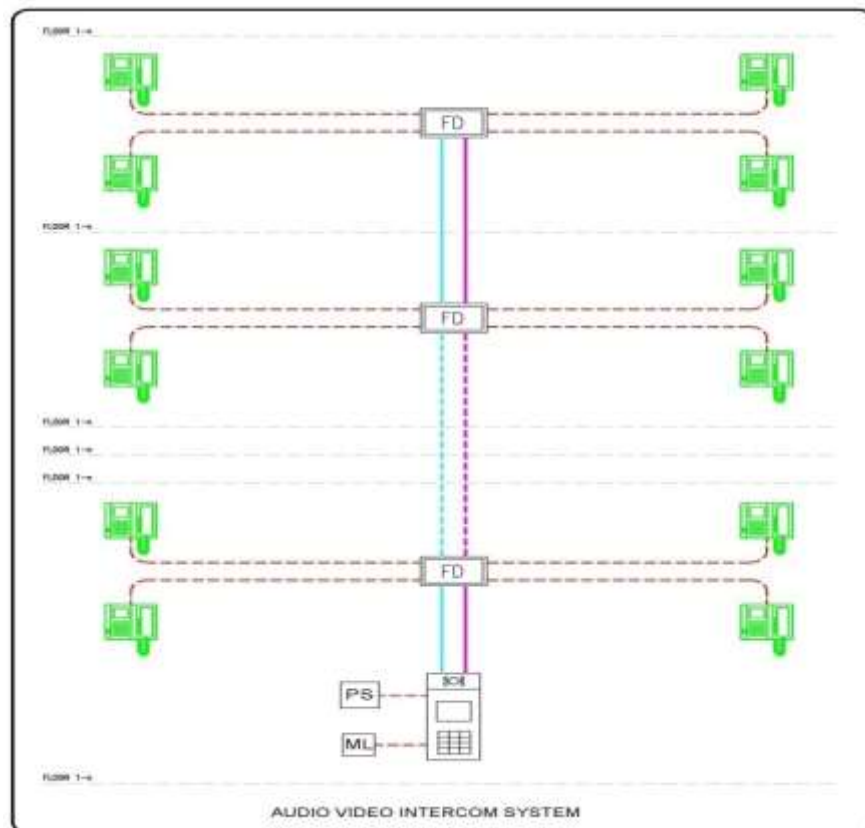


Figure 3.1.4a (Principle layout of Intercom System in Towers)

3.1.5 Shopping Malls:

- **IP CCTV:** Shopping malls must implement CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-All entrances and exits — indoor and outdoor. — (Identification Level)

-Front desk/ Reception desk. — (Identification Level)

-Full coverage of Lobby/entrance hall and Client service area such as kitchen (75% of coverage inside the kitchen), kitchen entrance door, laundry, housekeeping, etc. — (Recognition Level)

-Full coverage of Client indoor & outdoor parking passages areas. — (Detection Level)

-Full coverage of Elevators, lobbies, inside elevators, escalators, access staircases. — (Recognition Level)

-Full coverage of all floor corridors, public open areas which is inclusive of all shop entrances, ATM areas, loading areas. — (Recognition Level)

-Full coverage of Emergency Doors/Exits — (Identification Level)

-Full coverage of liquor retail selling area, parking areas, liquor storage room, liquor warehouses inside and outside, loading/unloading areas, entrances/exits of liquor warehouses. — (Recognition Level)

-Full coverage of Server/Equipment room and CCTV Monitoring room. — (Identification Level)

-Full coverage of Open Coffee shop/Fast food dining areas/phone booth, kids playing area. — (Recognition Level)

-Coverage at entrances of entertainment areas, such as spa/gym/swimming pool/ cinema/ play & game area/bail rooms/pre-function areas, etc. — (Recognition Level)

-Coverage at entrances of restaurants (Full coverage required if restaurant is located in an open area)/dining area/bars, etc. — (Recognition Level)

-Coverage at entrances of Public toilets, — (Detection Level)

-Coverage at entrances of Conference Center/ meeting rooms/Client business center. — (Recognition Level)

-Coverage at entrances of Communication room/Telecom Rooms/IT room/HVAC/transformers rooms/Electrical room. — (Recognition Level)

-Coverage at entrances of Bank/Exchange/Jewelry/ Mosque. — (Recognition Level)

-General View of Swimming Pool water area/ kid's pool area (Provision only).

-Main point of entry for all vehicles (Guest & Service vehicles) to Client premises should be covered by LPR cameras (Vehicle Number Plate, type and color of vehicle, driver, passenger and overview of surrounding area). — (Identification Level)

* Refer to pages 34 & 35 tables for choosing & the right cameras resolution & installation position.

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For period time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

- **Access Control System:** ACS is recommended to be able to control the following areas:

- All building exit/entry rather than main public entrances and fire exit doors

-MTR, STR, MER doors

- FTR, RTR & FER

- All facility rooms (UTT rooms, Electrical & mechanical, security room & server's room)

ACS containment, communication cable, material & power requirements to be coordinated & approved by UTT in early design stage

ACS has to have the capability of integrate guard tour management, visitor management & facility management.

ACS system should be capable to integrate complicated time schedules according to mall management requirement

Gate Barrier & Parking Management System: Shopping mall car parking entrances to be controlled by gate barriers operated by ticketing system integrated with parking management system.

Intelligent parking management system capable for indicating available spaces location and updating live information for visitors on proper LED signage distributed according to parking design

Safety requirement has to keep in consideration loop detectors, safety photo cells, and earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

Pedestrian Gates: according to building functionality pedestrian gate to be implemented to control exit/entry of pedestrians to controlled areas.

These gates shall be controlled by the access control system in both directions, 13 Amp fused socket shall be provided at each gate location.

Containments, communication cables, design layout and products to be coordinated with UTT in earlier stage and as per UTT approved vendor list.

Digital Signage System:

Each building has a digital sign at or near the front desk or main lobby area and other common area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well. At each DSS points a 13 AMP fused socket shall be supplied & SCS point shall be supplied

Installation height, positioning & other fixture requirements to coordinate with UTT team in advance.

Additional requirements for Shopping Malls to be enhanced at design stage with UTT.

3.1.6 Hotels:

- **IP CCTV:** Hotels should implement CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-All entrances and exits — indoor and outdoor. — (Identification Level)

-Front desk/ Reception desk. — (Identification Level)

-Full coverage of Lobby/entrance hall and Client service area such as kitchen (75% of coverage inside the kitchen), kitchen entrance door, laundry, housekeeping, etc. — (Recognition Level)

-Full coverage of Client indoor & outdoor parking passages areas. — (Detection Level)

-Full coverage of Elevators, lobbies, inside elevators, escalators, access staircases. — (Recognition Level)

-Full coverage of all floor corridors, public open areas which is inclusive of all shop entrances, ATM areas, loading areas. — (Recognition Level)

-Full coverage of Emergency Doors/Exits — (Identification Level)

-Full coverage of liquor retail selling area, parking areas, liquor storage room, liquor warehouses inside and outside, loading/unloading areas, entrances/exits of liquor warehouses. — (Recognition Level)

-Full coverage of Server/Equipment room and CCTV Monitoring room. — (Identification Level)

-Full coverage of Open Coffee shop/Fast food dining areas/phone booth, kids playing area. — (Recognition Level)

-Coverage at entrances of entertainment areas, such as spa/gym/swimming pool/ cinema/ play & game area/bail rooms/pre-function areas, etc. — (Recognition Level)

-Coverage at entrances of restaurants (Full coverage required if restaurant is located in an open area)/dining area/bars, etc. — (Recognition Level)

-Coverage at entrances of Public toilets, — (Detection Level)

-Coverage at entrances of Conference Center/ meeting rooms/Client business center. — (Recognition Level)

-Coverage at entrances of Communication room/Telecom Rooms/IT room/HVAC/transformers rooms/Electrical room. — (Recognition Level)

-Coverage at entrances of Bank/Exchange/jewelry/ Mosque. — (Recognition Level)

-General View of Swimming Pool water area/ kid's pool area (Provision only).

-Main point of entry for all vehicles (Guest & Service vehicles) to Client premises should be covered by LPR cameras (Vehicle Number Plate, type and color of vehicle, driver, passenger and overview of surrounding area). — (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For period time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

- **Access Control System:** with ACS we recommend to control the following areas:

- All building exit/entry rather than main public entrances and fire exit doors.
- MTR, STR, MER doors.
- FTR, RTR & FER unless it is covered by CCTV.
- All facility rooms (UTT rooms, Electrical & mechanical, security room & server's room).

ACS containment, communication cable, material & power requirements to be coordinated & approved by UTT in early design stage.

ACS has to have the capability of integrate guard tour management, visitor management & facility management.

ACS system should be capable to integrate complicated time schedules according to hotel management requirement.

Gate Barrier & Parking Management System: Hotels Car Parking entrances to be controlled by gate barriers operated by ticketing system integrated with parking management system.

Intelligent parking management system capable for indicating available spaces location and updating live information for visitors on proper LED signage distributed according to parking design

Safety requirement has to keep in consideration loop detectors, safety photo cells, and earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

Pedestrian Gates: according to building functionality pedestrian gate to be implemented to control exit/entry of pedestrians to controlled areas.

These gates shall be controlled by the access control system in both directions, 13 Amp fused socket shall be provided at each gate location.

Containments, communication cables, design layout and products to be coordinated with UTT in earlier stage and as per UTT approved vendor list.

Digital Signage System:

Each building has a digital sign at or near the front desk or main lobby area and other common area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well. At each DSS points a 13 AMP fused socket shall be supplied & SCS point shall be supplied

Installation height, positioning & other fixture requirements to coordinate with UTT team in advance.

Additional requirements for Hotels to be enhanced at design stage with UTT.

3.1.7 Private & Public Hospitals:

- **IP CCTV:** Hospitals should implement CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

- Main entrance & Exits – Indoor & outdoor (Identification Level).
- Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
- Full coverage of all corridors (Recognition Level).
- Entrance of casualty. – (Identification Level)
- Emergency Doors/Exits – (Identification Level)
- Full coverage of Elevators, Elevator lobbies, inside elevators, escalators, access staircases. – (Recognition Level)
- Full coverage of patients/customer waiting area. – (Recognition Level)
- Full coverage of parking areas. – (Detection Level)
- Full coverage of kitchen/pantry. – (Recognition Level)
- Coverage at entrances of Utility rooms like Communication room/Telecom Rooms/IT room/HVAC/transformers rooms/Electrical room. – (Recognition Level)
- Main point of entry for all vehicles (Guest & Service vehicles) to Client premises should be covered by LPR cameras (Vehicle Number Plate, type and color of vehicle, driver, passenger and overview of surrounding area). – (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For period time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

- Access Control System: with ACS we should be able to control the following areas:

- All building exit/entry rather than main public entrances
- Fire exit doors should monitor but not control
- MTR, STR, MER doors
- FTR, RTR & FER unless it is covered by CCTV
- All facility rooms (Telecom Rooms, Electrical & mechanical, security room & server's room)

ACS containment, communication cable, material & power requirements to be coordinated & approved by UTT in early design stage

ACS has to have the capability of integrate guard tour management, visitor management & facility management.

ACS system should be capable to integrate complicated time schedules according to hospital management requirement

Gate Barrier & Parking Management System: Hospital car parking entrances to be controlled by gate barriers operated by ticketing system integrated with parking management system.

Intelligent parking management system capable for indicating available spaces location and updating live information for visitors on proper LED signage distributed according to parking design

Safety requirement has to keep in consideration loop detectors, safety photo cells, and earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

Pedestrian Gates: according to building functionality pedestrian gate to be implemented to control exit/entry of pedestrians to controlled areas.

These gates shall be controlled by the access control system in both directions, 13 Amp fused socket shall be provided at each gate location.

Containments, communication cables, design layout and products to be coordinated with UTT in earlier stage and as per UTT approved vendor list.

Digital Signage System:

Each building has a digital sign at or near the front desk or main lobby area and other common area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well. At each DSS points a 13 AMP fused socket shall be supplied & SCS point shall be supplied Installation height, positioning & other fixture requirements to coordinate with UTT team in advance. Additional requirements for Hospitals to be enhanced at design stage with UTT.

3.1.8 Group of shops and sheds (Retail Complex):

- **IP CCTV:** Retail Complex should implement CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

- All entrances and exits — indoor and outdoor. — (Identification Level)

- Front desk/ Reception desk. — (Identification Level)

- Full coverage of Lobby/entrance hall and Client service area such as kitchen (75% of coverage inside the kitchen), kitchen entrance door, laundry, housekeeping, etc. — (Recognition Level)

- Full coverage of Client indoor & outdoor parking passages areas. — (Detection Level)

- Full coverage of Elevators, lobbies, inside elevators, escalators, access staircases. — (Recognition Level)

- Full coverage of all floor corridors, public open areas which is inclusive of all shop entrances, ATM areas, loading areas. — (Recognition Level)

- Full coverage of Emergency Doors/Exits — (Identification Level)

- Full coverage of liquor retail selling area, parking areas, liquor storage room, liquor warehouses inside and outside, loading/unloading areas, entrances/exits of liquor warehouses. — (Recognition Level)

- Full coverage of Server/Equipment room and CCTV Monitoring room. — (Identification Level)

- Full coverage of Open Coffee shop/Fast food dining areas/phone booth, kids playing area. — (Recognition Level)

- Coverage at entrances of entertainment areas, such as spa/gym/swimming pool/ cinema/ play & game area/ball rooms/pre-function areas, etc. — (Recognition Level)
- Coverage at entrances of restaurants (Full coverage required if restaurant is located in an open area)/dining area/bars, etc. — (Recognition Level)
- Coverage at entrances of Public toilets, — (Detection Level)
- Coverage at entrances of Conference Center/ meeting rooms/Client business center. — (Recognition Level)
- Coverage at entrances of Communication room/Telecom Rooms/IT room/HVAC/transformers rooms/Electrical room. — (Recognition Level)
- Coverage at entrances of Bank/Exchange/Jeweler/ Mosque. — (Recognition Level)
- General View of Swimming Pool water area/ kid's pool area (Provision only).
- Main point of entry for all vehicles (Guest & Service vehicles) to Client premises should be covered by LPR cameras (Vehicle Number Plate, type and color of vehicle, driver, passenger and overview of surrounding area). — (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

- **Access Control System:** with ACS we should be able to control the following areas:

- All building exit/entry rather than public entrances and fire exit doors
- MTR, STR, MER doors
- FTR, RTR & FER unless it is covered by CCTV
- All facility rooms (Telecom Rooms, Electrical & mechanical, security room & server's room)

ACS containment, communication cable, material & power requirements to be coordinated & approved by UTT in early design stage

ACS has to have the capability of integrate guard tour management, visitor management & facility management.

ACS system should be capable to integrate complicated time schedules according to mall management requirement

Gate Barrier & Parking Management System: Shopping mall car parking entrances to be controlled by gate barriers operated by ticketing system integrated with parking management system.

Intelligent parking management system capable for indicating available spaces location and updating live information for visitors on proper LED signage distributed according to parking design

Safety requirement has to keep in consideration loop detectors, safety photo cells, and earth & power requirements

Containments, communication cables, design layout to be coordinated with UTT earlier to implementation stage.

Digital Signage System:

Each building has a digital sign at or near the front desk or main lobby area and other common area that will show location-specific information, in addition to Housing-wide information, events, and announcements. If residence hall also has a dining hall, the signs will display there as well. At each DSS points a 13 AMP fused socket shall be supplied & SCS point shall be supplied

Installation height, positioning & other fixture requirements to coordinate with UTT team in advance.

Additional requirements for Sheds/Retail Area to be enhanced at design stage with UTT.

3.1.9 Government Department \Public Sector Buildings:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-Main entrance & Exits – Indoor & outdoor (Identification Level).

-Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).

-Emergency Doors & Exist (Identification Level).

-Full Coverage of service areas/entrance/exits (Recognition Level).

-Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)

- Coverage of Kitchen/Pantry's (Recognition Level)

-Parking Area full coverage (Detection Level)

-Coverage at entrances of Utility Rooms like Communication .Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).

-Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

3.1.10 Mosques\Church\Temple:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - All entrances & Exits – Indoor & outdoor (Identification Level)
 - Full coverage of main Lobby /Entrance Hall (Recognition Level).
 - Parking Area full coverage (Detection Level)
 - Emergency Doors & Exit (Identification Level).
 - Coverage at entrances of public Toilets (Detection Level)
 - Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
 - Coverage at entrances of Utility Rooms like Communication Rooms /Telecom Rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).
 - Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.11 Education Institutions & its Transports:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - Student Pick-up & Drop-off (Vehicle Number Plate, type & color of vehicle, passenger & overview of surrounding area (Recognition Level).
 - Landscape (Detection Level).
 - Full coverage of main Lobby /Reception Lobby/Entrance Hall (Identification Level)
 - Cashier (Identification Level)
 - Access points to all Institution Buildings (Recognition Level).
 - Elevator lobbies in BOH, FOH & Car park where entry & exist from building is possible (Recognition Level).
 - Circulation corridors on all floors (Recognition Level).
 - Emergency Doors & Exit (Identification Level).

- Staircase in all Floors (Recognition Level).
- All canteen entries (Recognition Level).
- Kitchen entry\exists (Recognition Level).
- Canteen Dining Area (Recognition Level).
- Food Delivery & Storage entry\exist\cashier (Recognition Level).
- Chemical Labs (Recognition Level).
- Auditoriums\Ground \ Play Areas \Sports Hall \ Swimming Pools (Recognition Level).
- Entrances to Janitor room\Toilets\Stores (Recognition Level).
- Monitoring Room (Recognition Level).
- Corridors leading to bathroom & washing room (Recognition Level).
- Full coverage inside the transport (Recognition Level).
- Acknowledgment alarm to make sure all passengers has left from transport.
- Cameras inside the transport must be equipped with audio inputs & GPS.

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

3.1.12 Men's, Ladies & Children Clubs, Theme Parks, Parks & other Recreational Areas:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
- All entrances & Exists – Indoor & outdoor (Identification Level)
- Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
- Emergency Doors & Exist (Identification Level).
- Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
- Parking Area full coverage (Detection Level)
- Full coverage of all outdoor walkway (Recognition Level)

- Coverage of Ticket counters (Recognition Level)
 - Entrance to all indoor outdoor game areas (Recognition Level)
 - Full coverage of refreshment area (Recognition Level)
 - Coverage at entrances of public Toilets (Detection Level)
 - Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
 - Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)
 - Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.13 Liquor Retail Areas:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - Full coverage of Liquor selling areas (Recognition Level)
 - All entrances & Exits – Indoor & outdoor (Identification Level)
 - Full coverage of Liquor storage rooms (Recognition Level)
 - Full coverage of Liquor warehouses inside & outside (Recognition Level)
 - Full coverage of loading\unloading areas (Recognition Level)
 - All entrances & Exits of warehouses (Recognition Level)
 - Parking Area full coverage (Detection Level)
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.14 Equestrian, Shooting & Golf Clubs:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - All entrances & Exits – Indoor & outdoor (Identification Level)
 - Full coverage of Reception \ front Desk (Identification Level)
 - Full coverage of lobby \ entrance hall & Client service area such as kitchen (75% of coverage inside the kitchen) laundry, housekeeping, etc. (Recognition Level)
 - Full coverage of Client indoor outdoor parking passages areas (Detection Level)
 - Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
 - Emergency Doors & Exit (Identification Level).
 - Full Coverage of all floor corridors, public open areas which is inclusive of all shop entrances ATM areas, loading areas (Recognition Level)
 - Coverage at entrances of Utility Rooms like Communication .Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)
 - Full coverage of open coffee shop\Fast food areas \phone booth (Recognition Level).
 - Kids Playing Areas (Recognition Level).
 - Coverage of entrance of entertainment areas such as SPA\GYM\Swimming pools \Cinema etc. (Recognition Level).
 - Coverage of entrance of restaurants (Full coverage required if restaurant is located in an open area) (Recognition Level).
 - Coverage at entrances of public Toilets (Detection Level)
 - Coverage at all Facilities like Clubs, shooting area etc. (Recognition Level)
 - Coverage of entrance of Conference Center \ meeting rooms \ Client business Center (Recognition Level)
 - Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For period time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.15 Labor Accommodation Camps:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - All entrances & Exits – Indoor & outdoor (Identification Level)
 - Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
 - Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
 - Parking Area full coverage (Detection Level)
 - Full coverage of Kitchen \ Pantry (Recognition Level).
 - Coverage at entrances of public Toilets (Detection Level)
 - Coverage at entrances of Utility Rooms like Communication .Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)
 - Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.16 Banks, Money Exchanges, Jewelry & other financial institutions:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - All entrances & Exits – Indoor & outdoor (Identification Level)
 - Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).
 - Parking Area full coverage (Detection Level)
 - Full coverage of cash counters (Identification Level)
 - Full coverage of perimeter areas (Detection Level)
 - Full coverage of service areas (Recognition Level).
 - Full coverage of locker\safe rooms (Identification Level)
 - Emergency doors\exist (Identification Level)

-Full coverage of ATM (Identification Level)

-Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

3.1.17 Independent Multi Level Hyper Markets, Super Markets, Offices & Stores:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-All entrances & Exits – Indoor & outdoor (Identification Level)

- Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)

-Emergency doors\exit (Identification Level)

- Full coverage of point of sales (Recognition Level)

- Parking Area full coverage (Detection Level)

-Full coverage of ATM (Identification Level)

-Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

3.1.18 Museum, Stadium & Exhibition Center:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-All entrances & Exits – Indoor & outdoor (Identification Level)

- Parking Area full coverage (Detection Level)

-Full coverage of perimeter areas (Detection Level)

-Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).

- Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)
 - Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)
 - Full coverage of Ticket counters (Recognition Level).
 - Emergency doors\exist (Identification Level)
 - Coverage at entrances of public Toilets (Detection Level)
 - Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)
 - Full coverage of Exhibition \ public Area \Stands \ Corridors (Recognition Level).
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.19 Petrol Filling Stations:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - Entry & Exist of station (Identification Level)
 - Parking Area full coverage (Detection Level)
 - Full coverage of petrol filling bay\Vehicle service & washing areas (Recognition Level).
 - Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level)
- Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.
- For time recording refer to Storage part at Technical Requirements Section.
- Design approval to be obtained in early stage for the IP CCTV system.

3.1.20 Bus\Taxi & All Public Transport Stands:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
- Entry & Exist of station (Identification Level)

-Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).

-Emergency doors\exist (Identification Level)

-Full coverage of Taxi\Bus pay (Recognition Level).

-Full coverage of Ticket counters & waiting area (Recognition Level).

-Full coverage of Bus service & petrol filling area (Recognition Level).

-Full coverage of corridor & service area (Recognition Level).

- Parking Area full coverage (Detection Level)

Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).

-Coverage at entrances of public Toilets (Detection Level)

-Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

3.1.21 Critical institutions Like power plants & refineries:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-All entrances & Exits – Indoor & outdoor (Identification Level)

-Full coverage of main Lobby /Reception Lobby/Entrance Hall (Recognition Level).

-Emergency doors\exist (Identification Level)

- Full coverage of elevators, Elevator lobbies, inside elevator, escalators, access staircases (Recognition Level)

- Parking Area full coverage (Detection Level)

-Full coverage of reception & service area (Identification Level).

-Full coverage of perimeter areas (Detection Level)

-Full coverage of production & Storage areas (Recognition Level).

Coverage at entrances of Utility Rooms like Communication Rooms /Telecom rooms/IT room /HVAC/Transformers & Electrical Rooms (Recognition Level).

-Main Point of entry for all vehicles to Client Premises should be covered by LPR Cameras (Identification Level)

-full coverage of loading\unloading docks & bays (Recognition Level)

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

3.1.22 Warehouses & open\enclosed Storage Yards:

- **IP CCTV:** CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:

-All entrances & Exits – Indoor & outdoor (Identification Level)

-Full coverage of loading\unloading docks & bays (Recognition Level)

- General Coverage of Storage areas (Detection Level)

-Optional general coverage with thermal technology for volatile\inflammable materials storage areas (Recognition Level).

Proper containments with right communication cables have to be used according to UTT guideline & approved vendor.

For time recording refer to Storage part at Technical Requirements Section.

Design approval to be obtained in early stage for the IP CCTV system.

4.2 Technical Requirements for CCTV

Client is requested to meet all the technical requirements as per MCC/MOI while designing and implementing the security system.

4.2.1 - CCTV Installation Requirements

The security systems design shall enable the security of the building to be monitored only in the Security Control Room and must have capability to integrate with third party systems in future such as BMS, Access Control, etc.

The system shall be designed, engineered, furnished, delivered, installed and tested to ensure it is fully operating and free of engineering, installation, system operation and Original Equipment Manufacturer (OEM) defects that provide a "turnkey" solution. The Integrator must also be certified in installing and supporting the system equipment from which they are manufactured and supplied from. The system must support three types of recordings: motion, continuous and video analytic recording.

Routine performance checks of the security system shall be the responsibility of the respective Client. A maintenance register shall be maintained to register all security equipment failure, with details on date & time of failure, type of failure, action taken, date of rectification, etc. All failures and intentional stoppage of the security system shall be reported to the UTT/MCC authorized auditing consultant in writing.

Cameras shall be installed in protective enclosures at locations and heights not easily accessible. Enclosures shall be rated to prevent ingress of dust, dirt, moisture and the likes that could affect the operation of the camera. Vandal proof housings shall be used for cameras installed at heights accessible to people. Outdoor camera enclosures shall be minimum IP66 rated with sun shroud. CCTV equipment's shall be installed in lockable racks/cabinets in secure risers/rooms.

Equipment's installed outdoor, shall be rated for use in extreme UAE weather conditions. Properly rated outdoor enclosure shall be provided to house field power and transmission equipment's. Outdoor enclosure shall be designed with sunshade and suitable cooling mechanism.

Camera shall satisfy the recommended observation criteria defined for that camera location. Selection of camera location shall also consider factors such as lighting conditions, seasonal foliage obstructions, temporary or permanent man made obstructions; etc.

Approval from the UTT auditing consultant is required for system design, CCTV layout drawings and material submittals before implementation phase.

4.2.2 - Cameras/Encoders*

- IP Cameras/Encoders shall be compliant with H.264 base encoding profile.
- IP Cameras/Encoders shall be capable of multi-streams with its native resolution & FPS.
- Live streams of IP Cameras/Encoders would be in native resolution/25-30 frames per second and the recording streams would be as per the requirements mentioned under storage units section.
- Each camera/encoder channel must be configurable with single dedicated IP address.
- IP cameras/encoders must support security features like HTTPS and 802.1x standards.
- The encoder/IP camera shall be able to automatically start streaming according to last known configuration when it is restarted/reset/rebooted.
- Cameras must support resolution from 4CIF to Full HD.
- Full HD quality day/night cameras with WDR above 120db and with backlight compensation should be required for the main areas as mentioned with identification level of coverage.
- I-Frame rate shall be at least one I-Frame once in every 1-4 seconds.
- FPS shall be selectable from 12 - 30 frames per second to allow proper video analytics of the stream.
- Camera/Encoder streams shall be streamed as Transport RTP/UDP.
- Cameras/Encoders/VMS must support multicast streaming and the multicast addresses will be defined by the UTT/MCC.
- IP cameras/Encoders shall not require having a heartbeat sent to video management system.
- IP cameras/Encoders must support stamping on the live stream with camera location ID, date and time.

- IP cameras/Encoders shall be synchronized to GPS time (NTP or similar based).
 - All the cameras shall be configured with unique name based on the location of coverage and camera names should not be repeated.
- * Encoders can be used for existing analog system by taking approval from the UT/MCC authorized auditing consultant and should meet all the above technical requirements.

4.2.3 - Network Switches/Firewall

- Cameras/Encoders/VMS IP addressing shall be compatible with UT/MCC provided IP scheme and based on the UT/MCC authorized auditing consultant provided scopes.
- If the Client uses the Multicast routing, that routing shall be based on PIM-SM and IGMP snooping should be enabled in all edge switches.
- Core Level switches (Layer 3) must be redundant in nature with two physical core switches (preferred one is a stackable solution or a VSS enabled to effectively use the entire bandwidth) with dual uplinks from each edge switches.
- Security systems would be installed in a dedicated network (network switches must be dedicated only for CCTV components).
- The network switches must be capable to configure the MTU size and the same shall be configured according to the UT/MCC requirement which is 1300.
- There should be four-core single mode fiber connectivity from equipment rack dedicated for integration to the Telecom POP room.
- Connectivity to MCC premises will be provided by Firewall.
- The Client responsibility is to purchase the Firewall according to list provided by the MCC.
- The Firewall connection to the site's Network is 1 GB copper wire.
- Apart from the connectivity of Client network to UT/MCC network; there should not be any kind of network connectivity to any remote/public networks. All the activities not limited to monitoring/maintenance/updates/renewal/activation/trouble-shooting would be done onsite/offline.
- The Firewall shall be defined as a default gateway for the VMS. In case this is unfeasible, VMS shall have a route defined to Source datacenter via above mentioned firewall.
- The requested firewalls brands and models will be listed by the Source.

4.2.4 - Video Management System

- The VMS recommended to support failsafe mode and by failsafe, the CCTV system recommended to be equipped with fail over servers and in case If any recording server fails then VMS must be capable for automatic switch over of configuration from failed recording server to standby/failover recording server. Once the failed recording server comes online then the configuration should switch back over automatically. All these switch over must be without any loss in live monitoring and recording of cameras associated to that particular recording server.
- VMS recommended to support Multicast streaming and external connection by a defined ICD (Interface Control Document).
- VMS recommended to allow connection to other systems threw an IP based WAN or LAN.
- The VMS recommended to support providing a list of connected cameras to an external interface.
- The system recommended to support parallel REAL TIME transition and transition of recorded replay.
- The VMS recommended to have the ability to stream in REAL TIME the video of selected cameras/a group of cameras/the whole cameras configured to VMS.
- The VMS recommended to have the ability to stream RECORDED channels of selected cameras/a group of cameras/the whole cameras configured to VMS.
- The system recommended to allow selection of the required cameras to be transmitted based on the camera ID (Name, Identification....)
- The system recommended to allow selection of the required cameras to be transmitted based on a defined time period (from [date], [hour], [min], to from [date], [hour], [min])
- The system recommended to include the video metadata of the cameras in the video transmission:
 - Location
 - Time stamp
 - Other recorded information
- The Local CCTV system recommended to be synchronized to GPS time (NTP or similar based).
- The broadcast process recommended to maintain the native cameras performance in domains of resolution, frame rate, colored / B&W).
- The VMS vendors support for at least 3 years from the system commissioning, or, upgrading the system to the latest supported VMS version by the vendor.
- The VMS system vendor recommended to use a standard tool for replay of the video, or shall provide the replay tool with its ICD.
- The Vendor/Client recommended to supply the ICD, and UTT will determine whether it complies with the OA. If it complies, UTT will approve it.
- The VMS recommended to support standard compression format H.264/MPEG-4 for the broadcast video or lossless conversion to a standard compression format.

- The VMS recommended to stream the video, in real time and recorded, in a standard non encrypted RTP/UDP protocol.

4.2.5 - Servers

- The servers recommended to be equipped with dual processors, dual power supplies and minimum 10/1Gbps dual communication Uplinks to network without any single point of failure.
- The servers designed must support failsafe by providing redundant/fail over servers for recording and management.
- The CPU load of servers must not exceed an average of 70%. Video server(s) should be able to process incoming streams with ease with 25% scaling capacity for future requirements.

4.2.6 - Storage Units

- The storage units recommended to be equipped with dual Controllers, dual power supplies and dual network uplinks to NAS/SAN switches without any single point of failure.
- The recording system recommended to be a unified NAS/SAN with minimum RAID 5 or above configured.
- The retention period of the recording storage will vary due to the purpose for the system and how long record retention is recommended as to serve its intended purpose. The period range is (30-180 days)
- The Client is recommended to record on their Storage Units all the Client channels (Cameras) for a period of (90-180) days as follows:-

Educational Institutions:-

Motion based recording by considering 50% motion with following conditions:-

- During Motion detected period all cameras record in native resolution at 12fps, h.264 codec at 30% compression.
- During non-motion period all cameras record in native resolution at 3fps, h.264 codec at 30% compression.

All Other Clients:-

- Continuous (24X7) in native resolution/12 fps, H.264 codec @ 30% compression.
- The hard disks required for recording recommended to be enterprise level one with minimum 7200 rpm.
- If the storage system is Block Level/File level system (SAN/NAS) the following points recommended to be implemented mandatorily:
- High availability recommended to be provided from the controller/head unit to all its attached .11300's.
- All the MOD's should be configured individually.

- Consider one hot spare hard disk in each JBOD.
- If the storage system is virtualized storage then a similar unit itself recommended to be considered as hot spare to the system.
- Video servers and storage recommended to be installed inside a dedicated lockable rack (hereafter CCTV Rack) with tamper-monitoring switch.
- CCTV Racks recommended to be placed in a separate lockable, well ventilated room. If CCTV Rack is placed in Monitoring Room, it has to be partitioned and proper cooling should be provided.
- For storage smaller than 50 TB, room recommended to have Air Conditioning Unit and well ventilated and for systems with more than 100 TB Storage, room must have Close Control Unit (CCU) cooling.

4.2.7 - Alarm Logs

The System is required to keep a detailed log file and to send alerts in the following events:

- Whenever the system dedicated cabinet for integration is opened (by means of a system cabinet tampering switch- an HW switch that indicate whenever the cabinet is Opened or Closed)
- Loss of system communication:
 - Loss of camera signal
 - System power down

The system logs should be available in a single log file for a period 90 days during UTT inspection.

4.2.8 - Availability & Maintenance

The Client CCTV system and its integration with the authority systems should be available 24/7. In any case of problem; it should be fixed within one hour during day time, and three hours during evenings and weekends.

The Client CCTV system needs to assure vendor/manufacturer availability to support it for a period of 5 years (from the system installation).

In case Client requires any maintenance/configuration changes on CCTV system, the Client should inform UTT and take prior approval by sending the detailed work schedule with task description.

Respective Client shall have either trained in-house maintenance staffs or have a formal maintenance contract with companies (Local UAE companies) specialized in security systems maintenance. The maintenance contract shall include both on-call and preventive maintenance. A clearly defined preventive maintenance schedule shall be followed and maintenance reports and logs shall be maintained at all times.

Routine performance checks of the security system shall be the responsibility of the Client. A maintenance register shall be maintained to register all security equipment failure, with details on date & time of failure, type of failure, action taken, date of rectification, etc.

During the maintenance period if any failure happened for the storage system; the faulty Hard disks should be under the safe custody of Client.

Quarterly maintenance shall include the following as minimum:

- Inspection and confirmation on correct operation of all CCTV equipment's including time synchronization of various security equipment's, recording and storage
- Periodic full system tests to evaluate performance and configuration
- Inspection of field devices and cleaning of cameras, illuminators, etc.
- Rectification and/or reporting of site conditions that may affect the original intended performance or purpose of the camera.

4.2.9 - Power

CCTV equipment's including cameras shall be on essential supply with UPS backup of minimum 30 minutes. 30 minutes backup is based on the condition that UPS is backed up Emergency power supply/ generator and the same will start within 10 minutes of the mains failure. If UPS is not backed up with Emergency power supply/ generator and for locations where the generator start up cannot be guaranteed or with no generator, a UPS with minimum 4 hours backup shall be provided.

Power distribution for cameras shall be from secured locations (security risers & equipment rooms). If power outlets and power supplies are required near field devices, they shall be mounted in fully enclosed enclosures at heights not accessible to general public. External exposed wall mounted power outlets and/or power supplies are not acceptable. Cameras lightings shall be on UPS power.

4.2.10 - Lighting

Well maintained balanced lighting shall be available at areas within the camera's field of view. Following site conditions shall be the key elements that drive the selection of camera, location and type additional illumination.

- Backlighting
- Glare caused by excessive bright light falling on camera lens
- Poor level of lighting or no lighting

The lighting in the cameras field of view shall enable the camera to give acceptable picture under all environmental and working conditions. The maximum to minimum illumination ratio available in the cameras field of view shall be better than 4:1. Cameras sensitivity and spectral response shall match the

lighting source spectrum. Additional lighting shall be considered where camera picture quality is impaired due to the existing lighting conditions. The selection and positioning of visible or non-visible lighting shall meet the safety requirements that prevent damage to eye. Light source shall be away from the camera and near to the object or area that is monitored by the camera.

4.2.11 - Live Monitoring & Control Room Procedures

The control room procedures would be implemented and maintained as following requirements. Security Control room with dedicated personnel recommended to be used for live monitoring of cameras (24 X 7); the operators will be trained for the daily operations and event response. Control room shall be operational to monitor the Client security System. The control room shall be ergonomically designed and shall be located in a secure area. Live monitoring of the Client security system is limited inside the dedicated control room;

The following display pattern is recommended:

- Multiplexed view of max four cameras if 15" Monitor is used
- Multiplexed view of max nine cameras if 17" – 21" Monitor are used
- Multiplex view of max sixteen cameras if 25"- 32"Monitors are used.
- Minimum one monitor is recommended for selective viewing of individual cameras.

Live monitoring shall be real time and of high resolution. The resolution of the monitors shall exceed the highest resolution camera used. The number of monitors in the control room will depend on the number of cameras.

Access control system and log book must be maintained to record visits to Control Room. The control room shall be ergonomically designed and shall be located in a secure area (should not be shared with reception, lobbies, etc.). Monitoring Stations (LCDs, PCs, PTZ joysticks, KVM switches, etc.) should be properly mounted / installed. Camera should be installed inside monitoring room to monitor activity inside.

Dedicated security personnel with Police clearance shall be appointed for live monitoring of cameras. Security operators shall not be allowed to play back recorded images; only head of Client/security can have this privilege and should be logged in log book.

Exporting to any media, taking photos/Screenshot is prohibited inside control room. Mobiles with cameras are not allowed inside control room. All control room activities must be logged in log book and should be available during inspection. Exporting of video to external media should be only performed by head of Client/security if requested and approved by concerned Law enforcement agencies in writing. The operators shall be trained for the daily operations and event response.

Third party visitors are not allowed inside the control room/equipment room; any visitor including the system supplier/integrator would be accompanied by authorized representative from Client and would log the purpose and details of the visit. All the entries to the control room/equipment room would take prior approval from the concerned head of Client/security.

All the data's related with Client security system should keep confidential and it is prohibited to transmit any data including IP details electronically via email to any parties including vendors. Any data related to Client security system must be kept in PC/hard disc which does not have any connectivity to remote/public network.

4.2.12 - Documentation

The Client shall maintain a copy of the following documents and shall be made available to Source/ authorized auditing consultant on request.

- Maintenance contract
- Trade license
- As Built Drawings
- Maintenance /Operational Manuals
- List of people/offices having access to live and recorded video
- Control Room/Equipment room register
- Risk assessment report.

Control room shall have laminated site plan with camera icons and identification numbers.

4.2.13 - 2D Maps (CCTV Layout Drawing)

The Client is requested to submit the AS-Built CCTV Layout drawings/2D maps as per the requirements mentioned by the Source/authorized auditing consultant upon commissioning the system.

The main preparation procedures includes as follows:-

- Scaling the drawings.
- Preparation of Layers.
- Preparation of camera description table.
- Cleaning the drawings with standardized formats of blocks, frame/layout, font/text, walls/lines & hatches.
- Anchoring the drawing in which the drawings has to be positioned as per UTM Coordinates UTM WGS 84.

4.2.14 - Training

Operators shall be trained for normal day to day operation of the CCTV system and for event response. All maintenance staff, in-house or contracted shall be formally trained on the system installed at the facility. At least two representatives from The Client shall be trained to perform system health check, review video recording, etc.

The Client shall maintain all operator and maintenance staff credentials including qualifications, training certificates, past employment history, etc.

4.2.15 - Signage

Advisory CCTV signage shall be installed in locations that make people entering the facility aware that a CCTV system is in operation. The signage shall clearly state "CCTV Cameras in operation" in both English and Arabic with a picture/icon of a camera.

4.2.16 - Pre-approved Manufacturers List

For Servers, Storage, Cameras/Encoders, network components & monitoring equipment's should be from reputed and reliable brands from the industry and as per UTT approved vendor. Material submittal for all equipment's would be submitted to the UTT and the relevant approvals would be taken before the implementation.

4.2.17 - Design, Approval and Integration Processes

Client is requested to complete and submit to the UTT a full detailed technical submittal of their system to obtain the approvals before the project implementation.

This technical submittal would include:

- Client name and address.
- Client security manager and his contact information.
- Client point of contact (POC) for enhancing and integrating the Client CCTV system to the Source system.
- Type and description of the Client system in terms of hardware, software configuration and alarms integration.
- Detailed Bill of Materials of the system.
- Compliance statement as per this publication.
- Camera Layout Drawings showing camera coverage of areas with camera details table (as per the format mentioned in the section Appendix-A on each floor layout). Field of View should be highlighted clearly.
- Schematic Diagram of CCTV system with integration cabinet to Source system & UPS distribution, including actual model/part numbers of equipment's, and Connection of Alarms.
- Storage calculation screen shot from manufacturer.
- Technical data sheets of UTT approved equipment's included in the design.
- Softcopy of Schematic and Camera Layouts.
- Project Organization Chart with CV's of Project Implementation & Maintenance team.

- Detailed work schedule (Design, Delivery, and Implementation & Completion) proposed for the project with step by step description of each task.
- Details of all personnel engaged for integration which should include the Name, Designation, Company Name and Telephone Number.
- Trade License copy of CCTV Installer /Integrator.
- Full detailed list of current Client cameras, their type and installed location.
- Information of Client CCTV system in the attached spreadsheets as per the section Appendix A.
- Copy of Confidentiality Undertaking (Non-Disclosure agreement) signed between the Client and their System Integrator in Integrator's letter head as per the format mentioned under the section Appendix A.

The Client is also required to describe its work plan to implement the CCTV system, by listing the major milestones and their due dates.

After receiving the Client design and implementation plans, the UTT will approve the design and the implementation work plans. Refurbished or 2' hand systems will not be approved.

For the integration of Client CCTV system to the UTT/MCC system; dedicated integration cabinet with Firewall and fiber connectivity would be provided by the Client as per the requirements mentioned in the section Network switches/Firewall.

4 STRUCTURED CABLING SYSTEM FOR RESIDENTIAL BUILDINGS (SCS)

4.1 INTRODUCTION:

To deliver state of the art services from the ONU, a SCS on star topology is required.

The minimum requirement is standard CAT 6 cable with Shielded RJ45 connectivity.

The SCS design shall be discussed and approved by UTT engineering team.

However, the following are the general minimum requirements of Structured Cabling Systems, for provision of service.

4.2 INSTALLATION OF INDOOR FIBER CABLES:

4.2.1 HIGH RAISE BUILDINGS:

The building owner/Developer shall install a minimum of 4 core Single Mode (SM) tight buffer fiber cable G657-B – ITU-T standard as specified in the structure cabling guideline, from ONU enclosure of each flat/premises to the Floor telecom room.

From the Floor telecom room to Main telecom in ground floor a multicore indoor single mode fiber cable shall be provided. Size of the cable from main telecom room to floor telecom room should be equal to (4 x Flats) /premises on the floor plus 2 fibers for smart solutions plus 25% extra for maintenance & unforeseen demand.

Each RTR, and STR rooms must be provided with single mode fiber cable, the size of the cable have to be 24 core connected between MTR room and each RTR, STR room.

All the fiber cables in the Main Telecommunication rooms, Floor Telecommunication rooms and Secondary telecommunication rooms shall be terminated on 19", 24 ports simplex fiber patch panels.

As shown in the tables below, the single mode fiber shall have maximum attenuation of 0.38 dB/km @ 1310 nm and 0.22 dB/km @ 1550 nm in line with ANSI/TIA/EIA-568B1 FO attenuation limits.

	Attenuation/ Km (dB/Km)	Attenuation/optical connector (dB)	Attenuation/joint (dB)	
Min	0.3	0.4	0.02	Best Conditions
Max	0.38	0.6	0.1	Normal

Table 4.2.1a for Wavelength 1310nm

	Attenuation/ Km (dB/Km)	Attenuation/optical connector (dB)	Attenuation/joint (dB)	
Min	0.17	0.2	0.01	Best Conditions
Max	0.22	0.35	0.05	Normal

Table 4.2.1b for Wavelength 1550nm

Figure 5.2.1c shows an example of a typical situation in the field:

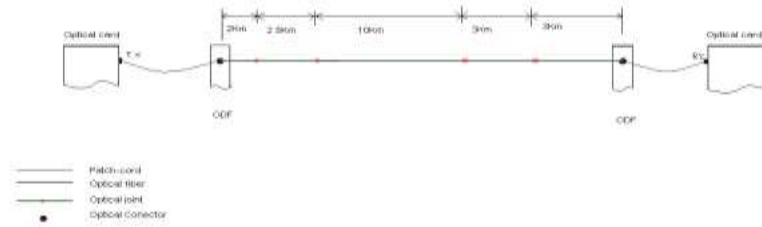


Figure 4.2.1c

The table below shows the size of FO cables that shall be installed according to the numbers of flats for the residential towers.

Termination of these fibers shall be done by the Installer in the wall mounted cabinets and in the ODF cabinets. The Installer must keep an extra length of 5 M of cable either end for terminations. The cables shall be suitably labeled. The supplier must get the approval from UTT before starting the work and test results of installed cables shall be submitted for final approval.

Additional 24 Fibers cables to be provided from MTR in main telecom room to each Secondary telecom room and the roof telecom room for GSM. Fiber termination box to be provided in these rooms and cables should be terminated at both ends with pigtails.

The building owner/developer shall provide 42U Cabinets with standard 19" rack and pre-connected patch panels with SC/APC fan-out cords in main telecom room for termination of main incoming cables to the building and pre connected patch panels with SC/APC pigtails for termination of building distribution cables which are located in adjacent 42U cabinets. Termination of incoming cable from PDP shall be by UTT. Termination of all other fiber cables shall be by owner/installer

Separate cabinets should be provided for UTT incoming fiber cables and building riser fiber cables.

4.3 CIVIL WORKS REQUIRED BY THE CONTRACTOR

4.3.1 BACK BOXES FOR ALL TELECOMMUNICATION OUTLETS:

All back boxes for the Telecommunication sockets must have a minimum of 47mm depth with the entrance of the cable from the top or bottom back side of the box as in the picture below.

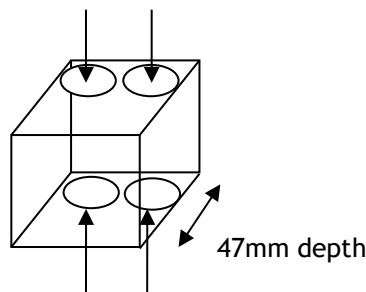


Table 5.3.1a (Standard Back Box for Dual or Single Data Point)

4.3.2 HORIZONTAL PATHWAYS (FROM FTR TO ONU):

- Horizontal Pathways (conduits, Sleeves, Cable trays etc.) are used for pulling the cables from the ONU cabinet to the Telecommunications outlets in the apartment.
- The methods of connecting the (FTR) and the (ONU) can be done only with cable trays or conduits
- In case a cable tray is used for connecting the (FTR) to the (ONU) 200mm sized cable tray shall be installed above the false ceiling from the FTR cabinet up to the entrance of the flat, afterwards 2 x 25mm conduits have to be interconnected between the cable tray and the ONU enclosure having a permanent access panel exactly at the point of the interconnection.
- In case if conduits are planned to connect the (FTR) and the (ONU) then 2 x 25mm conduits shall be installed to connect the FTR with each ONU enclosure (ropes to be inside the conduits for cable pulling). In the ONU side the conduits shall be connected directly up to the ONU enclosure while in the FTR the conduits shall be connected to a cable tray which will be connected to the opening of the wall mounted rack.

4.3.3 CONTAINMENT FOR GSM CABLES:

- 300 mm cable trays shall be installed from the FTR throughout the corridors in a ring shape
- A connection to the inside of each flat is required to be installed with a 100mm cable tray connecting the flats and the ring cable tray which is routed in the corridors. The cable tray shall enter inside the flat through an opening above the main entrance of the flat and stop above the first permanent access panel.

4.3.4 CONDUITS INSIDE THE FLATS:

- All conduits within the flat shall be installed in a star topology method (point to point) from ONU enclosure to each individual outlet.
- The minimum size of a conduit pipe used as a horizontal pathway from the ONU cabinet to the Telecommunications Outlet shall be 2 x25mm (1 inch).
- Each conduit installed shall not have more than 2 bends of 90°
- For the conduits, the inside bending radius should always be at least 10 times the internal diameter.
- Minimum of one nylon draw wire 6 mm at least must be installed in a conduit.
- Pull boxes should be located in a way where they are readily accessible at all times. Pull boxes to be spaced at a maximum of 15 M apart to minimize cable stress during installation and to provide serviceability in the future.
- Conduits must be free from sharp edges, to prevent cable damage during and subsequent to pulling.
- Conduits protruding through a floor should be terminated at a minimum of 50 mm from the floor to prevent water or other liquids from flowing into the conduits.

4.4 COPPER HORIZONTAL CABLING (U/UTP CABLE)

All conductors in each cable should be connected to a single RJ45 connector at the work area outlets and patch panel. Each cable should be terminated to maintain the twists in each pair within 5mm of the termination. Proper strain relief should be provided for the cable at the outlets and patch panel, avoiding strain on the conductors.

Color coding for the termination should be as per the following table.

Pair	Tip	Ring
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown

Table 4.4a (Color coding for termination)

4.4.1 HORIZONTAL CABLING

- The physical topology of the horizontal cabling shall be configured as a star topology with each outlet connected directly to a flat / Apartment Distribution Box inside the Flat or Apartment. No looping of cables from outlet to outlet is permitted.
- The horizontal cabling is to be provided to dual RJ45 angled outlets throughout.
- The length of cable between the farthest Telecommunications Outlet and the ONU enclosure shall not exceed 90m (295 ft.)
- A minimum of two dual Telecommunication Outlets are recommended to be provided for each individual room in different locations. (Living, Dining and bedrooms)
- A minimum of one dual Telecommunication Outlet are recommended to be provided for each kitchen and Maids room if available

4.4.2 CABLING & TERMINATION:

- The Cables used for these wiring must comply with minimum CAT 6 for Broad band services & for telephone standards.
- Horizontal cabling system shall be based on Cat 6 UTP LSZH Shielded as per the design drawings and UTT structure cabling guidelines.
- All the components in the link (Cable, Connectors and cable assemblies) must be shielded in line with this document.

- The SCS cable planned shall meet the designed service requirements within the particular flat level and should have built-in flexibility, to meet growing needs of the tenants.
- All SCS cables shall be properly labeled and terminated, in the RJ45 sockets and in CAT 6 Patch panel by the UTT approved Vendor.
- Building Owner is responsible for replacement of in-building cables and other fixtures, if these become faulty.
- Cable diagrams must be submitted to UTT for approval at the design stage and as-built is required on completion
- The whole SCS cabling (end to end Fiber and Copper) should be purchased from one of the vendors approved by UTT. Mix and match of different brands of cables are prohibited.
- Completed SCS shall be subject to acceptance by UTT. However, the design and performance of the SCS system shall be the responsibility of the installer / Owner
- Any upgrading required in the in-building facility, Telecommunication cables, due to either enhanced demand, change in building status or damage shall be provided by building Owner upon UTT approval.
- The supply and termination of U/UTP cables on Patch panel and sockets locations shall be the responsibility of the vendors approved by UTT.

4.4.3 TELECOMMUNICATION SOCKETS:

All outlets should be Category 6 performance, in a double gang white faceplate. All RJ45 outlets should be fitted with shutters to prevent the ingress of dirt and dust.

- Provision of two dual Sockets for Telecommunication services are recommended to be installed in every room and one dual for the kitchen and maids room. Conduit with not less than 2 x25mm (1 inch) shall be connected between each socket locations and the ONU enclosure.
- All sockets are recommended to have 2 x angled CAT 6 unshielded connectors
- Every socket are recommended to be connected with a minimum of 2 x four pair SCS Cat 6 cable, following are topology with RJ45.

Telecommunication sockets, cables and associated facilities within the various rooms and premises are to be provided by the building Owner.

4.4.4 MODULAR JACKS CATEGORY 6 UNSHIELDED RJ45:

- Modular jacks shall be Category 6 RJ45 meeting the minimum requirements of TIA/EIA 568 B-2.10 and ISO 11801:2002/Amd 2:2010. Modular jacks shall be wired to the T568B wiring pattern.
- Category 6 modular Jacks UTP UNShielded shall be third party component verified for compliance with ANSI/TIA/EIA 568-B.2-10 or ISO11801:2002/Amd 2:2010 category 6 transmission performance Standard.
- All accessory plates are recommended to be Dual. The use of any special faceplate, which may be specific to any other manufacturer's product range, such as brass finish etc. should be reviewed.
- The back boxes dedicated for the CAT 6 sockets shall be 50mm deep as per the drawing shown in the civil requirement

4.4.5 CABLE CAPACITIES IN CABLE TRAYS/CONDUITS:

When the internal cable trays, risers and Ladders etc., are designed, supplied and installed by others, the maximum number of U/UTP cables shall not exceed 75% of the tray . However this need to be reduced in the case of bends and crossovers.

Where an FO Cable block wiring is considered, a very careful consideration must be taken, while designing the system .The owner shall be responsible for the design, supply and maintenance of all related items.

4.4.6 PATCHING:

- The design of patch frame layouts is critical to create a high level of manageability within a compact cabinet, whilst maintaining effective operations when used by the customer.
- All the horizontal copper UTP cabling shall be terminated in 24 port Patch panel, placed inside the ONU cabinet.
- The SCS Contractor shall provide Category 6 LSZH cable assemblies at the ONT and at the Wall Outlets.
- The SCS Contractor shall provide 50%of the total number of the number of wall outlets and 50% of the number of patch panel connectors as per the below length
 - For Wall Outlet, the cable assembly shall be 3m
 - For the ONT the cable assembly shall be 1m
- Category 6 cable assemblies shall be 4-pair RJ45/RJ45 UTP Shielded horizontal cabling, and must be factory terminated.
- Fielded Terminated Cable assemblies are not accepted.

- The SCS Contractor shall provide detailed of FO patching schedule as per the table attached in the last section of the guidelines.

4.4.7 LABELING:

LABEL ELEMENTS

All cabinets, ports, patch panels, outlets, and horizontal cables should be labeled. A typewritten standard labeling system is recommended. The labeling scheme shall be submitted by the contractor for UTT approval at the design stage.

HORIZONTAL CABLE LABELS

The label on all horizontal cables at both ends shall be using a self-laminating, wrap around label.

USER OUTLET LABELS

Each RJ45 user outlet should be labeled with a unique identifier, typically using the agreed scheme.

4.5 BACKBONE CABLING:

4.5.1 RISER (VERTICAL) FIBER CABLING:

The backbone cabling is used to connect the MTR with each FTR in the building using fiber cables. The cables will be running from each MTR through the riser having the dressing done in a neat way where the cables shall be arranged side by side and tightened with Velcro tapes and not with the normal cable ties. The size of the cables pulled shall be as per table no 4.3 in this guideline. All backbone FO cables shall be G-657B standard tight buffer LSZH.

4.5.2 MTR CABINETS

- Building Distribution cabinets: Those 42U free stand cabinets shall be provided in the MTR for terminating the fibers that are connected to each FTR, in case more than one cabinet is required then the arrangement shall be side by side having the patching schedule hanged on the glass door. The cabinets shall be fully loaded with Fiber patch panels, cable managers and SC/APC pig tails.
- UTT Incoming cable cabinets: Those 42U free stand cabinets shall be provided in the MTR for terminating the fibers that are entering the building from the POP room, the cabinets shall be placed opposite the building distribution cabinets and in case more than one cabinet is required then the

arrangement of the UTT Incoming cable cabinets shall be side by side. The cabinets shall be fully loaded patch panels and cable managers identical to the number of the panels in the Building distribution Cabinets. The patch panels shall be provided with fan-out chords (SC/APC) and not pigtails.

- The termination of the Building riser cables and the UTT Incoming cables shall be in FDH rack except for the GSM and Commercial where have to be connected using 10m patch cords that have to be provided by the building owner. **Fiber cable raceways** shall be installed on top of the cabinets in a ring shape to connect the patch cords between both cabinets; the raceways shall be purchased by the approved vendors of UTT only.

4.5.3 TERMINATION

- In the MTR of commercial units the cables shall be spliced with G-657B pigtails in a simplex 24ports FO patch panel, each floor shall have a dedicated patch panel; mixing more than 1 floor in a single patch panel is prohibited. Each GSM/Secondary room shall also be terminated in a dedicated patch panel. The arrangement inside the 42U Rack shall have 2 FO patch panels and 1 Cable manager. The arrangement of the patch panels shall start from the top of the rack

4.6 HORIZONTAL FIBER CABLING:

The horizontal fiber cabling is used for connecting each flat (ONU) with the FTR on every thress floors, each ONU shall be connected with a minimum of a 4C FO cable LSZH G-657B standard tight buffer running through the dedicated conduits/cable trays up to the wall mounted rack in the FTR

4.6.1 TERMINATION ONU SIDE

- The 4 core FO cables that are reaching the ONU shall be terminated in a Fiber premises box containing 2 x SC/APC + 2 x LC/APC adaptors and pigtails, the termination shall be used by the splicing method

4.6.2 TERMINATION FTR SIDE

- The fibers from all ONUs reaching the FTR shall be spliced in the FTR wall mounted cabinet in FO patch panels. A separate patch panel shall be dedicated for those fibers, splicing in the patch panels that is used for the vertical back bone cables is prohibited

4.7 INDOOR CABINETS SPECIFICATION

Depending upon the termination and Patch panel requirement, and to accommodate other active and passive equipment, a Cabinet with standard 19" rack is required, generally complying with the following:-

FREE STANDING TYPES

The free standing types are used in high rise buildings, shopping malls, Hospitals, Airports, Large commercial establishments in Main Telecommunication Rooms.

42U 800mm wide x 800mm deep 19" equipment cabinet

- Glass front door with locks
- Steel doors on the sides and the back
- Air Circulation inside the cabinet
- Openings for cable entry on the top and bottom of the cabinet
- Jacking Feet
- Horizontal cable management
- Vertical cable management
- Bonded to a local earth point
- PDU and other accessories

B) WALL MOUNTED TYPE CABINETS

The wall mounted cabinets shall be installed in the Floor Telecommunication Rooms and the Secondary / GSM Telecommunication Rooms

12U (H) x 600mm wide x 500mm deep 19" equipment Cabinet

- Glass front door with locks
- Steel doors on the sides and the back
- Air Circulation inside the cabinet
- Openings for cable entry on the top and bottom of the cabinet
- Horizontal cable management
- Vertical cable management
- Bonded to a local earth point
- PDU and other accessories

C) INSIDE APPARTMENT CABINETS (ONU ENCLOSURE)

These shall be installed in Flats, Villas, shops, etc. and is flush mounted in the wall, at a common location where all SCS cables, patch panels, fibers, power and ONU equipment are proposed to be installed. The Cabinet shall be exclusive for UTT use and no access to others shall be allowed.

- 24U x 600mm wide x 150mm deep 19" equipment cabinet
- Perforated Front Door with provision for air circulation
- Vertical Cable Management
- Bonded to a local earth point
- RAL 9010 color coding We recommend that the proposed locations of the cabinets have sufficient space around the cabinets to allow access for installation and maintenance and should be located in central locations, where all the terminations of the SCS cables on Patch panels, fiber termination and ONUs, power socket and Battery backup, shall be installed. Refer to the below design of the cabinet

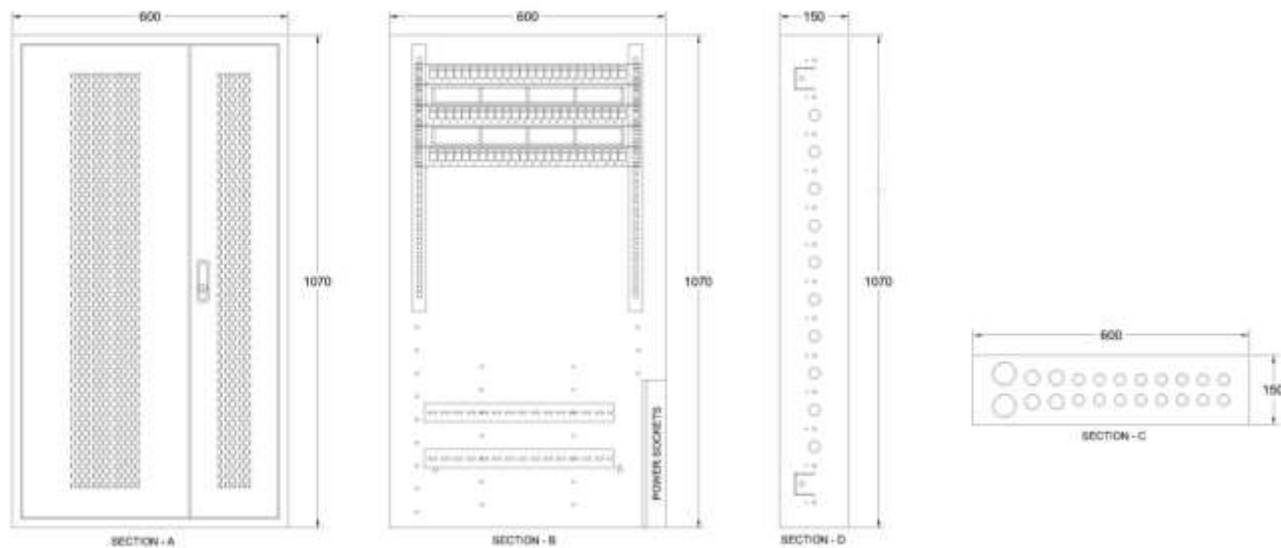


Table 4.7c (UTT Approved Optical Network Unit Enclosure)

5 **STRUCTURED CABLING SYSTEM FOR COMMERCIAL BUILDINGS / OFFICES / RETAIL AREAS (SCS)**

5.1 **INTRODUCTION:**

To deliver state of the art services from the ONU, a SCS on star topology is required either by the developer or by the end user in case of shell & core.

The minimum requirement is standard CAT 6 U/UTP cable with UNShielded RJ45 connectivity that in compliance with the TIA/EIA-568-B.2-10 or ISO 11801:2002/Amd2:2010 standards.

The SCS design shall be discussed and approved by UTT engineering team.

However, the following are the general minimum requirements of structured cabling Systems, for provision of service.

5.2 **INSTALLATION OF IN-BUILDING FIBER CABLES:**

5.2.1 **OFFICE AREAS IN COMMERCIAL BUILDINGS& RETAIL AREAS**

For Shell & Core where the floors of the commercial building is an open space then the building owner/Developer shall install a minimum of 8 core Single Mode (SM) tight buffer fiber cable G657-B – ITU-T standard as specified in the structure cabling guideline for every 50m² in open office areas and for every 100m² in open retail/shops areas, from ONU enclosure of each office to the Floor telecom room on each floor.

For buildings where the tenancy area is known and partitioned already, the building owner/Developer shall install a minimum of 4 core Single Mode (SM) tight buffer fiber cable G657-B – ITU-T standard as specified in the structure cabling guideline, from ONU enclosure of each office/premises to the Floor telecom room.

From the Floor telecom room to Main telecom in ground floor a multicore indoor single mode fiber cable shall be provided. Size of the cable from main telecom room to floor telecom room on each floor should be equal to the number of cores in each office on the floor plus 25% extra for maintenance & unforeseen demand.

All the fiber cables in the Main Telecommunication rooms, Floor Telecommunication rooms and Secondary telecommunication rooms shall be terminated on 19", 24 ports simplex fiber patch panels.

The single mode fiber shall have maximum attenuation of 0.38 dB/km @ 1310 nm and 0.22 dB/km @ 1550 nm in line with ANSI/TIA/EIA-568B1 FO attenuation limits.

Termination of these fibers shall be done by the Installer in the wall mounted cabinets and in the ODF cabinets. The Installer must keep an extra length of 5 M of cable either end for terminations. The cables shall be from UTT approved brand/vendor.

Additional 24 Fibers cables to be provided from MTR in main telecom room to each Secondary telecom room and the roof telecom room for GSM. Fiber termination box to be provided in these rooms and cables should be terminated at both ends with pigtails.

The building owner/developer shall provide 42U Cabinets with standard 19" rack and pre-connected patch panels with SC/APC fan-out chords in main telecom room for termination of main incoming cables to the building and termination of building distribution cables. Termination of incoming cable from POP shall be by UTT. The number of terminations shall be considered the same as the number of cables terminated for the building distribution. Termination of all other fiber cables shall be by owner/installer

Separate cabinets should be provided for UTT incoming fiber cables and building riser fiber cables.

5.3 CIVIL WORKS REQUIRED BY THE CONTRACTOR

5.3.1 BACK BOXES FOR ALL TELECOMMUNICATION OUTLETS:

All back boxes for the Telecommunication sockets must have a min of 47mm depth with the entrance of the cable from the top or bottom back side of the box as in the picture below.

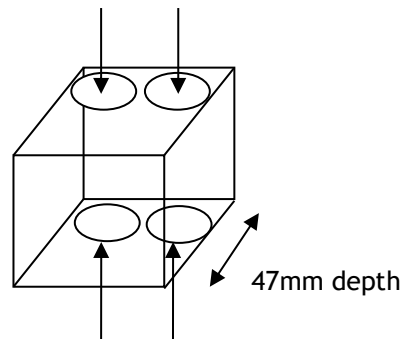


Table 5.3.1a (Standard Back Box for Dual or Single Data Point)

All floor boxes for the Telecommunication sockets shall be compatible for CAT6 U/UTP cables with shielded solution and adequate separation from the power sockets. The floor boxes shall be also compatible with the adaptors and connectors from the approved vendors of UTT

5.3.2 HORIZONTAL PATHWAYS (FROM FTR TO ONU):

- Horizontal Pathways (conduits, Sleeves, Cable trays etc.) are used for pulling the cables from the ONU cabinet to the Telecommunications outlets in the area.

- The methods of connecting the (FTR) and the (ONU) can be done only with cable trays or conduits
- In case a cable tray is used for connecting the (FTR) to the (ONU) 200mm sized cable tray shall be installed above the false ceiling from the FTR cabinet up to the entrance of the flat, afterwards 2 x 25mm conduits have to be interconnected between the cable tray and the ONU enclosure having a permanent access panel exactly at the point of the interconnection
- In case if conduits are planned to connect the (FTR) and the (ONU) then 2 x 25mm conduits shall be installed to connect the FTR with each ONU enclosure (ropes to be inside the conduits for cable pulling). In the ONU side the conduits shall be connected directly up to the ONU enclosure while in the FTR the conduits shall be connected to a cable tray which will be connected to the opening of the wall mounted rack.

5.3.3 CONTAINMENT FOR GSM CABLES:

- 300 mm cable trays shall be installed from the FTR throughout the corridors in a ring shape
- A connection to the inside of each office is required to be installed with a 100mm cable tray connecting the flats and the ring cable tray which is routed in the corridors. The cable tray shall enter inside the office through an opening above the main entrance of the flat and stop above the first permanent access panel.
- For Shell and core and open spaces in the floors the cable trays shall be installed as per the approved design of GSM system by UTT

5.3.4 CONDUITS INSIDE THE OFFICES / RETAIL:

- All conduits within the office shall be installed in a star topology method (point to point) from ONU enclosure to each individual outlet.
- The minimum size of a conduit pipe used as a horizontal pathway from the ONU cabinet to the Telecommunications Outlet shall be 2 x 25mm (1 inch).
- Each conduit installed shall not have more than 2 bends of 90°
- For the conduits, the inside bending radius should always be at least 10 times the internal diameter.
- Minimum of one nylon draw wire 6 mm at least must be installed in a conduit.
- Pull boxes should be located in a way where they are readily accessible at all times. Pull boxes to be spaced at a maximum of 15 M apart to minimize cable stress during installation and to provide serviceability in the future.
- Conduits must be free from sharp edges, to prevent cable damage during and subsequent to pulling.
- Conduits protruding through a floor should be terminated at a minimum of 50 mm from the floor to prevent water or other liquids from flowing into the conduits.

5.3.5 UNDER FLOOR RACEWAY INSIDE THE OFFICES / RETAIL:

- For general office spaces, an under floor raceway system should be used for maximum flexibility when a raised floor is installed
- In multi-channel layouts, separate raceways must be used for telecommunications and electrical power to reduce electromagnetic interference. The dividers for separation of compartments in the raceway should be bonded to ground.

5.4 COPPER HORIZONTAL CABLING (U/UTP CABLE)

All conductors in each cable should be connected to a single RJ45 connector at the work area outlets and patch panel. Each cable should be terminated to maintain the twists in each pair within 5mm of the termination. Proper strain relief should be provided for the cable at the outlets and patch panel, avoiding strain on the conductors.

Color coding for the termination should be as per the following table.

Pair	Tip	Ring
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown

Table 5.4.a (Color coding for termination)

5.4.1 HORIZONTAL CABLING:

- The physical topology of the horizontal cabling shall be configured as a star topology with each outlet connected directly to a Distribution Box inside the office / shop. No looping of cables from outlet to outlet is permitted.
- The horizontal cabling is to be provided to dual RJ45 angled outlets throughout.
- The length of cable between the farthest Telecommunications Outlet and the ONU enclosure shall not exceed 90m (295 ft.)
- A minimum of one dual Telecommunication Outlets shall be provided for each work area
- A minimum of one dual Telecommunication Outlet shall be provided for each kitchen if available and store room if available

5.4.2 CABLING & TERMINATION:

- The Cables used for these wiring must comply with minimum CAT 6 for Broad band services & for telephone standards.
- Horizontal cabling system shall be based on Cat 6 UTP LSZH Shielded as per the design drawings and UTT structure cabling guidelines.
- All the components in the link (Cable, Connectors and cable assemblies) must be shielded in line with this document.
- The SCS cable planned shall meet the designed service requirements within the particular flat level and should have built-in flexibility, to meet growing needs of the tenants.
- All SCS cables shall be properly labeled and terminated, in the RJ45 sockets and in CAT 6 Patch panel by the UTT approved Vendor.
- Building Owner is responsible for replacement of in-building cables and other fixtures, if these become faulty.
- Cable diagrams must be submitted to UTT for approval at the design stage and as-built is required on completion
- The whole SCS cabling (end to end Fiber and Copper) should be purchased from one of the vendors approved by UTT. Mix and match of different brands of cables are prohibited.
- Completed SCS shall be subject to acceptance by UTT. However, the design and performance of the SCS system shall be the responsibility of the installer / Owner
- Any upgrading required in the in-building facility, Telecommunication cables, due to either enhanced demand, change in building status or damage shall be provided by building Owner upon UTT approval.
- The supply and termination of U/UTP cables on Patch panel and sockets locations shall be the responsibility of the vendors approved by UTT.

5.4.3 TELECOMMUNICATION SOCKETS:

All outlets should be Category 6 performance, in a double gang white faceplate. All RJ45 outlets should be fitted with shutters to prevent the ingress of dirt and dust.

- Provision of one dual socket for Telecommunication services should be installed for every work area. Conduit with not less than 2 x 25mm (1 inch) shall be connected between each socket locations and the ONU enclosure.
- All sockets should have 2 x angled CAT 6 unshielded connectors
- Every socket must be connected with a minimum of 2 x four pair SCS Cat 6 cable, following star topology with RJ45.

Telecommunication sockets, cables and associated facilities within the various rooms and premises are to be provided by the building Owner.

5.4.4 MODULAR JACKS CATEGORY 6 UNSHIELDED RJ45:

- Modular jacks shall be Category 6 RJ45 meeting the minimum requirements of TIA/EIA 568 B-2.10 and ISO 11801:2002/Amd 2:2010. Modular jacks shall be wired to the T568B wiring pattern.
- Category 6 modular Jacks UTP UNShielded shall be third party component verified for compliance with ANSI/TIA/EIA 568-B.2-10 or ISO 11801:2002/Amd 2:2010 category 6 transmission performance Standard.
- All accessory plates should be Dual. The use of any special faceplate, which may be specific to any other manufacturer's product range, such as brass finish etc. should be reviewed.
- The back boxes dedicated for the CAT 6 sockets shall be 47mm deep as per the drawing shown in the civil requirement

5.4.5 CABLE CAPACITIES IN CABLE TRAYS/CONDUITS:

When the internal cable trays, risers and Ladders etc., are designed, supplied and installed by others, the maximum number of U/UTP cables shall not exceed 75% of the tray. However this need to be reduced in the case of bends and crossovers.

Where an FO Cable block wiring is considered, a very careful consideration must be taken, while designing the system. The owner shall be responsible for the design, supply and maintenance of all related items.

5.4.6 PATCHING:

- The design of patch frame layouts is critical to create a high level of manageability within a compact cabinet, whilst maintaining effective operations when used by the customer.
- All the horizontal copper UTP cabling shall be terminated in 24 port Patch panel, placed inside the ONU cabinet.
- The SCS Contractor shall provide Category 6 LSZH cable assemblies at the ONT and at the Wall Outlets.
- The SCS Contractor shall provide 50% of the total number of the number of wall outlets and 50% of the number of patch panel connectors as per the below length
 - For Wall Outlet, the cable assembly shall be 3m
 - For the ONT the cable assembly shall be 1m
- Category 6 cable assemblies shall be 4-pair RJ45/RJ45 UTP Shielded horizontal cabling, and must be factory terminated.
- Fielded Terminated Cable assemblies are not accepted.
- The SCS Contractor shall provide detailed of FO patching schedule as per the table attached in the last section of the guidelines.

5.4.7 LABELING:

All cabinets, ports, patch panels, outlets, and horizontal cables should be labeled. A typewritten standard labeling system is recommended. The labeling scheme shall be submitted by the contractor for UTT approval at the design stage.

HORIZONTAL CABLE LABELS

The label on all horizontal cables at both ends shall be using a self-laminating, wrap around label.

USER OUTLET LABELS

Each RJ45 user outlet should be labeled with a unique identifier, typically using the agreed scheme.

5.5 BACKBONE CABLING:

5.5.1 RISER (VERTICAL) FIBER CABLING:

The backbone cabling is used to connect the MTR with each FTR in the building using fiber cables. The cables will be running from each MTR through the riser having the dressing done in a neat way where the cables shall be arranged side by side and tightened with Velcro tapes and not with the normal cable ties. The size of the cables pulled shall be as the calculation based on the number of offices or area in case of open spaces. All backbone FO cables shall be G-657B standard tight buffer LSZH.

5.5.2 MTR CABINETS

- Building Distribution cabinets: Those 42U free stand cabinets shall be provided in the MTR for terminating the fibers that are connected to each FTR, in case more than one cabinet is required then the arrangement shall be side by side having the patching schedule hanged on the glass door. The cabinets shall be fully loaded with Fiber patch panels, cable managers and SC/APC pig tails.
- UTT Incoming cable cabinets: Those 42U free stand cabinets shall be provided in the MTR for terminating the fibers that are entering the building from the POP room, the cabinets shall be placed opposite the building distribution cabinets and in case more than one cabinet is required then the arrangement of the UTT Incoming cable cabinets shall be side by side. The cabinets shall be fully loaded patch panels and cable managers identical to the number of the panels in the Building distribution Cabinets. The patch panels shall be provided with fan-out chords (SC/APC) and not pigtails.
- The connectivity between the Building distribution cabinets and the UTT Incoming cable cabinets shall be connected using 10m patch cords that have to be provided by the building owner. **Fiber cable raceways** shall be installed on top of the cabinets in a ring shape to connect the patch cords between both cabinets; the raceways shall be purchased by the approved vendors of UTT only.

5.5.3 TERMINATION

- In the MTR the cables shall be spliced with G-657/B pigtails in a simplex 24ports FO patch panel, each floor shall have a dedicated patch panel; mixing more than 1 floor in a single patch panel is prohibited. Each GSM/Secondary room shall also be terminated in a dedicated patch panel. The arrangement inside the 42U Rack shall have 2 FO patch panels and 1 Cable manager. The arrangement of the patch panels shall start from the top of the rack

5.6 HORIZONTAL FIBER CABLING:

The horizontal fiber cabling is used for connecting each office (ONU) with the FTR , each ONU shall be connected with a minimum of a 8C FO cable LSZH G-657B standard tight buffer running through the dedicated conduits/cable trays up to the wall mounted rack in the FTR

5.6.1 TERMINATION ONU SIDE

- The 4 core FO cables that are reaching the ONU shall be terminated in a Fiber patch panel containing 4 x SC/APC simplex adaptors and pigtails, the termination shall be used by the splicing method. The patch panel will be installed and located in a 15U wall mounted cabinet.

5.6.2 TERMINATION FTR SIDE

- The fibers from all ONUs reaching the FTR shall be spliced in the FTR wall mounted cabinet in FO patch panels. A separate patch panel shall be dedicated for those fibers, splicing in the patch panels that is used for the vertical back bone cables is prohibited

5.7 INDOOR CABINETS SPECIFICATION

Depending upon the termination and Patch panel requirement, and to accommodate other active and passive equipment, a Cabinet with standard 19" rack is required, generally complying with the following:-

A) FREE STANDING TYPES

The free standing types are used in high rise buildings, shopping malls, Hospitals, Airports, Large commercial establishments in Main Telecommunication Rooms.

42U 800mm wide x 800mm deep 19" equipment cabinet

- Glass front door with locks
- Steel doors on the sides and the back
- Air Circulation inside the cabinet
- Openings for cable entry on the top and bottom of the cabinet
- Jacking Feet
- Horizontal cable management
- Vertical cable management
- Bonded to a local earth point
- PDU and other accessories

B) WALL MOUNTED TYPE CABINETS

The wall mounted cabinets shall be installed in the Floor Telecommunication Rooms and the Secondary / GSM Telecommunication Rooms

12U (H) x 600mm wide x 500mm deep 19" equipment Cabinet

- Glass front door with locks
- Steel doors on the sides and the back
- Air Circulation inside the cabinet
- Openings for cable entry on the top and bottom of the cabinet
- Horizontal cable management
- Vertical cable management
- Bonded to a local earth point
- PDU and other accessories

C) INSIDE OFFICES/ RETAIL CABINETS (WALL MOUNTED RACK)

The wall mounted cabinets shall be installed in the office areas for connection if the office with the FTR, in case of shell & core the cabinets have to be installed as per the regulation of open offices spaces in every 100m². For the known spaces the cabinets shall be installed either in the server room area of the office or in a suitable accessible location

15U (H) x 600mm wide x 500mm deep 19" equipment Cabinet

- Glass front door with locks
- Steel doors on the sides and the back
- Air Circulation inside the cabinet
- Openings for cable entry on the top and bottom of the cabinet
- Horizontal cable management
- Vertical cable management
- Bonded to a local earth point
- PDU and other accessories

6 STRUCTURED CABLING SYSTEM FOR VILLAS / TOWN HOUSES / DUPLEX FLATS (SCS)

6.1 INTRODUCTION:

To deliver state of the art services from the ONU, a SCS on star topology is required.

The minimum requirement is standard CAT 6 U/UTP cable with UNShielded RJ45 connectivity that in compliance with the TIA/EIA-568-B.2-10 or ISO 11801:2002/Amd2:2010 standards.

The SCS design in this section is little different than the previous sections as the FO cables are not included under the building contractor scope. When we talk about villas, only copper cables are required as UTT will be bringing in the Fiber Cable directly from the manhole to the ONU enclosure (customer premises box)

However, the following are the general minimum requirements of structured cabling Systems, for provision of service.

6.2 CIVIL WORKS REQUIRED BY THE CONTRACTOR

6.2.1 Back Boxes for All Telecommunication Outlets

All back boxes for the Telecommunication sockets must have a min of 47mm depth with the entrance of the cable from the top or bottom back side of the box as in the picture below.

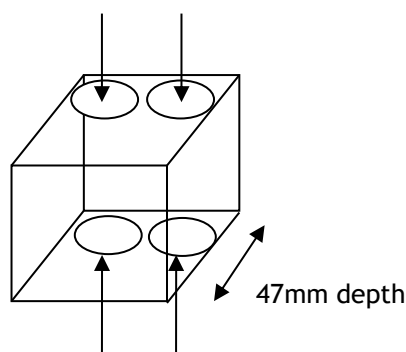


Table 6.2.1a (Standard Back Box for Dual or Single Data Point)

CONDUITS INSIDE THE VILLAS:

- All conduits within the flat shall be installed in a star topology method (point to point) from ONU enclosure to each individual outlet.
- The use of conduits as a horizontal raceway system should only be considered when the outlet locations are permanent, the device densities are low and flexibility is not required.
- The minimum size of a conduit pipe used as a horizontal pathway from the ONU cabinet to the Telecommunications Outlet shall be 2 x 25mm (1 inch).
- Each conduit installed shall not have more than 2 bends of 90°
- For the conduits, the inside bending radius should always be at least 10 times the internal diameter.
- Minimum of one nylon draw wire 6 mm at least must be installed in a conduit.
- In villas or town houses where it consists of more than one floor, all the conduits from upper floors shall be routed to a pull box on that floor and the pull box will be connected vertically in line with all other floors to the level of the location of ONU enclosure. All telecommunication sockets shall be connected to the ONU enclosure.
- Conduits must be free from sharp edges, to prevent cable damage during and subsequent to pulling.
- Conduits protruding through a floor should be terminated at a minimum of 50 mm from the floor to prevent water or other liquids from flowing into the conduits.

6.3 COPPER HORIZONTAL CABLING (U/UTP CABLE)

All conductors in each cable should be connected to a single RJ45 connector at the work area outlets and patch panel. Each cable should be terminated to maintain the twists in each pair within 5mm of the termination. Proper strain relief should be provided for the cable at the outlets and patch panel, avoiding strain on the conductors.

Color coding for the termination should be as per the following table.

Pair	Tip	Ring
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown

Table 6.3a (Color coding for termination)

- The physical topology of the horizontal cabling shall be configured as a star topology with each outlet connected directly to a flat / Apartment Distribution Box inside the Flat or Apartment. No looping of cables from outlet to outlet is permitted.
- The horizontal cabling is to be provided to dual RJ45 angled outlets throughout.
- The length of cable between the farthest Telecommunications Outlet and the ONU enclosure shall not exceed 90m (295 ft.)
- A minimum of two dual Telecommunication Outlets shall be provided for each individual room in different locations. (Living, Dining and bedrooms)
- A minimum of one dual Telecommunication Outlet shall be provided for each kitchen and Maids room if available

6.3.1 CABLING & TERMINATION:

- The Cables used for these wiring must comply with minimum CAT 6 for Broad band services & for telephone standards.
- Horizontal cabling system shall be based on Cat 6 UTP LSZH Unshielded as per the design drawings and UTT structure cabling guidelines.
- All the components in the link (Cable, Connectors and cable assemblies) must be shielded in line with this document.
- The SCS cable planned shall meet the designed service requirements within the particular flat level and should have built-in flexibility, to meet growing needs of the tenants.
- All SCS cables shall be properly labeled and terminated, in the RJ45 sockets and in CAT 6 Patch panel by the UTT approved Vendor.
- Building Owner is responsible for replacement of in-building cables and other fixtures, if these become faulty.
- Cable diagrams must be submitted to UTT for approval at the design stage and as-built is required on completion

- The whole SCS cabling (end to end Fiber and Copper) should be purchased from one of the vendors approved by UTT. Mix and match of different brands of cables are prohibited.
- Completed SCS shall be subject to acceptance by UTT. However, the design and performance of the SCS system shall be the responsibility of the installer / Owner
- Any upgrading required in the in-building facility, Telecommunication cables, due to either enhanced demand, change in building status or damage shall be provided by building Owner upon UTT approval.
- The supply and termination of U/UTP cables on Patch panel and sockets locations shall be the responsibility of the vendors approved by UTT.

6.3.2 TELECOMMUNICATION SOCKETS:

All outlets should be Category 6 performance, in a double gang white faceplate. All RJ45 outlets should be fitted with shutters to prevent the ingress of dirt and dust.

- Provision of two dual Sockets for Telecommunication services should be installed in every room and one dual for the kitchen and maids room. Conduit with not less than 2 x 25mm (1 inch) shall be connected between each socket locations and the ONU enclosure.
- All sockets minimum have 2 x angled CAT 6 unshielded connectors
- Every socket must be connected with a minimum of 2 x four pair SCS Cat 6 cable, following star topology with RJ45.

Telecommunication sockets, cables and associated facilities within the various rooms and premises are to be provided by the building Owner.

6.3.3 MODULAR JACKS CATEGORY 6A SHIELDED RJ45:

- Modular jacks shall be Category 6 RJ45 meeting the minimum requirements of TIA/EIA 568 B-2.10 and ISO 11801:2002/Amd 2:2010. Modular jacks shall be wired to the T568B wiring pattern.
- Category 6 modular Jacks UTP Unshielded shall be third party component verified for compliance with ANSI/TIA/EIA 568-B.2-10 or ISO 11801:2002/Amd 2:2010 category 6 transmission performance Standard.
- All accessory plates should be Dual. The use of any special faceplate, which may be specific to any other manufacturer's product range, such as brass finish etc. should be reviewed.
- The back boxes dedicated for the CAT 6 sockets shall be 50mm deep as per the drawing shown in the civil requirement

6.3.4 CABLE CAPACITIES IN CABLE TRAYS/CONDUITS:

When the internal cable trays, risers and Ladders etc., are designed, supplied and installed by others, the maximum number of U/UTP cables shall not exceed 75% of the tray , However this need to be reduced in the case of bends and crossovers.

Where an FO Cable block wiring is considered, a very careful consideration must be taken, while designing the system .The owner shall be responsible for the design, supply and maintenance of all related items.

6.3.5 PATCHING:

- The design of patch frame layouts is critical to create a high level of manageability within a compact cabinet, whilst maintaining effective operations when used by the customer.
- All the horizontal copper UTP cabling shall be terminated in 24 port Patch panel, placed inside the ONU cabinet.
- The SCS Contractor shall provide Category 6 LSZH cable assemblies at the ONT and at the Wall Outlets.
- The SCS Contractor shall provide 50%of the total number of the number of wall outlets and 50% of the number of patch panel connectors as per the below length
 - For Wall Outlet, the cable assembly shall be 3m
 - For the ONT the cable assembly shall be 1m
- Category 6 cable assemblies shall be 4-pair RJ45/RJ45 UTP Shielded horizontal cabling, and must be factory terminated.
- Fielded Terminated Cable assemblies are not accepted.
- The SCS Contractor shall provide detailed of FO patching schedule as per the table attached in the last section of the guidelines.

6.3.6 LABELING:

LABEL ELEMENTS

All cabinets, ports, patch panels, outlets, and horizontal cables should be labeled. A typewritten standard labeling system is recommended. The labeling scheme shall be submitted by the contractor for UT approval at the design stage.

HORIZONTAL CABLE LABELS

The label on all horizontal cables at both ends shall be using a self-laminating, wrap around label.

USER OUTLET LABELS

Each RJ45 user outlet should be labeled with a unique identifier, typically using the agreed scheme.

6.4 INDOOR CABINETS SPECIFICATION

Depending upon the termination and Patch panel requirement, and to accommodate other active and passive equipment, a Cabinet with standard 19" rack is required, generally complying with the following:

A) INSIDE APPARTMENT CABINETS (ONU ENCLOSURE)

These shall be installed in Flats, Villas, shops, etc. and is flush mounted in the wall, at a common location where all SCS cables, patch panels, fibers, power and ONU equipment are proposed to be installed. The Cabinet shall be exclusive for UTT use and no access to others shall be allowed.

- 24U x 600mm wide x 150mm deep 19" equipment cabinet
- Perforated Front Door with provision for air circulation
- Vertical Cable Management
- Bonded to a local earth point
- Ral-1013 color coding

We recommend that the proposed locations of the cabinets have sufficient space around the cabinets to allow access for installation and maintenance and should be located in central locations, where all the terminations of the SCS cables on Patch panels, fiber termination and ONUs, power socket and Battery backup, shall be installed. Refer to the below design of the cabinet

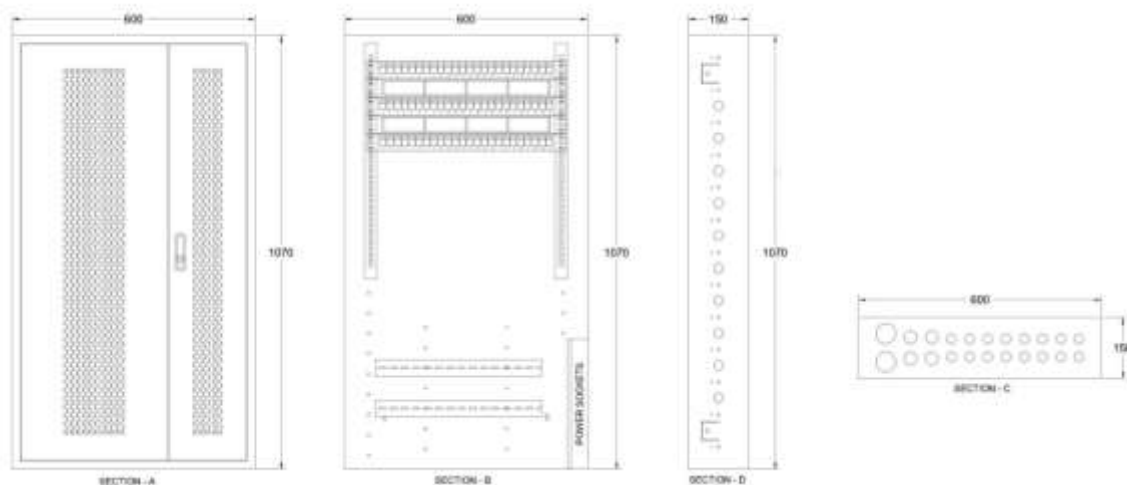


Table 6.4a (UTT Approved Optical Network Unit Enclosure)

7 PROTECTION FROM ELECTROMAGNETIC INTERFERENCE

The following requirements apply to UTP cabling, as pathways and spaces used to carry or house Telecommunications Cabling

- The proximity of cabling to electrical facilities and equipment that generate high levels of electromagnetic interference (EMI) should be taken into account for metallic cabling.
- Sources of EMI include : Power Cables, Photocopy equipment, electric motors, transformers, fluorescent lighting, arc welders and induction heaters etc.
- To avoid EMI, the Telecommunications pathways, spaces and metallic cables shall be installed with the following clearances :
 - 1.2 m (4 ft.) from large motors or transformers
 - 0.3 m (1 ft.) From conduit and cables used for electrical power distribution.
 - 12 cm (5 in) from fluorescent lighting.
- Pathways and metallic cables shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.

7.1 SEPARATION DISTANCE FROM POWER SOURCE:

During the design stages, separation of power and the Structured Cabling Systems (SCS) must be considered. Shielded data cables should not be installed near sources of electromagnetism. The following are a general guideline:

Typical Building Environment, Minimum Separation Distance from Power Source < 480V

Condition	<2kVA	2-5kVA	5kVA
Unshielded power lines or electrical equipment in proximity to open or non-metal pathways	130mm	300mm	600mm
Unshielded power lines or electrical equipment in proximity to grounded metal conduit pathway	65mm	155mm	300mm
Power lines enclosed in a grounded metal conduit (or equivalent shielding in proximity to grounded metal conduit pathway)	50mm	155mm	300mm
Transformers and Electric Motors	1M	1M	1M
Fluorescent lighting	300mm	300mm	300mm

Table 7.1 (Separation Distance from power source)

8 PRIVATE BRANCH EXCHANGE (PBX), SWITCHES & SERVERS

A **private branch exchange (PBX)** is a telephone exchange that serves a particular business or office, as opposed to one that a common carrier or telephone company operates for many businesses or for the general public. PBXs are also referred to as:

- **PABX** – private automatic branch exchange
- **EPABX** – electronic private automatic branch exchange

PBXs make connections among the internal telephones of a private organization—usually a business—and also connect them to the public switched telephone network (PSTN) via trunk lines. Because they incorporate telephones, fax machines, modems, and more, the general term "extension" is used to refer to any end point on the branch.

If the customer is having his own PBX, servers and networking system then a server room is required to place all the equipment. In this case the ONU(s) shall be installed on a shelf in the server rack having the FO cables from the FTR spliced in a Fiber patch panel.

9 TESTING

Testing of the copper cables and the Fiber cables is essential to obtain the BCC for the building

All copper cables shall be tested using Fluke DTX-1800/SYN power meter or higher version using the T568-b, TIA CAT6 Channel testing standard and the type of cable depending on what is installed on site.

All fiber cables shall be tested using Fluke DTX-1800/SYN power meter or higher version with DTX-SFM2 fiber modules with SC/APC adaptors.

All fiber links end to end testing shall be done as per the following:

1. End to end testing of back bone cables from MDF to ONU
2. End to end testing of spare back bone cables from MDF to FTR
3. End to end testing of GSM fiber cables from MDF to STR

Fluke Fiber backbone testing requirements:

Limit Loss Formula (budget loss / Limit loss):

a: For single fiber cable on 1310 nm

$(\text{Total no of adapters SC/APC} * 0.4\text{dB}) + (\text{Total no of splice} * 0.02\text{dB}) + (\text{Total length in KM} * 0.25\text{dB})$

b: For ribbon fiber cable on 1310 nm.

$(\text{Total no of SC/APC adapters} * 0.4\text{dB}) + (\text{Total no of splice} * 0.15\text{dB}) + (\text{Total length in KM} * 0.25\text{dB})$

Note: The limit loss from MTR to ONU shall be less than 2.16dB

All testers shall be calibrated up to date for both copper and fiber testing; calibration certificates have to be submitted along with the testing results.

All testing results shall be submitted in a soft copy with the original .flw file and a summary in a hard copy.

10 IMPORTANT NOTES

- 1) UTT design guide explains in general, all Authorities requirements that will facilitate the provision of Smart City Infrastructure to new buildings, yet the requirements indicated in the 'NOC' (No Objection Certificate) should be fully complied.
- 2) Approved Brands must be followed to obtain 'NOC' (No Objection Certificate)' upon successful inspection of the project. See Table 13
- 3) Architects/Consultants/Designers must liaise with UTT at the design stage and obtain UTT approval on the final Design Drawings. UTT approvals shall be valid for one year from the date of the approval.
- 4) Minimum two sets of SCS & ELV design drawings, must be submitted for study and approval, before tendering, the submission shall be done through the proper channel
- 5) Minimum two sets of SCS & ELV shop drawings shall be submitted for study and approval after awarding the contractor the project
- 6) Where deviations/comments/amendments are advised on the Design, Drawings must be corrected and re-submitted for approval.
- 7) One set of approved 'As-Built' drawings must be submitted along with the Building Completion Certificate, which will be certified by UTT.
- 8) UTT through its certified vendors will supply and install all the structured cabling & ELV (CCTV & Access Control System) equipment in line with other authority regulations after receiving confirmed order from Owner/Developers/Contractor.

this scope is not allowed to be carried out by any other party. Optional systems (Intercom, Gate Barrier & Digital Signage can be carried out by client in accordance with UTT approved brands and specification)
- 9) On completion of the requirements, any comments and snags advised by UTT Building Inspector must be attended to by the Contractor or Owner of the building, soon to avoid delays in the issuance of the Building Completion Certificate.

11 REQUIRED DOCUMENTATION FOR DRAWING APPROVAL

- For Al Reem Island, all drawings to be submitted through M/s Bunya.
- For Rawdhat Abu Dhabi, all drawings to be submitted by consultant directly.
- All drawings must be submitted in Box Type drawing cases separately for ELV & TELECOMMUNICATION

Smart Building Infrastructure Drawing approval	
1)	Cover letter from Consultant with drawing reference for each sheet
2)	Two hard copies of Telephone & ELV drawings with soft copies in two separate hard box files clearly labeled with Sector & Plot
3)	All contact information for Main contractor, MEP contractor and Consultant to be included along the cover letter.
4)	UTT Cable entry diagram to be submitted showing the sector and plot manhole connection as well as entry sleeves (Main & Diversity)
5)	Soft Copy of Architectural Building Design (Required for GSM Design)

Table 11.0 UTT Smart Building Infrastructure drawing approval documentation requirements

12 REQUIRED DOCUMENTATION FOR HANDOVER (PROJECT COMPLETION)NOC / BCC ISSUANCE

12.1 Design Stage (before starting construction)

- 1) Design Drawings approval form signed and stamped
- 2) Duct connection drawings showing the sections and elevations
- 3) 2 sets of the design drawings stamped by the consultant
- 4) 1 CD with the CAD drawings, CD shall be labeled with all the details
- 5) Contact list as per table 11.0

12.2 Mock up inspection

- 1) Mock up inspection request form signed and stamped
- 2) 2 sets of Shop Drawings (as per approved design drawings) signed and stamped by the consultant, main contractor and MEP contractor
- 3) Layouts showing the cabinet arrangement / under raised floor cable trays and overhead cable trays for all Telecommunication rooms
- 4) 1 CD with the CAD drawings, CD shall be labeled with all the details

12.3 Final inspection stage

- 1) Final inspection request form signed and stamped by all parties
- 2) Before backfilling of the duct connection to the building, UTT supervisor should be informed for inspection and approval
- 3) 2 sets of As Built Drawings (as per approved design drawings and shop drawings) signed and stamped by the consultant, main contractor and MEP contractor
- 4) 1 CD with the CAD drawings, CD shall be labeled with all the details
- 5) Contact list of the concerned engineers (Facility Management, Main contractor & MEP contractor)
- 6) Patching Schedule of the FO Back Bone as per UTT sheet
- 7) Labeling Scheme
- 8) Original Fluke testing results files for the copper and fiber back bone as per the testing procedure in section 9.0
- 9) Handover of all required copper and fiber patch cords

12.4 Building Completion Certificate (BCC)

- 1) All of the above fully complied 100%
- 2) 25 Year Warranty Certificate issued by the Vendor for the specific project
- 3) A copy of the keys/Access Cards for all MDF, FTR, STR rooms (labeled)
- 4) A copy of the keys for all Cabinets (labeled)

13 EXAMPLES OF RELATED DOCUMENTS AND TABLES

Table 13.0 UTT Smart Building Infrastructure SCS Requirements

Table 13.0 UTT Smart Building Infrastructure SCS Requirements (Continued)

Table 13.1a (Example of Patching Schedule Format)

	Single Villa	Complex of Villas	Building Up to (G+20)	Building more than (G+20)	Shopping Malls	Palaces, Hospitals & Hotels	Group of Shops & Sheds	Group of Warehouses
Entry Box	Size: 600mmx600mm800mm	Size: JRC-12 Joint Box	Size: JRC-12 Joint Box	Size: JRC-12 Joint Box	Size: JRC-12 Joint Box	Size: JRC-12 Joint Box	Size: JRC-12 Joint Box	Size: JRC-12 Joint Box
Entry Pipes / Duct	2x100mm	2x100mm	2x100mm	2x100mm	2x100mm	2x100mm	2x100mm	2x100mm
Main Telecom room Distribution Cabinet std 19" Rack	Not Required	42U (800 x 800mm) Stand alone type	42U (800 x 800mm) Stand alone type	42U (800 x 800mm) Stand alone type	42U (800 x 800mm) Stand alone type	42U (800 x 800mm) Stand alone type	42U (800 x 800mm) Stand alone type	42U (800 x 800mm) Stand alone type
Floor Telecom room Distribution Cabinet 19" Rack	Not Required	Not Required	12U (600 x 500mm) Mounted type	12U (600 x 500mm) Mounted type	12U (600 x 500mm) Mounted type	12U (600 x 500mm) Mounted type	12U (600 x 500mm) Mounted type	No Requirements
Secondary / GSM / Roof Top Telecom Room Distribution Cabinet 19" Rack	Not Required	Not Required	12U (600 x 500mm) Mounted type	12U (600 x 500mm) Mounted type	Not Required	12U (600 x 500mm) Mounted type	No Requirements	No Requirements

ONU Enclosure by approved UTT Vendors	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)	24U (H) x 600mm (W) x 150mm (D)
Junction Box (Floor Box Size)	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm	Size: 30 x30 150cm box in each floor, at height between 40 to 120 cm
POP Room	No Requirements	No Requirements	No Requirements	No Requirements	No Requirements	No Requirements	No Requirements	No Requirements
Main Telecom Room Size	No Requirements	To be decided on Design Stage	Size: 2m x 2m x 3m	Size: 3m x 3m x 3m	Size: 3m x 3m x 3m	Size: 3m x 3m x 3m	Size: 3m x 3m x 3m	Size: 2m x 2m x 3m
Floor Telecom Room Size	No Requirements	To be decided on Design Stage	Size: 0.6m X 1m X 3m	Size: 1m X 1m X 3m	Size: 1.5m X 1.5m X 3m	Size: 2m x 2m x 3m	To be decided on Design Stage	To be decided on Design Stage
Secondary / GSM Telecom Room Size	No Requirements	No Requirements	Size: 3m x 3m x 3m	Size: 3m x 3m x 3m	To be decided on Design Stage	To be decided on Design Stage	NA	NA
Roof op Telecom Room Size	No Requirements	No Requirements	Size: 3m x 3m x 3m	Size: 3m x 3m x 3m	To be decided on Design Stage	To be decided on Design Stage	NA	NA
Riser Cable Trays	2X50mm	2X50mm	1No. 450mmX50mm for fix service & 1No.300mm X50mm for IBS (GSM)	1No. 450mmX50mm for fix service & 1No.300mm X50mm for IBS (GSM)	1No. 450mmX50mm for fix service & 1No.300mm X50mm for IBS (GSM)	1No. 450mmX50mm for fix service & 1No.300mm X50mm for IBS (GSM)	1No. 450mmX50mm for fix service & 1No.300mm X50mm for IBS (GSM)	To be decided on Design Stage