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UT Technology
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UT TECHNOLOGY

SMART BUILDING INFRASTRUCTURE GUIDELINES

UTT Design guide requirements for Smart City Services

Revision 8.1

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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.

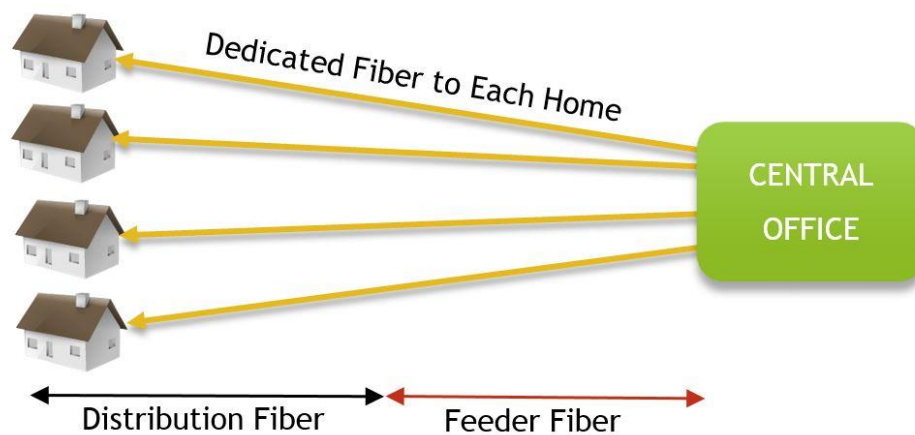


Figure 1.1 (Point to point (PTP) network)

- **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.

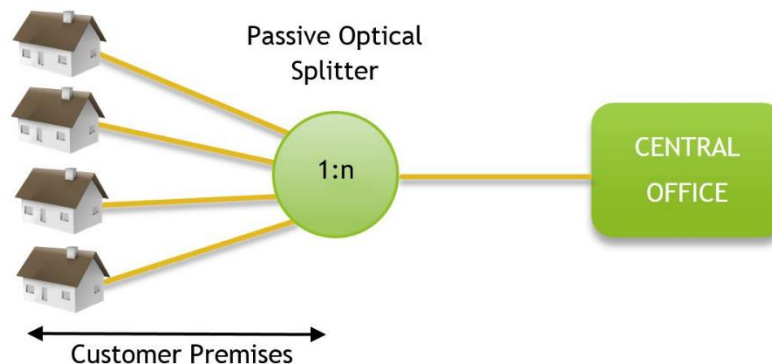


Figure 1.2 (Principle layout of passive optical network)

1.3 INTRODUCTION TO ELV SYSTEMS

With technology moving forward at a fast pace, the Extra Low Voltage system becomes essential in new buildings.

In terms of offering integrated services, UTT has set to provide the minimum requirements for deploy & develop ELV systems, the following are the minimum systems to be considered for a new building:

1.3.1 IP CCTV:

CCTV is an essential system in all new buildings with the goal to improve safety & security, reduce man-power security, reducing violence & keeping evidence about any incidents.

General IP CCTV topology:

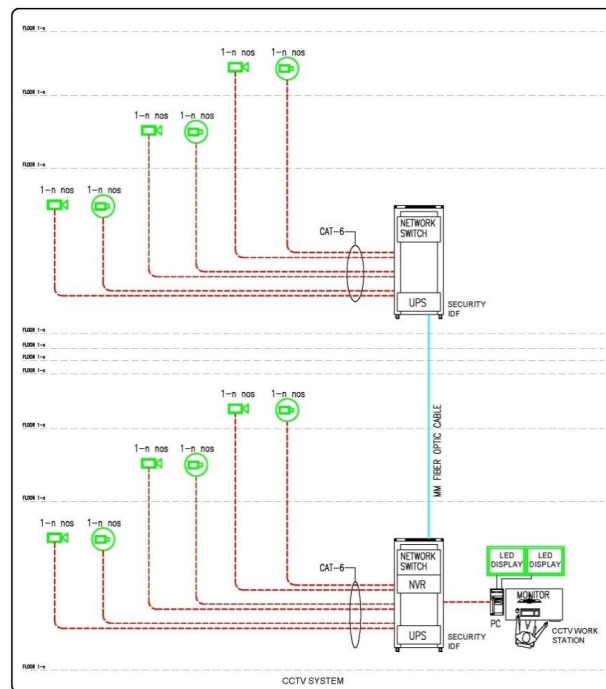


Figure 1.3.1 (Principle layout of CCTV system)

1.3.2 Access Control System (Common Areas):

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:

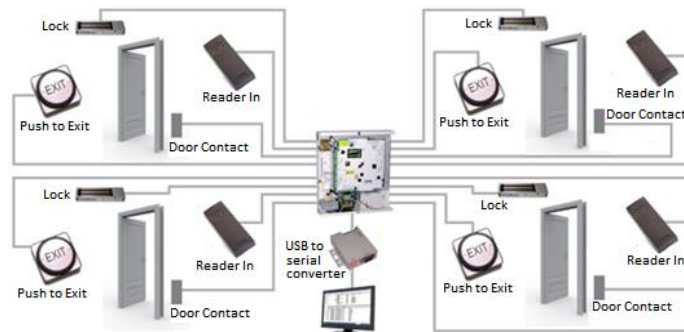


Figure 1.3.2 (Principle Access Control Layout for Common Areas)

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:

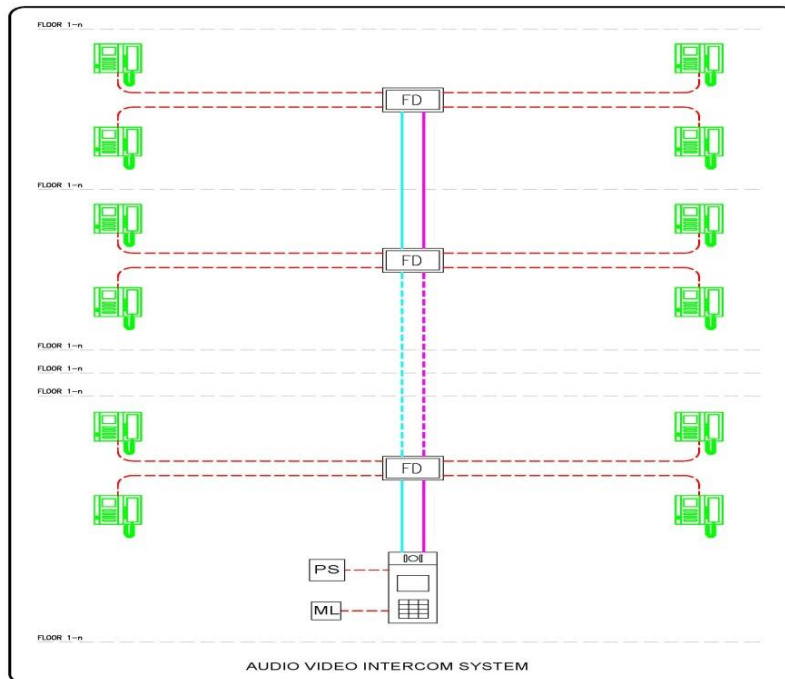


Figure 1.3.3 (Principle layout of A/V Intercom System)

1.3.4 Gate Barrier & Parking Management System:

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

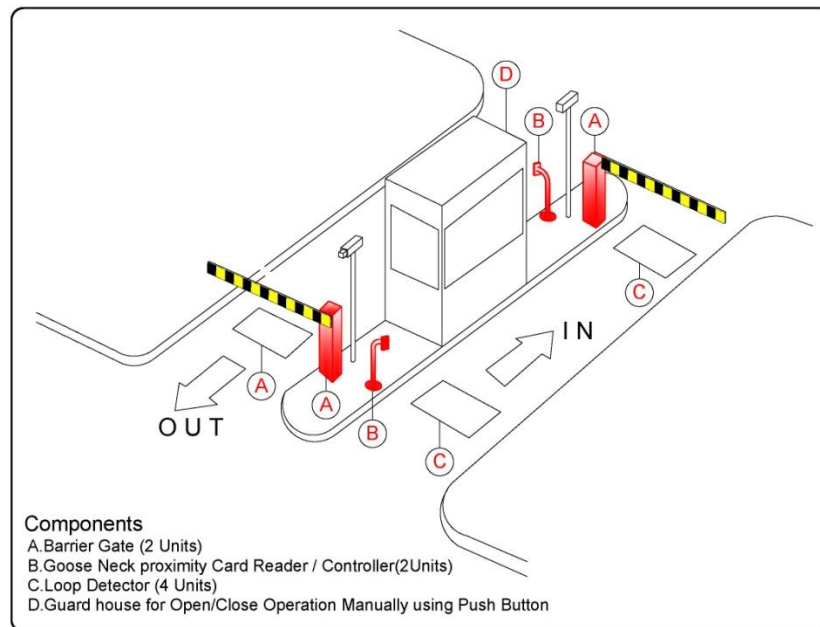


Figure 1.3.4 (Principle layout of Gate Barrier System)

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

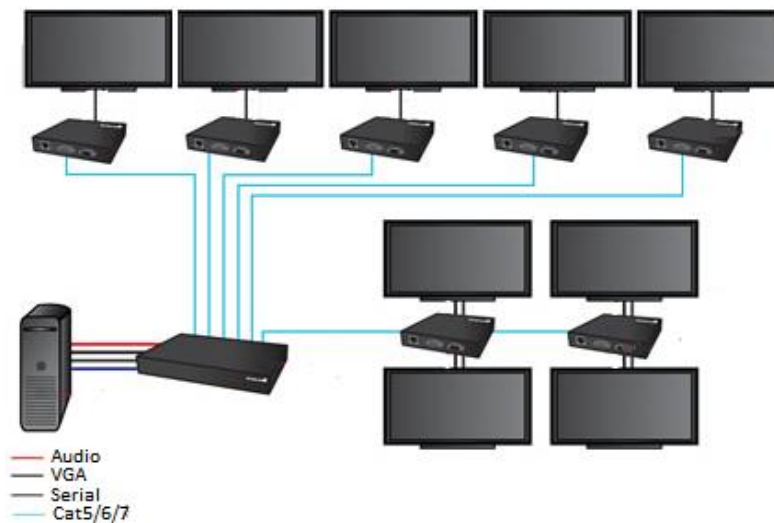


Figure 1.3.6 (Principle layout of multiple Digital Signage Units)

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 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 shall 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 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.
- If the ELV room is proposed in the basement, an automatic sump draining system shall be provided to handle water seepages.
- ✓ For the Main ELV Room size, please refer Table No. 14.0 (as per MTR room size)

MEP Requirements for MER:

1. Each ELV service has to have dedicated AC Electric Power Sockets 13A – 3 Nos.
2. Grounding earth bar: Dedicated AC clean earth & DC clean Earth bar – 2 Nos. each
3. 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 a dedicated room and required 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 (refer. 2.1.4).

- All floor ELV rooms shall be vertically aligned.
- If floor ELV room cannot be provided directly above the Main ELV room, then the distance between the floor ELV room and the main ELV room shall not exceed 40m (meters).
- 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 or under CCTV camera coverage.
- The room must be air-conditioned.
- The floor ELV 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 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".
- ✓ For the floor ELV room size, please refer Table No. 14.0 (same for FTR size)

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 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 ELV Room.
- Right angle or sharp bends are to be avoided. Not more than one reroute for the vertical riser is allowed.
- 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 FLOOR DISTRIBUTION BOX (PULL BOX):

Pull Boxes are metallic boxes, concealed, located on the wall, where the internal conduit from every ELV point is terminated. These empty boxes shall be located close to the risers and the cabinet and can be more than one, depending upon the number of ELV Services in Each floor.

- The Distribution Boxes shall be of size not less than 30(L) X 30(H) X 15(D) cm flush or wall mounted on the wall and shall be fixed inside the Floor ELV room of each floor. A suitable cover shall be provided.
- The installation height is at a height of 120 - 170 cm above the finished floor level.
- The conduits leading from the floor distribution Box towards each ELV point shall not be less than 25 mm diameter for each ELV Service Point.
- Adequate safe working space is to be provided around each location.
- The Distribution Boxes location should never be near any Electrical Junction Box or Bus bars. Adequate safe working space should be provided in front of each Box.
- UTT shall be consulted to enhance the requirements, if the building is designed for commercial use.

2.1.6 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 NDC/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 please refer to Table No. 14.0

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 600mm 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, please refer to Table 14.0

2.2.4 MAIN TELECOMMUNICATION ROOM (MTR):

Main Telecom room shall 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.
- The room must have an anti-static "raised floor" of minimum 30 cm.
- 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 FM200 firefighting.
- If the Telecom room is proposed in the basement, an automatic sump draining system shall be provided to handle water seepages.
- The Duct entry to building shall be sealed air and water tight.
- ✓ For the Main Telecom Room size, please refer Table No. 14.0
- 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. Under raised floor cable trays for the building distribution and the incoming cable. 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:

- I. 2 Units of 6-way AC Power Distribution Board having 160 Amps MCCB Incomer as Mains incomer, Surface mounting, TP + N & E, rated 415 volts AC supply fed from essential building power.

Each DB having:

- A) 160 amps, TP incomer MCCB – (Adjustable from 125 to 160A)
(TP + N + E) – 1 No.

Note: Proposed Incomer cable should be minimum 70sq.mm XLPE 4 core with Separate Earth.

- B) TP outgoing MCCB rating 63 Amps – 4 Nos. (Adjustable from 63 to 100A)

C) SP outgoing MCCB rating 10, 20, 30 Amps – 2 Nos. each

(MAKE: Square D, Merlin Gerin or Equivalent)

(Plug in type MCCB preferred e.g. 1 Line Square D

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 4 (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
- The room shall be equipped with CCTV monitoring system
- The room shall be equipped with Access control system

MEP Requirements for each STR:

1. 2 Units of 4 way AC power Distribution Board having 63 Amps RCD Incomer as Mains incomer, Surface mounting, TP + N & E, rated 415 volts AC supply fed from essential building power

Each DB having:

- A) 63 amps, TP incomer RCD 300 mA – 1 No
- B) TP outgoing MCB rating 32 Amps – 2 No
- C) SP Outgoing MCB rating 10, 20, 30 Amps – 2 No each

(MAKE: Square D, Merlin Gerin or Equivalent)

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.
- The floor telecom room, shall not be linked to or serve any other floor of the building and any other ELV cables are prohibited to be in the FTR.
- 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 should be consulted to enhance the requirements, if the building is designed for commercial use.
- The room shall be equipped with Access control system provided by UTT
- For the floor telecom room size, please refer Table No. 14.0

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 should 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 FM200 fire fighting
- The minimum size of the room is 3 (L) x 4 (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.
- The room must have an anti-static "raised floor" of minimum 30 cm
- The room shall be equipped with CCTV monitoring system
- The room shall be equipped with Access control system
- The room shall have adequate lighting

MEP Requirements:

1. 2 Units of 4 way AC power Distribution Board having 63 Amps RCD Incomer as Mains incomer, Surface mounting, TP + N & E, rated 415 volts AC supply fed from essential building power

Each DB having:

- D) 63 amps, TP incomer RCD 300 mA – 1 No
- E) TP outgoing MCB rating 32 Amps – 2 No
- F) SP Outgoing MCB rating 10, 20, 30 Amps – 2 No each

(MAKE: Square D, Merlin Gerin or Equivalent)

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°C ± 1°C

2.2.8 POINT OF PRESENCE ROOM (POP Room):

POP room is to be provided in addition to MTR and shall be required in all the buildings having more than 40 floors in total located preferably in the Ground Floor area or 1st basement.

The size of the POP room shall be minimum 12m(L) x 16m(W) x 3m(H), further agreements on the exact size shall be appointed during the design drawings approval stage.

The size of the rectifier / UPS battery room shall be provided near the POP room with a minimum size of 8m (L) x 6m (W) x 3m (H)

POP room shall be a dedicated room exclusive use of UTT. All MEP requirements mentioned below should be provided.

A) Air Conditioning System :

- Basic cooling demand for the POP room shall not be less than 1500 watts/sqm; however this will be revisited based on the proposed Telecom equipment heat dissipation. The temperature to be maintained between $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and relative humidity shall be 50 – 55%.
- Close Control Air Handling units (could be chilled water system based (or) DX split type), preferably down air discharge type.
- N + 1 operational philosophy of the A/C equipment to be configured.
- Dual source of power supply to feed the A/C units ensuring redundancy in case of mains power.
- DC or UPS equipment must be segregated from Telecom equipment as the above cooling demand limited to telecom equipment only.
- Additional cooling for DC and UPS room to be provided if separate DC and UPS rooms are considered and to maintain a temperature between $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and relative humidity shall be 50 – 55% with N+1 configuration.

I. Power Requirement :

1. Dedicated space/room shall be allocated to install DC plant / UPS equipment. Size of room shall be decided based on equipment requirement.
2. Floor loading of the above room/space shall not be less than 3000 kg/sqm.
3. Main AC Input Dist. Board shall be provided with 2x200 Amp MCCB as incomers in case of 1200 Ampere DC plant and 2x400 Amp. MCCB as incomers in case of 2400 Ampere DC plant, as applicable based on Telecom equipment load demand.
4. Dual source of power supply to feed the above DC plant AC Input DB, as one feeder from the mains power section and other feeder from standby generator board section of the Main LV Switch Board.
5. DC plant room temperature to be maintained in between 20 to 22°C and relative humidity shall be 50 to 55% and the cooling demand based on the DC plant (Batteries & Rectifiers) is 750 watts/m². If UPS equipment is to be installed in the same room then the cooling requirement is 1000 watts/m².
6. 2 Nos. earth terminal conductors shall be provided and connected to separate earth pits with less than 1Ω resistance. This arrangement is applicable for both POP room & DC plant room. The copper earth bar dimensions: 500mm x 50mm x 10mm, mounted on standard insulator assembly with 10 Nos. 10mm pre-drilled holes.
7. 5 Nos. 13 Amps. Twin switch socket outlets (with neon indicators) to be provided in the DC plant room and POP room combined.
8. One Telephone outlet to be provided in POP room.
9. Required cable openings shall be provided between DC plant room & POP room as mentioned below with fire sealant:
 - Option A: 450 x 250mm wall/ceiling opening (OR)
 - Option B: 6 Nos. 200mm UPVC ducts between the rooms.

All other openings in and out of the POP/DC rooms shall be sealed with approved material by civil defense.
10. Suitable hot dipped galvanized iron cable ladders shall be provided for Power and fiber cable entry opening/point at ceiling level to floor bottom vertically. Proper floor sealant "Cable boots/cable seals" shall be provided to prevent air leak to space.
11. Necessary G.I heavy duty cable trays shall be provided in POP room below the Raised floor for DC power distribution and it shall match with the telecom equipment/racks layout.
12. The size of the cable tray is 450mm x 50mm.

13. Dedicated cable trays (450mm x 50mm) shall be provided for Fiber Optic cables below Raised floor in coordination with telecom equipment / racks layout.

B) Mains Power /Distributions :

Main LV Switch board of the building/tower/project which is feeding UTT POP room & DC plant room should have two sections with common Bus bar and interlocking facility and Section-1 shall be fed from Service Authority (M/s. ADDC, DEWA, SEWA & FEWA, etc.) power source and Section-2 by Standby generator respectively. In case of mains power failure standby generator will be able to start automatically and provide backup power to the connected "Electrical and HVAC" loads of the related to POP & DC plant rooms.

C) Fire Detection & Fire Protection System :

POP room & DC plant room should be protected by "Double knock" Fire Detection System interfaced with Auto Fire Protection/Suppression Systems.

The above fire services control panel shall be interfaced with the Mechanical equipment controllers/control panels (Air Conditioning equipment, Motorized Fire dampers, Ventilation Fans, etc.) and as well as with Building Management System/ existing fire alarm control panel, as applicable.

D) Raised Flooring System :

a) POP room shall be provided with non-combustible modular type CaSO_4 / CaSi_3 Raised access flooring system with antistatic 2mm thick PVC top covering ranges between 500mm and 1000mm high depending on the size of POP with adequate perforate tiles to allow the cold air distribution. The perforated tiles shall be arranged in parallel to the cold air flow to achieve the Cold Aisle / Hot Aisle configuration.

b) DC plant room shall be provided with antistatic fire retardant PVC flooring.

E) Water Leak Detection System :

POP room shall be provided with Intelligent Water Leak Detection system and associated control panel. The system shall be provided below Raised floor. Also the water leak detection system shall be interconnected to Building Management System or remote sounder at watchman area as applicable for monitoring/ alarming.

It shall be ensured by all concerned that the POP room & DC plant room shall be properly protected against any water leakage / seepage prior to equipment installation.

F) Doors & Floors Loading :

POP room & DC plant rooms' entrance doors shall have a clear opening of 2200mm (width) x 2700mm (height) having the labels as UT POP Room

Floor loading for the POP room shall be 1000 kg/m² & DC plant room shall be 3000 kg/m².

G) Door Access Control System:

Access doors for the POP room & DC plant rooms shall be provided with Security Systems (Access Control and CCTV) at the Entry doors, gates, etc. To restrict the entry to authorized personnel only and adequate CCTV cameras shall be provided to monitor the activities in and around the rooms.

The Access Control & CCTV systems shall be connected to Etisalat Enterprise solution System Platform and shall be dually monitored by central Monitoring Station(s) and local Region Monitoring Station and/or BMS in the same building-if any-]

Adequate internal and external lighting shall be provided to allow for CCTV system to have clear vision of the inside and outside area surrounding the POP Room.

H) Lighting :

Adequate lighting (Minimum 300Lux) shall be provided inside POP & DC plant rooms. Also sufficient Emergency version fittings (provided with self-contained battery pack suitable for 3 hours duration) shall be provided. Maintained 3 hours Exit lights shall also be provided at the exit doors of the POP & DC plant rooms.

2.2.9 PEST CONTROL

All Telecommunication 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 telecommunication rooms & pathways. All cable entries should be properly sealed before & after laying cables. Cable trays may be provided with removable covers & sealing the ends.

2.2.10 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-1 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 interconnected 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 2 x (600mm x 50mm) cable trays for the telecommunication cables and 1 x (300mm x 50mm) for GSM cables

2.2.11 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.
- Three 3Amp 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.

2.2.12 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.
- Adequate lighting and minimum of four 20 Amp and 240 Volt A.C. Mains outlet from a dedicated circuit breaker should be provided.

3 UTT Smart Building Infrastructure Requirements

4 ELV Systems

4.1 **INTRODUCTION:**

The tables below, gives details of the different requirements for the various types of buildings and required 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 Requirements)

4.1.1 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.

If they do decide to install these systems UTT approval for design & layout is to be obtained earlier to the implementation.

- Intercom System: it is a required system in the villas, design approval to be obtained in design stage.

Intercom units, quantity, communication cables & power requirement to be submitted to UTT in initial design stage.

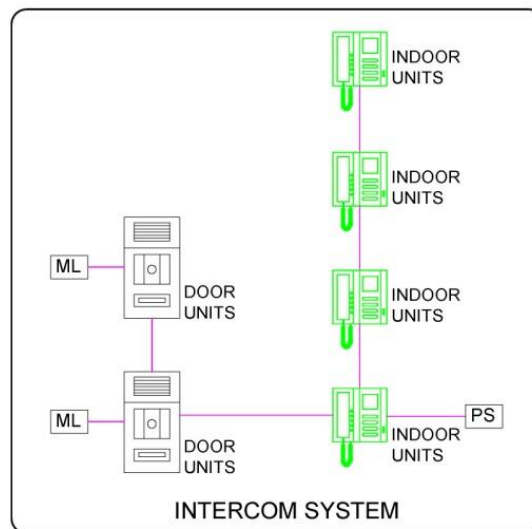


Figure 4.1.1 (Principle layout of Intercom System in a Single Villa)

4.1.2 COMPLEX OF VILLA:






- IP CCTV systems to be implemented in villas complex; CCTV coverage should include the following areas:
 - ✓ Main Entrance: coverage with identification* possibility
 - ✓ All exit/entry: coverage with identification* possibility
 - ✓ Complex boundaries: coverage with recognition* possibility

- MTR/MER main entrances: identification* required.

* Please look to the below table for choosing the right camera resolution for identification & recognition:

NAME	RESOLUTION	PIXELS
QCIF	176 X 120	21,120
CIF	352 X 240	84,480
2CIF	704 X 240	168,960
VGA	640 X 480	307,200
4CIF	704 X 240	337,920
D1	720 X 576	414,720
XGA	1024 X 768	786,432
720p	1280 X 720	921,600
WXGA	1152 X 864	995,328
SXGA	1280 X 1024	1,310,720
UXGA	1600 X 1200	192,000
1080p	1920 X 1080	2,073,600
5 MP	2580 X 1944	5,015,520

Table 4.1.2a (Table of standard Resolutions/Represented total Pixels & Industry Label)

SCENE	OVERVIEW	GENERAL SURVEILLANCE	RECOGNITION	IDENTIFICATION	LICENSE PLATE RECOGNITION
Example VGA (640 X 480)					
Pixels/ft.	Min. 10	Min. 20	Min. 40	Min. 80	Min. 80-120*
Pixels/in.	Min. 0.8	Min. 1.7	Min. 3.4	Min. 6.7	Min. 6.7-10*
Pixels/m.	Min. 33	Min. 65	Min. 130	Min. 260	Min. 260-400*
Pixels/cm.	Min. 0.3	Min. 0.65	Min. 1.3	Min. 2.6	Min. 2.6-4 *

* Proper lens calculation required to decide the lens size & camera installation position:

Table 4.1.2b (Distance/Quality ratio for a deployed CCTV unit to maintain recognition)

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

- CCTV recording has to be maintained for at least 31 days at native camera resolution.

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

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

-MTR/MER door has 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 to be installed in main complex exit/ entry & to be controlled by ACS in both directions

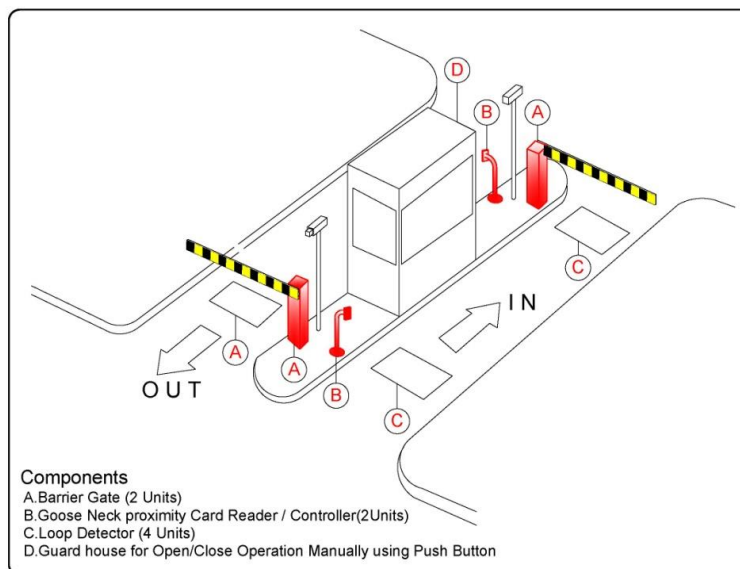


Figure 4.1.2c (Principle layout of Gate Barrier System)

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.

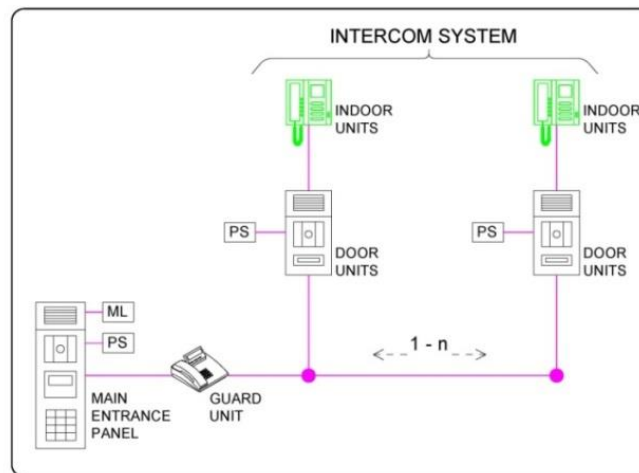


Figure 4.1.2d (Intercom System in a Complex of Villa's)

4.1.3 Building up to G+20:

- **IP CCTV:** all residential & commercial buildings up to G+20 require a CCTV system; the following areas shall be covered:
 - Main Entrance & all building exit/entry: coverage with identification* possibility
 - Lift lobby in all the floors: coverage with recognition* possibility
 - MTR, FTR, STR, RTR & MER rooms: coverage with identification* possibility
 - Car parking entrance: License Plate Recognition* required.
 - Car parking: cars passage coverage required with recognition*

- Entries to swimming pool, Health club or any other building facility such as laundry, nursery/ playing areas should be covered by cameras with recognition* possibility

* Please refer to tables 4.1.2a & 4.1.2b for choosing & the right cameras resolution & installation position.

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

CCTV recording has to be maintained for 31 days at native camera resolution.

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

- **Access Control System (G+20):** Access control should 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 unless it is covered by CCTV

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 shall 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 submitted with UTT team during the design stage.

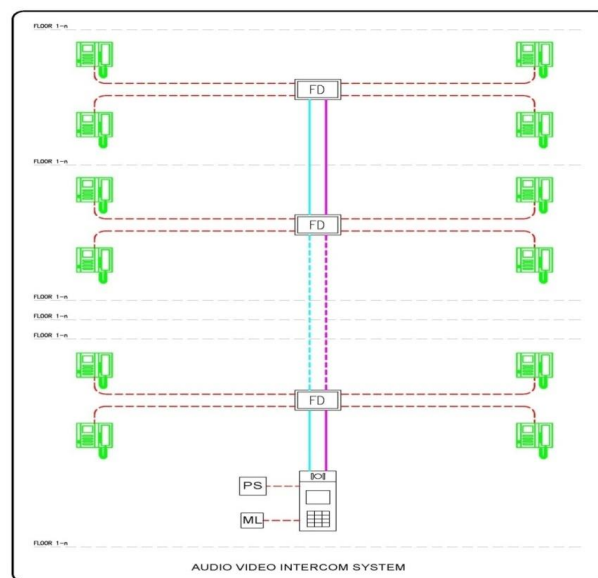


Figure 4.1.3a (Principle layout of Intercom System in Towers)

4.1.4 Building more than G+20:

- **IP CCTV:** all residential & commercial building more than G+20 require a CCTV system; the following areas shall be covered:
 - Main Entrance & all building exit/entry: coverage with identification* possibility
 - Lift lobby in all the floors: coverage with recognition* possibility
 - MTR, FTR, STR, RTR & MER rooms: coverage with identification* possibility
 - Car parking entrance: License Plate Recognition* required.
 - Car parking: cars passage coverage required with recognition*
 - Entries to swimming pool, Health club or any other building facility such as laundry, nursery/ playing areas should be covered by cameras with recognition* possibility

* Please refer to pages 4.1.2a & 4.1.2b 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.

CCTV recording has to be maintained for 31 days at native camera resolution.

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:

- Main building entrance
- Main car park entrance/exit
- All building exit/entry except fire exit doors
- MTR, STR, MER doors
- FTR, RTR & FER unless it is covered by CCTV

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

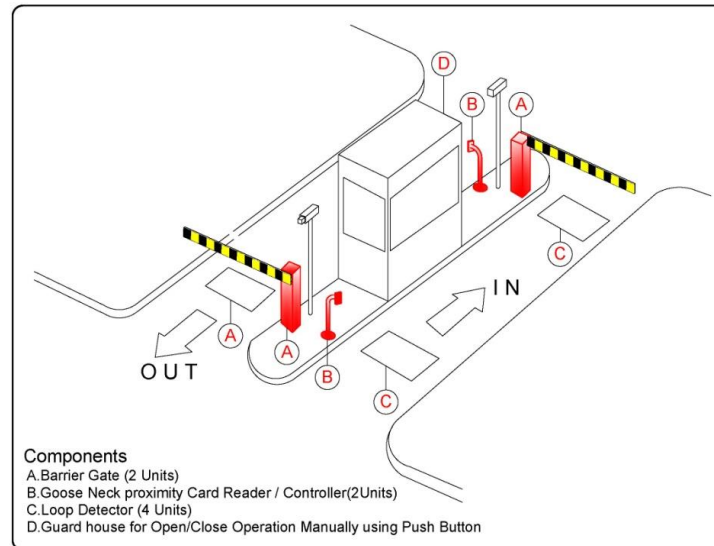


Figure 4.1.4a (Principle layout of Gate Barrier System)

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 shall 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.

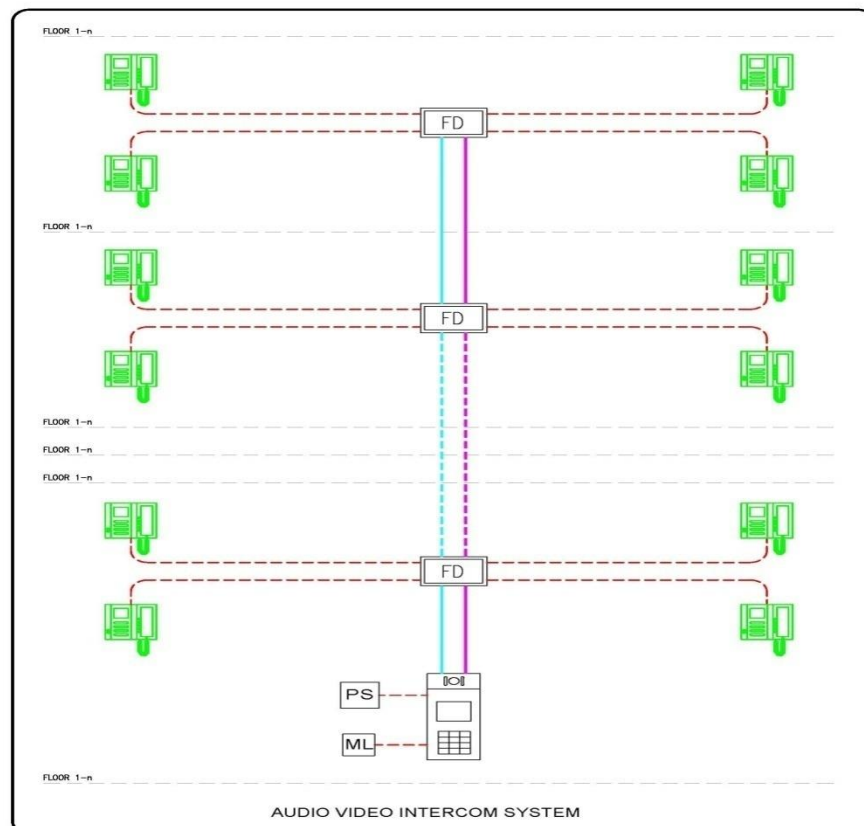


Figure 4.1.4a (Principle layout of Intercom System in Towers)

4.1.5 Shopping Malls:

- **IP CCTV:** Shopping malls should implement CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
- Main Entrances & all mall exit/entry: coverage with identification* possibility
- Lift lobby in all the floors: coverage with recognition* possibility
- All facility rooms (UTT rooms, Electrical & mechanical, security room & server's room): coverage with identification* possibility
- Public toilette entrances identification* possibility
- Fire exit doors & stair case identification* possibility
- Inside all lifts Recognition* required.
- Shopping Malls halls Recognition* required
- Escalators coverage with Recognition* required
- Car parking entrance: License Plate Recognition* required.
- Car parking: cars passage coverage required with recognition*
- Entries to swimming pool, Health club or any other building facility such as laundry, nursery/ playing areas should be covered by cameras with recognition* possibility
- All drop off area around the mall to be covered with recognition*
- All shopping mall boundaries to be covered with overview*
- Redundancy in communication cables required
- Alarm log & CCTV system log to be maintained as per MOI/MCC requirements
- CCTV recording has to be maintained at native camera resolution as per MOI/MCC latest requirement.
- * Please 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.

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 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 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.

4.1.6 Hotels:

- **IP CCTV:** Hotels should implement CCTV system in accordance to MOI/MCC regulation; following are the areas which have to be covered:
 - Main Entrances & all hotel exit/entry: coverage with identification* possibility
 - Floors corridor to be covered with recognition* possibility
 - Lift lobby in all the floors: coverage with recognition* possibility
 - All facility rooms (UTT rooms, Electrical & mechanical, security room & server's room): coverage with identification* possibility
 - Public toilette entrances identification* possibility
 - Fire exit doors identification* possibility
 - Inside all lifts Recognition* required.
 - Inside hotel kitchen
 - Car parking entrance: License Plate Recognition* required.
 - Car parking: cars passage coverage required with recognition*
 - Entries to swimming pool, Health club or any other building facility such as laundry, nursery/ playing areas should be covered by cameras with recognition* possibility
 - All drop off area around the hotel to be covered with recognition*
 - All Hotels boundaries to be covered with overview*
 - Redundancy in communication cables required
 - Alarm log & CCTV system log to be maintained as per MOI/MCC requirements
 - CCTV recording has to be maintained at native camera resolution as per MOI/MCC latest requirement.

* Please refer to pages 4.1.2a & 4.1.2b 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.

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 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.

4.1.7 Hospitals:

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

- Main Entrances & all hospital exit/entry: coverage with identification* possibility
- Floors corridor to be covered with recognition* possibility
- Lift lobby in all the floors: coverage with recognition* possibility
- All facility rooms (UTT rooms, Electrical & mechanical, security room & server's room): coverage with identification* possibility
- Public toilette entrances identification* possibility
- Fire exit doors identification* possibility
- Inside all lifts Recognition* required.
- Inside hospital canteen
- Car parking entrance: License Plate Recognition* required.
- Car parking: cars passage coverage required with recognition*
- Entries to operation theatre, laboratory, nursing station, pharmacy, ICU should be covered by cameras with recognition* possibility
- All drop off area around the Hospital to be covered with recognition*
- All hospital boundaries to be covered with overview*
- Redundancy in communication cables required
- Alarm log & CCTV system log to be maintained as per MOI/MCC requirements
- CCTV recording has to be maintained at native camera resolution as per MOI/MCC latest requirement.

* Please refer to pages 4.1.2a & 4.1.2b 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.

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 (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 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.

4.1.8 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:
- Main Entrances & all Retail Complex exit/entry: coverage with identification* possibility
- Lift lobby in all the floors: coverage with recognition* possibility
- All facility rooms (UTT rooms, Electrical & mechanical, security room & server's room): coverage with identification* possibility
- Public toilette entrances identification* possibility
- Fire exit doors & stair case identification* possibility
- Inside all lifts Recognition* required.
- Escalators coverage with Recognition* required
- Car parking entrance: License Plate Recognition* required.
- Car parking: cars passage coverage required with recognition*
- All drop off area around the Retail Complex to be covered with recognition*
- All Retail Complex boundaries to be covered with overview*
- Redundancy in communication cables required
- Alarm log & CCTV system log to be maintained as per MOI/MCC requirements
- CCTV recording has to be maintained at native camera resolution as per MOI/MCC latest requirement.

* Please refer to pages 4.1.2a & 4.1.2b 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.

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 (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.

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.

5 STRUCTURED CABLING SYSTEM FOR RESIDENTIAL BUILDINGS (SCS)

5.1 INTRODUCTION:

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

The minimum requirement is standard CAT 6A F/FTP cable with Shielded RJ45 connectivity that supports 10GbE in compliance with the TIA/EIA-568-B.2-10 or ISO 11801:2002/Amd2:2010 standards.

In addition one RGG socket shall be provided for the television purposes in every room for the TV 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.

5.2 INSTALLATION OF INDOOR FIBER CABLES:

5.2.1 HIGH RAISE BUILDINGS:

The building owner/Developer shall install a minimum of 2 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 on each floor.

From the Floor telecom room on each floor 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 double the number of flats/premises on the floor plus 2 fibers for smart solutions 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.

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 FD 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 5.2.1a 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 5.2.1b for Wavelength 1550nm

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

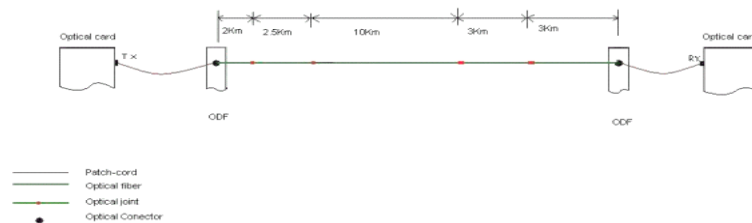


Figure 5.2.1c

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

Number of apartments/DNU on the floor	No. of fibers required in each FTR	Fibers for others	Additional 25%	Total Fibers required	Size of the FO for each FTR	Size of the FO Cable for each STR
2	4	2	2	8	8F	16F
3	6	2	2	10	12F	16F
4	8	2	3	13	16F	16F
5	10	2	3	15	16F	16F
6	12	2	4	18	24F	16F
7	14	2	4	20	24F	16F
8	16	2	5	23	24F	16F
9	18	2	5	25	36F	16F
10	20	2	6	28	36F	16F
11	22	2	6	30	36F	16F
12	24	2	7	33	36F	16F
13	26	2	7	35	36F	16F
14	28	2	8	38	48F	16F
16	32	2	9	43	48F	16F

Table 5.2.1d (Size of Fiber Optic cables from MTR to each FTR and STR according to the number of flats)

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 16 Fibers cables to be provided from ODF 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 pigtailed.

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 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 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.

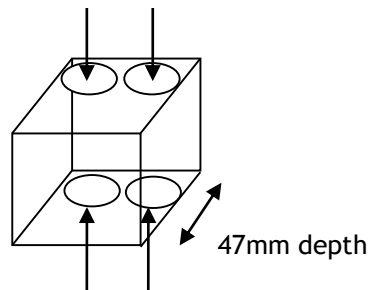


Table 5.3.1a (Standard Back Box for Dual or Single Data Point)

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 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.

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 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.

5.3.4 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 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 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.

5.4 COPPER HORIZONTAL CABLING (F/FTP 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 5.4a (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 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

5.4.2 CABLING & TERMINATION:

- The Cables used for these wiring must comply with minimum CAT 6A for Broad band services & for telephone standards.
- Horizontal cabling system shall be based on Cat 6A FTP 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 6A 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 F/FTP 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 6A 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 x25mm (1 inch) shall be connected between each socket locations and the ONU enclosure.
- All sockets should have 2 x angled CAT 6A shielded connectors
- Every socket must be connected with a minimum of 2 x four pair SCS Cat 6A 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.

5.4.4 TELEVISION CABLING, TERMINATION AND SOCKETS:

- The Cables used for these wiring must comply with minimum RG 6 coaxial cable for Broad band services & Television standards.
- Single coaxial cable shall be laid from the ONU enclosure to each Socket in each room of the flat following star topology.
- The connector of the socket shall be F-connector.
- Any upgrading required in the in-building facility, Television cables, due to either enhanced demand, change in building status or damage shall be provided by building Owner upon UTT approval.
- The modules for coaxial cable shall be individual snap-in style female-to-female bulkhead adapters, and shall fit all other installed telecommunications wall plates, Outlets and field-configurable patch panels and patch blocks. Bulkhead modules shall be available in multiple colors to match the housings or provide unique color-coding for port I.D. Modules shall be UL listed. All plastics used in construction of the module bodies shall be fire-retardant with a UL flammability rating of 94V-0.

- Minimum coaxial cables with an 18 AWG center conductor and 75 ohm characteristic impedance, the center conductor is ordinarily solid copper, the shielding shall be much heavier (typically aluminum foil/95% copper braid), and tolerances are more tightly controlled, to improve impedance stability.

5.4.5 MODULAR RG6 JACKS

Modular jacks shall be F-connector meeting the minimum requirements for T.V connection.

The outlets shall be distributed as single outlets in each room in the flat including the maid's room.

5.4.6 MODULAR JACKS CATEGORY 6A SHIELDED RJ45:

- Modular jacks shall be Category 6A 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 6A modular Jacks FTP Shielded shall be third party component verified for compliance with ANSI/TIA/EIA 568-B.2-10 or ISO11801:2002/Amd 2:2010 category 6A 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 6A sockets shall be 50mm deep as per the drawing shown in the civil requirement

5.4.7 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 F/FTP 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.

5.4.8 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 FTP cabling shall be terminated in 24 port Patch panel, placed inside the ONU cabinet.
- The SCS Contractor shall provide Category 6A 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 6A cable assemblies shall be 4-pair RJ45/RJ45 FTP 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.

5.4.9 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.

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 per table no 4.3 in this guideline. 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 pigtailed.
- 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-657B pigtailed 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 flat (ONU) with the FTR at the same floor, each ONU shall be connected with a minimum of a 2C 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 2 core FO cables that are reaching the ONU shall be terminated in a Fiber premises box containing 2 x SC/APC adaptors and pigtails, the termination shall be used by the splicing method

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:-

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 APARTMENT 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 SCG 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 (Default, other color coding available in Annex)

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 DNUs, power socket and Battery backup, shall be installed. Please refer to the below design of the cabinet

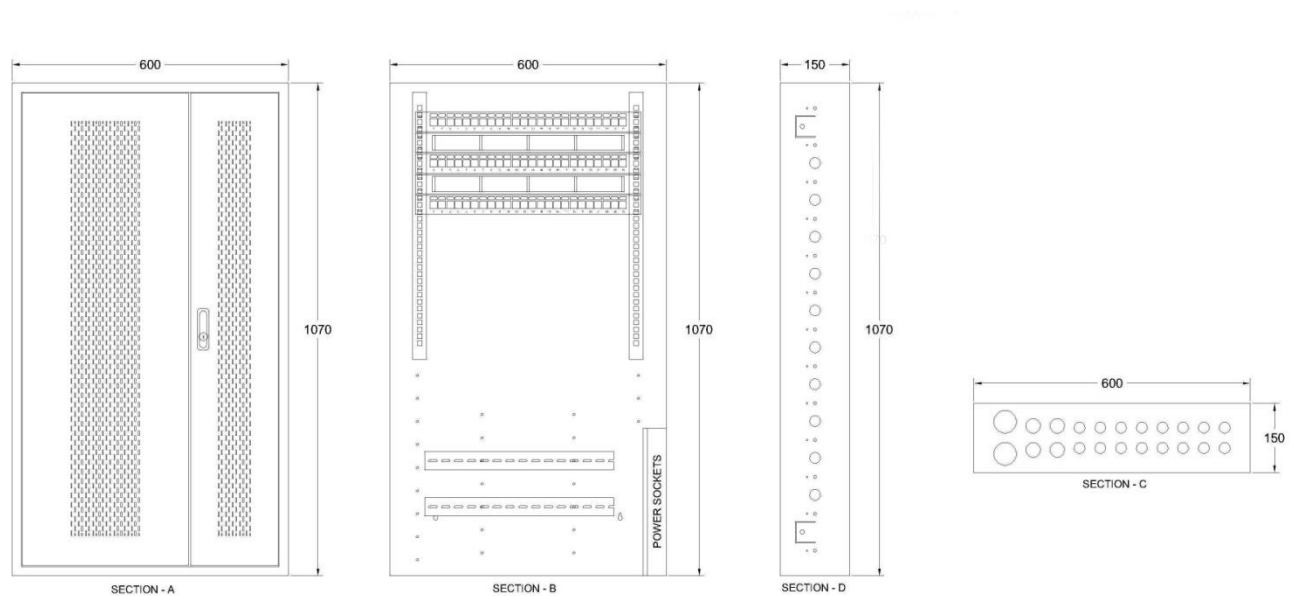


Table 5.7c (UTT Approved Optical Network Unit Enclosure)

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

6.1 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 6A F/FTP cable with Shielded RJ45 connectivity that supports 10GbE 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.

6.2 INSTALLATION OF IN-BUILDING FIBER CABLES:

6.2.1 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 8 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 on each floor.

From the Floor telecom room on each floor 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 double 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 FD 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 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 16 Fibers cables to be provided from ODF 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.

6.3 CIVIL WORKS REQUIRED BY THE CONTRACTOR

6.3.1 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.

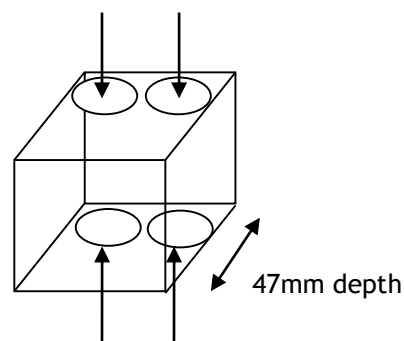


Table 6.3.1a (Standard Back Box for Dual or Single Data Point)

All floor boxes for the Telecommunication sockets shall be compatible for CAT6A F/FTP 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

6.3.2 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.

6.3.3 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

6.3.4 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 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.
- 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.

6.3.5 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.

6.4 COPPER HORIZONTAL CABLING (F/FTP 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 6.4.a (Color coding for termination)

6.4.1 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

6.4.2 CABLING & TERMINATION:

- The Cables used for these wiring must comply with minimum CAT 6A for Broad band services & for telephone standards.
- Horizontal cabling system shall be based on Cat 6A FTP 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 6A 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 F/FTP cables on Patch panel and sockets locations shall be the responsibility of the vendors approved by UTT.

6.4.3 TELECOMMUNICATION SOCKETS:

All outlets should be Category 6A 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 6A shielded connectors
- Every socket must be connected with a minimum of 2 x four pair SCS Cat 6A 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.

6.4.4 MODULAR JACKS CATEGORY 6A SHIELDED RJ45:

- Modular jacks shall be Category 6A 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 6A modular Jacks FTP Shielded shall be third party component verified for compliance with ANSI/TIA/EIA 568-B.2-10 or ISO 11801:2002/Amd 2:2010 category 6A 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 6A sockets shall be 47mm deep as per the drawing shown in the civil requirement

6.4.5 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 F/FTP 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.

6.4.6 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 FTP cabling shall be terminated in 24 port Patch panel, placed inside the ONU cabinet.
- The SCS Contractor shall provide Category 6A 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 6A cable assemblies shall be 4-pair RJ45/RJ45 FTP 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.

6.4.7 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.

6.5 BACKBONE CABLING:

6.5.1 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.

6.5.2 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.
- UT 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 UT 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 UT 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 UT only.

6.5.3 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

6.6 HORIZONTAL FIBER CABLING:

The horizontal fiber cabling is used for connecting each office (ONU) with the FTR at the same floor, 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

6.6.1 TERMINATION ONU SIDE

- The 8 core FO cables that are reaching the ONU shall be terminated in a Fiber patch panel containing 8 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.

6.6.2 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

6.7 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 (15U 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

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

7.1 INTRODUCTION:

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

The minimum requirement is standard CAT 6A F/FTP cable with Shielded RJ45 connectivity that supports 10GbE in compliance with the TIA/EIA-568-B.2-10 or ISO 11801:2002/Amd2:2010 standards.

In addition one RGG socket shall be provided for the television purposes in every room for the TV connectivity.

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.

7.2 CIVIL WORKS REQUIRED BY THE CONTRACTOR

7.2.1 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.

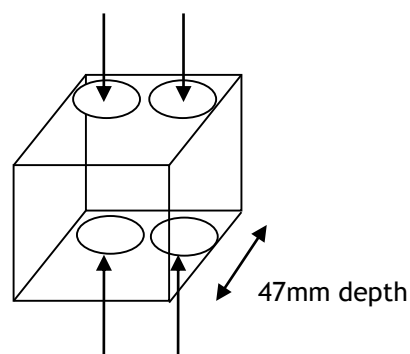


Table 7.2.1a (Standard Back Box for Dual or Single Data Point)

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.

7.3 COPPER HORIZONTAL CABLING (F/FTP 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 7.3a (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

7.3.1 CABLING & TERMINATION:

- The Cables used for these wiring must comply with minimum CAT 6A for Broad band services & for telephone standards.
- Horizontal cabling system shall be based on Cat 6A FTP 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 6A 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 F/FTP cables on Patch panel and sockets locations shall be the responsibility of the vendors approved by UTT.

7.3.2 TELECOMMUNICATION SOCKETS:

All outlets should be Category 6A 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 should have 2 x angled CAT 6A shielded connectors
- Every socket must be connected with a minimum of 2 x four pair SCS Cat 6A 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.

7.3.3 TELEVISION CABLING, TERMINATION AND SOCKETS:

- The Cables used for these wiring must comply with minimum RG 6 coaxial cable for Broad band services & Television standards.
- Single coaxial cable shall be laid from the ONU enclosure to each Socket in each room of the flat following star topology.
- The connector of the socket shall be F-connector.
- Any upgrading required in the in-building facility, Television cables, due to either enhanced demand, change in building status or damage shall be provided by building Owner upon UTT approval.
- The modules for coaxial cable shall be individual snap-in style female-to-female bulkhead adapters, and shall fit all other installed telecommunications wall plates, Outlets and field-configurable patch panels and patch blocks. Bulkhead modules shall be available in multiple colors to match the housings or provide unique color-coding for port I.D. Modules shall be UL listed. All plastics used in construction of the module bodies shall be fire-retardant with a UL flammability rating of 94V-0.
- Minimum coaxial cables with an 18 AWG center conductor and 75 ohm characteristic impedance, the center conductor is ordinarily solid copper, the shielding shall be much heavier (typically aluminum foil/95% copper braid), and tolerances are more tightly controlled, to improve impedance stability.

7.3.4 MODULAR RG6 JACKS

Modular jacks shall be F-connector meeting the minimum requirements for T.V connection.

The outlets shall be distributed as single outlets in each room in the flat including the maid's room.

7.3.5 MODULAR JACKS CATEGORY 6A SHIELDED RJ45:

- Modular jacks shall be Category 6A 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 6A modular Jacks FTP Shielded shall be third party component verified for compliance with ANSI/TIA/EIA 568-B.2-10 or ISO 11801:2002/Amd 2:2010 category 6A 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 6A sockets shall be 50mm deep as per the drawing shown in the civil requirement

7.3.6 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 F/FTP 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.

7.3.7 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 FTP cabling shall be terminated in 24 port Patch panel, placed inside the ONU cabinet.
- The SCS Contractor shall provide Category 6A LSZH cable assemblies at the DNT 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 6A cable assemblies shall be 4-pair RJ45/RJ45 FTP 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.

7.3.8 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.

7.4 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 APARTMENT 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. Please refer to the below design of the cabinet

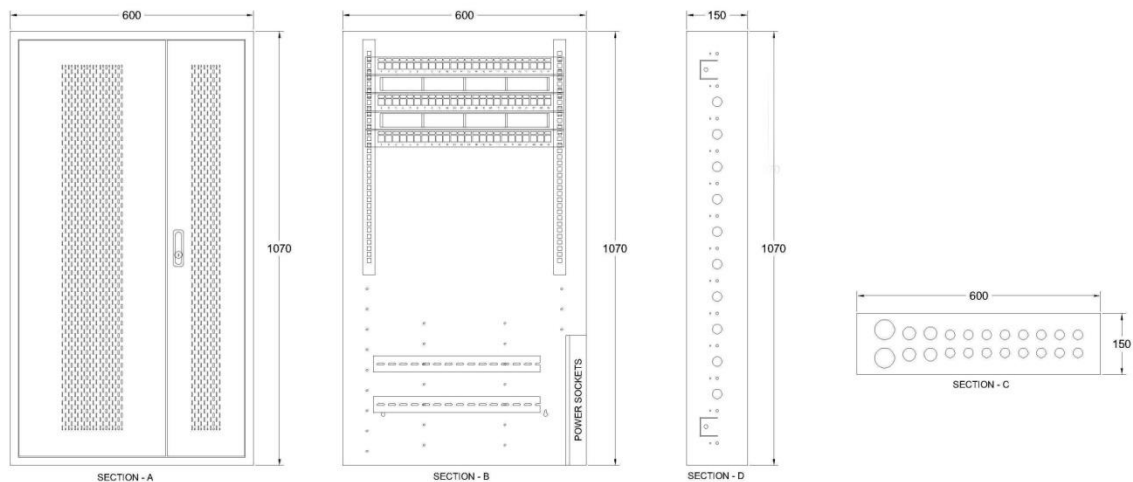


Table 7.4a (UTT Approved Optical Network Unit Enclosure)

8 PROTECTION FROM ELECTROMAGNETIC INTERFERENCE

The following requirements apply to FTP 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.

8.1 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 8.1 (Separation Distance from power source)

9 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.

10 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 using the T568-b, TIA CAT6a 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 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 MDF 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.

II IMPORTANT NOTES

- 1) This design guide explains in general, all UTT 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) 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.
- 3) 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
- 4) Minimum two sets of SCS & ELV shop drawings shall be submitted for study and approval after awarding the contractor the project
- 5) Where deviations/comments/amendments are advised on the Design, Drawings must be corrected and re-submitted for approval.
- 6) One set of approved 'As-Built' drawings must be submitted along with the Building Completion Certificate, which will be certified by UTT.
- 7) All Copper/Fiber optic cables & components shall be from the approved UTT vendors. Fiber cables, patch cords, pigtails and all other related accessories shall be conforming to ITU standard G657-B single mode fiber standards and shall be LSZH rated. All copper cables, patch cords and accessories shall be F/FTP cables LSZH having a complete end to end shielded solution.
- 8) 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.

12 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 12.0 UTT Smart Building Infrastructure drawing approval documentation requirements

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

13.1 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 12.0

13.2 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

13.3 Final inspection stage

- 1) Final inspection request form signed and stamped by all parties
- 2) Before backfilling of the duct connection to the building, UT 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

13.4 Building Completion Certificate (BCC)

- 1) All of the above fully complied 100%
- 2) Ownership Certification Issued and other mandatory documentation issued by relevant party.
- 3) All UTT Authority Fees have been settled (and but not limited to: NOC fees, Connection Charges) with UTT accounts.
- 4) 25 Year Warranty Certificate issued by the Vendor for the specific project
- 5) A copy of the keys/Access Cards for all MDF, FTR, STR rooms (labeled)
- 6) A copy of the keys for all Cabinets (labeled)
- 7) Copy of NOC letter from UTT's Smart Home Department

14 EXAMPLES OF RELATED DOCUMENTS AND TABLES

	SINGLE VILLA	COMPLEX OF VILLAS	BUILDINGS UP TO (G+20)	BUILDINGS MORE THAN (G+20)	SHOPPING MALLS	PALACES, HOSPITALS & HOTELS	GROUP OF SHOPS & SHEDS	GROUP OF WAREHOUSES
Entry Box	Size: 60x60x80cm. Location: Within the compound and at Max 1 M from compound wall line	Size: JRC-12 Joint Box (Etisalat standard) Location: Depends upon the layout	Size: JRC 12 Joint Box (Etisalat standard) Primary and redundant Location: Within the property, near plot line. Additional Boxes at all turning points of lead-in	Size: JRC 14 Joint Box (Etisalat standard) Primary and Redundant Location: Within the property, near plot line. Additional Boxes at all turning points of lead-in	Size: JRC 14 Joint Box (Etisalat standard) Location: Depending on the layout	Size: JRC 14 Joint Box (Etisalat standard) Location: Depending on the layout	Size: JRC-12 Joint Box (Etisalat standard) Position: Within Land plot where lead-in branching to other blocks end at turning points	Size: JRC 14 Joint Box (Etisalat standard) Location: Depending on the layout
Entry Pipes / Duct	2X4 inches (D54) pipes/duct towards the villa & 2 x (2") inches pipes/ducts to be extended outside the plot line towards UTT Network	2x4" inches (D54) from EB toward villa 2xD54 pipes/ducts from EB to towards main telecom room and 2xD54 be extended outside the plot line towards UTT Network. Internal Distribution within plot to be in accordance to UTT advise	2xD54 (4") inches pipes/ducts towards the building and 2xD54 Primary and Redundant pipes/ducts towards the UTT Network	4xD54 pipes/ducts towards the building and 4xD54 Primary and redundant pipes/ducts towards the UTT Network	4xD54pipes/ducts Towards the building and 4x D54 Primary and Redundant pipes/ducts towards the UTT Network	4xD54 pipes/ ducts towards the building and 4xD54 Primary and Redundant pipes/ducts towards the UTT Network	2xD54 pipes/ducts towards the building and 2xD54 pipes/ducts towards the UTT Network	4xD54 pipes/ ducts towards the building and 4xD54 Primary and Redundant pipes/ducts towards the UTT Network
Main Telecom room Distribution Cabinet std 19" Rack	Not required	42U(H)x 800mm (W) X 800mm (D) Stand alone type 19"equipment Cabinet	42U(H)x 800mm (W) X 800mm (D) Stand alone type 19"equipment Cabinet	42U(H)x 800mm (W) X 800mm (D) Stand alone type 19"equipment Cabinet	42U (H) x 800mm (W) X 800mm (D) Stand alone type 19" equipment Cabinet	42U(H)x 800mm (W) X 800mm (D) Stand alone type 19"equipment Cabinet	42U(H)x 800mm (W) X 800mm (D) Stand alone type 19"equipment Cabinet	42U(H)x 800mm (W) X 800mm (D) Stand alone type 19"equipment Cabinet
Floor Telecom room Distribution Cabinet 19" Rack	Not required	Not required	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	No requirements
Secondary / GSM / Roof Top Telecom room Distribution Cabinet 19" Rack	Not required	Not required	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	No requirement	12U (H) x 600 mm (W) X 500 mm (D) Wall mounted type 19" equipment Cabinet	No requirement	No requirements
ONU Enclosure (By approved UTT Vendors)	24U (H) x 600mm (W) X 150mm (D) flush mounted	24U (H) x 600mm (W) X 150mm (D) flush mounted on wall	24U (H) x 600mm (W) X 150mm (D) flush mounted on wall	24U (H) x 600mm (W) X 150mm (D) flush mounted on wall	24U (H) x 600mm (W) X 150mm (D) flush mounted on wall	24U (H) x 600mm (W) X 150mm (D) flush mounted on wall	24U (H) x 600mm (W) X 150mm (D) flush mounted on wall	15U (H) x 600mm (W) X 150mm (D) flush mounted on wall
Junction Box (Floor Pull Box size)	Size: One 30 x 30 x 15cm box Recessed inside the wall for each floor. Location: Convenient location with 1 meter free wall space around and at a height between 40 -120 cm above finished floor level.	Size: Per each single villa. Size: One 30 x 30 x 15cm box recessed inside the wall for each floor. Location: Convenient location with one meter free wall space around and at a height between 40 -120 cm above finished floor level.	Size: 30 x 30 x 15cm box recessed inside the wall for each floor. Location: Convenient location with one 1m free wall space around and at a height 120 cm above finished floor level with 200mm cable tray extended to main cable tray	Size: 30 x 30 x 15cm box recessed inside the wall for each floor. Location: Convenient location with one 1m free wall space around and at a height 120 cm above finished floor level with 200mm cable tray extended to main cable tray	Size: One 30 x 30 x 15cm box Recessed inside the wall for each floor. Location: Convenient location with 1 meter free wall space around and at a height between 40 -120 cm above finished floor level.	Size: One 30 x 30 x 15cm box Recessed inside the wall for each floor. Location: Convenient location with 1 meter free wall space around and at a height between 40 -120 cm above finished floor level	Size: One 30 x 30 x 15cm box Recessed inside the wall for each floor. Location: Convenient location with 1 meter free wall space around and at a height between 40 -120 cm above finished floor level	Size: One 30 x 30 x 15cm box Recessed inside the wall for each floor. Location: Convenient location with 1 meter free wall space around and at a height between 40 -120 cm above finished floor level
POP Room	No requirements	No requirements	No requirements	BLDGS MORE THAN (G+40) 10x12x4 (LxWxH) In addition to a battery room along the POP room with size of 6x5x4 (LxWxH)	No requirements	BLDGS MORE THAN (G+40) 10x12x4 (LxWxH) In addition to a battery room along the POP room with size of 6x5x4 (LxWxH)	No requirements	No requirements

Table 14.0 UTT Smart Building Infrastructure SCS Requirements

Main Telecom Room size	No requirements	Size: 3x4x3 (LxWxH) meters for villas more than 10 numbers	Size: 3x4x3 (LxWxH) meters Location: In the ground floor common area, and every 10 floors	Size BLDGS UP TO (G+40) 5x4x3 (LxWxH) BLDGS MORE THAN (G+40) 9X8X3 (LxWxH) Location: In the ground floor common area, and every 10 floors	Size: 4x5x3 (LxWxH) meters Location: In the ground floor common area.	Size: 4x5x3 LxWxH) meters Location: In the ground floor common area.	Size: 4x5x3 (LxWxH) meters Location: In the ground floor common area.	Size: 4x5x3 (LxWxH) meters Location: In the ground floor common area.
Floor Telecom Room size	No requirements	No requirements	Size: 2.3 x 2.3 x 3m (LxWxH) Location: Close to the main vertical structural core the multi-story Bldg.	Size: 2.3 x 2.3 x 3m (LxWxH) Location: Close to the main vertical structural core of the multi-story Bldg.	Size: 2.3 x 2.3 x 3 (LxWxH) Location: Close to the main vertical structural core of the shopping mall.	Size: (2.3 x 2.3 x 3 (LxWxH) Location: In common areas	Size: 2.3 x 2.3 x 3 (LxWxH) Location: In common areas	No requirements
Secondary /GSM Telecom room Size	No requirements	No requirements	Size: 3x4x3m (LxWxH) Location: Close to FTR	Size: 3x4x3m (LxWxH) Location: Close to FTR	No requirements	Size: 3x4x3m (LxWxH) Location: Close to FTR if more than 10 floors	No requirements	No requirements
Roof Top Telecom room	No requirements	No requirements	Size: 3x4x3m (LxWxH) Location: Close to the main vertical structural core the multi-story Bldg.	Size: 3x4x3m (LxWxH) Location: Close to the main vertical structural core the multi-story Bldg.	No requirements	Size: 3x4x3m (LxWxH) Location: Close to FTR if more than 10 floors	No requirements	No requirements
Riser Cable trays	No requirements	No requirements	(1x) 60x5 cm + (1x) 150x5 cm cable trays	(2x) 60x5 cm + (1x) 300x5 cm cable trays	No requirements	(1x) 60x5 cm + (1x) 150x5 cm cable trays	(2x) 60x5 cm + (1x) 300x5 cm cable trays	No requirements

Table 14.0 UTT Smart Building Infrastructure SCS Requirements (Continued)

FIBER PATCHING SCHEDULE SAMPLE													
Project:													
FDH -													
UTT - HD CABINET			BUILDING ODF			FLOOR ODF				FLOOR LEVEL	ONU		
Rack No.	Shelf No	Port No.	Rack No.	Shelf No	Port No.	Fiber	IN		OUT		Port No.	Flat No.	
							Shelf No	Port No.	Shelf No	Port No.			
			1	1	1	48	1	1	2	1	1	1	
			1	1	2	48	1	2	2	2	1	2	

			1	1	3	48	1	3	2	3	1	1	2
			1	1	4	48	1	4	2	4	1	2	2
			1	1	5	48	1	5	2	5	1	1	3
			1	1	6	48	1	6	2	6	1	2	3
			1	1	7	48	1	7	2	7	1	1	4
			1	1	8	48	1	8	2	8	1	2	4
			1	1	9	48	1	9	2	9	1	1	5
			1	1	10	48	1	10	2	10	1	2	5
			1	1	11	48	1	11	2	11	1	1	6
			1	1	12	48	1	12	2	12	1	2	6
			1	1	13	48	1	13	2	13	1	1	7
			1	1	14	48	1	14	2	14	1	2	7
			1	1	15	48	1	15	2	15	1	1	8
			1	1	16	48	1	16	2	16	1	2	8
			1	1	17	48	1	17	2	17	1	1	9
			1	1	18	48	1	18	2	18	1	2	9
			1	1	19	48	1	19	2	19	1	1	10
			1	1	20	48	1	20	2	20	1	2	10
			1	1	21	48	1	21	2	21	1	1	11

			1	1	22	48	1	22	2	22	1	2	11
			1	1	23	48	1	23	2	23	1	1	12
			1	1	24	48	1	24	2	24	1	2	12
			1	1	25	48	1	25	2	25	1	1	13
			1	1	26	48	1	26	2	26	1	2	13
			1	1	27	48	1	27	2	27	1	1	14
			1	1	28	48	1	28	2	28	1	2	14
			1	1	29	48	1	29	2	29	1	1	15
			1	1	30	48	1	30	2	30	1	2	15
			1	1	31	48	1	31	2	31	1	1	16
			1	1	32	48	1	32	2	32	1	2	16
			1	1	33	48	1	33	2	33	1	SPARE	N/A
			1	1	34	48	1	34	2	34	1	SPARE	N/A
			1	1	35	48	1	35	2	35	1	SPARE	N/A
			1	1	36	48	1	36	2	36	1	SPARE	N/A
			1	1	37	48	1	37	2	37	1	SPARE	N/A
			1	1	38	48	1	38	2	38	1	SPARE	N/A
			1	1	39	48	1	39	2	39	1	SPARE	N/A
			1	1	40	48	1	40	2	40	1	SPARE	N/A

			1	1	41	48	1	41	2	41	1	SPARE	N/A
			1	1	42	48	1	42	2	42	1	SPARE	N/A
			1	1	43	48	1	43	2	43	1	SPARE	N/A
			1	1	44	48	1	44	2	44	1	SPARE	N/A
			1	1	45	48	1	45	2	45	1	SPARE	N/A
			1	1	46	48	1	46	2	46	1	SPARE	N/A
			1	1	47	48	1	47	2	47	1	SPARE	N/A
			1	1	48	48	1	48	2	48	1	SPARE	N/A
			1	7	1	8	3	1	N/A	N/A	6	N/A	GSM
			1	7	2	8	3	2	N/A	N/A	6	N/A	GSM
			1	7	3	8	3	3	N/A	N/A	6	N/A	GSM
			1	7	4	8	3	4	N/A	N/A	6	N/A	GSM
			1	7	5	8	3	5	N/A	N/A	6	N/A	GSM
			1	7	6	8	3	6	N/A	N/A	6	N/A	GSM
			1	7	7	8	3	7	N/A	N/A	6	N/A	GSM
			1	7	8	8	3	8	N/A	N/A	6	N/A	GSM

Table 14.1a (Example of Patching Schedule Format)

Application for Building Inspection



Smart Home
 1st & 2nd Inspection
 Telecom
 Subsequence Inspection

STRUCTURE TYPE

Villa
 Tower 1-09 storey
 Tower 10-19 storey
 Tower 20-29 storey
 Tower 30-39 storey
 Tower 40-49 storey
 Tower ≥ 50 storey
 Commercial Building
 School
 Hotel
 Office Complex
 GSM Site

No. of Villas :
 No. of Towers :
 No. of Towers :
 No. of Towers :
 No. of Towers :
 No. of Towers :
 No. of Towers :

Commercial Complex
 Utility Building
 Mosque / Imam House
 Hospital / Clinic
 Others :

LOCATION DETAILS

Project Name: _____ Sector: _____
 Plot No.: _____ No. of Floors: _____ No. of Flats: _____

STRUCTURE DETAILS

Developer: _____ Owner: _____ Contact No.: _____

CONSULTANT DETAILS

Name: _____
 P.O.Box: _____ Fax No.: _____
 Contact Person: _____ Contact No.: _____

CONTRACTOR DETAILS

Name: _____
 P.O.Box: _____ Fax No.: _____
 Contact Person: _____ Contact No.: _____

SUB CONTRACTOR / ELECTRICAL CONTRACTOR DETAILS

Name: _____
 P.O.Box: _____ Fax No.: _____
 Contact Person: _____ Contact No.: _____

FOR ACCOUNTING USE ONLY

Ref.: _____
 Invoice No.: _____ Fax No.: _____
 Details: _____

FOR OFFICIAL USE ONLY

Ref.: _____ Application Checked By: _____ Date: ____/____/____
 Approved By: _____ Valid up to: ____/____/____

*Note: 6 Months Validity Relevant documents : Copy of approved drawings

PO Box : 3838 - Abu Dhabi, United Arab Emirates T: +971 2 618 4718 E: info@utt.ae W: www.utt.ae

Application Form Building Plan Approval

This application to be duly completed and submitted together with relevant documents

<input type="checkbox"/> SMART HOME		<input type="checkbox"/> TELECOM	
STRUCTURE TYPE			
<input type="checkbox"/> Villa	No. of Villas :		
<input type="checkbox"/> Tower 1 - 09 Storey	No. of Towers :		
<input type="checkbox"/> Tower 10 - 19 Storey	No. of Towers :		
<input type="checkbox"/> Tower 20 - 29 Storey	No. of Towers :		
<input type="checkbox"/> Tower 30 - 39 Storey	No. of Towers :		
<input type="checkbox"/> Tower 40 - 49 Storey	No. of Towers :		
<input type="checkbox"/> Tower \geq 50 Storey	No. of Towers :		
<input type="checkbox"/> Commercial Building	<input type="checkbox"/> Commercial Complex		
<input type="checkbox"/> School	<input type="checkbox"/> Utility Building		
<input type="checkbox"/> Hotel	<input type="checkbox"/> Mosque / Imam House		
<input type="checkbox"/> Office Complex	<input type="checkbox"/> Hospital / Clinic		
<input type="checkbox"/> GSM Site	<input type="checkbox"/> Others :		
LOCATION DETAILS			
Sector :			
Plot No. :	No. of Floors :	No. of Flats :	
STRUCTURE DETAILS			
Developer :	Owner :	Contract No. :	
CONSULTANT DETAILS			
Name :		Signature & Company Stamp	
P.O. Box :	Fax No. :		
Contact Person :	Contact No. :		
CONTRACTOR DETAILS			
Name :		Signature & Company Stamp	
P.O. Box :	Fax No. :		
Contact Person :	Contact No. :		
SUB-CONTRACTOR / ELECTRICAL CONTRACTOR DETAILS			
Name :		Signature & Company Stamp	
P.O. Box :	Fax No. :		
Contact Person :	Contact No. :		
For Accounting Use Only			
Ref :		Signature & Company Stamp	
Invoice No. :	Date :		
Details :			
For Official Use Only			
Ref :	Application Checked By :	Date :	
Approved by :	Valid up to :		

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Form 14.1c (Application for Building Inspection, available in M/s Bunya)



Photo 14.1d (Floor Telecommunication Room Cable Tray Layout example)



Photo 14.1e (Main Telecommunication Room Incoming Feed HDRF Trays)