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Introduction

Telecommunication is now an integral part of social, economic and political issues of the world. Networks of the future will be digital and intelligent and will offer high transmission capacity and flexible bandwidth; in addition, they will be easily accessed and connected while its services will be personal and tailored to individual needs. These 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 communications technology have substantially widened the range of services carried by the network. Satellites, microwave radio, optical cable links, digital switching and transmission, offer a potential for the improvement of quality and for the extension of access to the most remote areas. 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 in their lives that affordable information access can provide. While businesses will look for total telecommunications solutions that will not only enable them to remain productive and compete globally but will also give them a competitive edge.

Etisalat 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 telecommunications industry well into the 21st century.

As technology and mode of transport are changing fast, a broad approach to suit all future type of services will have to be borne in mind, while designing the infrastructures for buildings. A properly designed building with clear Access Path supports the triple play services, viz telephony, data and video services. Also, supports future advanced services, warranting higher speeds and higher bandwidth, planned to be available in near future, for faster provision of services.

The present booklet is to provide guidelines for consultants, contractors and 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 Etisalat for the new buildings, primarily to develop and deploy FTTH (Fibre to the Home), based on GPON technology.
General telecom requirements

“The FTTH requirements in new buildings, established in this Design Guide, represent only Etisalat’s technical requirements for connection/access to Etisalat’s Network. These technical specification should not be assumed to establish requirements for other telecommunications operators’ networks as well”.

To provide telecom services, the internal concealed pipe and other associated requirements vary for the different building types. The various types of buildings are grouped as commercial buildings, residential towers, ware houses, medium high-rise buildings, shopping complexes, retail houses, row houses, independent villas, campus villas, labour camps, mosques, petrol pumps, etc.

The building owners, builders, property developers, consultants and contractors are advised to provide the various in-building requirements, as applicable, to ensure timely provision of services.

Civil requirements applicable for all types of buildings

Entry box
Entry box is an underground joint box built, exclusively to allow installation of Etisalat 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’ and size is 600mm X 600mm X 800mm. The cover shall have marking as “Telephones”
- The location of the entry box depends on the location of existing/proposed Etisalat external line plant
- The entry box should be constructed at a maximum distance of 1 meter from plot line. Make sure it touches the boundary wall. However, if such provision is not feasible due to site conditions, Etisalat must be consulted for further advice
- The entry box should be exclusive for Etisalat use and no other services shall be allowed to use the same
- Due to the variables involved, it is essential to consult Etisalat at the design stage, to decide the location of the entry box and entry pipe. The consultants/contractors must not deviate from the stipulated location
- An earth rod must be provided at the entry box. The required earth resistance should not exceed more than 5 ohms
- For entry box size details please refer to Table No. 1

Entry pipes (Lead-in ducts)
The entry pipes are uPVC ducts. These ducts are to be extended from the entry box towards premises and towards Etisalat line plant location.

- Entry pipes should be laid at a depth of 600mm from the proposed finished paving level. The entry pipe must be protected with concrete to prevent damages, especially at points where pipes cross with other services
- Entry pipe should be extended to the entry box and beyond to the nearest existing Etisalat plant location, or 1 meter from plot limit or as advised by Etisalat
- The entry pipe should be of uPVC material and of black color
- The open ends of the entry pipe must be properly sealed, to prevent entry of sub-soil materials and ingress of water
- Location of entry pipes must be clearly marked, above ground especially pipe ends outside the plot for easy location
- Building contractors shall be responsible to locate the installed entry pipes on site, if requested by Etisalat
- No right-angled sharp bends should 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 600mm (L) X 600mm (W) X 800mm (D) must be provided
- Entry pipes must be assigned, exclusively for Etisalat telecommunication services
- Entry pipes must be provided with a draw rope made of nylon of minimum 6mm diameter
- For the number and size of entry pipes, for the various types of buildings, please refer to Table 1

Main telecom room
Main telecom room should be a dedicated room. This is to be provided either on the ground floor or basement of the building for the purpose of terminating telecommunication cables and to house the present & future telecom equipment. If in any case, the main telephone room will be in different floors other than recommended Etisalat must be consulted. The room must be reserved exclusively for Etisalat use.

- The room must be easily accessible to Etisalat Personnel 24 hr./day, (all days including weekends). The room must be clean, dry and free from dust and secured from unauthorized entry.
- The room location must not be beneath or next to kitchens, washrooms, garbage areas, swimming pools and other wet areas.
- Adequate lighting and minimum of four 20 amp. and 240 volt A.C. Mains outlet from a dedicated circuit breaker should be provided.
- The room must be air-conditioned.
A "raised floor" of minimum 300mm should be provided if required, depending on the telecom room usage.

The room must be provided with a good earth set with resistance of less than 1 ohms.

The door opening for the room should swing outwards.

The floor, roof and surrounding wall of the telecom room, should be free of any concealed water/drainage pipes and air-conditioning ducts passing through.

The room must be provided with an emergency light, a smoke detector and a fire alarm including two hand held CO2 fire extinguishers of minimum 10KG capacity.

If the telecom room is proposed in the basement, an automatic sump draining system must be provided to handle water seepages.

The duct entry to building must be sealed air and water tight.

For the Telecom room size, please refer Table No. 1

Floor telecom space
Floor telecom space is a dedicated area, and required on each floor for the purpose of routing and/or terminating telecommunication cables, and it should be exclusively for Etisalat use.

The room must readily be accessible to Etisalat personnel and equipment 24 hr./day, all the days, round the clock and it must be clean, dry, free from dust and secured from unauthorized entry.

The door opening for the room should swing outwards, when opened.

For the floor telecom space, please refer Table No. 1

Roof-top telecom room
Roof-top telecom room is a dedicated room to be provided on the roof-top of the proposed multi-storey buildings, exclusively for Etisalat use and secured from unauthorized entry. The minimum roof-top telecom room size should be 3m (L) X 3m (W) X 3m (H).

The floor loading of this area must be maximum possible, to support future installation of telecommunications equipment.

An opening of size 600mm X 400mm to be provided on the wall of the room, facing the terrace, 500mm below the room ceiling.

The location of the room should 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 (DB), earthing less than 1 ohms, adequate lighting, two 13 amp. 240V AC power socket and one telephone socket.

The room must be provided with an emergency light, a smoke detector and a fire alarm.

Risers from main telecom room to individual floors
The risers are required in multiple-storey buildings for the installation of fibre optic cables from main telecom room to other rooms, as detailed below:

Galvanized slotted iron cable trays minimum 200mm X 50mm Heavy Duty, Return Flange (HDRF) should be provided from the main telephone room, to each typical floor telecom room and extended up to the roof-top telecom room.

The risers to each floor must be symmetrical and vertically in line with the main telecom room. However, where the main telecom room, floor telecom space and roof-top telecom room are to be located one below the other in vertical line, a continuous cable tray must be provided up to the main telecom room.

If a building consists of more than one tower, all the above specified requirements are required in each tower. The towers must be inter-connected at the main telecom room, by separate cable trays of minimum 2 nos. and size 200mm X 50mm or through floor raceways passing through a common area between the two buildings.

The size of the floor raceways is to be decided at the design stage by Etisalat. 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.

Floor distribution box
Floor distribution boxes are either PVC made or metallic boxes, concealed, located on the wall, where the internal conduit from every flat is terminated. These empty boxes should be located close to the risers and can be more than one, depending upon the number of flats and conduits proposed to be terminated. These distribution boxes facilitate to route the fibre optic cables to the premises directly and where the number of cables corresponds to the number of flat/premises.

However, floor distribution box may not be required for cases where horizontal distribution leading to each flat/premises is through cable tray.

The distribution boxes should be of size not less than 300mm (L) X 300mm (H) X 150mm (D) flush mounted on wall. A suitable hinged cover must be provided.
• It should be installed at a height of 600mm to 1200mm from finished floor level
• Adequate safe working space is to be provided around each location
• The distribution boxes on a floor, should not be linked to or serve any other floor of the building
• The distribution boxes location should never be near any electrical junction box or bus bars
• A single conduit of at least 25mm (1 inch) internal diameter, black and of uPVC material should be provided from each floor distribution box up to the indoor equipment cabinet of each office, residence, flat and other independent areas in the same floor
• Etisalat should be consulted to enhance the requirements, if the building is designed for commercial use

Indoor equipment cabinet
Indoor equipment cabinet must be provided in each flat, villa or office and must be installed in a secured place. The cabinet specified will house Optical Network Units (ONU) & its accessories and must be located as per the following conditions:
• The cabinet should be at a common point where all internal conduits meet in support of SCS on a star topology
• The cabinet should be in central and accessible locations and shall house the following
  • RJ45 patch panel/IDC modules
  • Micro ODF for fibre termination
  • Power sockets
• Should have sufficient space around the cabinet to allow access to installation and maintenance
• The cabinet should be installed at a height of 1200mm above finished floor level for better working position and to prevent accidental access by children
• Should be located where the farthest telecom socket must not exceed 90 meters from the indoor equipment cabinet
• Should be installed in an air-conditioned environment.
• Should not be installed adjacent to any electrical distribution or bus bars.
• Should not be installed in the kitchen or near to washroom and other wet areas.
Details and specification of indoor equipment cabinet in residential and commercial buildings are provided in Annexure 3.

Flat distribution
All UTP cables inside the flat must be through a PVC conduit from indoor equipment cabinet to individual telecom socket.
• Internal conduit must run from indoor equipment cabinet up to individual socket in each room

Villa distribution
• Indoor equipment cabinet must be installed at ground floor of the villa for distributing internal cables
• A secured floor distribution box of size 300mm (L) X 300mm (H) X 150mm (W) flush mounted on wall is required in every floor of the villa, for distributing SCS, from the indoor equipment cabinet
• The distribution 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 600mm and 1200mm above the finished floor level
• The distribution boxes on different floors of a villa should be connected through a 1 X 50mm black PVC conduit. If the conduit space will exceed the standard fill-in capacity, then additional conduit of same size may be provided
• The distribution box should have 1 X 50mm (2 inch) conduit to the roof-top of the villa, from the cabinet or from the telephone entry duct location, in order to provide access to cables from the antenna Installation of in-building fibre drop cables

Structure Identification Plate
Structure identification plate will hold Etisalat FTTH details in each villa and building. Building owner must provide and install the plate in a location where it is clearly visible and can be easily seen. The plate must have minimum dimensions of 100mmx70mm (LxW) and thickness of 1mm. It must be made from PVC with aluminium coating or equivalent materials where Etisalat ID (EID) will be laser-printed or engraved. The information to be printed on the plate must be obtained from Etisalat. Details are provided in annexure 9.

Mobile requirements
A number of telecom mobile rooms will be required in a development depending on the characteristic of the buildings. During NOC issuance, Etisalat Mobile Development team shall determine the need for mobile telecom rooms in the building.

Details and requirements are provided in separate document ‘FTTH Network Installation Guide and Mobile Requirements’.
Fiber to the Home (FTTH) requirements

The following FTTH components must be supplied and installed by the building owner or building developer. It must be installed according to manufacturer’s specification using the proper tools and testing equipments, to ensure quality, high performance of the system and to meet expected standards. All cables and equipments must be provided with suitable labels for easy identification.

Fibre Distribution Hub (FDH) at main telephone room
FDH serves as termination point of bulk fibre optic drop cables or multicore riser cables. Its dimensions and type varies depending on the number of cables to be terminated.

FDH should be installed with sufficient space around the cabinet to allow access to installation and maintenance.

Free standing type FDH
This type of FDH cabinet is recommended for high rise and multi-storey buildings, shopping malls, hospitals, airports, large commercial establishments, etc. with more than 100 tenancies.

Wall-mount type FDH
Low-rise buildings including complex of villas may use wall-mount FDH cabinet. This cabinet is recommended for less than 100 tenancies.

For more details of FDH requirements for various types of buildings, you may refer to Table-1. Also, FDH details & requirements, specifications are provided in Annexure 4.

Fibre optic cable
All fibre optic cables must be provided and installed by the building owner/developer including termination on both ends. As-built drawings must be submitted along with the test reports showing the performance of the cabling system. The test should be performed through the use of Optical Time Domain Reflectometer (OTDR).

Fiber test result must be submitted in format provided in Annexure 6.

Fibre optic cable- in buildings
Depending on the building size and number of tenancies, in-building optical network system should be deployed based on the following topology. For more details of optical fibre cable requirements for different types of buildings, you may refer to Table-1.

Direct Fibre
A minimum of 1 core fibre drop cable (2 cores fibre, optional) or as approved design shall be pulled from the main telecom room FDH location up to indoor equipment cabinet in each flats/offices, with no cut and splice in between and where both ends must be terminated using SC/APC connector or through fusion splicing.

Multicore Fibre
In multicore fibre system, the cable must be installed from FDH up to mini ODF which is strategically located in floor telecom room. The cable must be terminated on both ends using SC/APC connector. Multicore riser must be planned with 25% spare fibers in each riser cable for future service.

In addition, a minimum of 1 core fibre drop cable (2 cores fibre, optional) shall be pulled from the mini ODF up to indoor equipment cabinet in each flats/offices.

Optical fibre cable details and specifications are provided in Annexure 5.

Fibre optic cable- in single & complex of villas
For single villa, Etisalat to provide the fibre drop cable. However, in case of complex of villas, building owner/developer must provide, install and terminate outdoor fibre distribution cables & drop closures if required, including 1 core fibre drop cable (2 cores fibre, optional).

Fibre optic cable- in mobile service rooms
For buildings with mobile service rooms, multicore fibre optic cable must be provided by the building owner/developer. It must be installed from the main telecom room and must be terminated on both ends in a mini-ODF. Number of fiber cores and termination point to be determine during planning stage. Details and requirements are provided in separate documents “FTTH network installation guide and mobile requirements”.

Micro ODF
Inside the customer premises, termination of fibre drop cable must be through micro ODF also known as Rosette and it must be installed inside the indoor equipment cabinet.

Specifications for micro ODF are provided in Annexure 5.
The Table No. 1 below, details the different requirements for the various types of buildings and types.

### Table 1 - Telecom Requirements

<table>
<thead>
<tr>
<th>Entry Box*</th>
<th>Entry Pipes/ Ducts</th>
<th>Main Telecom Room</th>
<th>Roof Top Mobile Service Room</th>
<th>Mobile Service Room</th>
<th>Floor Telecom Space</th>
<th>Riser Cable Containment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module</strong></td>
<td><strong>Qty. &amp; Size</strong></td>
<td><strong>No Requirements</strong></td>
<td><strong>No Requirements</strong></td>
<td><strong>No Requirements</strong></td>
<td><strong>No Requirements</strong></td>
<td><strong>Type: Fibre Optic</strong></td>
</tr>
<tr>
<td><strong>size:</strong></td>
<td><strong>3X100mm</strong></td>
<td><strong>1.5mX2mX3m (LxWxH)</strong></td>
<td><strong>1.5mX3mX3m (LxWxH)</strong></td>
<td><strong>1.5mX3mX3m (LxWxH)</strong></td>
<td><strong>1.5mX2mX3m (LxWxH)</strong></td>
<td><strong>200mmX50mm or HDRF cable tray</strong></td>
</tr>
<tr>
<td><strong>Notes:</strong></td>
<td><strong>The same duct quantity and size to be extended towards the Etisalat network.</strong></td>
<td><strong>Notes:</strong></td>
<td><strong>Notes:</strong></td>
<td><strong>Notes:</strong></td>
<td><strong>Notes:</strong></td>
<td><strong>Remarks:</strong></td>
</tr>
</tbody>
</table>

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**Notes:**
- Sizes: JRC-12 (Etisalat standard) for plot entry and, 600mmX600mmX800mm per shop/shed.
- Location: Plot entry box must be within the compound.
- Notes: Entry box must have grade A cover.

---

**Notes:**
- Sizes: JRC-12 (Etisalat standard) for plot entry, and 600mmX600mmX800mm per factory/warehouse.
- Location: Plot entry box must be within the compound.
- Notes: Entry box per shop/shed must have grade A cover.
<table>
<thead>
<tr>
<th><strong>Table 1 - Telecom Requirements</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single Villa</strong></td>
</tr>
<tr>
<td>Complex of Villas</td>
</tr>
<tr>
<td>Buildings up to (B+C+G)= 5 floors or building area up to 3000m²</td>
</tr>
<tr>
<td>Building (B+C+G+10) floors and more, or building of over 100 tenancies, or building area more than 7000m²</td>
</tr>
<tr>
<td>Palaces and Hospitals</td>
</tr>
<tr>
<td>Factories and Warehouses</td>
</tr>
<tr>
<td>Group of Shops and Sheds</td>
</tr>
</tbody>
</table>

**Floor Distribution Box**

| Size: 300mmX300mmX150mm | Size: 300mmX300mmX150mm |
| Location: convenient location with 1 meter free wall space around | Location: convenient location with 1 meter free wall space around |
| Notes: The box must be recessed inside the wall for each floor, and must be installed at a height between 600-1200mm above finished floor level. | Notes: The box must be recessed inside the wall for each floor, and must be installed at a height between 600-1200mm above finished floor level. |

**Indoor Equipment Cabinet**

| Size: 600mmX120mmX60mm (W) | Size: 600mmX120mmX60mm (W) |
| Location: Common and accessible areas in each villa | Location: Common and accessible areas in each flat |
| Notes: To be provided in each floor telecom room, flush to wall | Notes: To be provided in each floor telecom room, flush to wall |

**Fibre Network Architecture**

| No Requirements | No Requirements |
| Direct fibre for 20 villas or less, where distance from FDR is less than 200 meters. Outdoor fibre distribution for more than 20 villas. Then direct fibre to each villa | Direct fibre |
| Direct fibre | Direct fibre |

**Fibre Cable Drop**

| No Requirements | No Requirements |
| Types: 1 core indoor-type or outdoor-type as per application (2 cores, optional). Notes: To be provided from main telecom room or joint box (as per advised) up to indoor equipment cabinet to each villa | Types: 1 core indoor-type (2 cores, optional). Notes: To be provided from main telecom room up to indoor equipment cabinet to each flat |
| Types: 1 core indoor-type (2 cores, optional). Notes: To be provided from main telecom room up to indoor equipment cabinet to each flat | Types: 1 core indoor-type (2 cores, optional). Notes: To be provided from main telecom room up to indoor equipment cabinet to each flat |
| Types: 1 core indoor-type (2 cores, optional). Notes: To be provided from main telecom room up to indoor equipment cabinet to each flat | Types: 1 core indoor-type (2 cores, optional). Notes: To be provided from main telecom room up to indoor equipment cabinet to each flat |

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*Entry box size and location may vary depending on area Engineer/Planner assessment.*

*If proposed Entry Box (EB) location cannot accommodate the standard EB size, 600mm x 600mm x 600mm EB may be considered, subject to Etisalat approval.*
Structured Cabling System (SCS)
To deliver the services from the ONU, an SCS System on star topology is required. The minimum requirement is EIA/TIA standard CAT 6 cable with RJ45 connectivity. An SCS design being project specific, a discussion with complete details is recommended with system designers and Etisalat.

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

Cabling & termination
Telecommunication cabling
• The cables used for these wiring must comply with minimum CAT 6 standards.
• The planned SCS cable should 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 are to be properly labeled and terminated, in the RJ45 sockets and in patch panel or in CAT 6 compliant Insulation Displacement Connector (IDC) modules by the owners/building contractor.
• Building owner is responsible for replacement of in-building cables and other fixtures, if these become faulty.
• Cable diagrams must be submitted to Etisalat for approval at the design stage and as-built is required on completion.
• Cables and other accessories required for block wiring may be purchased from any reputable source provided that the material meets standards.
• The name and contact telephone numbers of the SCS installer should be labeled at appropriate location.
• Completed SCS should be subject to acceptance by Etisalat. However, the design and performance of the SCS system should 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 should be provided by building owner.
• The supply and termination of UTP cables on patch panel or IDC modules and sockets locations should be the responsibility of the installers/owners.

Telecommunication socket
All outlets should be Category 6 performance, outlets mounted in shutters, typically in dual, triple or quad formation in a single or double gang white faceplate. All RJ45 outlets should be fitted with spring loaded sliding shutters to prevent the ingress of dirt and dust.
• Provision for at least one dual socket for telecommunication services should be made in every room including kitchen. Conduit with not less than 25mm should be connected between the socket locations and indoor equipment cabinet.
• Every socket must be connected with a minimum of four pair SCS CAT 6 cable, following star topology. In case of hotel buildings, the provision of telecommunication socket should also be extended to the bathrooms.
• Telecommunication sockets, cables and associated facilities within the various rooms and premises are to be provided by the building owner.

Accessories
All accessory plates should be dual or quad white PVC plated. 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 choice of outlets distribution, location and type, either it is single, dual, or quad, the optimum requirements in each area, ultimate number of outlets in every locations, flexibility and maximum usage, should be the responsibility of consultants.

Horizontal subsystem (UTP Cables)
All horizontal cables should be based on EIA/TIA Category 6 performance compliant.

All conductors in each cable should be connected to a single RJ45 socket 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. Colour coding for the termination should conform with EIA/TIA 568B standard and as per the following table.

<table>
<thead>
<tr>
<th>Pair</th>
<th>Tip</th>
<th>Ring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
<td>Blue</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
<td>Orange</td>
</tr>
<tr>
<td>3</td>
<td>White</td>
<td>Green</td>
</tr>
<tr>
<td>4</td>
<td>White</td>
<td>Brown</td>
</tr>
</tbody>
</table>
Conduit cable capacities
Spare conduit capacity is important for the removal and replacement of cables if became faulty. The maximum number of UTP cables inside a conduit recommended for the installation of a Structured Cabling System is shown below. However, the number of cables may be adjusted if cable pulling difficulties may be encountered.

<table>
<thead>
<tr>
<th>Conduit trade size</th>
<th>Conduit Internal diameter (mm)</th>
<th>No. of CAT6 Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>25.40</td>
<td>7</td>
</tr>
<tr>
<td>1 ¼&quot;</td>
<td>34.04</td>
<td>13</td>
</tr>
<tr>
<td>1 ½&quot;</td>
<td>39.88</td>
<td>18</td>
</tr>
<tr>
<td>2&quot;</td>
<td>51.31</td>
<td>30</td>
</tr>
</tbody>
</table>

Tray and trunking cable capacities
When the internal cable trays, risers and ladders, etc. are designed, supplied and installed by others, the maximum number of UTP cables, recommended to be installed on a tray as shown; however this need to be reduced in the case of bends and crossovers. The formula applied is that for every 25mm x 25mm cross-section, 8 cables can be accommodated. No trunking or cable tray should be more than 75% full on installation.

<table>
<thead>
<tr>
<th>Cable Tray Size (mm)</th>
<th>Trunking Size (mm)</th>
<th>No. of CAT6 Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>50x50</td>
<td>50x50</td>
<td>30</td>
</tr>
<tr>
<td>75x50</td>
<td>50x75</td>
<td>45</td>
</tr>
<tr>
<td>100x50</td>
<td>50x100</td>
<td>60</td>
</tr>
<tr>
<td>-</td>
<td>75x75</td>
<td>67</td>
</tr>
<tr>
<td>150x50</td>
<td>75x100</td>
<td>90</td>
</tr>
<tr>
<td>200x50</td>
<td>100x100</td>
<td>120</td>
</tr>
<tr>
<td>300x50</td>
<td>-</td>
<td>180</td>
</tr>
<tr>
<td>450x50</td>
<td>150x150</td>
<td>270</td>
</tr>
<tr>
<td>900x50</td>
<td>-</td>
<td>540</td>
</tr>
</tbody>
</table>

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

Horizontal cabling
- The physical topology of the horizontal cabling should be configured as a star 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 single, dual, triple and quad outlets throughout.
- The length of cable between the farthest telecommunications outlet and the indoor equipment cabinet should not exceed 90m (295ft). Etisalat must be notified in case the cable will exceed allowable length for further advice.
- A minimum of two telecommunications outlets should be provided for each individual work area. The outlets may be located with one or more faceplates in the work area.

Horizontal pathways
- Horizontal pathways (conduits, sleeves, cable trays, etc.) are used for taking the cables from the floor telecommunications room to the telecommunications outlets in the same floor.
- A variety of methods are available and the choice of selection of method should depend on the purpose of the floor area to be served (i.e. general office spaces, apartment dwellings, etc.)

Conduits
- 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 distribution box to the telecommunications outlet should be 25mm (1 inch).
- For the conduits, the inside bending radius should always be at least 10 times the internal diameter.
- Minimum of one nylon draw wire must be installed in a conduit.
- Pull boxes should be located such that they are readily accessible at all times. Pull boxes to be spaced at a maximum of 15m 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; a minimum of 50mm from the floor to prevent water or other liquids from flowing into the conduits.

Conduit trade size

<table>
<thead>
<tr>
<th>Conduit Internal diameter (mm)</th>
<th>No. of CAT6 Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.40</td>
<td>7</td>
</tr>
<tr>
<td>34.04</td>
<td>13</td>
</tr>
<tr>
<td>39.88</td>
<td>18</td>
</tr>
<tr>
<td>51.31</td>
<td>30</td>
</tr>
</tbody>
</table>

Where an FO cable block wiring is considered, a very careful consideration must be taken, while designing the system. The owner should be responsible for the design, supply and maintenance of all related items.
Patching
The design of patch frame layouts is critical to create a high level of manageability within a compact cabinet, while maintaining effective operations when used by the customer.

We recommend all horizontal UTP cabling should be terminated in a 12 or 24 port patch panel, placed inside indoor equipment cabinet. Alternatively, CAT6 compliant IDC modules can also be used. Voice services can be fed from the services patch panel directly to the user outlet using standard 1 pair patch cords.

Labeling
Label elements
All fibre optic and SCS infrastructure including floor outlets, patch frames and horizontal cables should be labeled. A typewritten standard labeling system is recommended. The labeling scheme shall be agreed on with the clients’ telecom team. Labeling guide for fiber optic infrastructure is provided in Annexure 7.

Horizontal cable labels
Label all horizontal cables at both ends 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.

Under-floor systems
• For general office spaces, an under-floor raceway system should be used for maximum flexibility
• 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. Main elements of under-floor raceway systems

Main elements of under-floor raceway systems
Distribution raceway
• Distribution raceway provides a pathway for the cables from the feeder raceway to the work areas. The minimum size of the distribution raceway should be 30mm (H) X 60mm (W) of cross-sectional area. The same size must be used for every (multi-channel) layout

Feeder raceway
• Feeder raceway provides a pathway for the cables from the distribution box in the floor telecommunications room to the distribution raceways. The minimum size of the feeder raceway should be 40mm (H) X 200mm (W) of cross-sectional area. The same size must be used for every (multi-channel) layout
• The feeder raceways starting point in the floor telecommunications room must be adjacent to the distribution box. The Feeder raceway should end at the last distribution raceway it is serving.

Access unit
• The access unit provides access at the point of intersection of the feeder and the distribution raceways

Cable trays
• Cable trays are mostly used for floors with raised tiles or floorings
• As a general guideline, cable trays that intersect must be provided with a transitional bend radius of 150mm in all directions.
• Exposed sheet metal edges must be provided with bushings or other means of protection such that cables will not be damaged during or after installation. Since cable trays are usually metallic, all sharp edges, burrs and screw tips that may come into contact with cabling should be removed.
• The minimum access space between the sub-floor and the underside of the floor tile should be minimum 150mm (6 in). Etisalat should be consulted in the initial design stage to decide on the requirements if the building is designed for office use.

Protection from electromagnetic interference
The following requirements apply to UTP cabling, as pathways and spaces used to carry or house telecommunications cabling.
• The proximity of cabling to electrical facilities and equipment that generate high levels of Electromagnetic Interference (EMI) should be taken into account for metallic cabling.
• Sources of EMI include: power cables, photocopy equipment, electric motors, transformers, fluorescent lighting, arc welders and induction heaters, etc.
To avoid EMI, the telecommunications pathways, spaces and metallic cables should be installed with the following clearances:

- 1200mm from large motors or transformers
- 300mm from conduit and cables used for electrical power distribution
- 120mm from fluorescent lighting
- Pathways and metallic cables should cross perpendicular to fluorescent lighting and electrical power cables or conduits.

Separation distance from power source

During the design stages, separation of power and the Structured Cabling Systems (SCS) must be considered. Unshielded data cables should not be installed near sources of electromagnetism.

**Typical building environment**

Minimum separation distance from power source ≤480V

<table>
<thead>
<tr>
<th>Condition</th>
<th>&lt;2KVA</th>
<th>2-5KVA</th>
<th>&gt;5KVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unshielded power lines or electrical equipment in proximity to open or non-metal pathways</td>
<td>130mm</td>
<td>300mm</td>
<td>600mm</td>
</tr>
<tr>
<td>Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway</td>
<td>65mm</td>
<td>155mm</td>
<td>300mm</td>
</tr>
<tr>
<td>Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to grounded metal conduit pathway</td>
<td>50mm</td>
<td>155mm</td>
<td>300mm</td>
</tr>
<tr>
<td>Electric motors and Transformers</td>
<td>1000mm</td>
<td>1000mm</td>
<td>1000mm</td>
</tr>
<tr>
<td>Fluorescent lighting</td>
<td>300mm</td>
<td>300mm</td>
<td>300mm</td>
</tr>
</tbody>
</table>

**Private Branch Exchange (PBX)**

In case where communication systems with more than 64 extensions (i.e. PBX system) are required, special facilities need to be provided as follows:

**Equipment room**

A room for exclusive use of Etisalat is needed for the telephone equipment. The room should be accessed by the underground cables, fibre optic cables, patch panel and the distribution to the floor cables. The main telecom room can be considered for PABX installation in case of commercial single owner building.

**Room size**

- For up to 100 extensions, the minimum floor space required is 2m X 3m
- For up to 400 extensions, the floor space required is 4m X 4m
- For large systems Etisalat must be consulted at the planning stage
- The room should have a minimum height of 3m, be air-conditioned, clean, and dry and free from dust

**Room general requirements**

- The room should be far away from high voltage plant. Other services/utility ducts should not run through this room and it should not be directly under a toilet or bathroom, kitchen and electrical rooms
- The room should provide ready access to Etisalat personnel or Etisalat’s authorized personnel and equipment but must be secured from unauthorized entry
- The room must be properly protected from the risk of flooding if provided in the basement
- In multi-PBX user building, each PBX to have its own room
- Raised flooring should be provided when required depending on the PBX type
- For large PBX installations, air-conditioned battery room adjacent to the equipment room will be required. Etisalat will supply details at the design stage. The battery room should be provided with an exhaust fan. Conduit or tray is required between the equipment room and the battery room
- Direct sunlight should not fall in the PBX room. Curtains/screens are to be provided for the windows if any
- Power conduit and telecom cable conduit must be separate

**Electrical requirements**

- A minimum of two 13 amp 240 v A/C main outlets (via) UPS system should be provided. The actual mains power requirements will depend on the size and type of the PBX
- The room should be provided with an earth not more than 5 ohms
- Anti-static flooring should be provided, including the battery room
- The rooms must be provided with an emergency light, a smoke detector and a fire alarm

PABX can be installed in the main telecom room in the case of a single owner.
Important notes

1) This design guide explains in general, all Etisalat requirements that will facilitate the provision of telecommunication services to new buildings, yet the requirements indicated in the No Objection Certificate (NOC)/approved building drawing should be fully complied.

2) Architects/consultants/designers must liaise with Etisalat at the design stage and obtain Etisalat approval on the final design drawings.

3) Minimum two sets of telephone design drawings must be submitted for study and approval, before tendering. For projects located in Dubai Region, design drawings must be uploaded to eNOC portal in PDF format.

4) Where deviations/comments/amendments are advised on the design, drawings must be corrected and re-submitted for approval.

5) One set of approved ‘As-Built’ drawings, fibre test results and fibre connection details must be submitted along with the building completion certificate request, which will be certified by Etisalat.

6) Etisalat’s responsibility is limited to provisioning and installation of the following:
   - Main or feeder cable including splicing and termination in the FDH
   - Patching of optical splitter inputs from patch panel (feeder module)
   - Optical Network Units (ONUs) including patching from micro ODF.
   - Patching from ONU to SCS patch panel

7) The owners are responsible for supply and installation of FTTH components such as FDH, optical splitter, optical patch panel, patch cords, mini ODF, micro ODF, connectors and adaptors. Including all internal fibre optic cables from FDH (main telecom room) to ONU (customer premises) locations, provision of indoor equipment cabinets to accommodate ONU, power, patch panels, etc. and complete Structured Cabling System.
   Also, in case outdoor fibre distribution is required for complex villas, group of shops ft sheds. The building owner shall be responsible for the supply including accessories, installation and termination of outdoor distribution cable and fibre drop closures.

8) FTTH components recommended brand or make must be acquired from Etisalat prior to purchase and installation by the building owner/developer. This is to ensure in-building network performance meets Etisalat standard.

9) The building owner/developer may choose to buy these FTTH components from Etisalat if available, or from any reputable source. However, if the building owner/developer wishes to use different brands other than recommended, “Product Approval” Product Registration and Certificate number must be obtained from the Vendor.

10) FTTH components that are not in Etisalat recommended brand must be certified through “Product Approval” process. Sample component and specification sheet must be submitted by the Vendor prior to building owner/developer purchase.

11) Building owners/developers are responsible for the maintenance and repair of FTTH in-building network and SCS installations including replacement of faulty components.

12) The indoor drop 1F fibre cables (2F, optional) should be from a popular brand and make, conforming to ITU-T standard G.657A1/A2 single mode fibre standards.

13) The owners must ensure all fibre optic installations and terminations including the Structured Cabling System (SCS) are installed with utmost quality according to but not limited to the checklist provided in Annexure 8.

14) On completion of the requirements, any comments and snags advised by Etisalat 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.
List of Annexures
Annexure 1 - Type of Entry Box

a) JRC-4

b) JRC-12
Annexure 2 - Type of Entry Box

a) Typical Telecom Requirement in Villas - Ground Floor

b) Typical Telecom Requirement in Villas - G+1
c) Typical Telecom Requirement in Multi-Storey Building

- Minimum Height: 600mm
- Minimum Width: 425mm
- Minimum Depth: 120mm
- Lockable door
- Should be fitted with RJ45 patch panel
- Should be fitted with micro ODF
- Should have two power sockets for ONU and battery rectifier powering
- Should have adequate number of aesthetically designed holes on the front door for ventilation
- Should be installed flush mounted on wall

Note: The same can be used also for Small-offices, Home-offices. e.g. Small clinics, shops etc.
Annexure 4 – Fiber Distribution Hub (FDH)

I) Free standing type FDH cabinet

a) Specifications

- 42U rack cabinet, 2200mm x 600mm x 300mm (H x W x D)
- Suitable for 19-inch rack mounting equipment and SC/APC termination
- Standard mounting frame ETSI standard,
- Lightweight modular construction
- Cabinet design must be installed with access from all sides
- Any metal parts must be free from sharp edges and must be earthed / earth bonded in accordance with the manufacture’s guidelines and safety standards.

Specifications

- Minimum Height: 600mm
- Minimum Width: 600mm
- Minimum Depth: 300mm
- Suitable for 19” rack equipment mount
- Lockable door
- Should be fitted with RJ45 patch panel
- Should have two power sockets for ONU and battery rectifier powering
- With provision for air circulation
- Partially concealed or Wall mount installation

Note: This type of cabinet is applicable for commercial building with pre-defined offices and for big palaces. For commercial building with open-floor, Etisalat must be consulted.
c) Free standing type FDH cabinet requirements

The following optical materials are required when a free standing type of FDH cabinets will be deployed.

Optical splitter module – specifications
- Modular optical splitter, 2x32
- Compact size, rack mountable 19”.
- Wide operating wavelength range (1310/1490/1550/1620nm).
- Low insertion loss.
- Low Polarization Dependent Loss (PDL).
- Excellent Insertion Loss (IL) uniformity.
- Telcordia qualified
- RoHS Complaint
- Return loss of 50dB
- SC/APC connectivity
- Operating temperature of -5°C to +60°C
- All fibers are single mode (ITU-T-G.652D or G.657A1/A2)

Optical patch panel module – specifications
- 24 Ports with SC/APC adapters
- Front plate compatible for SC/APC adapters
- Cable entry at the rear and sides of the module
- With cable manager (guide) and patching ring
- Capable of sliding or swiveling in when accessing the interior of the module
- Must be equipped with splice trays
- LSZH and OFNR rated
- High Tensile Strength, min 10kgf
- Strength member cord, aramid yarn or Kevlar
- Typical length from 2 to 10 meters
- Diameter, 2mm/3mm

Optical patch cord – specifications
- Single mode SC/APC
- Low insertion loss.
- Wavelength 1260 – 1620 nm
- High return loss 50 dB.
- Good repeatability and exchangeability.
- Operating temperature -20°C to +60°C
- High Tensile Strength, min 10kgf
- Good repeatability and exchangeability.

d) To determine the quantity of Optical Splitter module and Optical Patch Panel module

- To find the Optical splitter quantity
  Number of Tenants/32
  (where splitter has 32 output ports)
  Note: Etisalat must be consulted for splitter quantity in case of commercial buildings.
- To find the Optical patch panel or drop module
  (Number Tenants)/24
  (where patch panel has 24 ports)
- For Optical patch panel for feeder cable
  Provide one dedicated 24-port patch panel for terminating Etisalat cable.

e) Layout Plan for FDH (Free standing)

[Diagram showing layout plan for FDH cabinet]
II. Wall-mount type FDH Cabinet-19" rack mounting

a) Specifications
- 12U – 22U 600 mm wide x 515 mm deep 19" wiring/equipment cabinet
- Suitable for 19-inch rack mounting equipment and SC/APC termination
- Any metal parts must be free from sharp edges and must be earthed / earth bonded in accordance with the manufacture’s guidelines and safety standards.

b) Wall-mount type FDH Cabinet-19" requirements
This type rack mountable FDH cabinet requires the following optical modules.
- Optical splitter module
- Optical patch panel

III. Wall-mount type FDH Cabinet with modular splitter

a) Specifications
- With one 2:32 Splitter pre-installed
- Dimension 970mm (L) X 640mm (W) X 160mm (D)
- Maximum capacity of 128 connections
- Operating temperature: -40°C to +65°C
- RAL7038 colour

b) Sample Wall-mount FDH with modular type of splitter

b) Multicore cable specifications
- Characteristics conform to ITU-T G.652D or G.657A1/A2 standards for single mode fiber.
- Mode field diameter
  - @ 1310 nm: 8.6 ± 0.4 µm
  - @ 1550 nm: 9.8 ± 0.5 µm
- Cladding diameter: 125 ± 1 µm
- Coating Diameter: 245 ± 5 µm
- Cable 16F or 24F core
- OFNR or OFNP listed
- Cable shall be all dielectric
- Thermoplastic buffer coating shall 900 ± 50 µm
- Buffered fibers shall be surrounded with high modulus strength yarn
- The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service
- The optical fiber color coding shall be in accordance to EIA/TIA-598
- The outer cable jacket shall be marked with manufacturer’s name, date of manufacture, fiber count, fiber type, flame rating, listing symbol and sequential length markings
- Operating temperature shall be -20 to +70 °C
- Rated tensile load of 200 N
- Attenuation: max 0.3 dB/Km (1550 nm) and max 0.4 dB/Km (1310 nm)
- Cut-off Wavelength 1190-1330 nm

- Fibre drop cable specifications
  - Single mode
  - Indoor drop fibers
  - Cable to be of flat cross-section
  - Suitable for SC/APC connectors
  - Low Friction
  - Compliant with ITU-T G.652D or G.657A1/A2
  - Flame Retardant Low Smoke Zero Halogen (LSZH)

- Outdoor Fibre Distribution Cable (Loose tube)
  - Fibre shall conform to ITU-T Recommendation G.652D or G.657A1/A2 standards for single mode fibre
  - Mode field diameter @1310nm: 9.3±0.5µm
  - Cladding diameter, 125±1µm
  - Maximum attenuation, @1310nm: 0.36dB/km
  - @1550nm: 0.220dB/km
  - 8F, 16F or 24F core
  - Central strength member, steel stranded wire

Annexure 5 – Fibre Optic Cable, Outdoor Drop Closure, Mini ODF & Micro ODF

- Multicore cable specifications
- Characteristics conform to ITU-T G.652D or G.657A1/A2 standards for single mode fiber.
- Mode field diameter
  - @ 1310 nm: 8.6 ± 0.4 µm
  - @ 1550 nm: 9.8 ± 0.5 µm
- Cladding diameter: 125 ± 1 µm
- Coating Diameter: 245 ± 5 µm
- Cable 16F or 24F core
- OFNR or OFNP listed
- Cable shall be all dielectric
- Thermoplastic buffer coating shall 900 ± 50 µm
- Buffered fibers shall be surrounded with high modulus strength yarn
- The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service
- The optical fiber color coding shall be in accordance to EIA/TIA-598
- The outer cable jacket shall be marked with manufacturer’s name, date of manufacture, fiber count, fiber type, flame rating, listing symbol and sequential length markings
- Operating temperature shall be -20 to +70 °C
- Rated tensile load of 200 N
- Attenuation: max 0.3 dB/Km (1550 nm) and max 0.4 dB/Km (1310 nm)
- Cut-off Wavelength 1190-1330 nm
- Fibre drop cable specifications
- Single mode
- Indoor drop fibers
- Cable to be of flat cross-section
- Suitable for SC/APC connectors
- Low Friction
- Compliant with ITU-T G.652D or G.657A1/A2
- Flame Retardant Low Smoke Zero Halogen (LSZH)
d) Outdoor Drop Closure
- Closure shall be rigid, vibration resistant material of high quality
- Must be gas and water tight seal
- All assembly part of closures that contain any metal parts must be stainless steel construction
- Capable of termination up to 32 drop fibres

e) Mini ODF specifications
- Shall be wall-mountable
- Shall be compact in size and durable
- Riser cable pass-through feature
- Uncut cable installation possibility
- Capable of up to 48 SC/APC Terminations
- Fiber Management
- The color shall be RAL 7038
- Color shall be RAL9003
- Must have a pre-installed SC/APC adaptor

f) Micro ODF specifications
- Dimension: 85mm (L) X 85mm (W) X 20mm (D)
- Indoor type and wall mountable
- Suitable for single fiber termination with provision for 1 additional port
- Fiber selection and mini ODF port capacity are mostly dependent on the number of flats in each floor.

g) Fibre optic cable connector specifications
- Low Back Reflection
- Telcordia GR-326 compliant
- Low Loss
- Operating Environment -20 °C to +80 °C
- Precision pre-angled Ferrule
- Easily assembled
- Can accommodate both 0.25mm and 0.9mm fibre
- Compatible with G.652D fibres and wavelength for 1310/1550nm

To determine mini ODF location, multicore cable size including required number of connectors and SC/APC adaptors can be determined as shown in the matrix.

<table>
<thead>
<tr>
<th>Tenants Per Floor</th>
<th>Mini ODF Location</th>
<th>Cable Size</th>
<th>Number Of SC/APC Adaptor</th>
<th>SC/APC Connector (FDH To Mini ODF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Every 3 Floors</td>
<td>1X16F</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Every 3 Floors</td>
<td>1X16F</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Every 3 Floors</td>
<td>1X16F</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Every 3 Floors</td>
<td>1X16F</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>Every 3 Floors</td>
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<td>15</td>
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</tr>
<tr>
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<td>36</td>
</tr>
<tr>
<td>8</td>
<td>Every 3 Floors</td>
<td>1X16F</td>
<td>21</td>
<td>42</td>
</tr>
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<td>24</td>
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<td>Every 3 Floors</td>
<td>1X16F</td>
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<td>15</td>
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<td>2X12F</td>
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<td>84</td>
</tr>
<tr>
<td>16</td>
<td>Every 3 Floors</td>
<td>2X12F</td>
<td>46</td>
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<td>1X16F</td>
<td>69</td>
<td>138</td>
</tr>
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<td>Every 2 Floors</td>
<td>1X16F</td>
<td>72</td>
<td>144</td>
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<td>1X16F</td>
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<tr>
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<td>1X16F</td>
<td>84</td>
<td>168</td>
</tr>
<tr>
<td>30</td>
<td>Every 2 Floors</td>
<td>1X16F</td>
<td>87</td>
<td>174</td>
</tr>
</tbody>
</table>

Mini ODF location, fiber size, required number of connectors and SC/APC adaptors can be determined as shown in the matrix.
Typical Multicore riser cabling system

Outdoor fibre distribution cabling for complex of villa

Annexure 6 – FTTH test result & termination sheet

I. Test result sheets

a) Typical FTTH component losses

Insertion loss of FTTH components may differ based on the brand and make. The following are the typical insertion loss.

<table>
<thead>
<tr>
<th>SN</th>
<th>Description</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optical Splitter, 2X32</td>
<td>17.2</td>
<td>dB</td>
</tr>
<tr>
<td>2</td>
<td>Fibre Drop Cable</td>
<td>0.35</td>
<td>dB/Km</td>
</tr>
<tr>
<td>3</td>
<td>Multicore Cable</td>
<td>0.25</td>
<td>dB/km</td>
</tr>
<tr>
<td>4</td>
<td>SC/APC Connector</td>
<td>0.4</td>
<td>dB</td>
</tr>
</tbody>
</table>

b) Splitter test result sheet

To ensure splitter is at its highest performance and to avoid installation of splitter with faulty ports, test of each output ports must be provided in format shown below. Loss must not exceed the manufacturer's insertion loss.

<table>
<thead>
<tr>
<th>Emirates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector/Block Number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Splitter No.</th>
<th>Splitter Ports</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5</td>
<td></td>
</tr>
<tr>
<td>Splitter 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Splitter 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Splitter 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Splitter 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Splitter 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement Setting: 1310nm/1550nm Date
### Multicore cable test result sheet

<table>
<thead>
<tr>
<th>SN</th>
<th>Riser No./ No. of fibres</th>
<th>Mini ODF No.</th>
<th>Cable length (meters)</th>
<th>Measured Cable Loss (db)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 / 16F</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2 / 24F</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3 / 24F</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4 / 24F</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5 / 24F</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement Setting: 1310nm/1550nm Date

### Fibre drop cable test result format

<table>
<thead>
<tr>
<th>Floors</th>
<th>Flat Number</th>
<th>Cable length (meters)</th>
<th>Measured Cable Loss (db)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0F</td>
<td>Shop 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shop 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1F</td>
<td>101</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>102</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>103</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>104</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10F</td>
<td>1001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1004</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement Setting: 1310nm/1550nm Date

### Fibre connection details

#### a) Direct fibre termination

<table>
<thead>
<tr>
<th>Splitter Port No.</th>
<th>Patch Panel</th>
<th>Flat No.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Shop 1  Modern Bakery</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Shop 2  German Rent-A-Car</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>Shop 3  The Textile Co.</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>4</td>
<td>Shop 4  Clock Grocery</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>5</td>
<td>MZ01</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>6</td>
<td>MZ02</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>7</td>
<td>MZ03</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>8</td>
<td>MZ04</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>9</td>
<td>101</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>10</td>
<td>102</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>11</td>
<td>103</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>12</td>
<td>104</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>13</td>
<td>201</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>14</td>
<td>202</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>15</td>
<td>203</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>16</td>
<td>204</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>17</td>
<td>301</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>18</td>
<td>302</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>19</td>
<td>303</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>20</td>
<td>304</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>21</td>
<td>401</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>22</td>
<td>402</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>23</td>
<td>403</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>24</td>
<td>404</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>1</td>
<td>501</td>
</tr>
<tr>
<td>26</td>
<td>2</td>
<td>2</td>
<td>502</td>
</tr>
<tr>
<td>27</td>
<td>2</td>
<td>3</td>
<td>503</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>4</td>
<td>504</td>
</tr>
<tr>
<td>29</td>
<td>2</td>
<td>5</td>
<td>601</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
<td>6</td>
<td>602</td>
</tr>
<tr>
<td>31</td>
<td>2</td>
<td>7</td>
<td>603</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>8</td>
<td>604</td>
</tr>
</tbody>
</table>

Measurement Setting: 1310nm/1550nm Date
<table>
<thead>
<tr>
<th>Splitter Port No.</th>
<th>SPLITTER 1</th>
<th>ODF1/P1</th>
<th>ODF1/P2</th>
<th>ODF1/P3</th>
<th>ODF1/P4</th>
<th>ODF2/P1</th>
<th>ODF2/P2</th>
<th>ODF2/P3</th>
<th>ODF2/P4</th>
<th>ODF3/P1</th>
<th>ODF3/P2</th>
<th>ODF3/P3</th>
<th>ODF3/P4</th>
<th>ODF4/P1</th>
<th>ODF4/P2</th>
<th>ODF4/P3</th>
<th>ODF4/P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shop 1</td>
<td>Direct connected from FDH/Shop 1</td>
<td>SHOP1</td>
<td>SHOP2</td>
<td>SHOP3</td>
<td>SHOP4</td>
<td>SHOP5</td>
<td>SHOP6</td>
<td>SHOP7</td>
<td>SHOP8</td>
<td>SHOP9</td>
<td>SHOP10</td>
<td>SHOP11</td>
<td>SHOP12</td>
<td>SHOP13</td>
<td>SHOP14</td>
<td>SHOP15</td>
</tr>
<tr>
<td>2</td>
<td>Shop 2</td>
<td>Direct connected from FDH/Shop 2</td>
<td>SHOP2</td>
<td>SHOP3</td>
<td>SHOP4</td>
<td>SHOP5</td>
<td>SHOP6</td>
<td>SHOP7</td>
<td>SHOP8</td>
<td>SHOP9</td>
<td>SHOP10</td>
<td>SHOP11</td>
<td>SHOP12</td>
<td>SHOP13</td>
<td>SHOP14</td>
<td>SHOP15</td>
<td>SHOP16</td>
</tr>
<tr>
<td>3</td>
<td>Shop 3</td>
<td>Direct connected from FDH/Shop 3</td>
<td>SHOP3</td>
<td>SHOP4</td>
<td>SHOP5</td>
<td>SHOP6</td>
<td>SHOP7</td>
<td>SHOP8</td>
<td>SHOP9</td>
<td>SHOP10</td>
<td>SHOP11</td>
<td>SHOP12</td>
<td>SHOP13</td>
<td>SHOP14</td>
<td>SHOP15</td>
<td>SHOP16</td>
<td>SHOP17</td>
</tr>
<tr>
<td>4</td>
<td>Shop 4</td>
<td>Direct connected from FDH/Shop 4</td>
<td>SHOP4</td>
<td>SHOP5</td>
<td>SHOP6</td>
<td>SHOP7</td>
<td>SHOP8</td>
<td>SHOP9</td>
<td>SHOP10</td>
<td>SHOP11</td>
<td>SHOP12</td>
<td>SHOP13</td>
<td>SHOP14</td>
<td>SHOP15</td>
<td>SHOP16</td>
<td>SHOP17</td>
<td>SHOP18</td>
</tr>
</tbody>
</table>

### Annexure 7 - Cable labeling

#### a) Label legends
- SP1, SP2, SP3, SP4 refers to optical splitter module numbers
- ODF1, ODF2, ODF3, ODF4 refers to patch panel modules where fibre drop or multicore cables are connected
- P1, P2, P3, P4 refers to splitter or patch panel ports
- MODF1, MODF2, MODF3, MODF4 refers to mini ODF number where multicore cables are connected
- SHOP1, SHOP2, MEZ1, MEZ2, F101, F102, F801 refers to the shop, mezzanine and flat numbers of the building

#### b) Label size
- SP1/P1 - ODF1/P1
  - Label size 9mm
  - Font size 5mm, black color and all capital

#### c) Patch cord labeling
- End 1 (Splitter side)
  - SP1/P2 - ODF1/P2
    - FROM Splitter 1/Port 2
    - TO Patch panel 1/Port 2

- End 2 (Patch panel side)
  - ODF1/P2 - SP1/P2
    - FROM Patch panel 1/Port 2
    - TO Splitter 1/Port 2

#### e) Fibre drop cable labeling - in Patch panel & mini ODF
- MODF1/P1/3F - ODF1/P1
  - FROM Mini ODF number 1/Port 1
  - TO Patch panel 1/Port 1
  - TO Flat Number 101
# Annexure 8 - FTTH Installation Checklist

<table>
<thead>
<tr>
<th>SN</th>
<th>Descriptions</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Fiber Distribution Hub (FDH)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is the FDH secured properly?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is FDH properly earthed?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is FDH tidy and clean?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is internal cable management properly done?</td>
<td></td>
</tr>
<tr>
<td>B. Optical Splitter and Patch Panel Modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is the Module(s) placed properly within the rack?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Does splitter rack have enough space for maintenance purpose?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is the splitter and patch panel properly labeled?</td>
<td></td>
</tr>
<tr>
<td>C. Patch Cord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is the patch cord linking the splitter and patch panel (drop module) properly routed?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is the patch cord arranged and properly secured?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is patch cord bending does not exceed maximum bending radius?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is patch cord properly labeled?</td>
<td></td>
</tr>
<tr>
<td>D. Fibre Drop Cable (for direct fibre &amp; multicore riser)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is it made sure that cables are not in contact with any heating pipes located above the ceiling?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are the drop cables from each floor bunched together for easy identification?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is fibre cable fitted with the right connector?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is fibre cable properly labeled?</td>
<td></td>
</tr>
<tr>
<td>E. Multicore Riser</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Are individual fibers terminated based on EIA/TIA 568 standards?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is individual fiber properly fitted with right connector?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is multicore cable properly labeled?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. Mini ODF (for multicore riser)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is the mini ODF properly fixed in the floor telephone room?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is the mini ODF properly labeled?</td>
<td></td>
</tr>
<tr>
<td>G. Micro ODF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is micro ODF properly fixed in the indoor equipment cabinet?</td>
<td></td>
</tr>
<tr>
<td>H. UTP Cabling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Is the total length of the CAT 6 cables including any patch cords or drop cables at each end below 100 meters?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are the cables do not have kinks and bends that exceed its minimum bending radius?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are the UTP CAT 6 cables are kept a safe 12 – inch separation from power cables and other potential sources of EMI (electrical cables, transformers, light fixtures, etc.)?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are all the communication sockets firmly fixed in the wall?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Does all the connection points and cables are properly labeled.</td>
<td></td>
</tr>
</tbody>
</table>

# Annexure 9 - Structure Identification Plate

- EID Font type "Arial Narrow" in Bold characters
- Etisalat logo in the middle top portion
- Details must be laser-printed/engraved